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Exploring Digital Equity Through Parent Perceptions of Students' Use of 1:1 Devices: a Mixed Methods Approach

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by

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Abstract

Over the last two decades, 1:1 initiatives, in which each child in a school building is provided a school-issued device, have increased dramatically around the world. However, the outcomes of such programs are not always clear and studies regarding 1:1 one programs have found mixed results. It is important to ensure that1:1 initiatives are equitable and do not perpetuate the digital divide. Many studies exist that examine use of 1:1 devices in schools from a teacher or student perspective. However, only a few studies examine the experience of 1:1 initiatives from a parent perspective and also focus on equity. The purpose of this mixed methods study was to explore parents' perspectives about their child's use of school-issued devices for learning and completion of schoolwork in school and at home. The setting for this study was a rural school district in the Mid-Atlantic region of the United States, which began implementing a 1:1 initiative several years ago. An online survey comprised of demographic questions, Likert-scale items and open-ended response was utilized to collect information regarding parents' feelings about the devices. Results of the study find that parents are generally positive regarding the devices and feel they are important for their child's learning, but parents still have some concerns. This study also found that access to reliable, high-speed internet is still a barrier in this rural community.

Keywords: 1:1 initiative, 1:1 device, digital divide, digital equity, educational technology, parent perceptions, rural schools

Chapter 1: Introduction to the Study

School districts are investing vast amounts of time, money and training in technology in an effort to transform education and move instruction into the 21st century. This transition can be seen through the adoption of online assessments, digital textbooks, open-access resources, data management, and digital learning platforms. In an effort to increase students' access to and use of technology, many school districts have increased the number of devices available to students, which is often achieved through the implementation of one-to-one (1:1) device initiatives (Harper & Milman, 2016; Penuel, 2006). The specifics of 1:1 programs vary greatly based on a variety of factors, including the type of device and whether students use them only at school or are also allowed to take them home. The stated goals of 1:1 programs often include encouraging 21st century learning, increasing student motivation and engagement, developing technology skills necessary in today's world, and addressing equity concerns (Imbriale et al., 2017).

However, while stories highlighting innovative technology use in schools appear frequently in the news, research suggests that the average student in everyday classrooms is not experiencing such transformative technology (Evans, 2019). Even though a great deal of time and money has been expended increasing technology resources in public schools, many barriers to innovative use of technologies remain (Schnellert & Keengwe, 2012). Research shows that differences persist in the ways in which technology is used with different populations of students (Rafalow, 2018). For example, Reich and Ito (2017) found that while schools of differing socio-economic levels had access to the same technology, teachers in more affluent and often White schools were more likely to use technology in innovative ways compared to teachers in less affluent and predominately minority schools. These different uses of technology across schools may result in digital inequities based on students' race, gender, socioeconomic status, class,

primary language, and geography, among other factors. This research also indicates that teacher attitudes and use of technology play a role in how technology is used with students and that teachers, as a dominant group over students, greatly control how students interact with technology for instruction.

The increase in available technology, coupled with the growing recognition of digital competency as a necessary skill for success in school, has also led to a greater emphasis on students' access to and use of technology at home (KewalRamani et al., 2018). Even though increasing numbers of students are being given school-issued devices for use at home, a digital divide exists between students who have both the access and the knowledge to use devices in ways that support learning and those who do not (Moore & Vitale, 2018). There are a number of factors contributing to digital inequity at home, the most basic of which is access. Ali et al. (2021) reported that prior to the COVID-19 pandemic almost 30% of K-12 students lacked either sufficient access to high-speed internet and/or access to a device such as a desktop or laptop computer necessary to complete schoolwork at home. Beyond access, students also need to possess the necessary digital skills to utilize devices for completing work. As with any homework, students (especially younger students), may need support from family members to successfully complete assignments. In addition, parents make the decisions about purchasing, sustaining, maintaining and monitoring family technology use. Therefore, family factors, such as parents' experience and comfort with technology can impact students' use of devices. For example, if parents cannot afford, or choose not to pay for unlimited wireless access, students' computer time may be limited. Also, parents often have valid concerns about students' use of devices, including being distracted or off-task, loss of family social time, ability to monitor students' use, having the technical skills to help students, online safety and concerns related to

increased screen time and reduced physical activity (Bate et al., 2013; Hollingworth et al., 2011; Jin & Schmidt-Crawford, 2017; Keane & Keane, 2018). Another concern held by some parents, especially minority or low-income families, is fear of having to pay for damaged, lost or stolen devices (Katz & Gonzalez, 2016; Jin & Schmidt-Crawford, 2017; Nogueron-Liu, 2017). For all of these reasons, simply giving students devices to take home will not achieve equity. In fact, it may perpetuate inequities due to lack of access or digital competence. Exploring educational technology use through a critical lens can help to identify these inequities.

Including parents in the planning, implementation and evaluation of one-to-one programs could also result in more successful technology outcomes. Tsuei and Hsu (2019) found that establishing parent-school partnerships and cultivating positive parent perceptions about devices was important to the success of students' use of technology for school related homework tasks. Varier et al. (2017) also found that parent concerns can greatly impact how effectively teachers can use 1:1 devices for homework. However, when schools are making decisions regarding 1:1 devices, parents are largely left out of the process. Research which explores families' experiences using devices at home to complete schoolwork would help inform this issue. This is the case with research regarding educational technology as well. Parent perspectives are almost completely lacking in the literature. Therefore, research that looks at educational technology from a critical perspective by examining inequities, and also employs a parent perspective are both needed to help understand the inequities that exist.

Background

Over the last several decades technology has become more prevalent and more widely available in schools. What began in the 1980's as a few desktop computers in a computer lab has evolved to a computer for almost every student in many schools. As technology has become

more widely available and the price of mobile devices has dropped, many schools have instituted one to one computing initiatives, in which every student is given a school-issued device (Penuel, 2006). According to one survey of instructional technology leaders from across the US, 82% report that their districts are providing devices to students to try and reach the goal of a 1:1 device ratio (Maylahn, 2019). However, these initiatives are expensive. Bulman and Fairlie (2016) report that providing laptops for all of the public-school children in the United States would cost "tens of billions of dollars each year even if these laptops were replaced only every three years" (p. 3). That figure does not include all of the associated costs such as paying for the learning management software, personnel required to manage and troubleshoot devices, infrastructure and staff development.

As the meaning of 1:1 initiatives can vary, it is important to define how the concept will be used for the purposes of this study. The term "one to one" (often abbreviated 1:1) is used in a combination of phrases in the literature and has a variety of synonyms including: one to one laptop, one to one device, one to one computing, one to one initiative and one to one learning, just to name a few (Zheng et al., 2016; Imbriale et al., 2017; Vu et al., 2019). Defining the idea of a "1:1 device initiative" is complex. The implementation of such programs is multi-faceted and often varies across countries, states and districts based on the ideas and goals envisioned (Richardson et al., 2013). The idea of a 1:1 initiative encompasses many types of devices, who provides the device, and where and for what purposes the device is used (Penuel, 2006; Zucker, 2004). For the purposes of this study, 1:1 will be used for one to one; device will refer to any mobile tablet or laptop device with internet capabilities. Smartphones are not included because they often have limited functionality for completing schoolwork (Becker et al., 2020; Mardis,

2016). For the purposes of this study, the term *1:1 device initiative* will refer to any school or district plan to provide a school-issued device to every student for use at school and at home.

Statement of the Problem

One commonly stated goal of 1:1 programs is to increase access and equity for all students. During the COVID-19 pandemic digital equity was highlighted due to the number of students forced to learn remotely during widespread school closures. While the pandemic brought this issue to the forefront of everyday society, digital equity has been a recognized issue in education for several years. The US Department of Education (USDOE) specifically addressed the issue of digital equity in its National Education Technology Plan Update with a stated goal of greater access and equity in use and availability of technology with students (USDOE Department of Educational Technology, 2017). Another US government agency, the National Center for Education Statistics (NCES) published the Ed Tech Equity Initiative to focus on equity as it relates to technology. This publication recognized that the same inequities that often exist with respect to certain populations such as students with disabilities, English learners, and those from minority race/ethnicity groups can also be found with technology use and outcomes (NCES, 2019). Considering and combining several different views, Becker (2007) suggests that in education, digital equity means ensuring that technology resources are equally distributed across schools regardless of school factors and that educational technology use is also equally distributed and not dependent on student factors.

Another goal of most educational technology programs is to help students develop the digital literacy and citizenship skills they will need to be successful in life beyond school. Development of digital skills requires that students use technology to foster 21st century skills such as communication, collaboration, creativity and critical thinking, not just for lower-level

tasks such as practice or remediation of skills. The importance of these higher order skills is evident in the International Society for Technology in Education's (ISTE) seven standards, identifying the student as an: empowered learner, digital citizen, knowledge constructor, innovative designer, computational thinker, creative communicator, and global collaborator (ISTE, 2021). However, studies have found that schools with higher socio-economic populations more often use technology in ways that support higher order thinking than schools of lower socio-economic populations[1] (Hohlfeld et al., 2017; Reinhart et al., 2011). Similar findings were reported by Reich and Ito (2017), who found that even between schools with the same access to technology, those "serving privileged students" used technology "in more progressive ways" than schools serving less privileged populations (p. 3). Thus, even in schools with similar technology access, technology is often used in ways that reproduce inequities for students who come from lower income populations and minority groups. Even if every student has a school-issued device (equity in access), the ways that students use the devices in school and at home can result in inequities.

Access at Home as a Means to Equity

The US Department of Education recognizes that access to digital resources outside of school buildings plays an important role in student success. The Every Student Succeeds Act (ESSA) mandated that the Institute of Education Sciences (IES) produce a report detailing students' access to digital learning resources (DLR) outside of school buildings (KewalRamani et al., 2018). A new term donned 'the homework gap,' which views the old idea of homework through the lens of digital equity, has also become prevalent in K-12 education. In a report by the

[1] Designation of socio-economic status schools was based on numbers of students receiving free and reduced lunch.

non-profit organization Common Sense Media, Fazlullah and Ong (2019) define the homework gap as “the divide between students who have home access to broadband internet and the digital tools needed to be academically successful and those who do not” (p. 4). While lack of broadband availability may be the main barrier for rural students, affordability of broadband continues to be an issue for urban and suburban students (Ali et al., 2021; Naff, 2020). However, simply having broadband access is not enough to ensure digital equity for students’ use of digital technologies at home. The need for ubiquitous access requires consideration of a wider range of variables than simply who has broadband access and who does not (Fox & Jones, 2019). There are many more factors that contribute to equity than just providing all students with a device for home use. Digital equity and the homework gap have been recognized as issues in education for many years. However, the recent widespread school closures and the need for many school districts to quickly switch to remote learning during the COVID-19 pandemic has suddenly highlighted this issue that has been lurking in the K-12 education background for years. While the access gap may have narrowed, there are still millions of students in the US without the access they need to complete learning, especially entirely remote learning, from home.

Socio-Cultural Factors Impacting Home Use

Students’ learning and success in school is not only dependent on the instruction that occurs within a school building. A great deal of children’s learning occurs through interactions with adults and other family members in their home and community. This includes parents’ views and experiences with technology. Research on the digital divide has found that relationships exist between socio-demographic factors and adoption and use of the internet among adults (Remaley, 2020). These adoption rates in the home and community are important because they impact students. Horrigan and Duggan (2015) reported that broadband adoption

rates have begun to plateau as more people are moving to smartphone and data packages as their primary internet access. The trend is more prevalent among African Americans and Hispanics, who already reported lower levels of broadband access. This suggests that even fewer African American and Hispanic families in the US are likely to have a broadband connection at home (Horrigan & Duggan, 2015). Of those who report not having home broadband, 59% identify cost as the reason, meaning that students in lower-income households may also have less access. Thus, lack of access could have a significant impact on African American and Hispanic, as well as low-income students' ability to complete schoolwork.

Level of education is another significant indicator of broadband adoption. In 2013, 90% of adults aged 25 and older with a bachelor's degree reported having home broadband, compared to 79% of those with some college and only 43.8% of those without a high school degree (Council of Economic Advisers, 2015). Geography plays a significant role in levels of broadband adoption as well. Rural areas of the US, especially in the Southeast and Southwest, are significantly less likely to have high broadband adoption rates, as are some areas of the Midwest (Council of Economic Advisers, 2015). These areas represent high concentrations of African Americans (in the case of the Southeast) and high concentrations of Native Americans living on tribal lands (in the case of the Southwest). However, stratification exists in urban centers as well. When looking at the concentration of broadband adoption in metropolitan areas, the same low levels of adoption are found in sections of cities with lower incomes as is found in rural areas. These data show a strong relationship between geography and broadband availability, which indicates that students in rural areas, and students in lower income urban areas, are both at a disadvantage when trying to complete schoolwork at home due to lack of dependable high-speed internet. Together, these findings suggest that students whose family has less educational

attainment, are African American or Hispanic, have lower incomes, or who live in rural or low-income urban areas will generally have a harder time completing schoolwork due to access issues, even when provided a school device to use at home.

This trend became especially clear during the school closures for COVID-19. In a poll conducted with California parents from March 26-April 1, 2020, low-income parents (those making $50,000 or less per year in this poll) were less likely to report that remote learning would be successful for them. This poll also found that two of the top barriers to remote learning were lack of enough devices and lack of dependable, high-speed internet. In this survey 23% of parents report having technological issues using the learning management platform, and 65% give themselves an A or B rating related to using technology in general. That leaves 35% of parents who may struggle helping their children with remote learning due to technology issues.

Another issue that could prohibit students from completing work using devices is related to parents' comfort and experience with technology. Tsuei and Hsu (2019) used the Technology Acceptance Model, along with other external factors, to predict parents' acceptance of integration of technology into students' learning. They found that parents' beliefs, experiences using technology with their children, attitudes toward technology in general, perceived ease of use and perceived usefulness all had significant positive relationships with parents' feelings toward use of technology in their child's education. Based on these results, it appears that parents' overall opinions about technology extend to their feelings about children's use of technology. Hollingworth et al. (2011) reported similar findings related to social class status. Generally, working class parents who reported less technology expertise reported higher levels of concern about their children's use of technology. Alternatively, middle class parents expressed less concern, and more confidence in their ability to monitor their children's use of technology.

In almost all reports, the overwhelming majority of parents indicated that technology is an important, and even necessary component of education today (Bate et al., 2013; Hollingworth, 2011; Keane & Keane, 2018; Ortiz et al., 2011; Tripp, 2011). However, parents also have genuine concerns about their children's interaction with technology. The Pew Research Center (2020) polled 3,640 parents with children ages 17 and below and found that 71% were *somewhat* or *very* concerned about screen time for their children and 61% had sought advice from doctors or medical professionals about screen time. While parents were mostly concerned about non-educational uses, such as children watching YouTube or using social media, this concern can extend to using devices in general, especially mobile devices. If parents see children using school-issued devices for things other than schoolwork, such as playing games or watching videos, they may have fewer positive views regarding devices. In a survey conducted by Project Tomorrow during the 2018-2019 school year, 64% of parents were concerned about their children having too much screen time (Evans, 2019). However, only 1/3 of those same parents were concerned about the amount of screen time for children while in school, possibly indicating that parents place a higher value on time spent on devices for educational purposes than for entertainment. These findings have implications for evaluating parents' beliefs about device usage, indicating that it may be necessary to specifically ask about use of devices for education rather than entertainment.

Recent research has clearly established that, while home internet and device access have increased over the last decade, digital equity remains a concern that needs to be addressed in K-12 education. Some populations of students are disproportionately affected by issues of access, including students of color and students from low-income families. The digital divide literature also identifies factors beyond simple access, such as digital skill level and competency of

students and parents can also impact students' ability to complete schoolwork at home. Studies that focus on how families are experiencing these inequities can help to inform educational practice and work toward finding solutions to close the digital divide and ensure equity for all students.

Theoretical Foundations

Many theories could be considered as a framework for conducting a study on educational technology. In considering which theories I would use to guide the current study two frameworks guided my work. Neoliberalism emerged as a helpful theory because the basis of many 1:1 initiatives comes from the idea that providing each student with a device to use at home and at school will achieve equity. This assertion seems to be rooted in the neoliberal assumption that if education provides an "equal" playing field, then students' success or failure is a result of their own effort. A critical framework also guided my thinking about educational technology because many of the studies regarding educational technology began from a stance that perceived technology as beneficial. Looking at technology through a critical lens can help to balance this perspective.

Neoliberal Views of Technology

Neoliberalism is a theoretical perspective that is useful to consider when viewing educational technology through a critical lens since many ideas about technology use in education stem from some basic Neoliberal assumptions. Neoliberalism began as an economic philosophy and is based on the ideas of free (unregulated) markets, increased privatization of government functions, and a general decrease in government oversight and interventions into economic issues (Perez & Salter, 2019; Schmeichel, Sharma & Pittard, 2017; Shutkin, 2005). In

the neoliberal view, educational technology is seen as a way to make education more efficient and equalize the playing field so that students can take control of their own learning. From a neoliberal standpoint, we live in a post-racial world where racial differences are minimized and individual success is based on one's own intelligence, effort, and merits (Au, 2015). This vision of the "pull yourself up by your bootstraps" ideal supposes that all other factors are equal, and success depends solely on an individual's hard work and desire to succeed.

Many 1:1 initiatives are also centered on the idea of personalized learning and making schooling more efficient and individualized. This may at first sound like a worthy goal, as it could offer the ability to accelerate students who desire advanced learning opportunities, offer supports for students of differing abilities, or support students for whom English is not a primary language. From a neoliberal standpoint, however, technology is viewed in terms of dollar signs, as a way to make learning more efficient and potentially decrease spending on staffing and personnel. The idea of technology replacing teachers may seem more efficient and less expensive, however building relationships with teachers has always been considered a key tenet of education. While it might be ideal to say that students can be more efficient and complete more coursework faster working online or through self-paced courses, this learning style may not meet the needs of all learners. For example, Valenzuela (1999) spent several years in a school with a high Mexican immigrant population and found that one of the most important factors for Mexican American students' success in schools was having meaningful, caring relationships with teachers. Therefore, the idea of computers and online learning replacing teachers may not turn out to be as desirable as it first seems to some.

The underlying idea of technology initiatives, and many 1:1 initiatives, seems to be based on these same assumptions of an equal playing field (e.g., if we give all students the same device

and access to the internet then their success or failure is a result of effort they expend). There are several problems with this thinking because other factors that influence students' learning and behaviors are not addressed. However, the research addressing the results of 1:1 initiatives on students' learning is not definitive (Harper & Milman, 2016; Islam & Gronlund, 2016; Zheng et al., 2016). It is similar to thinking that if we give children more books they will automatically learn how to read and become better readers. Just like with any other instructional method or tool, the specific technology should be carefully considered with regard to whether it is actually beneficial and not just using technology for technology's sake.

Several problems arise when one views progress as the inevitable outcome of technology in education. First, this thinking views technology from a technological deterministic view, which assumes that technology will change students' outcomes and that it will do so in a positive way. Selwyn (2012) cautions against taking a technological deterministic view because it focuses on the technology and tends to leave out all of the other societal factors that affect students' use of technology. Second, it assumes that all students have the necessary access and skills to use devices for learning, which is not always the case. For example, Aesart and van Braak (2015) found that while students scored higher on basic information and communication technology (ICT) skills such as searching the internet, the same students scored much lower on higher order ICT skills, such as evaluating information they found in their internet searching. Findings such as these show that students' ICT skills vary, which could impact their ability to use devices to complete assignments. Lastly, students who lack necessary ICT skills may struggle with online assignments, especially if they do not have a person at home who has the ICT skills and knowledge to help them. Together, these factors negate the assumption that providing students with devices alone can achieve digital equity.

While the implementation of 1:1 initiatives are often promoted as a way to achieve equity, other factors also influence school divisions' decisions regarding technology purchases. With the move to online assessment and online textbooks, as well as other digital content used in instruction, the number of devices needed per student has increased. This need for more devices, coupled with the falling cost and increased availability of mobile devices has allowed school districts to purchase more devices. Additional devices require the purchasing of learning management platforms such as Blackboard, Schoology, and Clever, subscriptions to educational programming, purchasing of online assessments and textbooks. While many school budgets for things such as professional development and basic supplies such as paper and library books have steadily decreased, the expenditures on technology hardware, software, and associated infrastructure to support it has steadily increased. Meanwhile, the money spent on hardware and software often does not include staff development nor the personnel required to establish and maintain technology. The result of all of this is that the educational technology market has become a huge capitalist endeavor, where private industry and companies profit from schools purchasing more technology (Picciano & Spring, 2013). The environment of efficiency and high-stakes accountability prevalent in public education discourse also puts pressure on school divisions to keep-up with technology in order to appear innovative when compared to other school divisions (Cuban, 2012). While equity may be one goal of educational technology, in the high-stakes education environment it may not be the primary concern. Other factors such as online testing, ease of data management and record keeping may be the bigger motivators driving technology purchasing.

Viewing Technology through a Critical Lens

In *Official Knowledge*, Apple (1993) argues that the highly lucrative economic market around textbooks has created a competitive market. The result is that decisions made about which textbooks are published are often driven by the capitalist market. A similar market has developed in the field of educational technology, where devices such as XO® tablets, iPads®, and more recently Chromebooks®, have dominated the market. Similar to the textbook adoption committees of the past, decisions about electronic devices are often made by a small committee of school members with cost being the most significant factor (Vu et al., 2019). Sufficient thought is often not given to how the devices will actually be implemented with students in classrooms and at home. Parents are rarely involved in such decision-making committees. Just as the capitalist market has become the driving force for textbooks, so has profit become a driving force in educational technology. Picciano and Spring (2013) discuss in detail how the educational technology market is led by private corporations, tech companies and non-profit organizations all pushing their own agendas. This has resulted in what the authors call the *great education industrial complex* in which companies and profit may influence educational technology decisions more than concerns about equity. Educational research that views technology through a critical lens, instead of an assumption of the positive outcomes of technology can help shift the focus away from money and back toward equity.

This shift to a critical perspective of educational technology is needed in order to balance the research that largely views technology from a technological deterministic approach. Selwyn (2012) argues that the majority of research conducted in the field of educational technology is conducted by researchers who themselves rely on technology and thus tend to "focus mainly on the potential of technology use to 'enhance' learning and cognitive development" (p. 82). His argument is that technology is not neutral, and that it needs to be viewed in light of the forms of

power and profit which are part of the technology world. It is not only educators who view technology through a technological deterministic lens. Parents may also fall into the mindset that children's technology use in schools is an inevitable part of schooling today. As researchers, the questions we ask about technology, what we choose to study, how and why all have implications for our outcomes. There is a need, then, for technology research that addresses the issue from a critical lens instead of a technological deterministic view.

There are additional problems with the field of educational technology research. Selwyn (2010) also argues that academics studying educational technology tend to focus on "how people can learn with digital technology" and more studies need to focus on "how digital technologies are *actually* being used – for better or for worse- in 'real-world' educational settings" (p. 66). Much of the research around educational technology takes a learning sciences approach, focusing on the ways that learners interact with technology, but not taking into account the variety of societal factors that affect how learners interact with technology. Selwyn (2010) states, "a critical approach seeks to move beyond the deterministic assumption that technologies possess inherent qualities and are therefore capable of having particular 'impacts' or 'effects' on learners" (p. 68). He also suggests that taking a critical approach "does not entail a dogmatic adherence to any particular theoretical stance, school of thought or '-ism'" (Selwyn, 2010, p. 68). According to Selwyn, a critical approach to educational technology research focuses on how educational technologies are being used and experienced by users right now and in context, not on some theoretical vision of how they should or will be used in the future. This study strives to take a critical stance to educational technology by not focusing on how technology should or will impact students, but instead focusing on the actual experiences of students using school-issued devices for learning at home. This study also takes into account societal factors by focusing on

parents' perceptions of students' use of devices at home versus at school. Many traditional studies focus on how students use technology in the classroom from the teacher perspective. This study strives to look at how parents perceive students' use of devices. This includes gathering information about parents' concerns and barriers that are experienced by students using devices at home. The parent perspective was chosen because that perspective is lacking in the literature, as suggested by only five studies that were found to address parent perspectives. The critical view of educational technology, as suggested by Selwyn (2010), should also strive to uncover inequities that result from use of educational technology and suggest ways to address them. That is why this study asked specifically about barriers experienced and concerns expressed by parents and families using devices at home.

As schools are increasingly providing students with devices and expecting them to use the devices at home, it is important that research explore how this affects students and families. While many studies have focused on technology use in schools, fewer studies have focused on students' uses of technology outside of schools. Ito et al. (2009) point out one thing that is lacking in the literature "is an understanding of how new media practices are embedded in a broader social and cultural ecology" (p. 537). Even as access to technology and high-speed internet has increased in recent years, simply having access to devices at home does not mean that all students will be able to use them in ways that benefit them with schoolwork. As Beckman et al. (2018) suggest, "moving toward an understanding of technology practice in and across contexts may uncover digital inequalities and how they may be reproduced and transformed" (p. 198). Research regarding students' technology use at home is increasingly important as students are expected to use devices at home. The variety of factors that impact student use of technology at home, including device access, internet access and parent support all need to be considered.

Studies such as the current study, which examine students' use of devices at home help to fill that need.

It is clear that many factors other than equity impact decisions about educational technology. Varying political, economic and educational views are considered when school districts implement technology initiatives that impact families. Studies such as the current one, that focus on how technology decisions are experienced by families, and how students are increasingly expected to use technology to complete schoolwork at home, can help to understand the impact that educational technology decisions have on families. Understanding how technology may be experienced differently by families of varying social and economic groups, as in the Hollingworth et al. (2011) study, can help to ensure that digital inequities are not perpetuated. The current study also specifically incorporates items to elicit barriers and concerns in an effort to overcome the bent toward technological determinism in educational technology research, while at the same time trying not to unduly influence the respondents' responses.

Positionality

While I believe that educational technology can enhance teaching and learning, from a critical standpoint as an educator and parent, I am concerned about the lack of inclusive decision-making that often occurs with technology initiatives. This topic is of personal interest to me because of my work as a librarian in a public-school setting over the last 20 years. I have watched firsthand as various devices, hardware and software have come and gone with little input from either teachers, parents, or students. This has resulted in a hodge-podge of technology cobbled together with no real change in the curriculum or teaching, often resulting in high levels of spending with little result.

As an advocate for my students, I am also concerned about digital equity. I feel that it is important to understand the impact on families whenever large-scale projects such as 1:1 initiatives are undertaken. To ensure equity, parents and families need to be included in the decision-making process regarding devices that are expected to be used at home. I am also the parent of a high school student in a school district where a 1:1 initiative was phased in for the middle school in my daughter's first year of middle school. I have had the unique perspective of being able to watch the process over four years as a parent and educator living and working in a rural school system. My discussions with other parents about issues, concerns and expectations for how students use the devices and access barriers led me to consider how parents' perceptions and access at home can result in inequities. During the pandemic, I experienced first-hand what it was like as both a parent and educator to transition from fully in-person schooling to fully remote and hybrid schooling. My personal experiences as an educator, parent, and advocate for my students has greatly influenced my interest in digital equity.

Purpose of the Study

The purpose of this mixed methods study was to explore parents' perspectives about their child's use of school-issued devices for learning and completion of schoolwork in school and at home. This study was conducted based on a constructivist worldview that sought to better understand the feelings and experiences of the participants. Both quantitative and qualitative methods were used in an effort to understand the range of parents' perceptions more fully. The data was collected simultaneously employing a convergent design. The overarching research question (RQ1) for this study was: *How do parents feel about students' use of school-issued devices for learning*?

Other research questions to be addressed in this study include:

RQ2: *How do factors of race, access, education, income, geography and technology acceptance impact parents' perceptions of children's use of 1:1 devices for learning?*

RQ3: *What are parents' observations, feelings and concerns regarding students' use of 1:1 devices for learning?*

RQ4: *What barriers have parents experienced regarding students' use of devices for completing schoolwork at home?*

Need for This Research

The homework gap and the digital divide are well-documented problems existing for students and families. Even as more devices are being provided to students, and more students are being expected to use devices at home, there are still students who will not be able to complete their schoolwork at home due to a variety of factors. It is important that educators understand these factors in order to avoid reproducing digital inequities. Research that explores how families navigate using devices at home can help inform educators. There is a limited amount of research addressing use of 1:1 devices at home. The majority of the research focuses on students' use of 1:1 devices in school. In a literature review of 1:1 technology from 2004-2014, Harper and Milman (2016) found that the most common themes were: student achievement, student motivation and engagement, classroom uses, barriers to classroom use and changes to the learning environment. There is also a fair amount of research about how students use technology for personal and entertainment uses outside of school. However, there are very few studies which focus on students' uses of technology outside of school for learning. Also, since parents are in charge of providing access for students and are also often in control of how students use their devices and how much time they can spend on devices, it is important to

understand parent perspectives. As parents are valuable partners in students' success completing schoolwork at home, their beliefs, concerns and feelings are important to understand. In the review of the literature only five studies were found which specifically addressed parent perspectives of 1:1 initiatives (Bate et al., 2013; Chappelear, 2019; Håkansson Lindqvist, 2021; Jin & Schmidt-Crawford, 2017; Keane & Keane, 2018). Therefore, more research in the field can help to inform this issue. Since the digital divide is well-documented, studies which include barriers, as the current study does, help contribute knowledge to the field from a perspective that looks critically at educational technology. The use of quantitative and qualitative methods allowed me to gain a more complete picture of how parents and families experience use of devices than would use of either approach by itself. Of the five studies which specifically addressed parent perspectives of 1:1 initiatives, four used mixed methods surveys with Likert scales and open-ended response questions (Bate et al., 2013; Håkansson Lindqvist, 2021; Jin & Schmidt-Crawford, 2017; Keane & Keane, 2018), and one used qualitative methods (Chappelear, 2019). The current study also utilized a mixed methods survey with a variety of Likert scales and also open-ended response questions. This study adds to the literature by expanding the understanding of parents' and families' experiences and perspectives that is lacking in the research.

Summary

Over the last two decades vast amounts of money have been spent by K-12 school districts to implement 1:1 device initiatives, where every child in the school building has a computer, tablet, laptop, or other school-issued device. As schools increasingly provide 1:1 devices, more research is needed to explore the many aspects of such large scale and costly programs, especially since findings regarding the effectiveness of 1:1 devices have been mixed

(Zheng et al., 2016). Decisions about these initiatives are typically made by a small committee of members, leaving other stakeholders, including teachers, students and parents, out of the process (Vu et al., 2019). One area that is quite often overlooked is parent involvement in the process of implementing the program and expectations for how students will use the devices provided to them by the district (Jin & Schmidt-Crawford, 2017). Access at home, along with parent views of technology is another factor which can adversely impact student use of devices; therefore, these issues need to be considered (Keane & Keane, 2018; Varier et al., 2017). In our growing technological world, having the tools and resources, as well as the knowledge to employ technology for themselves and with their children is increasingly seen as a dominant form of capital. Parents who do not engage in the many aspects of technology or adopt technology for themselves are often perceived as lacking and unable to fully participate in their child's education (Hollingworth et al., 2011). Therefore, parents' perspectives about their child's technology use for learning need to be explored since they may impact the success of their children's digital learning. Maybe more importantly, as educators concerned with equity, it is important to understand the effect that school initiatives have on families and students.

Chapter 2: Review of Literature

This review of literature begins by focusing on empirical studies that examine the relationship between sociocultural factors and digital equity. Studies which address access are discussed first, followed by how differing levels of access affect children's use and outcomes. The second part of the review assesses the existing literature on 1:1 initiatives. The last section focuses on parents' views about their children's use of educational technology in general and 1:1 initiatives specifically. Focusing on parents' perceptions about technology is important because it might impact how parents perceive and monitor their children's use of devices and also the level of access available at home. The main focus of this literature review concentrated on findings regarding parent perspectives of technology, and specifically parent perspectives of 1:1 initiatives directly involving their families with devices provided by schools for their children to use in school and at home.

Methodology

This literature review focused on three main topics: 1) the digital divide as it relates to K-12 education; 2) 1:1 device initiatives and programs that have been employed in educational settings over the last several decades; and 3) parent perspectives of children's technology use for educational purposes. The first search of literature focused on the more general topic of digital equity and the digital divide in education. The purpose of this search was to establish if a divide exists, and if so, what research has been conducted that explores this topic. I began by searching for the terms: *education* and *digital divide* or *digital equity* in Google scholar to gain a broad view of the existing literature and to establish appropriate terms for keyword searching. This was helpful, but many of the articles were not fully accessible through Google Scholar. I then searched in the Academic Search Complete database for articles using the same terms and

published in English, which resulted in 3,573 sources. Limiting the search to scholarly journals further narrowed the results to 707 sources. Skimming the titles and abstracts, I eliminated most of the articles because they related to healthcare, adults and the elderly, higher education, or specific fields such as librarianship, which left 57 articles. A more thorough reading of the remaining articles led me to exclude articles that were related to education but focused on technology use in specific curriculum (e.g., use of devices for a digital history project). Articles relating to access were excluded if they reported findings based on data collected prior to 2010, since more recent data is available. Additional articles were identified through citation snowballing, using the reference lists at the end of articles to identify sources cited in multiple publications.

The second topic focused on 1:1 initiatives. I followed the same procedure beginning with Google Scholar to familiarize myself with the literature, then searched the Academic Search Complete database using the following terms: *1:1 laptop*, *1:1 device*, *1:1 initiative*, *1:1 computer*, *1:1 computing*. This search resulted in 31 sources. Some of these articles were excluded because they were not related to education or focused on a specific educational aspect such as the school librarian's role in 1:1 initiatives. Other articles were excluded because they studied perspectives of pre-service teachers or focused on a specific use of 1:1 devices in education, such as gaming or educational programs. A second search using the same terms in the database Education Research Complete yielded 55 sources. The majority of these were duplicates of articles found in the first search. Several others were excluded because they focused on a specific aspect of 1:1 uses not related to education in general. The last search of these terms used the ERIC database and returned 96 results. Most of these were the same articles that were already found or excluded from the first two searches. Reviewing the titles and

abstracts for these results, many of the non-duplicated articles were discarded because they were no longer accessible, were not empirical articles, or focused on a specific use of devices.

The final literature search focused on parent perspectives regarding children's use of technology for education in general, and 1:1 devices specifically. During previous research on this topic, I discovered that the terms *educational technology* and *information communication technology (ICT)* are commonly used interchangeably. Therefore, the Boolean search: *ICT* OR *educational technology* AND *education* AND *parent perceptions* OR *parent perspectives* was used in the Academic Search Complete and ERIC databases. The initial search using Academic Search Complete returned 439 results, the majority of which were related to parents' perceptions of various health conditions and were excluded based on the title and abstract. Only ten articles were retained. The same search in the ERIC database returned 35 results, of which six were kept. A search was also conducted in both of these databases utilizing search terms: *1:1 device,* AND *parent perceptions* OR *parent perspectives*. All resulting articles were duplicates of those found during the search of 1:1 devices. Because parent involvement in children's technology use is also a topic frequently studied in other social sciences such as sociology, anthropology and psychology, I also searched the JSTOR database for *educational technology* OR *ICT* and *parent perspectives* or *parent perceptions*. While 200 results were returned, none were related to education. A search of the database Sociological Abstracts using the same terms also returned no related results.

Digital Equity and the Digital Divide In Education

Digital equity in education is based in large part on the digital divide. On a basic level, the digital divide is usually viewed in terms of three levels: access, use and outcomes (Dolan, 2016; Warschauer & Matuchniak, 2010). Access is the first concern because use and outcomes

are dependent upon access. Studies then address the uses and outcomes based on availability of access. A large portion of the literature regarding use and outcomes relates to use and outcomes within the school building. However, since my focus is on how students and families interact with technology in general, and school-issued devices in particular, I did not include those studies in the review. Instead, this review focused on access, use and outcomes as they relate to children's engagement with technology at home.

Home Access

While many general studies exist regarding the digital divide and access in economic and social terms, five were found which specifically address access through the lens of education and equity. In the earliest study, Vekiri (2010) used questionnaires to collect data from 345 fifth and sixth grade Greek students regarding ways that ICT experiences outside of school, such as activities with computers and parental support and monitoring, affected students' ICT self-efficacy and beliefs. For students in low socio-economic status (SES) households, 22.8% reported having no computer at home, as opposed to 8.8% of middle SES and 2.9% of high-middle SES students. Referring to internet access in the home, 44.3% of low SES students reported no internet, compared with 35% of middle SES and 12.6% of high-middle SES students. Additionally, 43.6% of high-middle SES students reported access to educational software, compared to 37.8% of middle SES and 13.2% of low SES students. Interestingly, Vekiri also looked at where in the home students had access to computers and/or internet. Students from the high-middle SES group indicated higher levels of access to a computer both in their room and elsewhere in the home (31%), while for middle and low SES students the numbers were 26.3%, and 17.7%, respectively. A similar trend existed for internet access within the home. High-middle SES students reported 25.9% internet access in their own room and

elsewhere in the house, compared with 18.8% of middle SES and 11.4% of low SES students. Data regarding where in the house access is available could be important because children who have access both in their room and elsewhere likely have more than one computer in the home, or wireless access throughout. Having more computers and ubiquitous access also means that students would not have to share these resources among many family members. Also, the location of computers within the house could affect how much parental monitoring or help students receive when using computers. If a student only uses a computer in their room, parents are less likely to be monitoring or helping students, as opposed to using a computer in a more communal space, such as a living room. This study helps to illustrate the complexity of the access issue. However, since access to technology changes so rapidly, more recent studies may provide a more accurate picture of current access trends.

More recently, Mardis (2016) conducted a secondary data analysis to study inequities in broadband access between rural and urban areas across Florida. This is an important topic to study because in 2015 Florida moved all instructional materials and assessment online. Using data from the "2013 US census, the National Broadband Map, and the Florida Department of Education," this study found that, among families with children under 18 living in the home, the most commonly cited reasons for not having broadband were because it was: *not needed/not important* (*n*=33, 47%), *too expensive* (*n*=28, 40%), or that *service was not available* (*n*=7, 10%; Mardis, 2016, p. 61). Overwhelmingly, the most significant factor related to rural broadband adoption in this study was a belief that it was not important or not needed. While those of lower incomes and lower levels of education did have slightly higher levels of non-adoption than those with higher incomes and levels of education, these factors were not found to play a significant role. While it is possible that parents truly do not feel broadband is important, it is also

reasonable to think that this could be the result of a confounding variable. Parents who cannot afford broadband might respond that it is not important rather than admit that they cannot afford the service. Broadband access might also be considered less important than other, more necessary items in households where income is limited. These findings could imply that, with respect to access, schools need to make a greater effort to provide access and also educate parents about the benefit of having broadband at home. Schools may want to provide students with wireless access at home even if parents indicate that they do not feel it is important. It would be valuable for future studies to provide families with access and education about its importance and then measure the effect of moderating variables such as parents' feelings toward broadband adoption on students' usage.

Another study, by Liao et al. (2016), focused on the access inequality between rural and urban students using national surveys conducted by the Research, Development and Evaluation Commission (RDEC) of the Executive Yuan, Taiwan. The sample of n =1953 responses, of which n =1008 were rural and n =945 were urban, measured differences between rural and urban students' digital self-efficacy (DSE). Urban students scored 1.337 points higher in DSE, which was statistically significant at the .1 level. Liao et al. (2016) also found that student factors such as family background and student characteristics accounted for 35% of the variance in DSE scores. When looking at non-student factors which contributed to this divide, number of computers at home accounted for 24% of the variance, while home internet accounted for 16% and the number of computers at school accounted for 36% of the variance in DSE between rural and urban students. These findings support the assertion that inequities exist between urban and rural students in Taiwan. They also point to the fact that access and use at home impact digital self-efficacy.

Ecuador is fairly representative of other South American and Caribbean nations and the progress they have made toward infrastructure and policy changes to enhance broadband access. In a study that used a random stratified sample of 3,754 secondary students in Ecuador, Tirado-Morueta et al. (2017) used structural equation modelling to determine if there was a direct effect of physical access on the development of operational internet skills. A significant direct effect of .36 was found on operational internet skills and indirect effects of physical access were also found in the areas of analysis and evaluation (.19), creative use (.06) and academic use (.08). Looking at socio-demographic factors, parents' level of education had a larger indirect effect (.10) than household income (.04) on students' operational internet skills. These results indicate that physical access may have implications for students' competency in digital skills and ICT. However, as Tirado-Morueta et al. (2017) acknowledge, this study did not include smartphones as an indicator for physical access. Excluding smartphone access could be considered a limitation of this study since smartphone-only access has increased in recent years.

The most recent study by Kim and Padilla (2020) looked at the impact of access on low-income families of school-age children living in a mobile park in Palo Alto, using in person surveys and follow-up interviews. Palo Alto city lies in the middle of Silicon Valley, and while Latinos make up 40% of the population in California as a whole, the Latino residents in Palo Alto account for only 6% of the population. The district is considered a middle-high income community, has schools that are ranked in the top 10% of the US based on graduation rates, and as a whole also has very high levels of computer and internet access at home (Kim & Padilla, 2020). However, this particular community of low-income Latinos had much lower levels of income, assess, and education than the larger population of Palo Alto. The participants in this survey included all 55 families living in the mobile park, with school-age children who all

attended the elementary, middle or high school at the public schools within the district. The average income of the mobile park residents was in the bottom third of the income level of the larger community. Of the families surveyed, 76.4% had access to high-speed internet at home, compared with 92.3% of the general population of Palo Alto. Only 63.6% of families had devices at home for students, with 12.7% owning a device and the other 50.9% utilizing a device provided by the school (Kim & Padilla, 2020). Of the 76.4% of families with high-speed access, 36.4% did not have a device. Slightly less than half (49%) of families reported having a smartphone in the home and students who had access to smartphones did indicate using them occasionally to go online. However, they also reported that the phones were not very useful or helpful for completing schoolwork. These students reported either completing schoolwork at school or going to other places with wireless access to complete work. Parents expressed mixed feelings about the online management systems used by the school. Some parents reported that having online access to communicate with teachers and monitor their child's grades and assignments was helpful. However, parents who were not very proficient in English shared that language was often a barrier to using and understanding the online platforms, since they were mostly only available in English. Kim and Padilla (2020) recommend that it might be beneficial for school districts to provide supports, such as training, for parents and also to consider utilizing online systems that are available in multiple languages.

As this research was taking place just prior to the COVID-19 pandemic, the Kim and Padilla (2020) decided to conduct some follow-up interviews with 10 of the families in August of 2020 to learn more about their experiences with technology during online learning. All of the families reported that the school provided devices to them during remote learning. Parents and students shared that while they had access to devices, having a stable internet connection was

often a problem, and that language was an even greater barrier when students were doing all of their learning remotely. These findings reflect what was largely reported regarding families' experiences with remote and virtual learning during the pandemic, that even when provided a school-issued device, barriers exist for families in using them for academics at home. This study provides further evidence that simply providing families with devices does not solve the problem of access, and this may have a greater impact on low income and minority families.

These five studies from different areas of the world represent developed nations from Eastern Asia, Europe, South America and North America. Each of these studies shows that digital inequities in access still exist, and taken together, they reinforce the idea that school children across the world are feeling the effects of digital inequities. This research also adds small-scale support to the findings of larger studies such as the National Center for Educational Statistics (NCES) report by KewalRamani et al. (2018) which noted that in 2015 overall, 87% of US households owned a home computer and 77% had access to the internet. However, these numbers varied greatly by state. For example, while 93% of homes in Utah, had a computer in 2015, only 79% of homes in Mississippi had them. With respect to the internet, 85% of homes in New Hampshire and Washington state had internet, compared to 62% of homes in Mississippi (KewalRamani et al., 2018). These findings show that states with higher average incomes and more White residents (such as Utah and New Hampshire) have higher rates of both home computer and internet than states like Mississippi, which have larger percentages of Black residents and higher levels of poverty. Adding the factor of geography, levels of fixed broadband at home were as follows: suburbs (85%), distant towns (70%), distant rural (66%), remote rural (65%). Looking at race/ethnicity data from 2015 within remote rural locations, 41% of Black households and 26% of Hispanic households had either no internet access or only dial-up access,

compared to 13% of White and 11% of Asian households. As noted by the Kim and Padilla (2020) study, even in relatively affluent areas, such as Palo Alto, California, access still disproportionately affects neighborhoods with lower incomes and minority populations. These data support the idea that disparities exist across America based on race/ethnicity, and urban/rural location. Clearly home access is still an issue which needs to be addressed on many levels, especially if students are expected to complete more learning from home.

Students' Uses of Technology Outside of School

Many studies regarding student use of technology try to determine a "typology" of users based on how they make use of technology at home. Eynon and Malmberg (2011) conducted phone surveys of over 1,000 young people aged 8-19 in the UK to try and develop such a typology. Using sociodemographic factors and student characteristics such as ethnicity, SES, gender and age, the authors were able to establish four types of users which they called: peripheral, normative, all-arounder and active participator. Peripheral users were those identified as showing low levels of internet use in all five studied areas, while normative users were at or slightly below the mean for usage, with lower levels of usage in the more engaged categories such as creating. All-arounders were characterized by usage levels above the mean, and active participators exhibited the highest levels of usage in all five areas of internet use. The authors clearly state that the goal of their study was to not to make judgements about whether a certain type of use was preferable or more worthy than another (Eynon & Malmberg, 2011). Instead, they wanted to classify types of users and characteristics of those users that might help educators to identify gaps and strengths with differing groups so they could support students. In this way, the Eynon and Malmberg (2011) study was different from many of the other studies regarding

typology because it did not attribute positive or negative associations with certain types of student use.

Hinostroza et al. (2015) utilized an even larger, national sample of over 10,000 Chilean students to develop an understanding of students' self-reported use of ICT activities outside of school. Only students who reported having internet access at home were studied. Like Eynon and Malmberg (2011), the authors of this study recognized that there were many studies about use, including: typology of users, factors affecting types of users, skills and competencies of users, and use based on available access, among others. The purpose for Hinostroza et al. (2015) was to question the findings of previous studies to see if differences were really that great among Chilean students based on socioeconomic group (SEG). This study was unique because it looked at types of users from a different perspective, finding that while there are differences in types of users based on sociodemographic factors as other studies suggest, the differences are relatively small and do not constitute large differences of use among secondary students in Chile (Hinostroza et al., 2015). This study is important to consider because it stands somewhat in contrast to commonly held beliefs about children's ICT use. It also demonstrates the importance of studying the same topic from many perspectives because findings may take on a different significance based on how the study is framed.

Furlong and Davies (2012) completed a three-year long mixed-methods study on computer use of juveniles and young adults ranging from 8-21. The study involved several stages and methods, including interviews with students in schools, interviews with students and parents in the home, survey questionnaires, and additional qualitative interviews. The premise of the study was that as students are increasingly using technology at home where much informal learning takes place, researchers should begin to consider how this informal learning at home

impacts formal learning in school. Students were found to develop several useful skills through the use of technology in their informal home setting including networking, development of judgement, technical skills and collaborative skills. Using Bernstein's ideas about framing and classification, the authors conclude that children's use of ICT is interwoven and highly connected to their self-identities, which allows them to employ ICT for their own purposes and often results in richer and more meaningful learning (Furlong & Davies, 2012). This study differed from other studies because it did not try to make an explicit connection between at-home learning and school learning of ICTs or try to study the effects of the at-home learning on academic learning.

Framing home technology use through the lens of Bourdieu's theory of capital, a study by Zhang (2015) looked specifically at the use of two web sites, Cartoon Network as an entertainment site, and Kahn Academy, as a "capital enhancing site" to indicate the value of children's home internet use (p. 212). The complex design of this quantitative study utilized many sources for gathering data, including Google trends, which collects monthly search term data by country and region, Compete web analytics, which tracks web site visits by over two million US internet users, demographic data from NCES, and National Assessment of Educational Progress (NAEP) data. Combining data from all of these sources, Zhang (2015) found that, generally speaking, Cartoon Network was visited more often by lower academically achieving and lower socio-demographic users, whereas Kahn Academy was visited more often by higher achieving and higher socio-demographic students. Much digital equity research stems from the idea that the way certain populations utilize computers, and the internet may disadvantage some and advantage others. This quantitative study seems to support that general assumption. A strength of this study lies in the large numbers made available by "big data tools,"

which may make it more generalizable. On the other hand, large scale studies such as this study by Zhang (2015), which apply large-scale data collection tools, may overgeneralize trends across populations.

Using PISA data about ICT use, two studies (Aypay, 2010; Drabowicz, 2014) specifically analyzed differences in usage based on gender. Findings were similar for both studies. Conducting *t*-tests, ANOVAs and correlations on data from 4,942 students from over 160 schools in Turkey, Aypay (2010) found no statistically significant differences in the reported amount of daily usage of computers at home or at school between males and females. However, significant differences were found for the ways male and female students used computers. Two types of use were specified: *entertainment and internet use*, such as gaming, searching, downloading, and *software and programs*, such as using spreadsheets or drawing programs. Males reported using computers for entertainment and internet purposes, and also having significantly higher confidence in using computers for those activities compared to girls. Education level of the parents was also found to have a negative relationship for both entertainment and internet use and software and programs for both males and females. As the mother's level of educational attainment went down, student's interest in and use of ICT went up (Aypay, 2010).

Using similar PISA data from the same year, Drabowicz (2014) compared findings from 39 countries related to gender differences in ICT use. For almost all countries (35/39), girls' use of computers at home was statistically significantly less than boys', and for use in other places such as homes of friends and family and internet cafes, differences were statistically significant for 36 out of 39 countries (Drabowicz, 2014). With respect to uses for communication, 10 countries were found to have no significant differences between males and females. In 19

countries, girls' use for communication was higher than for boys, and in 10 countries, girls were less likely to use ICT for communication than boys. In all countries, boys were found to use computers for entertainment at higher levels than girls (Drabowicz, 2014). Both the studies from Drabowicz (2014) and Aypay (2010) seem to show that there are differences in uses between boys and girls. However, the existence in itself of differences may not be significant if the differences do not result in inequities. More studies which not only identify differences in usage between boys and girls, but also seek to understand if those differences advantage one group over another may add to the understanding in the literature.

Outcomes Based on Home Access to Internet and Devices

All of the studies discussed in this review that looked at student outcomes based on access or lack of access employed either quantitative or mixed methodology. Of the six studies which looked at these relationships, three found generally positive outcomes of home access to computers and internet for marginalized groups of students (Jara et al., 2015; Wainer et al., 2015; Zhong, 2011). Using a construct commonly used in Brazil called socioeconomic class (SEC), which combines family wealth with head of household's education, Wainer et al. (2015) found that within the same SEC groups test scores were generally higher for students having a computer at home, while test scores were generally lower within the same SEC groups for students having internet access at home. This trend was also found in other studies from the first decade of the 2000's. However, the effect sizes have decreased in more recent studies, so the authors conclude their significance may be lessening (Wainer et al., 2015). In a similar study on computer use and outcomes, Jara et al. (2015) found that amongst both high and low achieving students, having a computer at home was related to higher test performance on a digital skills test. These results suggest that, overall, having a computer at home results in positive outcomes

for the Brazilian and Chilean students in these studies. In the third study, looking at PISA data from 2003 and 2006, Zhong (2011) assessed self-reported ICT skills across 16 countries and found that access at home was a statistically significant predictor in both reporting years. Zhong also found that SES and history of using ICT both had statistically significant positive relationships with self-reported ICT skills. These findings seem to support the idea that access at home and experience using computers contributes to higher achievement, and thus better outcomes for students.

Less positive results for traditionally marginalized groups were found by other studies. Comparing groups of rural and urban students in China, Li and Ranieri (2013) found that rural or migrant students had lower scores on all indicators related to internet inequality and were thus more disadvantaged than those in urban areas. However, they also found that most students, urban and rural, reported having better internet access at home than at school, and that there were no significant differences in outcomes based on gender. The most negative results regarding access and outcomes were from a US study of students in North Carolina. Vigdor et al. (2014) found that a gap existed based on SES and home access. For students in 5-8th grades, acquiring broadband internet access actually resulted in lower standardized test scores in the measure used in this study. The authors assert that there are many downsides to students having high-speed access at home and that these negative effects disproportionately affect economically disadvantaged children. It is notable, however, that this study evaluates the benefits from an economic perspective, weighing the cost of providing devices and access for students against outcomes. The same study, viewed from an education standpoint, might draw different conclusions based on the same results, similar to how effect sizes for studies in the hard sciences

and mathematics which are considered small might be considered large effect sizes when applied to education.

Two studies which seemed to have mixed findings regarding access and outcomes both concluded that the timing of when students gain access to computers might matter (Hatzigianni & Margetts, 2012; Moon & Hofferth, 2018). Using longitudinal data from immigrant families in the US, Moon and Hofferth (2018) found that there were differences in math scores associated with gaining computer access at a young age, but no significant differences were found in reading scores. Also, the gains in math for boys with access to computers at a young age occurred across more categories than those for girls. This may indicate that the timing of access matters, and specifically the earlier students have access to computers the better the outcomes. Meanwhile, Hatzigianni & Margetts (2012) studied preschool children in Australia and found mixed results regarding access. Students who had access to computers both at home and at school reported the highest computer self-efficacy. However, students who had access only at school also had high computer self-efficacy. Lower mean self-efficacy scores were reported for students who had access only at home as opposed to those with access only at school, but they were still higher than scores of those students who had no computer access in either place (Hatzigianni & Margetts, 2012). One limitation of this study is that it relies on self-efficacy reports by preschoolers, which as the authors themselves note, is a hard construct to measure in general, and especially with younger students. It might be informative to conduct a longitudinal study that measured the same preschoolers' self-efficacy in elementary, middle and high school to see if the self-reporting remains consistent. However, mortality would be a threat to validity in such a study, as would test-retest factors and any number of confounding variables.

Another study on outcomes used a more complex construct of ICT competence and also relied on a performance-based measure of ICT skills, as opposed to student reporting of self-efficacy (Aesaert & van Braak, 2015). This study focused on students' use of ICT to search for, process, store, and communicate information using higher-order skills such as communicating, creating and curating. The study also utilized a computer-based assessment that may make it easier to replicate results in future studies. Overall, Aesaert and van Braak (2015) found that all students were better at technical ICT skills such as basic searching and retrieval of information, however they had trouble with higher-order ICT skills such as conducting complex searches and evaluating information for accuracy. Comparing groups based on gender, it was found that girls outperformed boys on 47/53 items, especially with respect to communication, with 16/47 items being statistically significant. Looking at constructs of SES, Aesaert and van Braak (2015) also found statistically significant differences for 34/53 items where the higher education level of the mother indicated higher performance in ICT competencies. This study was notable because it sought to measure a more complex construct of ICT competency than many other studies and also because it sought to standardize the performance task using an assessment-based measure which could theoretically be more easily replicated by other studies. However, this could prove to be a limitation of the study as well, since many educators recognize that it is difficult to standardize measures of performance-based learning tasks.

Some studies were more specific in their focus regarding outcomes of student access. Wu et al. (2014) compared 117 Taiwanese students with learning disabilities with a control group of 117 Taiwanese students without diagnosed learning disabilities to see if access and success with computers differed in both school and home settings. No inequities with regard to computer and internet access were found for students with disabilities either at school or at home. However,

students with learning disabilities had lower scores in ICT skills across all grades and did not show as much growth over time in ICT skills as their peers (Wu et al., 2014). This may indicate that access is not the source of inequity for students with learning disabilities in Taiwan. It might be beneficial for future studies to look at other factors that could contribute to lower ICT scores for learning disabled students, such as the type of opportunities afforded them for learning ICT skills in and out of school. It is also important to note that this study relied on self-reporting of ICT access and skills, which may not be the most reliable measure. For example, it is possible that students with learning disabilities gave themselves lower scores on skills based on perceived deficits because they have been labeled as learning disabled.

One dissertation was found that examined outcomes specifically for Hispanic students based on full access to technology (Carr, 2012). In this dissertation, Carr (2012) considered perspectives of parents, students and teachers to gain a complete picture of students' access to technology and expectations for technology by teachers and parents across a variety of settings. In one phase of the mixed methods study, students were grouped into three groups: *achieving*, *struggling to achieve* and *failing*, using their GPA over a three-year span. Based on data collected from questionnaires and interviews, students in the *achieving* group all indicated having access to computer and internet at home, as well as having parents who valued technology, were skilled at technology and monitored students' technology use. For students in the *struggling to achieve* group: all had computers, only one did not have internet, all had parents who valued and monitored their technology use, but only one had a parent with skills in technology. In the final group, labeled as *failing*, all four had parents who valued technology and two had parents who monitored use, but only one had a computer at home, none had internet, and none had parents who were skilled with technology. These findings seem to indicate that having

access to devices and internet at home, along with parents who are skilled with technology, supports students' academic achievement. A strength of this study is that it is a lengthy dissertation which considered many perspectives and utilized mixed methods, which strengthens the findings. A particularly interesting aspect of this study is the data regarding having both access and parental support, skills and monitoring. Between the two groups, *achieving* and *struggling to achieve*, access, parent belief in technology and monitoring all seems to be similar. The main difference is parents' technology skill level. Therefore, research that explores parents' technology experience and skill level in addition to access may provide more complete information.

In another study which looked at digital competencies of Norwegian students in upper secondary school, Hatlevik et al. (2015) hypothesized that cultural capital and language integration would influence students' digital competence. Based on statistically significant bivariate correlations for cultural capital ($r=.26$, $p<.01$) and language integration ($r=.17$, $p<.01$) Hatlevik et al. (2015) concluded that "student's cultural capital and language integration have positive prediction of digital competence" (p. 350). The construct for cultural capital was based on one self-reported question about how many books were in the household. Similarly, the construct of language integration was based on what language is spoken in the home: Norwegian, or Norwegian and another language. I think that additional indicators of cultural capital and language integration would strengthen this study.

The final two studies addressed outcomes of a 1:1 device program (Morris, 2011; Stoneman, 2018). In a case study of the *Computers for Pupils* initiative, in which computers were provided for home use to disadvantaged students in the UK, Morris (2011) found that students reported mostly using the laptops for leisure. Most students reported having the

hardware and software they needed, but also reported that when they did have technical problems there was little support. It was also found that ICT teachers were not fully involved in the initiative. Since the teachers were not provided much information about the devices and did not know which students had devices, they were unable to provide much help. Based on these results, it seems like there was a disconnect between the goals of the program and the implementation. As this study indicates, in order for technology initiatives to be effective in reaching marginalized populations, input and participation from all stakeholders is needed. The disconnect between the teachers' awareness of the program and the students' possession of the devices without any associated instructional goals likely led to the frequent use of devices for leisure activities.

In a dissertation study, Stoneman (2018) compared test scores of a group of 2,359 students who were given 1:1 devices for use at home to a control group of 2,281 students who were given no device. This study found "statistically significant gains of approximately 1% in achievement scores for students in the one-to-one program in both English language arts and mathematics" (Stoneman, 2018, p. iii). Comparative studies such as this one provide valuable data to help determine outcomes of programs like one-to-one initiatives since they allow the researcher to make comparisons between an intervention and control group. However, more studies of this kind, or more in-depth studies, may be beneficial to identify if the costs of such initiatives are warranted. Depending on the goals of the program, some might argue that a 1% test score increase does not justify the costs associated with such a program.

Summary of Digital Equity and Digital Divide Literature

Like many topics in education, digital equity is complicated and requires investigation of multi-faceted constructs to capture the entire picture. The literature clearly shows that issues of

access still exist in the United States and across the world. Simply providing access to a device will not achieve equity if sociocultural factors are not also considered. Based on the studies in this review, it appears that the same patterns of disparity are found in technology as with other aspects of education. Level of education of the parents and socioeconomic factors seem to play very significant roles in outcomes for students, especially when you factor in the constructs of race/ethnicity and immigrant populations. Having more extensive knowledge about the home climate regarding technology could help educators and parents plan and implement large scale programs that are more successful for students and families. However, it is also worth noting that many of the studies in this section were also from other countries and have limited generalizability to the United States due to economic, social and cultural differences.

Literature On One to one (1:1) Initiatives

As discussed in chapter one, the definition of one to one or 1:1 initiatives can vary. Three reviews of the literature were found which provided a detailed analysis of the studies in this field (Harper & Milman, 2016; Islam & Grönlund, 2016; Zheng et al., 2016). For the purposes of this literature review only the findings from Zheng et al. (2016) were utilized. The review by Islam and Grönlund (2016) included handheld devices such as smartphones and iPods as 1:1 devices, which I have chosen not to include in my study due to their limited functionality for educational purposes. Harper and Milman (2016) focused on in-school use. Therefore, the findings of those two reviews are not included here.

Zheng et al. (2016) provided a review of 96 items related to 1:1 laptop programs, including 65 articles and 31 dissertations published between 2001 and 2015. They also conducted a meta-analysis of 10 of these studies. For the purposes of their review, they defined a 1:1 laptop program as one “in which all the students in a class, grade level, school, or district are

provided computers for use throughout the school day and, in some cases, at home" (Zheng et al., 2016, p. 1053). To be included in the review, studies had to meet the following criteria: meet the authors' definition of a 1:1 laptop program, be an empirical study and involve a K-12 educational setting and have clear research questions and utilize qualitative and/or quantitative methods to answer them. These articles were evaluated using the one-to-one initiative evaluation framework developed by Zucker (2004). This framework was developed as a way to look at 1:1 programs across settings such as a school, district or state and considers factors of setting (device used, with whom, how), implementation (teaching methods employed) and outcomes based on student learning (Zucker, 2004).

There was great variety among the 96 studies included in the broader review by Zheng et al. (2016). Studies included students from all levels of K-12 schooling across a range of SES settings, different countries, of differing scales, and studies lasting from less than two years to more than four years. Study designs included qualitative, quantitative and mixed methods, employing a range of methods from surveys and interviews to test data, observations and document analysis. A majority of the studies (70/96) focused on how and how often the laptops were used by teachers and students. Nearly half of the 96 studies reviewed by Zheng et al. (2016) involved student and teacher views of the laptops. Another area addressed by many studies was related to the somewhat general construct of 21st century learning and skills. Since one main goal of many 1:1 laptop programs is to reduce inequity by providing every student with a device, some studies focused on whether providing each child with a device promoted equity.

Zheng et al. (2016) established the criteria for the 10 articles included in the meta-analysis to be much more precise and rigorous than those in the larger review. To be included, articles had to be quantitative and employ a time-constrained intervention and control group, use

some type of norm-referenced measure to assess student achievement or outcomes, and provide complete statistical information so that effect sizes could be calculated. Since the studies often reported multiple statistics across multiple content areas using different measure of effect size, the authors grouped the data from the studies by content across five areas and then calculated overall effect sizes using Cohen's *d*. Based on the commonly accepted effect sizes in educational outcomes, the effect sizes generally indicated small, but overall positive outcomes for the students using laptops. Effect sizes were statistically significant ($p < .05$) for all subjects except Reading, with combined effect sizes across all areas found to be significant ($p < .001$). These findings point to some positive outcomes regarding use of 1:1 laptops across content areas, though clearly stronger findings would be desirable. This indicates an area that future research could address.

Summary of 1:1 Initiatives Literature

The review of literature in this section shows that much of the literature pertaining to 1:1 initiatives examines ways in which students and teachers make use of the devices. It is clear that a variety of qualitative, quantitative and mixed methods designs are used and involved a variety of data collection methods. Based on the effect sizes calculated as part of the meta-analysis of 10 specific studies, it would appear that 1:1 programs do have a positive effect on student outcomes related to use of the devices. While the existence of significant effect sizes is noteworthy, future studies that continue to monitor student outcomes with devices would contribute to the field. Continued studies in the rapidly changing field of technology are warranted. The increasing percentage of school funds that are spent on devices for students and teachers each year also makes 1:1 programs important to study since funds are limited and it is important to spend money on technology that impacts students and not just spending for technology's sake. Zheng et

al. (2016) found that 45 of the 96 studies in their review addressed student and teacher attitudes, perceptions or views of use of the devices, while parent perspectives were not mentioned in any of the articles. Since parents play an important role in the education of students it seems important that their views would be included as well. This review of the literature regarding 1:1 initiatives indicates that continued study on such programs would strengthen the field of knowledge and help educators make critical decisions regarding educational technology programs.

Literature Regarding Parent Perceptions of Technology

Only five empirical studies were found to directly address the topic of parent perceptions of 1:1 programs (Bate et al., 2013; Chappelear, 2019; Håkansson Lindqvist, 2021; Jin & Schmidt-Crawford, 2017; Keane & Keane, 2018). Four were articles and one was a dissertation. All were completed within the last eight years, which is important because technology changes rapidly. Four utilized mixed methods (Bate et al., 2013; Håkansson Lindqvist, 2021; Jin & Schmidt-Crawford, 2017; Keane & Keane, 2018) and one was a qualitative study (Chappelear, 2019). Six studies were also found that addressed parent perceptions of technology for education but were not specific to 1:1 device initiatives (Ball & Skrzypek, 2019; Hollingworth et al., 2011; Katz & Gonzalez, 2016; Nogueron-Liu 2017; Ortiz et al., 2011; Tripp, 2011). The five studies specific to parent perceptions of 1:1 devices are discussed first, followed by the six studies regarding parents' views of technology for learning.

Parent Perceptions of 1:1 Devices

The study by Jin and Schmidt-Crawford (2017) looked at parent perceptions during the first year of a 1:1 program implemented at a midwestern high school during the 2013-2014

school year. All students and teachers were provided a MacBook Air by the district for use at home and at school. Orientation sessions were held prior to the start of the school year for parents and students. This mixed methods study used a pre-post-test survey design. A survey created for this study was given to parents in the second week of school and again in April. The survey asked open and closed-ended questions related to parents' expectations for student outcomes related to use of the device, teacher use of devices for instruction, and district policies and supports for the devices. A total of 205 respondents completed and returned both surveys, all of which were included in the study. In one section, the questions asked parents to rate their expectations for device effects in several areas, including: student motivation toward schoolwork, interactions with teachers and classmates, interest in classes, grades, attendance and behavior. The choices for expected outcomes were *positive change*, *negative change* and *no change*. Results of the post-test show that the percentage of parents choosing *positive change* went down in every category. However, on the 12 Likert scale items used to rank overall outcomes (teachers' technological and content knowledge, and district policies and supports for the device), no statistical differences were found between pre- and post-test results. Content analysis of the open-ended question responses revealed that parents were generally happy with the program and identified several areas where they felt the devices had helped their child with schoolwork, including allowing them access to the same materials at home, providing access to textbooks, and allowing students to collaborate with peers on projects. Parents also had concerns, which varied a bit between the pre- and post-test. The top four pre-test concerns in order of highest to lowest concern were: "(a) students might lose the laptop or have it stolen (52.2%), (b) students might break the laptop (49.3%), (c) students might be distracted by the laptop and not stay on task at school (41.5%), and (d) students might use it for too much socializing instead of

doing schoolwork (38.5%)" (Jin & Schmidt-Crawford, 2017, p. 81). The post-test showed some movement of these items, as students using the laptop for socializing (53.2%) and students being distracted from schoolwork (51.7%) became the top two concerns. Some other concerns that parents noted in their open-ended questions included teachers not always using the devices in high-tech ways, students' need for more digital literacy and digital citizenship training, and trouble monitoring students' use of the devices.

One limitation of the study by Jin and Schmidt-Crawford (2017) is the population of the parents surveyed, which while appropriate for the purpose of this study, may not be generalizable to other populations. A close look at the parent demographic information seems to point to fairly high levels of education and experience with technology. Out of the 205 parents in the study, 181 reported having at least a four-year degree and 99% reported using computers daily, with all but one parent reporting intermediate or advance computing skills. This may lead to sample bias, since, in adults, higher levels of education are positively associated with higher levels of technology use and access (Council of Economic Advisors, 2015).

The goal of the study by Bate et al. (2013) was also to look at parent perceptions of a 1:1 initiative in an all-boys school in Perth, Western Australia over a three-year period. Participants included students and parents from two cohorts, Year Five (Cohort A) and Year Seven (Cohort B). This mixed methods study collected data from questionnaires, focus groups, interviews and observations of parents and students. Students in Cohort B reported using the laptops for greater amounts of time than Cohort A, and parents in Cohort B were more likely to feel that students were spending too much time on computers than parents in Cohort A. For all three years of the program, between 80-85.7% of the parents in Cohort A reported that students spent an appropriate amount of time on computers, while 75% of Cohort B parents felt the same in the

inception year and only 55.6% felt students used devices an appropriate amount of time at the end of Year 2. Qualitative data revealed that parents who felt their child spent too much time on the computers also more frequently shared concerns about students using the devices for non-school related activities such as social media and gaming. Overall, parents reported a positive impact from the program; 69.8% of parents in Cohort B, and 91.2% of parents in Cohort A. Some common concerns were shared by parents of both cohorts, including loss of handwriting skills, feeling more detached and disconnected from their child's learning and worrying about their child spending too much time on the devices. Most parents reported being intermediate or experienced users of technology, although 19 of the 196 parents reported being novice users of technology. Interestingly, "of the 19 novice parents, 29.4% believed their child used their laptop too much" (Bate et al., 2013, p. 19). This seems to support other findings, such as those by Hollingworth et al. (2011) who found that parents with lower confidence and skill levels using technology were generally less positive regarding their children's use of technology. This study reveals that even when parents are generally positive about the use of 1:1 devices, they still have genuine concerns about the ways and amount of time their children use devices. When looking at any 1:1 device initiative it is important to weigh both the positive and negative feelings of parents and work with parents to ensure that students are getting the most benefit from devices. Studies like this one, that capture parent perceptions over time are needed to continue to capture the rapidly changing field of educational technology.

The third study, by Keane and Keane (2018), also explored parent perspectives of a 1:1 laptop program through a mixed methods design. Using the same questionnaire yearly over a four-year period, this longitudinal study involved 121 parents in a co-educational Catholic secondary school in Melbourne, Australia. The questionnaire contained 16 open-ended questions

regarding parent expectations, concerns and perceptions of the program, as well as some Likert scale items asking parents to identify how much they agreed with statements relating to their feelings about the 1:1 program. After the second year of the study the decision was made to switch from a Netbook to an iPad device. The decision to switch devices has implications for the findings of this study because there were some criticisms specifically related to type of device. While an overwhelming majority (92%) of parents felt that computers are important for learning, only 58% believed the devices would have a positive effect on learning. Results were not overwhelmingly positive regarding many of the factors surveyed. Only 42.5% of parents reported that their child was more motivated to do homework, 33% said their child was more engaged, and 26.5% reported their child was more organized. These results seem a bit surprising considering that at the end of the first year 73% of parents believed that the devices were necessary for their students' learning in the future. Taken together, these seemingly contrasting opinions demonstrate that while parents generally believe that computers are important and necessary for their child's education, they may not be clear on exactly how they should be or will be used. This may be related to the idea of technological determinism, in which computers are viewed as inherently good and necessary, which seems to permeate so much of society (Adler, 2006; Oliver, 2011; Selwyn, 2012; Shutkin, 2005). Parents were also much more positive regarding the netbooks than the iPads. Parents' comments revealed more worries about the iPad being used for game playing and non-educational uses than were held for netbooks. While all of the parents reported having home internet, many were also generally concerned about monitoring and limiting children's time on devices for a variety of concerns including, but not limited to: inappropriate content, cyberbullying, social media, loss of family time, loss of physical activity and other leisure activities. Based on these findings, future studies that explore the relationship

between parents' experience and beliefs about technology and their perceptions of educational technology may contribute to a deeper understanding of this complex issue. Many of these same concerns are repeated in other studies of parents' views of children and technology, indicating that they continue to be worthy of study. Longitudinal studies similar to Keane and Keane (2018) may be beneficial in the future, especially as technology evolves and continues to permeate our society.

The fourth study by Håkansson Lindqvist (2021) was part of a larger study that took place in Umea, Sweden and collected data from 2011-2014 that examined a 1:1 program from the teacher, student, school leader and school perspective. This small-scale phase of the study collected data on parent perspectives 18 months after the beginning of the initiative and again one year later. A survey containing open and closed questions was mailed to households of students in an upper-secondary and a compulsory school. The first round of surveys was mailed to 57 households, resulting in 25 surveys returned and the second round was mailed to 50 households with 17 returned. The surveys were analyzed separately and results between the two surveys were also compared. The results of this small-scale survey were similar to results found in the other studies regarding parent perspectives and were generally positive. For survey one, 24 out of 25 respondents viewed the 1:1 initiative as "very positive or positive" and in survey two all 17 parents viewed the initiative as "very positive or positive" (Håkansson Lindqvist, 2021, p. 8). Parents expressed that opportunities afforded by the laptops included ease of student to teacher and student peer collaboration, increased access to knowledge and information, and recognition of the laptop as a pedagogical tool. Concerns cited by parents included less reading of physical books, loss of physical activity and ergonomic concerns, loss of handwriting skills, worries about children being responsible for an expensive device, dealing with technical issues

and children being distracted or using devices for non-academic purposes. Interestingly, while some parents reported technical issues with devices, such as getting onto the network or troubleshooting, home internet access was not mentioned as a problem at all. Overall, this study echoed the findings of the other studies which indicated that, while parents have some concerns with children using laptops for schoolwork, they are generally accepting of the program and view it as a positive development in their child's education.

The last study that focused on parent perspectives of a 1:1 laptop program was a dissertation conducted by Chappelear (2019). All participants for this qualitative exploratory case study were parents of high school students from two large, urban high schools in the southwestern United States with predominantly minority students. In school one the student population was: 85.5% Hispanic, 3.3% African American, 2.4% Asian, 5.9% White, with a 23.8% English learner population and 84.6% of students receiving free or reduced lunch. For school two, the student percentages were: 51.5% Hispanic, 25.3% African American, 3.3% Asian, 16.6% White, 6.9% English learner and 65.6% receiving free or reduced lunch. The focus group for school one was comprised of five parents of varying income and education levels, three female and two male, of which four were Hispanic and one was Hispanic/White. Six participants made up the second focus group. All were females who had at least a Bachelors' degree but had varying levels of income and of which two were Hispanic, two were White and two were African American. Purposeful sampling was used in an effort to select a range of parents who were representative of the larger school population and whose child had been involved in the laptop program for at least six months, used the laptop both at home and at school and had a GPA of at least 2.0. Each focus group took place at the parent center in the school and lasted for about one hour. Follow-up interviews were conducted with one parent from

each focus group. The selection of these participants was based on their general willingness to share during the focus group and also to follow up or clarify about statements they made during the focus group. Chappelear (2019) also conducted interviews with the principal, parent coordinator and instructional technology specialist at each school in order to try and triangulate and confirm findings. An effort was also made to obtain documents and correspondence with parents to further this effort of triangulation, however no documents existed beyond the parent agreement for the laptops.

Parents showed overwhelming support for the program across all focus groups and follow up interviews, even using the word *love* many times to express feelings about the program, the laptops and their experiences with them. In this study, Chappelear (2019), parents felt that the laptops helped them know more about their children's schoolwork and increased their access to grades, assignments and due dates. However, parents noted that some teachers made better use of the technology than others. Many parents shared that having school-provided laptops made the program more equitable. Even parents who said their child already had their own device recognized that it was probably easier for teachers and schools to use the devices if every student had the same type of device. Parents reported valuing that the school had a central person to contact for technical problems, but they also did not seem to find it necessary for the school to provide training for them on the laptops. When problems occurred, the parents shared that the students just took their devices to the school-level instructional technology (IT) personnel. This was confirmed during the interview with the IT person at each school. Parents also believed that the laptops were a necessary part of learning in today's world, and now that students had the devices they could not imagine students learning without the devices.

This study by Chappelear (2019) is informative with regard to addressing parent perspectives. However, as the focus of the dissertation was not equity, only parents whose children were able to use the devices at home were selected for the study. This may have excluded parents of students who were unable or unwilling to use the devices. It does not seek to uncover any barriers that may inhibit parents and students from using the devices effectively. It is helpful, however, that the parent population included predominantly non-White parents of varying income and education levels, since race, education and income have all been established as factors relating to equity in technology use (Horrigan & Duggan, 2015). Many of the interview questions and how they relate to themes found in the research, such as how parents see their children making use of the devices, are relevant to parent perceptions and can inform my research.

Parents' Views Regarding Children's Use of Technology For Learning

The purpose of an exploratory study by Ortiz et al. (2011) was to gather information about parents' general views regarding technology use themselves and by their children. The study took place in an elementary school in Southern California with a large (85%) minority population that is also middle to upper-middle class based on income. Over half of the parents also identified as first-generation immigrants, mostly Asian. A 24-item survey was sent to all parents in the school (N=957) with a total of N=596 surveys returned and used in this study. Nearly 90% of the parents reported having at least some college education, with about 60% reporting having a college degree. A majority of the parents reported having experience using computers and feeling that computers were important for jobs and as tools for learning. Most of the parents also reported that their children would need to know how to use computers to be successful and that schools should teach computer skills. Overall findings of this study indicate

that parent's perceptions were overwhelmingly positive toward both their use of computers and their child's use of computers for learning. This supports other research which finds that parents with higher levels of education tend to have generally positive views of technology and its benefits for learning. However, this study is limited for several reasons. First, being an exploratory study, it only seeks to gauge parents' views of technology in general and does not include any questions which might expand on why parents feel the way they do regarding technology. Also, all of the Likert-type survey items were worded as affirmative statements, for example: "knowing how to use a computer will help my child do well in school" and "my child will need to know how to use a computer to be successful in life" (Ortiz et al., 2011, p. 213). While parents could answer in the negative, by choosing "strongly disagree," there were no negatively worded questions regarding computers. For example, "I do not want my child to spend too much time on computers" or "I limit the time my child spends on the computer." Therefore, it is possible that the wording of the questions leans toward a more positive view of computers and computer use for their children. Overall, the design and purpose of this survey provide a basic level of understanding but do not expand upon any of the findings. Research which examines not just how parents feel about technology, but also explores why they feel this way would be more informative from an equity perspective.

Hollingworth et al. (2011) conducted a study which looked at parents' views of technology and how families interact with technology in the home using Pierre Bourdieu's theories of capital, field and habitus. This qualitative study gathered data from 10 focus groups with a total of 80 parents of children aged 8-14. In an effort to reach all types of parents, not just those who were already active in schools, the parents were recruited from a variety of parent groups in schools, the community and elsewhere in five different areas across England. These

efforts yielded a mix of parent types including male and female, single parent, parents of special needs children, minorities and English as additional language parents. Questionnaires were used to gather demographic data such as income, education, occupation, family structure and age. Focus groups used a semi-structured interview format and generally focused on the types of technology in the home, how families interacted with the technology, and parents' own experiences with and views of technology. Transcripts of the focus groups were made at the individual level so that individual responses could be matched with demographic information, which was used to establish social class groupings of *working class* or *middle class*. Social class designations were typically determined by a combination of factors including home ownership, income and occupation, recognizing that intersectionality makes assigning labels regarding "class" difficult at times.

In Hollingworth et al. (2011), almost all families talked about interacting with technology together, including playing video games and watching television, as well as technology endeavors of individual family members such as downloading music and taking photos and videos. However, families without high-speed internet access at home were more likely to talk about challenges related to trying to find access for children to complete homework. Of the 11 people who did not have internet access at home, nine of them were White working class, indicating that while much progress has been made, access is still an issue. Parents shared the challenges their children faced, having to go to a friend's house, or the library, or rushing to complete their homework during lunch. While all parents shared a variety of concerns about children being online, middle-class parents tended to feel more confident in their ability to monitor and control students' use through tools such as parental controls. In contrast, working class parents were more likely to resort to withdrawing internet access, or only allowing children

to use it when parents were available to monitor its use. Middle class parents were also more likely to talk about teaching their children to navigate potential threats as a learning opportunity. Many of the parents across both groups lamented the difference between their own use of technology as kids and their children's exposure to technology. However, parents who were more efficient with technology, mostly middle-class parents, expressed less despair about this prospect than their working-class counterparts. All of these findings point to the idea that the construct of social class may be an important factor in the ways students experience technology at home due to parent and home factors.

There were four studies found which specifically studied the views of immigrant parents. One study, by Green et al. (2009) regarding Korean parents, was part of the larger study on parent perceptions by Ortiz et al. (2011) which was discussed above. The other three studies focused specifically on the perspectives of Latinx immigrant families (Katz & Gonzalez, 2016; Nogueron-Liu 2017; Tripp, 2011). All three studies utilized qualitative methods in an effort to provide a deeper understanding of the many dimensions of parents' views of their children's technology use. The Tripp (2011) study, which was part of the larger, multi-site ethnographic Digital Youth Project, utilized the researchers' role as observers and program helpers as a starting point for the study. One class of students from the Project was invited to take part in research that involved interviews about technology and in-home visits to observe how families negotiated technology in the home. Nogueron-Liu (2017) used a practitioner inquiry model, gaining an understanding of the parents' views through her work as facilitator for a family digital literacy workshop. The author worked with parents in school-sponsored workshops for parents in conjunction with the district's new 1:1 or bring your own device initiative. Katz and Gonzalez (2016) recruited study participants from K-8 schools in Chula Vista, California, Denver,

Colorado, and Tucson, Arizona, all of which had high percentages of students on lunch subsidies. The criteria for participating families were that they identified as Hispanic or Latinx, received subsidized lunch, had internet at home and had a child aged 6-13.

There were many similar findings in these three studies. The families in these studies all expressed that they valued the educational use of computers and felt that computers would help their children be successful in school and in life (Katz & Gonzalez, 2016; Nogueron-Liu 2017; Tripp, 2011). Another common theme between all three articles was that the parents were worried about their children spending too much time on the computers, and they wanted to make sure they still went outside and still played with physical toys. Parents also worried about the safety of their children when they were on the internet and the dangers associated with online predators. One mother shared that she physically took the ethernet cord with her when she left the house so that her daughters could not get online when she was not home (Tripp, 2011). Some parents were afraid to use the computers that were provided by the school and chose to use their own devices instead. One parent in Tucson, Arizona, where tensions over immigration were very high, was afraid that the computers would be used to monitor and identify undocumented families (Katz & Gonzalez, 2016). Several parents from the Nogueron-Liu (2017) study shared that they were worried that the school-issued devices would get broken, lost or stolen and that they would have to pay for them. Because of these worries, parents from both the Katz and Gonzalez (2016) and Nogueron-Liu (2017) study preferred to use their own devices. The feelings shared by parents in these three studies indicate that access alone may not be enough to ensure use of school-issued devices at home by students. They also indicate that perhaps family beliefs about technology have more impact on use than other factors. Finally, these studies imply that

factors in the local community may have an impact on family technology beliefs and practices as well.

A study by Ball and Skrzypek (2019) was different from the other studies of parent perceptions because the investigation focused specifically on student and family engagement after being given a take home device with wireless access. In this study, all students in two fourth and fifth grade classrooms were provided tablets for use in school. In addition to use of the devices in school, one fourth and one fifth grade classroom were randomly chosen to receive a take-home tablet and free broadband access at home for the duration of the four-month intervention. All students participated in eight one-hour long lessons on digital literacy, digital citizenship and using the devices for learning, which were taught by school internet technology personnel. Parents in the intervention group also "participated in four workshops about (1) the use of technology for learning, (2) use of district- specific programs to engage with the school, (3) troubleshooting and academic concerns, and (4) community-based family supports and summer learning opportunities" (Ball & Skrzypek, 2019, p. 2). This study took place in an urban school with a majority of the students in the control group (85.7%) and the intervention group (91.9%) identifying as African American or Black. In the parent sample 85.7% of the parents identified as African American or Black, and 100% of the intervention groups parents identified as such. Both groups of students had high numbers of students receiving free/reduced lunch; 87.3% for control group and 97.3% for intervention group. A pre- and post-test design was used, and t-tests, ANOVA's and MANOVA's were used to test for significant statistical variations between groups. No statistically significant differences were found except in one area of the intervention parent group, which found a significant increase for "perceptions of school support" between pre- and post-test (Ball & Skrzypek, 2019, p. 5). However, parents in the intervention

group did self-report increased engagement with their children through use of the technology. The authors suggest that this indicates a need for more parent involvement in the planning, not just the implementation of technology programs, as parents may have different goals for use of the technology than the school.

Summary of Parent Perspectives of Technology and 1:1 Initiatives

A total of 11 studies were included in this literature review that specifically addressed parents' perspectives regarding students' use of technology for learning. The common theme shared across all studies was that parents felt technology was useful for students' learning and that children will need to develop digital skills in order to be successful and prepared for today's world. However, the parents also had many concerns about children's use of technology. Common themes included worrying about students' loss of physical activity and social interaction, concerns about cyberbullying and online safety, students using devices for off-task behaviors and being distracted. The fact that the same concerns were shared by parents across multiple studies establishes that these concerns are important to study, and also provides themes that will likely be found in my study. Recognizing that family factors influence how students and parents relate to technology is an important finding that is uncovered in the literature. Studies featuring Latinx immigrant families show that these families may struggle more with digital technology use at home due to lack of both financial resources and inexperience with technology (Katz & Gonzalez, 2016; Nogueron-Liu, 2017; Tripp, 2011). However, other immigrant parents who are more financially secure and have more digital skills, such as the immigrant parents in the Ortiz et al. (2011) study seem to have fewer struggles with technology. More studies with populations of immigrant families from different backgrounds could help to further explore this issue. The study by Ball and Skrzypek (2019) recommended that giving families devices and

training on how to use them with students might increase both families' meaningful interaction with technology and also strengthen communication between families and schools. Hollingworth et al. (2011) found that social class can be a powerful factor impacting families' attitudes toward and interaction with technology. Studies that specifically addressed parent perspectives of school-issued devices found overwhelming support for devices, but similar concerns were also found across all studies regarding parents and technology (Bate et al., 2013; Chappelear, 2019; Håkansson Lindqvist, 2021; Jin & Schmidt-Crawford, 2017; Keane & Keane, 2018). The common themes regarding concerns, expectations, and socio-cultural factors that were addressed in these studies helped to inform survey items in the current study as well.

Summary, Implications and Future Research

This review began by looking at the digital divide literature related to education. Several studies found that access is still an issue that may result in inequities and also disproportionately impacts students based on factors of race, household income, parents' level of education and geography (KewalRamani et al., 2018; Kim & Padilla, 2020; Li & Ranieri, 2013; Mardis, 2016; Vekiri, 2010). Access at home has also been found to affect students' assessment outcomes on nationally and internationally normed tests and cumulative grade point averages (Carr, 2012; Moon & Hofferth, 2018; Stoneman, 2018; Vigdor et al., 2014; Wainer et al., 2015). Many studies also examined the impact of home access on students' development of ICT skills and determined that a divide can exist based on those who have access to and experience with technology at home and those who do not (Aesaert & van Braak, 2015; Hatlevik et al., 2015; Hatzigianni & Margetts, 2012, Jara et al., 2015; Liao et al., 2016; Tirado-Morueta et al., 2017; Wu et al., 2014; Zhong, 2011). Studies have also found that students use technology in differing ways outside of school, and this can have implications for how they use technology for learning

(Aypay, 2010; Drabowicz, 2014; Eynon & Malmberg, 2011; Furlong & Davies, 2012; Hinostroza et al., 2015; Morris, 2011; Zhang, 2015). All of these studies provide strong evidence that a digital divide exists. However, establishing that a digital divide exists should not be the endpoint. Research that goes beyond establishing evidence for a divide and begins to explore nuances within the divide are needed. For example, Carr (2012) found that the only factor that was significantly different between the *achieving* and the *struggling to achieve* groups was having a parent skilled in technology. This is an important finding, but studies that apply an intervention to find ways to enhance parents' digital skills would be beneficial and possibly find ways to address the problem. My study used quantitative methods to not only explore relationships between socio-cultural variables and parent perspectives of technology, but also followed up with qualitative methods to better understand how this barrier impacted families and makes recommendations that might address this problem.

The literature on 1:1 initiatives is fairly extensive, but as Zheng et al., (2016) found, much of that research focuses on in-school use of devices. Studies that look at out of school uses, such as Eynon and Malmberg (2011) and Furlong and Davies (2012) are helpful in identifying types of users. However, there is a disconnect between research that looks at how students use devices in school, and how they use digital technologies outside of school. More research that connects how students are using technologies outside of school and how it impacts uses for learning would be valuable. By focusing on parent perspectives of how students use devices at home, my study will add to the literature in this respect.

Among the four studies which specially addressed parent perspectives of 1:1 devices and used mixed methods, three utilized surveys with both Likert questions and open-ended questions (Håkansson Lindqvist, 2020; Jin & Schmidt-Crawford, 2017; Keane & Keane, 2018). Only Bate

et al. (2013) also utilized focus group interviews with parents to further explore findings from the questionnaire. The use of only open-ended questions allowed researchers to derive themes from the study but did not allow them to follow up with specific questions that could help further understand the findings. An interesting finding from the Keane & Keane study was that while an overwhelming majority (92%) of parents felt that computers are important for learning, only 58% believed the devices would have a positive effect on learning. Studies that utilize a method such as follow-up interviews, which allow researchers to further explore seemingly discrepant findings, would add to the literature.

Studies which examined how social class affected views on technology, such as Hollingworth et al., (2011) are important in establishing that parents' experiences and skill with technology can impact how their family interacts with technology. This has implications for future research because there is a need for more studies that examine different aspects, such as how parents' technology use impacts availability and use of technology in the home. To try and address this, my study explores the relationship between parents' technology use and parent perceptions regarding their children's use of technology.

Parents play a large role in students' education at home. The literature in the field of educational technology should be representative of this role. However, very few studies regarding parent perspectives of technology exist, and even fewer exist that specifically address 1:1 devices for completing schoolwork at home. It appears that educational technology will only continue to progress, and more studies will be needed to continually assess parents' and students' interaction with technology as it evolves. Without such research, digital inequities may be perpetuated that disproportionately affect traditionally marginalized populations. Studies such as

this dissertation, which consider sociocultural factors in the context of use of 1:1 devices for use at home will help add to the knowledge base and promote digital equity.

Definition of Terms

Broadband: reliable, fixed high-speed internet access (such as DSL, satellite, fiberoptic) that is always on and supports a wide bandwidth of data transmission and supports speeds of at least 25 Mbps download speeds and 3 Mbps upload speeds (NTIA, 2021; Cooper, 2018)

Digital citizenship: "responsible use of technology to learn, create and participate" (Common Sense Media, 2020, p. 1)

Digital divide (in education): Hohlfeld et al. (2017) view the digital divide in terms of three levels. Level one, the base level, refers to access to hardware, software and the internet. Level two refers to how teachers and students make use of technology and level three, the highest level, refers to how students use technology to empower themselves.

Digital equity: ensuring that technology resources are equally distributed across schools regardless of school factors and that educational technology use is also equally distributed and not dependent on student factors such as race, income or ability (Becker, 2007)

Digital literacy: "the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills" (American Library Association, 2022, para. 1)

Educational technology (Ed tech): technology hardware and software that is used to support teaching and learning

Homework gap: "the divide between students who have home access to broadband internet and the digital tools needed to be academically successful and those who do not" (Fazlullah and Ong, 2019, p. 4).

*Information and Communication Technology (ICT) literacy: "*using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society" (International ICT Literacy Panel, 2002, p. 2)

One to one (1:1) device initiative: refers to any school or district plan to provide a school-issued device to every student for use at school and at home

Chapter 3: Methodology

This chapter provides a detailed description of the methods and procedures used in the study. An explanation of the research design and alignment of the research questions and methods is presented. The procedures used for data collection and analysis of both quantitative and qualitative data are also discussed. The final section addresses the significance and limitations of the study.

Research Design

The purpose of this study was to better understand parents' experiences and perceptions regarding students' use of school-issued devices for learning. The design of this mixed methods study was a convergent (QUAN+QUAL) design. Creswell and Plano Clark (2018) explain the convergent design as "a mixed methods design in which the researcher collects and analyzes two separate databases—quantitative and qualitative—and then merges the two databases for the purpose of comparing or combining the results" (p. 68). Benefits of this design include the ability to collect both types of data at once, which can often be done more quickly than sequential designs, and this design also gives the researcher the ability to analyze the two types of data separately before integration (DeCuir-Gunby & Schutz, 2017). In the parallel-database variant, the findings from the individual databases are considered in the discussion in order to construct a more complete picture of a phenomena. In this study, the quantitative data were used to explore relationships between the independent variables and parent perceptions, as well as barriers and concerns experienced by families. The open-ended response questions were used to gain qualitative data that offered further insight into quantitative findings and also allowed participants to share specific observations and concerns. These responses were important to help capture what is actually happening for families when using technology instead of assuming what

is supposed to happen with technology as do many studies regarding educational technology. While the data were collected simultaneously using the survey, the quantitative analyses were conducted first, followed by the qualitative analysis. The findings from both analyses were then compared to try and gain a more complete understanding of parents' feelings about their children's use of 1:1 devices.

This study utilized a researcher-created survey (see Appendix) comprised of a variety of questions including open-ended questions, Likert-type scales, and demographic questions. The survey gathered quantitative data on factors including access, geography, race/ethnicity, income, education and technology acceptance; these are variables which have been documented in the literature as relating to technology access and use. Analysis of the survey data was used to investigate if these variables identified in the literature were also related to this study sample. In order to answer the two qualitative research questions, a combination of Likert scales and open-ended response questions were used. For example, survey question nine used a Likert scale that allowed parents to indicate their level of concern on a scale from *never concerned* to *always concerned*. There was an additional open-ended question asking parents to elaborate on their concerns. While the semi-structured interview is a more common qualitative data collection method, Braun et al. (2020) argue that use of qualitative surveys can also provide valuable information, since participants may be more willing to share their true feelings in an anonymous survey than when interacting with a researcher. Using open-ended response questions also allows respondents to think about their responses and revise them to reflect their thoughts and feelings more accurately, which could be another benefit of open-ended survey responses over semi-structured interviews. The combination of Likert scales and open-ended responses to try and answer the qualitative questions was purposeful and required a careful balance. In taking a

critical look at technology it was important to ask about student uses and especially about barriers and concerns. However, it was also important not to make the tone of the study negative so as to bias the open-ended responses.

It is common practice to label research as qualitative or quantitative based on the theoretical lens used or the research methods applied. However, as Ercikan and Roth (2006) point out, phenomena and the perception of them by a researcher are neither strictly quantitative nor strictly qualitative. In the search to understand varying perspectives about a topic, it may be beneficial to examine the issue from both a qualitative and quantitative perspective in order to fully understand the research problem. That is why mixed methods were chosen for this study. The use of both quantitative and qualitative methods provided a better understanding of the overall experiences and perceptions of parents. The method of data collection, analysis and reporting that was used to address each research question is shown in Figure 1.

Figure 1

Research Question Matrix

Research Question	Related Survey Item	Method of Analysis	Results Shared Via
RQ1: How do parents feel about students' use of school-issued devices for learning?	All items	Thematic coding of open-ended responses Descriptive statistics of Likert item responses	Narrative Tables showing response percentages of Likert scale items Example quotes
RQ2: *How do factors of race, access, education, income, geography and technology acceptance impact parents' perceptions of children's use of*	Survey items 1-6 & 8	Linear regression analysis using SPSS	Regression tables

1:1 devices for learning?			
RQ3: *What are parents' observations, feelings and concerns about students' use of 1:1 devices for learning?*	Survey items 8, 9, 10, 11, 14, 15, 16	Thematic coding of open-ended responses Descriptive statistics of Likert item responses	Narrative Tables showing response percentages for Likert scale items Example quotes
RQ4: *What barriers have parents experienced regarding students' use of devices for completing schoolwork at home?*	Survey items 12 & 13, 16	Thematic coding of open-ended responses Descriptive statistics of Likert item responses	Narrative Tables showing response percentages for Likert scale items Example quotes

The quantitative analyses were conducted first followed by the qualitative analysis. Findings from the two databases were then combined to answer research question number one and are discussed using a combination of tables and narrative.

Population

This study was conducted in a rural school system that serves approximately 2,000 students in grades PK-12 in four schools: one primary school (PK-2), one elementary school (3-5), one middle school (6-8), and one high school (9-12). The student population is comprised of roughly 75% White and 20% African American students, with around 1% each of Native American and Hispanic students and less than 1% Middle Eastern and Asian students. A category titled *unspecified* that has been added as an option in the school district's data collection system accounts for the remainder of the population. The primary school is a fully funded Title 1 school. The study was conducted while the researcher was a doctoral candidate and also an employee of the school system. The school system aided this study by allowing the recruitment of participants via emails sent to parents. In return, the anonymous findings from the study will

be shared with the school district to better inform their continued efforts regarding the 1:1 devices.

The school district began phasing in a 1:1 initiative during the 2017-2018 school year, distributing Chromebooks to all high school students in the fall of 2017. All middle school students received Chromebooks in September of 2018. In addition to making sure that devices are charged and ready for use at school each day, students are also allowed, and expected, to use Chromebooks at home. However, since the school district knows that access is an issue for many students at home, all middle and high school students have a designated period each day when they can download items to their device so they can access them offline at home. Students at the elementary and primary school also have assigned Chromebooks, however they do not take them home. The exception to this was during the 2020-2021 school year, when the division operated on a hybrid schedule due to COVID-19. Prior to COVID and at the time of this study, only middle and high school students were using Chromebooks provided by the division both at home and at school. Due to the phased in approach and the age of the student, families in the study have varying levels of experience having school-issued Chromebooks. For example, students in eleventh and twelfth grades have had devices for all of high school, while younger students have had devices for most of middle and high school. Sixth grade students are in their first year of having school-issued devices for use at home. Because data was not collected on the age of students, that information is not known.

Sample

The goal of this study was to gather information about parent perceptions regarding their child's use of school-issued devices at home. Since the students at the elementary and primary school do not transport their devices between school and home, only parents of middle and high

school students were included. There were a total of 1,157 students in the population, comprised of 473 middle school students and 684 high school students. Due to the relatively small number of parents and students in this population, and the desire to allow all parents the opportunity to participate, recruitment emails were sent to the entire population of parents. The recruitment email was sent by the Assistant Superintendent to each parent email address listed for each middle and high school student in the PowerSchool database. Since some families have multiple students, there were many duplicate email addresses. Based on the PowerSchool output report, recruitment emails were delivered to a total of 724 unique email addresses to parents with students in the middle or high school.

Human Subjects Protection

Prior to distributing any information to parents, approval from the Institutional Review Board (IRB) at Virginia Commonwealth University (VCU) and the school district was obtained. Approval from the school district was received in July 2021, and final approval from VCU's IRB was received in September 2021. A low level of risk was associated with this study since the participants were adults and completion of the survey was voluntary. No identifying data was collected. All data was collected using the Question Pro survey platform licensed through VCU for academic purposes. Study data and information were stored on my password-protected personal computer and in my password-protected Google account managed by VCU.

Data Collection

A pilot survey was conducted in July 2021 using a small number of parents with schools in another school district that has had a 1:1 initiative for many years. In order to establish that both the instrument and method of survey delivery were both practical, the instrument was

distributed in the same manner that was used in the actual study. In the pilot process, the survey was emailed to the personal email addresses of 10 parents who were acquaintances of the dissertation committee chair and whose children have participated in their school district's 1:1 initiative. Pilot survey respondents shared that the questions were not confusing, the survey was appropriate in length, the ratings in the Likert scale were easy to understand and the overall appearance and navigation was user-friendly. One respondent did say they felt that the survey was a little long and one respondent felt that it might be helpful to ask about the age and number of students the parent had and also any special learning needs of the student. As the majority of the respondents were satisfied with the survey, and to ensure brevity of the survey, those changes were not made.

A recruitment email containing survey information, protections for participants, consent information and a link to the survey was sent to participants by the division's Assistant Superintendent on October 11, 2021. Following the protocol approved by the VCU IRB, the subject line read *1:1 Chromebook Parent Survey* and the body of the email contained the exact wording copied and pasted from the approved recruitment document. A reminder email was sent to parents on October 21, 2021. The survey was closed on November 1, 2021.

Survey Instrument

A researcher-created survey was used to collect the quantitative and qualitative data. The researcher-created survey was chosen over an established survey because no established survey existed that would allow for all of the various data that was to be collected in the same survey. Data including *race/ethnicity*, *education*, *income*, *type of access*, *geographic location* and *technology acceptance* were collected at the beginning of the survey. These items served as independent variables for the regression analysis. As there is a great deal of variation in the

collection of race and ethnicity data, labels for these categories were based on labels commonly used in US Census data and other US government reports (KewalRamani et al., 2018). Level of *education* and *income* also used categorical descriptions on the survey to make them easier for participants to understand. The independent variable *technology acceptance* was based on nine items on a five-point Likert-type scale ranging from *strongly disagree* to *strongly agree* and included options for *no opinion* and *neutral*. Three constructs made up this overall score: self-efficacy, use, and perceived usefulness. There were three statements which addressed each sub-category. The sub-categories *use,* and *perceived usefulness* were loosely based on the Technology Acceptance Model developed by Fred Davis in the 1980's that has been widely used and adapted for many different types of technology. The sub-category *self-efficacy* was used based on findings from the literature that parents' self-efficacy with technology was often related to their feelings about technology (Carr, 2012; Hollingworth, 2011). This researcher-designed construct was used instead of an established measure because technology acceptance was not the focus of the survey and other, established surveys of technology acceptance would have to be adapted to fit this study. The goal of this item was to develop an independent variable that would measure parents' feelings about technology in general. A confirmatory factor analysis was run in SPSS using a principal component analysis extraction method and a varimax rotation. The single-factor technology acceptance variable, consisting of nine items, was found to be highly reliable ($\alpha = .873$). The component matrix values for each item are show in Table 1.

Table 1

Component Matrix for Single-Factor Parent Technology Acceptance Variable[a]

Technology acceptance statement	Component 1
I use technology every day for personal use.	.672
Our family owns a computer, tablet or other device (not smart phone).	.568

Use of computers is a major part of my job.	.626
I feel comfortable using computers.	.776
Having a device makes my life easier.	.795
I think computers are important in today's world.	.798
I can usually figure out what I need to do with computers.	.797
I rely on computers to get things done.	.822
I know a lot about computers.	.634

Note. Extraction method: principal component analysis

[a]1 component extracted

The dependent variable was *parent perception* of the 1:1 device. In order to establish this construct, the survey included ten Likert-type items, ranging from *strongly disagree* to *strongly agree* and also included an option for *neutral* and *no opinion*. Parents were asked to indicate how strongly they agreed with statements regarding various aspects of the devices, such as *the Chromebook is an important tool for my child's learning*. The purpose of this construct was to establish a scale that could be reported as a single score representing parent perceptions of devices. Using IBM SPSS, a confirmatory factor analysis was run using principal component analysis for extraction and a varimax rotation. The single-factor variable parent perception, consisting of 10 items, was found to be highly reliable (α= .944). Table 2 shows the component matrix value for each item.

Table 2

Component Matrix for Single-Factor Parent Perception of 1:1 Device Variable[a]

Parent Perception statement	Component 1
The Chromebook is an important tool for my child's learning.	.840
Using the Chromebook for learning helps my child be successful.	.870
It is important that schools teach students to use technology such as the Chromebook.	.744
Having a Chromebook has helped my child learn.	.877
I want my child to have a school-issued Chromebook in the future.	.853
Teachers ask students to use Chromebooks in ways that are beneficial to their learning.	.806

My child is comfortable using their Chromebook to complete schoolwork.	.765
My child is more motivated to complete homework using the Chromebook.	.742
Being able to use the same device at home and in school has helped my child be more organized.	.792
Overall I am pleased with how the Chromebooks are being used.	.880

Note. Extraction method: principal component analysis

[a]1 component extracted

One question that was added to the survey after consultation with the school district asked about the parent's voting district. Since access is known to be a problem in many areas of the county, it was thought that this information would be a useful way to establish geographic location within the county without asking for personal information, such as an address, that would violate the participant's anonymity.

There were three additional questions on the survey that asked parents to select from a list of choices. One question asked about ways parents observed children using devices and contained responses ranging from *never* to *always*. Another question asked how often parents had various concerns or how often they had faced barriers. These questions were also on a Likert scale and included a range of responses from *never* to *always* and also included an open-ended response item for parents to elaborate further. The final question was an open-ended question allowing for parents to add anything else they would like to share about their experiences with the devices.

Threats to Validity of Quantitative Data

Since completion of the survey was voluntary and there were no means of compelling parents to participate, one of the most significant threats for this study was the possibility of sample bias. One way this study attempted to address this was by sending the survey to the entire

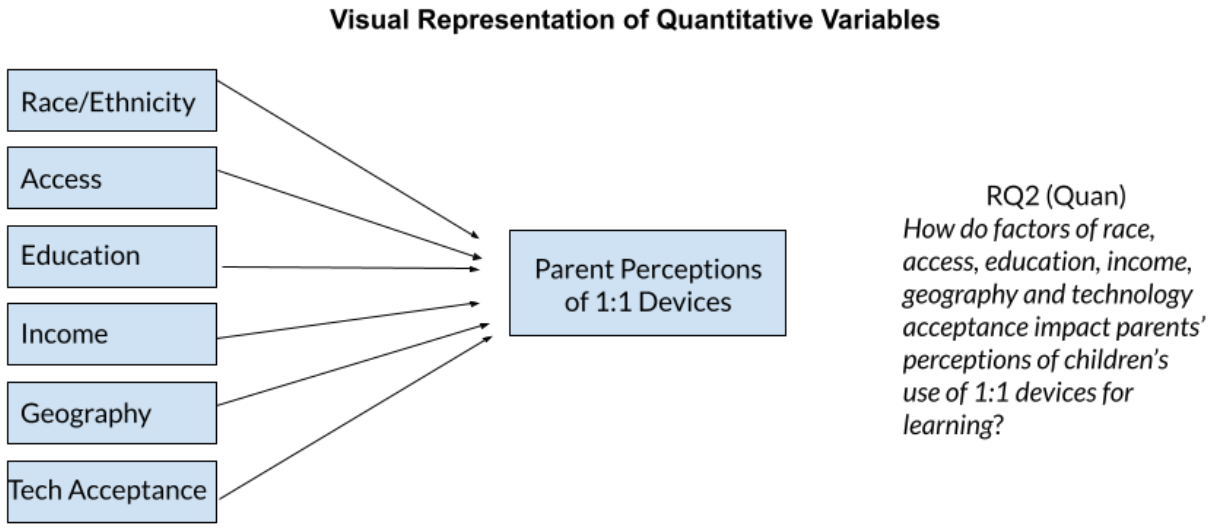
population of parents of middle and high school students so that anyone who wanted to complete the survey had the opportunity to participate. Another potential threat to this study was the instrumentation. Since a researcher-created survey was used instead of an established instrument it is possible that the survey was not the best measure for the data the survey was attempting to collect. Conducting the pilot survey was one way this study addressed that threat. To establish validity of the researcher-created constructs for parent perceptions and technology acceptance confirmatory factor analysis was used to obtain Cronbach's alpha values for both constructs. There were also several benefits to using a web survey that made this a good choice for this study. As described by Mitchell and Jolley (2013) benefits to using a web survey include the ability to collect a large amount of data, less researcher influence, and allowing the participants to remain anonymous. One threat to the study listed by Mitchell and Jolley (2013) includes the possibility that the same person might take the survey more than once. Since the surveys were anonymous there was really no way to mitigate this threat. Another possible threat to validity was the use of an online survey for participants where access may be an issue. However, most all parents have access to email and would thus also have had access to complete the survey, which is even accessible on mobile devices such as smartphones.

Quantitative Data Analysis

Descriptive statistics were displayed in a table to provide an overview of the respondent demographics and to evaluate whether the sample results were representative of the general population of the school system. The statistical software package IBM SPSS Statistics version 28.0.1.0 was used to carry out all statistical analyses. Simple linear regressions were run with each of the six independent variables predicting the dependent variable parent perceptions. A

visual representation of the multiple regression analysis that was run, showing independent and dependent variables, is shown in Figure 2.

Figure 2



Simple linear regressions were used to examine the relationship between each independent variable and the dependent variable. A multiple regression was then run using all six of the independent variables to predict the dependent variable. Frequencies and percentages of the Likert scale responses were also run using SPSS software. These findings were presented in tables showing percentages of responses and also discussed in narrative form.

Qualitative Data Collection

Qualitative data was collected using the same survey instrument. Six open-ended questions were asked in order to specifically encourage parents to share their own thoughts and feelings. These questions were positioned after the Likert-style items relating to that question. For example, after the Likert items regarding ways parents observed their child using their

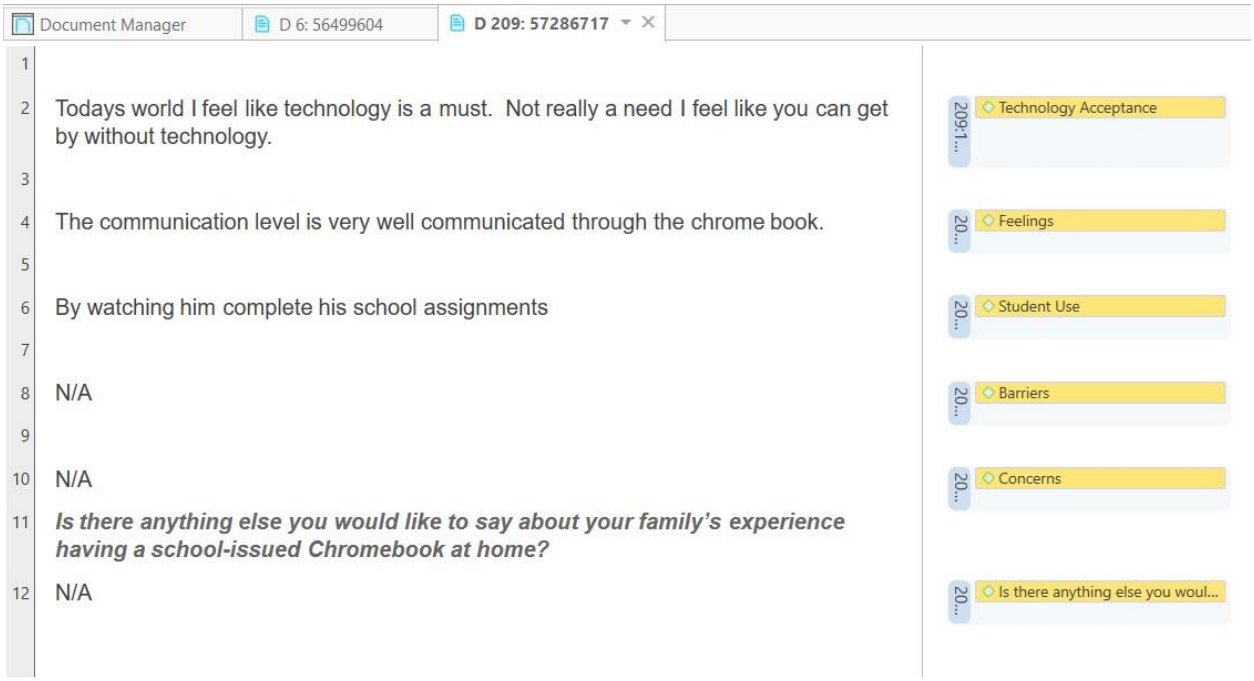
device, an open-ended response question requested that parents list any additional ways they had observed their child using their device. Questioning techniques such as asking parents to "please list, add or elaborate" instead of asking "is there anything you would like to add" were also used to elicit more responses from parents.

Qualitative Data Analysis

All survey data was imported into the qualitative software program Atlas.ti. A new document was created for each survey response. There were 259 separate documents created upon import. Of these, 183 responses included open-ended answers provided by participants versus answers being left blank or marked N/A, none, etc. Responses were prepared for import by creating a thematic code in the Excel spreadsheet for each question. Due to this preparation, each open-ended response was tagged with a code based on the theme of the question when it was imported. These themes were colored orange and served as organizational codes. Figure 3 shows a screenshot from my computer screen of how the imported codes appeared in Atlas.ti.

Figure 3

Screenshot of Qualitative Codes in Atlas.ti Software



Note. Text on the left are the open-ended responses provided by the respondent. Organizational codes applied on import are in yellow on the right.

As explained by Maxwell (2013) these "organizational categories function primarily as bins for sorting the data for further analysis" and allowed me to know which question the respondent was answering (p. 107). The next step was to read through all of the responses several times over a two-week period to get a feel for the data. During this phase of data analysis, two data reduction methods were used: coding (thematic and inductive) and memoing (Miles & Huberman, 1984). Coding is described by Miles and Huberman (1984) as a "critical data reduction tool" while memoing involves "a brief conceptual look at some aspect of the accumulating data set" (p. 25). While reading, handwritten research memos were recorded in a notebook which included jotting down key words and ideas that seemed to be emerging themes and concepts. This iterative process of reading and re-reading was helpful because I realized that the "organizational bins" the responses were in did not capture the nuances represented. In a common approach to coding discussed by McMillan (2016), my next step was to "read through

the transcripts and look for words, phrases, or events that seem[ed] to stand out" and record these words and phrases to in handwritten memos (p. 351). Open coding was used to build codes based on the common word and themes recorded in the memos. The words and phrases based on the memos were typed into a Google doc, which were then physically moved, grouped, and condensed, resulting in 32 codes created based on the open coding method.

Using the 32 codes, I then went through all of the documents again, highlighting specific responses and applying codes. For a period of approximately two weeks all of the open-ended responses were repeatedly read and re-read, and codes were applied to participant responses. Eventually, a point of saturation was reached where no new codes were applied upon subsequent readings of the data. At this point the codebook was shared with a colleague in order to help ensure credibility of the findings, which is discussed below. While reading each group of documents tagged with specific codes, themes began to emerge based on the frequency of codes. At this point a second page was added to the Google doc detailing themes and sub-themes. Once themes were established, a Google sheet containing each theme and spaces for example quotes was created. Atlas.ti software was then used to view all quotes tagged under each open code and selected example quotes that seemed to best illustrate the theme. The example quotes were then chosen and copied and pasted into the Google sheet with their corresponding theme. Using the themes and example quotes I began writing the findings for the qualitative analysis.

Establishing Credibility of Qualitative Findings

According to McMillan (2016) credibility in qualitative research "usually refers to whether the results accurately portray the views and meanings of the participants" (p. 308). One potential threat to this study was researcher bias. Researcher bias can be a threat to qualitative methods because collection and analysis of the data is sometimes less objective, and more

subjective (Maxwell, 2013; McMillan, 2016). Peer de-briefing was used in order to try and address this threat. Onwuegbuzie and Leech (2007) characterize peer de-briefing as similar to inter-rater reliability, often used in quantitative methods, in which another person provides feedback, proposes alternative theories and questions the researcher's assumptions. I asked a colleague who is also in the field of educational technology, and in my doctoral cohort, to review my codes and offer suggestions. Prior to our meeting I shared the Google doc I had created with the 32 codes via email for my colleague to review. We then met virtually using Google meet, during which time I used screen share to allow my colleague to view my coded documents in Atlas.ti. The ability to view all quotations that had the same code was extremely helpful in recognizing emerging themes and we were able to review the codes and talk through them together. During this time, I also shared some of my illustrative quotes that supported the emerging themes and the colleague provided feedback on those as well.

Another method used to build credibility in this study was triangulation. Onwuegbuzie and Leech (2007) describe triangulation as the "use of multiple and different methods, investigators, sources and theories to obtain corroborating evidence" (p. 239). Because this was a mixed methods study, the quantitative and qualitative findings served as a type of triangulation, allowing me to look at the issue of parent perspectives from many angles to develop a deeper understanding of the overall experiences of parents. The use of quantitative methods such as descriptive statistics of Likert scale items and regression analysis, combined with quotations from open-ended responses provided different types of data that was used to examine findings from multiple analyses.

Another possible threat to the credibility of this study was reactivity. Maxwell (2013) defines reactivity as "the influence of the researcher on the setting or individuals studied." As the

researcher in this study, who also works in the county where the study was conducted, it is possible that some respondents recognized my name and associated me with the study, which could have influenced their responses. One way that this study tried to lessen this potential threat was to have the survey sent from the assistant superintendent instead of directly by me, in order to distance me from the study in the eyes of the respondents. In addition, respondents were informed that responses were anonymous, and no identifying data was collected, so there should not have been any expectation that I would know how any individual participant responded.

Limitations

In the case of this study, the participants were nested within a given school district, thereby making it impossible to have a truly randomized sample which may be generalizable outside of this sample population. Another obstacle was that there was not a great deal of ethnic or racial diversity within this school system, again making generalizability difficult. However, that does not mean that generalizations cannot be made which would add to the understanding of the research questions in this study for this specific population. Additionally, not being able to generalize to a larger population does not negate the need for a study. When looking to implement and maintain a successful 1:1 program, generalizability may not be helpful. As Peterson and Scharber (2017) point out, “each district’s localized context requires them to look within their own system to find the answers to these questions” (p. 60). If there is a small population of parents within a school system that exhibits a pattern of acceptance or non-acceptance regarding the initiative, that information still adds to the literature on digital equity. While this study will add to the literature about parent perspectives and 1:1 initiatives, the most important facet from my point of view was that it provides a clearer picture of the experiences of

these parents, within this district, that can guide the school system and possibly others moving forward.

Significance of the Study

This study added to the body of literature in a number of ways. First and foremost, it focused on a segment of stakeholders, namely parents, which are largely left out of the decision-making process with regard to 1:1 initiatives and also with regard to research on 1:1 technology. From a critical stance, it was important to consider these stakeholders that are largely left out of the body of research and take in to account the sociocultural factors that impact students' technology use at home. The mixed methods study design was another aspect of this study that contributed to the body of literature on technology use by students at home because it may help to develop a more complete understanding of families' experiences that can inform the quest for equity. In addition to adding to the literature in general, this study also offered valuable information to the school district used in the study that will help guide them as they continue their 1:1 initiative in the future. Most important to me, this study focused on the lived experiences of the parents in the district where I live and work and where my own child attends school. I hope that in some small way, my focus on equity will give a voice in the literature, and in my district, to families who may not otherwise be given a voice in the digital divide.

Chapter 4: Findings

The results of the current study are presented in this chapter as they relate to the research questions. Characteristics from the response sample are shared first to provide an overview of the respondent characteristics. The findings will then be shared in the order of the research questions. In the analysis process the quantitative data was analyzed first, followed by the qualitative data, and the data was then mixed, as is common in the convergent (QUAN+QUAL) design (Creswell and Plano Clark, 2018). However, the results are presented here in the order of the research questions because the first research question provides an overview of the data that is important for context. The quantitative data which helped to answer research question two is then presented, followed by the qualitative data which provided insight into research questions three and four. While the other studies did not follow the exact same methodology as the current study, presenting the results in the order of the research questions is similar to the format followed in other studies regarding parent perspectives of 1:1 devices (Bate et al., 2013; Håkansson Lindqvist, 2021; Jin & Schmidt-Crawford, 2017; Keane & Keane, 2018). Finally, a summary of the findings is presented.

Response Characteristics

Recruitment emails were sent to parents of all middle and high school students in the district, at 724 unique addresses. Some email addresses were duplicates, as parents may have had multiple middle or high school students. Responses were received from 287 participants. Twenty participants were deleted because they did not answer any of the survey questions. Another 31 were considered “dropouts” because they answered only the first few questions. The majority of these answered question one, but dropped off after question two, three or four. Because the main focus of this study was parent perceptions, respondents who answered the items for parent

perceptions were included in the analysis if they also answered some of the other questions. This left a total of 236 respondents. Based on the rate of respondents retained (236) and the total emails delivered to unique addresses (724), this study had a response rate of 32.6%. The specific sociodemographic characteristics of the respondents are presented in Table 3.

Table 3

Sociodemographic Characteristics of Participants

Characteristic	*n*	%
Race		
American Indian or Alaska Native	5	2.12
Asian	2	0.85
Black or African American	16	6.78
White	192	81.4
Hispanic or Latinx	3	1.27
Two or more races	12	5.08
Other	1	0.42
Missing	5	2.12
Total	236	100
Type of home access		
Don’t have home internet access	7	2.97
Low speed (such as dial up)	10	4.24
High speed (such as DSL, satellite, cable)	145	61.4
Mobile data	73	30.9
Don’t know	1	0.42
Total	236	100
Highest level of education		
Did not complete high school	1	0.42
High school	32	13.6
Vocational training, apprenticeship, certificate	24	10.2
Some college	59	25.0
Associate of bachelor’s degree	87	36.9
Graduate degree	32	13.6
Missing	1	0.42
Total	236	100
Income		
Below $25,000	5	2.12
$25,000-$50,000	30	12.7
$50,000-$75,000	41	17.4
$75,000-$100,000	58	24.6
$100,000-$150,000	65	27.5

Above $150,000	31	13.1
Missing	6	2.54
Total	236	100
District		
5th district	41	17.4
4th district	68	28.8
3rd district	54	22.9
2nd district	44	18.6
Don't know	21	8.90
Reside outside county (tuition or non-resident)	7	2.97
Missing	1	0.42
Total	236	100

Mixed Methods Results

The over-arching question guiding this research study was: how do parents feel about students' use of school-issued devices for learning? The purpose behind using mixed methods research was to try and more fully explore this topic than either quantitative or qualitative means alone would do. In order to understand this topic, it was important to look at the many factors that may impact how parents feel about devices. These factors included parents' own personal feelings, their observations and experiences watching and helping their child use devices, concerns they have about devices and any barriers they have experienced that they feel have kept them from fully utilizing the devices. Use of Likert style scales provided feedback regarding specific areas of concern commonly found in the literature. The open-ended responses also allowed participants to clarify and expand on their own experiences. The results of the Likert scale items combined with the commentary from parents in open-ended responses provided a better understanding of parents' overall feelings about devices and helped to answer the first research question. Example quotes[2] from open-ended responses are presented in the narrative.

[2] Direct quotes taken from open-ended responses were not edited and may include grammatical, spelling or other errors.

Parents' Overall Technology Acceptance

Parents' technology acceptance was found to have a statistically significant and positive relationship to parents' perceptions of their children's use of devices for completing schoolwork. The mean score for *technology acceptance* (M=5.288, SD=.666, min.=2, max=6) indicates that most parents had high levels of technology acceptance. The frequencies and percentages of responses to the individual questions are shown in Table 4.

Table 4

Frequencies and Percentages of Parents' Technology Acceptance

Statement	No opinion		Strongly disagree		Disagree		Neutral		Agree		Strongly Agree	
	N	%	N	%	N	%	N	%	N	%	N	%
Use technology every day[a]			5	2.10	1	0.40	8	3.40	49	20.8	172	72.9
Family owns computer[b]			13	5.50	12	5.10	11	4.70	50	21.2	149	63.1
Use computers for job[c]	4	1.70	13	5.50	7	3.00	12	5.10	47	19.9	151	64.0
Comfortable using computers[d]	1	0.40	1	0.40	2	0.80	12	5.10	71	30.1	148	62.7
Device makes life easier[e]	1	0.40	3	3.10	6	2.50	22	9.30	68	28.8	135	57.2
Computers are important[f]	1	0.40	2	0.80	1	0.4	16	6.80	72	30.5	143	60.6
Know how to use computers[g]	1	0.40	2	0.80	9	3.80	9	3.80	109	46.2	104	44.1

Rely on computers[h]			4	1.70	14	5.90	40	16.9	74	31.4	103	43.6
Know a lot about computers[i]	1	0.40	7	3.00	21	8.90	77	32.6	86	36.4	42	17.8

Note. [a] *N*=235, missing=1; [b] *N*=235, missing=1; [c] *N*=234, missing=2; [d] *N*=235, missing=1; [e] *N*=235, missing=1; [f] *N*=235, missing=1; [g] *N*=234, missing=2; [h] *N*=235, missing=1; [I] *N*=234, missing=1

The overwhelming majority of parents agreed or strongly agreed that they used technology every day (93.7%) while 92.8% of parents agreed or strongly agreed that they are comfortable using computers and 91.3% agreed or strongly agreed that computers are important. These findings were echoed in the open-ended responses. There were 22 open-ended responses regarding technology acceptance and 50% of them (11/22) were positive regarding technology. Comments included statements such as, “they play and will continue to play a critical role in daily living,” and “could not see myself functioning without them,” and also, “comfortable and use them daily.”

However, only 75% of parents agreed or strongly agreed with the statement, *I rely on computers to get things done*. Some of the open-ended responses seemed to be related to parents’ desire to moderate their own technology use. For example, one parent stated, “I remain the master of my devises and regularly step away from them especially during times of relaxation and holiday (vacation).” Another parent expressed mixed feelings, explaining, “it's a love -hate relationship! Technology makes things easier and more convenient, but sometimes exposes my family to unwanted stress/materials.” Parents also shared the desire to provide limits for their children. One parent shared, “I use technology for work and personal use daily. I limit

technology use for my children." Another parent explained that balance was necessary saying, "I think students should be exposed to computers and technology. I think it is important for kids to be able to do things without technology as well. A good mix is important." Of the 22 comments regarding technology acceptance, eight of them (36%) contained statements regarding mixed feelings such as those presented here. Parents appeared to acknowledge and appreciate the increasing role that computers and technology play in our lives, but also seemed to want to find a balance between technology and other activities for themselves and their families.

Parents' Perceptions of Devices

Parents' perceptions of the devices were not quite as positive overall as their feelings toward technology and computers for themselves. The variable *parent perceptions*, which was the dependent variable used in the simple linear regressions, had a lower mean score (M=4.896, SD=.846, min.=1, max=6) than the variable *technology acceptance* discussed above. Looking at the individual items that comprised this mean score shows much lower percentages of parents agreeing or strongly agreeing with many of the statements. Frequencies and percentages of responses for the Likert scale items related to parent perceptions are reported in Table 5.

Table 5

Frequencies and Percentages of Parent Perceptions of Devices

Statement	No opinion		Strongly disagree		Disagree		Neutral		Agree		Strongly Agree	
	N	%	N	%	N	%	N	%	N	%	N	%
Important tool[a]	2	0.80	3	1.30	11	4.70	40	16.9	102	43.2	77	32.6
Helps child be successful[b]	2	0.80	9	3.80	19	8.10	52	22.0	87	36.9	66	28.0

Important to learn technology[c]	1	0.40	1	0.40	6	2.50	12	5.10	96	40.7	119	50.4
Helps child learn[d]	3	1.30	10	4.20	20	8.50	51	21.6	86	36.4	64	27.1
Want device in future[e]	5	2.10	4	1.70	9	3.80	31	13.1	93	39.4	93	39.4
Teachers use in beneficial ways[f]	7	3.00	6	2.50	7	3.00	44	18.6	110	46.6	60	25.4
Child comfortable using device[g]	2	0.80	2	0.80	6	2.50	22	9.30	112	47.5	91	38.6
More motivated to do work[h]	3	1.30	14	5.90	30	12.7	83	35.2	67	28.4	39	16.5
Helps with organization[i]	5	2.1	6	2.5	10	4.2	39	16.5	106	44.9	70	29.7
Overall pleased[j]	2	0.8	5	2.1	15	6.4	40	16.9	108	45.8	65	27.5

Note. [a] *N*=235, missing =1; [b] *N*=235, missing=1; [c] *N*=235, missing=1; [d] *N*=234, missing=2; [e] *N*=235, missing=1; [f] *N*=234, missing=2; [g] *N*=235, missing=1; [h] *N*=236, missing=0; [I] *N*=236, missing=0; [j] *N*=235, missing=1.

There seem to be some discrepant findings. Over 90% of parents agreed or strongly agreed that *it is important for schools to teach children how to use technology, such as the Chromebook*. But only around three quarters of parents agreed or strongly agreed with the statements: *the Chromebook is an important tool for my child's learning* (75.8%), *I want my child to have a school-issued Chromebook in the future* (78.8%) and that *teachers ask students to use Chromebooks in ways that are beneficial to their learning* (72%). These were echoed in the qualitative findings (discussed in detail later) where parents shared that Chromebooks were

"limited" and some desired a more fully functioning device. Also, parents shared that the devices were not compatible for students enrolled in dual enrollment classes with the local community college.

Regarding the devices helping students with learning, 74.6% of parents agreed or strongly agreed that the *devices helped students be more organized*. There were eight responses shared by parents pertaining to the device helping their child to be more organized and efficient. One parent stated, "having the chromebook at home when my child is home on the weekends has allowed her to complete schoolwork that she may have had to wait to do if she did not have it." Only 44.9% agreed or strongly agreed that their child was *more motivated to do schoolwork*, with 18.6% disagreeing or strongly disagreeing and 35.2% remaining neutral. None of the comments in the qualitative findings mentioned motivation or students being more motivated to do work using a device. Also, 63.5% of parents agreed or strongly agreed that *the Chromebook has helped their child learn*, and 64.9% felt that *the Chromebook helped their child be successful*. In the open-ended responses one parent called the device a "remarkable tool" while another parent stated, "the Chromebook does provide an easier way for my child to do and submit their work; however, I have seen less improvement in my child's overall success in school." A higher number of parents (72%) agreed or strongly agreed that *the teachers ask students to use Chromebooks in ways that are beneficial to their learning*. And 86.1% of parents agreed or strongly agreed that their child was *comfortable using the Chromebook*.

Observed Student Uses

There were ten Likert style questions regarding ways that parents observed students using their devices. The most often observed use parents reported was completing and submitting assignments through learning management systems such as Schoology, Google Classroom,

Canvas, etc., followed by internet searching and word processing. Parents reported students *completing or submitting assignments* often or always (82.7%), *internet searching* often or always (69.9%) and *word processing* often or always (66.1%). Other observed student uses that parents saw often or always included: *data and spreadsheets* (28.4%), *creating presentations* (47.4%), *collaborating with peers* (38.1%), *communicating with teachers* (46.6%), *watching videos/tutorials* (45.3%), *content creation* (15.7%), *leisure/entertainment* (22%). Frequencies and percentages of students' uses are displayed in Table 6.

Table 6

Frequencies and Percentages of Observed Student Uses of Device

Statement	Don't know		Never		Rarely		Sometimes		Often		Always	
	N	%	N	%	N	%	N	%	N	%	N	%
Word processing[a]	11	4.70	2	0.80	10	4.20	43	18.2	103	43.6	53	22.5
Data and spreadsheets[b]	30	12.7	8	3.40	50	21.2	64	27.1	46	19.5	21	8.90
Creating presentations[c]	16	6.80	2	0.80	20	8.50	71	30.1	85	36.0	27	11.4
Internet searching[d]	11	4.70	3	1.30	7	3.00	36	15.3	106	44.9	59	25.0
Completing assignments[e]	2	0.8	2	0.80	7	3.00	15	6.40	104	44.1	91	38.6

Schoolwork with peers[f]	39	16.5	3	1.30	28	11.9	62	26.3	73	30.9	17	7.2
Communicating w/ teachers[g]	11	4.70	9	3.80	21	8.90	70	29.7	67	28.4	43	18.2
Watching videos/tutorials[h]	18	7.60	5	2.10	16	6.80	76	3.20	68	28.8	39	16.5
Content creation/sharing[i]	51	21.6	44	18.6	53	22.5	37	15.7	26	11.0	11	4.7
Leisure or entertainment[j]	14	5.9	55	23.3	51	21.6	50	21.2	38	16.1	14	5.9

Note. [a] *N*=222, missing =14, 5.9%; [b] *N*=219, missing=17, 7.2%; [c] *N*=221, missing=15, 6.4%; [d] *N*=222, missing=14, 5.9%; [e] *N*=221, missing=15, 6.4%; [f] *N*=222, missing=14, 5.9%; [g] *N*=221, missing=15, 6.4%; [h] *N*=222, missing=14, 5.9%; [I] *N*=222, missing=14, 5.9%; [j] *N*=222, missing=14, 5.9%.

In the open-ended response portion of the survey, parents elaborated on a few other things they observed students doing on devices. One parent responded that their child used the device for, “research, math help, slide shows, proof reading, checking grades/assignments.” Another parent mentioned their child using Quizziz, which is a program that allows teachers to create review and assessment tools that students use online. Other apps and programs parents mentioned included FlipGrid and Kahoot, both of which are interactive online educational sites. Other responses are discussed in detail in the qualitative findings, but included things such as editing photos, entering art contests and researching colleges.

A few parents also mentioned that they observed their child using their device in ways that they did not consider to be productive. One parent stated, “without my constant guidance and supervision the Chromebook is little more that an entertainment console. Schoolwork and learning are a distant second.” Another parent seemed frustrated that their child used it, “to sneak the internet when grounded from electronics at home. He uses it for entertainment more than anything else.” Though there were only a few comments such as these that indicated the students used the devices for off-task endeavors.

Parent Perceived Barriers

Based on the Likert scale responses, *slow internet* was the largest reported barrier, with 30% of parents experiencing slow internet often or always. An additional 21.6% reported *slow internet* as a problem sometimes, and 38.6% reported *slow internet* rarely or never being a problem. *Running out of data* and *not having access* were the second most often experienced barriers parents reported. About a quarter of parents reported *running out of data* often or always (24.6%) and another 12.3% reported *running out of data* sometimes, while 51.7% of parents reported rarely or never experiencing this problem. *Lack of access* was reported often or always by 24.2% of parents, and 26.3% reported *lack of access* as sometimes a problem. That means that over half of the respondents reported *lack of access* and *internet being too slow* as a problem at least sometimes. These findings were echoed in the open-ended responses. There were 65 open-ended responses parents submitted when asked about barriers. Of those, 28 mentioned either no internet, or slow speeds as barriers to usage. Also, several parents indicated that access was an issue before broadband was available. For example, one parent said, “our internet was able to be upgraded last year so the slow internet issue is no longer an issue.” Other parents mentioned that

while they had access to high-speed internet, they knew that it was a problem for others in the county. Frequencies and percentages of specific responses to barriers are reported in Table 7.

Table 7

Frequencies and Percentages of Barriers

Statement	Don't know		Never		Rarely		Sometimes		Often		Always	
	N	%	N	%	N	%	N	%	N	%	N	%
Lack of access	1	0.40	51	21.6	43	18.2	62	26.3	37	15.7	20	8.50
Slow internet	1	0.40	49	20.8	42	17.8	51	21.6	48	20.3	23	9.70
Running out of data	5	2.10	95	40.3	27	11.4	29	12.3	37	15.7	21	8.90
Having enough devices	3	1.30	112	47.5	33	14.0	23	9.70	27	11.4	16	6.80
District barriers	30	12.7	74	31.4	45	19.1	37	15.7	19	8.10	9	9.30

Note. *N*=214, missing=22, 9.3%

Another barrier that was mentioned by parents was the inability to email students. The Likert scale responses regarding district barriers indicated that only 17.4% of parents experienced *barriers due to district restrictions* often or always and 15.7% experienced them sometimes. Never or rarely experiencing *barriers due to district restrictions* were reported by 50.5% of parents. Three parents mentioned in the qualitative findings that students could not receive emails from people outside of the school email system and this was a barrier, but also said they understood why this restriction was placed on devices. One additional parent spoke about inability to email as a barrier for some parents when trying to submit assignments. That parent shared,

> I often have to use a handheld device to screen shot and text or email teacher to prove we are attempting to submit - haven't been successful getting /forwarding items to myself to attempt alternate means of submission outside Childs's school account.

Based on this statement, it seems that if the child could email the work to the parent then the parent could submit it from their device when they were having trouble submitting assignments at home. However, having the students' email blocked from emails outside of the district prohibits this.

Not having enough devices for everyone in the family who needed them did not appear to be a very big issue. The majority of parents (61.5%) reported never or rarely having this problem, and only 18.2% reported *not having enough devices for everyone* often or always. Four parents indicated in the open-ended comments that having the school-issued devices was helpful because they either had no home computer or not enough for all the students in the home. While access to devices did not appear to be a problem for the majority, it is still a problem for some.

There were a few comments listed by parents as barriers in addition to those addressed by the Likert scale questions. Two parents mentioned lack of access to a printer and the inability to print at home. One other parent referred to using the camera, stating "use of camera - we do not allow use of the camera in our home." It was difficult to discern exactly what was meant by this comment, as there were no other comments related to this one by the respondent.

Parent Concerns

With regard to concerns expressed by parents, many of the open-ended responses were closely linked to the concerns listed in the Likert scale items. About half of parents (50.9%) were never or rarely concerned about *students being off task*, while 14.4% were often or always

concerned. Regarding *inappropriate content* 59.8% were never or rarely concerned and only 12.8% were often or always concerned. *Online safety* was never or rarely a concern for 51.7% of parents. The largest percentage of parents (32.7%) were often or always concerned when it came to *too much screen time* for their children and 23.7% were sometimes concerned. This meant that 56.4% of parents were either sometimes, often or always concerned about *too much screen time,* making it the most pressing concern for parents. *Lack of physical activity* and *social concerns* were the next two most concerning items for parents, with 50.1% of parents being sometimes, often or always concerned about *loss of physical activity* and 52.1% having *social concerns* for their child. Monitoring was never or rarely a concern for 43.2% of parents and often or always a concern 23.3% of parents. Even less of a concern for most parents was *being able to help their child, district expectations*, and *loss or damage to devices*. Only 18.2% of parents were often or always concerned about *being able to help their child with devices,* while 14.9% were often or always concerned about *district expectations for use of devices*. *Loss or damage* was often or always a concern for only 15.7% of parents, but it was sometimes a concern for 27.1% of parents. About 46.6% of parents reported never or rarely being concerned about *privacy* while only 18.2% were often or always concerned and 19.5% were sometimes concerned. Table 8 reports the detailed findings, showing frequencies and percentages of specific parent concerns.

Table 8

Frequencies and Percentages of Parent Concerns

Statement	No opinion		Never		Rarely		Sometimes		Often		Always	
	N	%	N	%	N	%	N	%	N	%	N	%
Off-task[a]	5	2.10	54	22.9	66	28.0	46	19.5	24	10.2	10	4.20

Inappropriate content[b]	6	2.50	91	38.6	50	21.2	28	11.9	19	8.10	11	4.70
Online safety[c]	4	1.70	64	27.1	58	24.6	38	16.1	21	8.90	19	8.10
Screen time[d]	3	1.30	26	11.0	42	17.8	56	23.7	49	20.8	28	11.9
Lack of physical activity[e]	4	1.70	42	17.8	41	17.4	49	20.8	36	15.3	33	14.0
Social concerns[f]	4	1.70	37	15.7	41	17.4	56	23.7	33	14.0	34	14.4
Monitoring[g]	4	1.70	55	23.3	47	19.9	44	18.6	26	11.0	29	12.3
Being able to help child[h]	6	2.50	50	21.2	63	26.7	42	17.8	25	10.6	18	7.60
District expectations[i]	22	9.30	55	23.3	52	22	40	16.9	20	8.50	15	6.40
Loss, damage[j]	5	2.10	38	16.1	61	25.8	64	27.1	20	8.50	17	7.20
Privacy, data collection[k]	5	2.10	37	15.7	73	30.9	46	19.5	23	9.70	20	8.50

Note. [a] *N*=205, missing=31, 13.1%; [b] *N*=205, missing=31, 13.1%; [c] *N*=204, missing=32, 13.6%; [d] *N*=204, missing=31, 13.6%; [e] *N*=205, missing=31, 13.1%; [f] *N*=205, missing=31, 13.1%; [g] *N*=205, missing=31, 13.1%; [h] *N*=204, missing=32, 13.6%; [i] *N*=204, missing=32, 13.6%; [j] *N*=205, missing=31, 13.1%; [k] *N*=204, missing 32, 13.6%

The open-ended responses did not offer much additional information regarding concerns, though there were a few things worth noting. One parent elaborated about their concern related to privacy, stating “I believe the Chromebooks pose a great threat to personal privacy. Minor children being required to use such technology and have google accounts creates an environment where student activities, tendencies, and communications are undoubtedly traced and profiled.” Online safety was a large concern for a parent who shared that their family had an issue in the past, so they were wary of such problems. The parent shared, “My primary concern with regard

to any devise used to access the internet is my child's security… I am also concerned with her physical safety." One parent was concerned about not being able to access and monitor their child from their personal device, and explained that, "a device agreement that would allow parents to be more interactive and involved would be helpful." I am unsure what this comment means, but I thought it was worth noting.

Quantitative Data Analysis

Research question two focused on how the independent variables of *race, education, income, access, geography* and *technology acceptance* impacted parent perceptions of student device usage. In order to explore the relationship between these independent variables and the dependent variable parent perceptions, individual linear regressions were conducted. The dependent variable *parent perception* was created by taking the average of the ten Likert-scale items that parents answered regarding feelings about their child's use of their school-issued device. This parent perception score was treated as a continuous variable.

Regression Analysis Based on Race

Even though there was a choice for two or more races, some respondents indicated the specific races/ethnicities with which they identify. Respondents who selected multiple choices for race were recoded into "7", the numerical category for *two or more races* for data analysis purposes. Since the number of respondents identifying as White was the largest group, making up 80.1% of the participants, this sample did not have enough power to make comparisons based on race. However, since the actual demographics of this population are roughly 75% White and 25% People of Color, as reported above, the racial demographics of the respondents do fairly closely reflect the demographics of the population. One main focus of this study was equity. The

literature regarding technology use suggests that Whites tend to demonstrate higher levels of access, use and outcomes with technology compared to other groups such as Black/African Americans, Hispanics and Native Americans (KewalRamani et al., 2018; Kim and Padilla 2020). Therefore, comparing responses received from those identifying as White and those identifying as persons of color seemed reasonable. Results of this simple linear regression were not found to be significant (t=.784, p=.434, n=231). The R Square value of .003 indicates that this model is not able to explain much of the variance in the data. The F-value of .615 (p=.434) indicates that this model also has very little predictive power. Based on this analysis of the data, race does not appear to be a significant factor in parent perceptions for this study sample. The results of the regression analysis for the variable *race* are displayed in Table 9.

Table 9

Regression Results Using Race to Predict Parent Perceptions

Variable	*B*	*SE*	*t*	*p*	R^2	F
Constant	4.90	.058	84.3	<.001	.003	.615
Race[a]	.111	.142	.784	.434		

Note. N=231. Race was a dichotomous variable with two categories: White and Person of Color. [a] White=0, Person of Color=1.

Regression Analysis Based on Education

Highest level of education achieved was a categorical variable with six levels. However, the group *did not complete high school* had only one respondent, so it was combined with the *high school* category leaving five groups for all analyses. Two regression models were run. In model 1, education was treated as a dichotomous variable where *1* represented respondents with a college degree and *0* represented respondents with no college degree. I chose no college degree

as the baseline group because it was easy for me to remember that the number 0 indicated no college degree. Results of Model 1 using respondents holding a college degree versus those without a college degree to predict parent perceptions were not found to be significant (t=1.77, p=.078, n=235). The F-value of 3.123 (p=.078) also suggests that the model does not have much predictive power. The R Square value of .013 indicates that this model only accounts for 1.3% of the total variance in parent perceptions. Therefore, Model 1 does not appear to be a useful model for this study sample.

Dummy variables were created in order to conduct the linear regression in Model 2. The group *high school or less* was used as the baseline comparison group because it represented the least amount of education reported. The results of the simple linear regression indicated that holding an advanced degree was found to be a significant (t=2.24, p=.026, n=236) predictor of parent perceptions, when compared to respondents having a high school diploma or less. The model suggests that parent perceptions of those self-identifying as having an advanced degree would be .465 points higher, on average, than that of a parent with a high school diploma. However, the F-value of 1.51 (p=.201) suggests that the model overall does not have much predictive power. The R Square value of .025 also suggests that this model can only account for 2.5% of the total variance in the data. No other education groups were found to be significant. However, the category college degree was nearly significant (p=.054). Results of the regression analysis for parent perception based on level of education are displayed in Table 10.

Table 10

Regression Results Using Education to Predict Parent Perceptions

Variable	*B*	*SE*	*t*	*p*	R^2	F

Model 1						
Constant	4.81	.077	62.4	<.001	.013	3.12
Education[a]	.191	.108	1.77	.078		
Model 2						
Constant	4.64	.144	32.1	<.001	.025	1.51
Trade cert. or prof. license	.175	.225	.777	.438		
Some college	.236	.181	1.30	.194		
College degree	.329	.170	1.93	.054		
Adv. degree	.465	.208	2.24	.026*		

Note. N=235. Model 1 used education as a dichotomous variable to predict parent perceptions. Model 2 used dummy variables and compared all other groups against the baseline category High school or less.

[a] College degree=1 and No college degree=0 *p<.05

Regression Analysis Based on Income

There were six self-reported household income ranges in the variable *income*. Since the original categories were grouped by equal increments of $25,000, the variable could be considered ordinal. In Model 1, a simple linear regression was conducted to explore the relationship between *income* and *parent perceptions*. The results of the linear regression considering income as an ordinal variable were not found to be significant (t=28.40, p=.306, n=230). Due to the small *n* of the groups, another simple linear regression (Model 2) was run, where the six income levels were condensed into three categories for analysis and run as a categorical variable. In Model 2, dummy variables were created in order to carry out the regression with the lowest income category of *$50,000 and below* used as the reference category. The results of the simple linear regression considering income as three nominal groups were also not found to be significant. The R Square value of .001 indicates that this model is not able to

explain much of the variance in the data. The F-value of .108 (p=.898) indicates that this model also has very little predictive power. Based on the results of both of these analyses, income does not appear to be a significant factor in parent perceptions for this study sample. Results of the statistical analyses are shown in Table 11.

Table 11

Regression Results Using Income to Predict Parent Perceptions

Variable	*B*	*SE*	*t*	*p*	R^2	F
Model 1						
Constant	5.09	.179	28.4	<.001	.005	1.051
Income	-.043	.042	-1.03	.306		
Model 2						
Constant	4.95	.133	37.3	<.001	.001	.108
Middle Income	-.063	.158	-.397	.692		
High Income	-.071	.158	-.450	.653		

Note. Model 1, N=230. Model 1 treats income as an ordinal variable with values ranging from 1 to 6 in order to predict Parent Perceptions. For Model 2, N=235. In Model 2 middle income represents self-reported household income ranging from $50,000-$100,000 and high income above $100,000. When creating dummy variables for Model 2, missing values were included in the comparison category.

Regression Analysis Based on Access

The five categories of *access* were coded into one dichotomous variable for analysis. The three categories for *no access*, *low speed access* and *mobile devices* were combined into a category representing *no/low speed limited access* versus *high-speed access*. Access through mobile data plans was included in the *limited access category* due to the limits placed on data

packages which slow down after a certain amount of usage and thus may not provide reliable high-speed access. The results of this simple linear regression were found to be non-significant (t=54.1, p=.252, n=235). The R Square value of .006 indicates that the model only accounts for .6% of the variance. The F-value of 1.32 (p=.252) also indicates that this model has very little predictive power. Therefore, this data is unable to establish evidence of a relationship between *access* and *parent perceptions* based on this study. Regression results for this data are presented in Table 12.

Table 12

Regression Results Using Access to Predict Parent Perceptions

Variable	*B*	*SE*	*t*	*p*	R^2	F
Constant	4.82	.089	54.1	<.001	.006	1.32
Access[a]	.130	.113	1.15	.252		

Note. N=235. Access was a dichotomous variable with two categories: High speed reliable access and No/low/limited access. [a] No/low/limited access=0, High speed reliable access=1.

Regression Analysis Based on Geography

The independent variable *district* had six categories. The voting district was used as a way of establishing geographic location within the county while still maintaining respondents' anonymity. Within the county, districts three and four have the highest levels of broadband availability. District 4 was used as the comparison group for this variable, since it was the largest group (n=68). Dummy variables were created for the remaining five categories. Results of this simple linear regression were non-significant for all groups. The R Square value of .010 indicates that this model does not account for very much of the variance in parent perceptions. The F-

value of .444 (p=.818) determines that this model does not have much predictive power. Based on the results of this analysis, there is no statistical significance regarding the level of access as a predictor of parent perceptions. Regression results are presented in Table 13.

Table 13

Regression Results Using Geography to Predict Parent Perceptions

Variable	*B*	*SE*	*t*	*p*	R^2	F
Constant[a]	4.85	.102	47.3	<.001	.010	.444
District 5	.174	.168	1.04	.302		
District 3	.025	.155	.158	.874		
District 2	-.018	.164	-.109	.913		
Don't know	.098	.212	.460	.646		
Nonresident	.323	.338	.957	.340		

Note. N=236. [a] District 4 was used as the comparison group because it was the largest group (n=68). The nonresident category represents parents of students who reside outside of the county and might include tuition students or children of staff members.

Regression Analysis Based on Parent Technology Acceptance

The independent variable of *parent technology acceptance* was comprised of nine items, each of which had a value ranging from 1-6. Scores from each of the nine items were averaged to create one score, *technology acceptance*, which was used as a continuous variable. Values ranged from 1 (no opinion) to 6 (strongly agree). Results from the simple linear regression suggest that there is a positive and significant relationship (t=6.37, p<.001, n=235) between parent technology acceptance and parent perceptions of devices. This model suggests that a parent's perception would be expected to increase by .482 units for every one unit increase in the parent technology acceptance score. The R Square value of .148 suggests that this model

accounts for about 14.8% of the total variance in the data. In addition, the F-value of 40.6 ($p<.001$) suggests that the model has some predictive power when compared to the sample mean. Regression results are presented in Table 14.

Table 14

Regression Results Using Parent Technology Acceptance to Predict Parent Perceptions

Variable	*B*	*SE*	*t*	*p*	R^2	F
Constant	2.36	.403	5.84	<.001	.148	40.6
Parent Technology Acceptance	.482	.076	6.37	<.001*		

Note. *N*=235. The predictor variable parent technology acceptance was the mean score based on the nine Likert scale items for technology acceptance. The dependent variable parent perceptions was the mean score of ten Likert scale items measuring parent perceptions.

Regression Analysis with All Predictor Variables

The simple linear regressions provided an understanding of how each variable independently predicted the dependent variable, parent perceptions. After running the simple regression analyses, a multiple regression was run inputting all of the predictor variables. The purpose of the multiple regression was to model the simultaneous effect of the independent variables to see how they uniquely predicted the dependent variable. The multiple regression utilized all of the same variables as the simple regressions. *Race* was treated as a dichotomous variable with White as the baseline category. *Education* was a categorical variable with five levels and high school or less was treated as the baseline category. *Income* was a categorical variable with three levels and the lowest income (below $50,000) was the baseline category. *Geography* was a categorical variable with six categories and district four was used as the

baseline category because it had the largest number of respondents. *Access* was a dichotomous variable with no, low or limited access as the baseline. *Technology acceptance* was treated as a continuous variable. The dependent variable *parent perceptions* was also a continuous variable.

Based on the analysis of variance, the overall model significantly predicts parent perceptions (F=4.41, p<.001). This model corresponds to an Adjusted R Square value of .172, suggesting that that model explains about 17.2% of the total variance in the data. Further, the F-value of 4.41(p<.001) suggests that the model has some predictive value when compared to the mean. Results of the analysis of variance are shown in Table 15.

Table 15

Analysis of Variance Between Predictor Variables and Parent Perception[a]

Model	Sum of Squares	df	Mean Square	F	Sig.[b]
Regression	33.1	14	2.36	4.41	<.001*
Residual	115	215	.536		
Total	148	229			

Note. N=230 [a] dependent variable is parent perception; [b] predictors are race, education, income, geography, type of access and technology acceptance.

Results of this multiple linear regression suggest that there is a negative and statistically significant relationship (t=.-2.13, p=.034, n=230) between respondents with income between $50,000 and $100,000 and the parent perceptions, after controlling for race, geography, type of access, education and technology acceptance. This model also found a negative and statistically significant relationship (t=-2.60, p=.009, n=230) between respondents with household income above $100,000 and parent perceptions, after controlling for race, geography, type of access,

education and technology acceptance. In other words, parents in the two highest income groups had significantly lower perceptions of technology.

The model also found a positive and statistically significant relationship (t=7.07, p<.001, n=230) between parent's technology acceptance and parent perceptions, after controlling for race, geography, education, income, and type of access. Results from the multiple regression are shown in Table 16.

Table 16

Regression Results of Associations Between Independent Variables and Parent Perceptions

Variable	*B*	*SE*	*t*	*p*	95% CI
Constant[a]	1.92	.443	4.33	<.001	[1.04, 2.79]
Race[b]	.083	.134	.621	.535	[-.181, .348]
Education[c]					
Trade cert. or license	.151	.207	.730	.466	[-.256, .558]
Some college	.010	.167	.061	.952	[-.320, .340]
Associate's or Bachelor's degree	.041	.162	.253	.800	[-.278, .360]
Advanced degree	.256	.196	1.30	.194	[-1.31, 6.43]
Income[d]					
Household income ($50,000-$100,000)	-.311	.146	-2.13	.034*	[-.599, -.023]
Household income ($100,000 and above)	-.412	.157	-2.60	.009*	[-7.21, -.103]
Geographic location[e]					
District 5	.147	.155	.949	.344	[-.159, .454]
District 3	.024	.139	.176	.861	[-.249, .298]
District 2	-.128	.153	-.836	.404	[-.429, .173]
Don't know district	.368	.196	1.88	.062	[-.018, .753]
Reside outside county	-.086	.301	-.286	.775	[-.680, .507]
Type of access[f]	.007	.110	.068	.946	[-.209, .224]
Technology acceptance[g]	.601	.085	7.07	<.001**	[.433, .768]

Note. N =230. [a] Dependent variable is parent perception; [b] White=0, Person of Color=1; [c] Baseline category is high school or less; [d] Baseline category is household income below $50,000;

[e] Baseline category is district 4; [f] Baseline category is no/low/limited access; [g] Technology acceptance is a continuous variable

Summary of Quantitative Findings

The results of the simple linear regression analyses found that there were no statistically significant differences for the variable *race/ethnicity*, *income, access* or *geography*. Therefore, the null hypothesis that there were no differences between groups could not be rejected. Within the variable *education*, having an advanced degree was found to be significant (p=.026) and having a college degree was almost significant at the .05 level (p=.054). The variable of *technology acceptance* was also found to have a significant and positive relationship with *parent perception* (p<.001). That is, as parents' technology acceptance increases, so do parent perceptions. The results of the multiple regression found a negative and significant relationship between medium household income (p=.034) and high household income (p=.009) relative to parent perceptions. Technology acceptance was also found to have a significant and positive relationship (p<.001) with parent perceptions.

Qualitative Data Analysis

The qualitative data was used to help answer research questions three and four regarding parents' observations, feelings, concerns and barriers regarding students' use of devices. The qualitative analysis focused on all open-ended survey responses related to parents' feelings, observations of students' use of devices, concerns and barriers. There were 259 survey responses imported into Atlas.ti, but 74 of them either left the open-ended response blank or replied none or N/A in their open-ended response. These 74 were therefore excluded from the coding, leaving 185 respondents who answered one or more open-ended response questions. The

relatively high value of *parent perceptions* found in the quantitative findings was supported by the 50 qualitative responses that were coded for feeling that devices were beneficial or useful. Based on the qualitative findings, the general sentiment seemed to be that despite some barriers, the school-issued Chromebooks were a useful tool and beneficial to students' learning. However, there were also some common concerns found in the qualitative data. Access was found to be a significant theme in the qualitative data, occurring as a code 60 times, often in relation to other codes such as negative feelings or technical difficulties. Echoing findings from the literature, physical concerns such as handwriting and heavy backpacks were coded as a concern 17 times in open-ended responses. In all, five key themes emerged regarding devices: teaching and teaching methods related to use of devices, issues related to hardware or software, parent-perceived benefits of the device, parent-perceived concerns, and access as a barrier. Some of these major themes also had several sub-themes that were more specific.

Theme 1: Teaching and Teaching Methods Related to Use of Devices

While parents were generally positive about their child's use of a device for learning, many still expressed a desire for their child's learning to be interactive and hands-on. There were 25 responses related to teaching and teaching methods. For example, one parent stated, "I think chrome books are a good resource, but I don't want them to be over used or a replacement for face to face communication and teaching." This statement reflects two sentiments that were common among many parents: that they don't want students to spend all their time on devices, and that they still want them to engage in person with other students and teachers. Speaking to the idea that students spend too much time on devices one parent said, "students in class spend too much time on computers - it should be more interaction, open discussion." A main concern

was not necessarily the device itself, but the way it was used. One parent detailed their thoughts saying,

> I think the use of a Chromebook is good as long as teachers are still using actively engaging students in the classroom. A Chromebook if just used for assignments is no different than a worksheet. If teachers are using technology to enhance the learning and discussion in the classroom then I think they are important. It really is about how the teacher integrates them and not about the actual device.

This statement leads to one sub-theme, which was that parents felt some teachers were using the devices as a substitute for teaching.

Device as a Substitute for Teaching and Hands-On Learning

In roughly half (48%) of the responses related to teaching and teaching methods parents discussed feeling that teachers were using devices so they didn't have to actually teach. One parent expressed, "some teachers rely so heavily on the Chromebooks that there is no class discussion or interaction it is just log into your Chromebooks and do your work." This sentiment was also reflected in quotes such as, "I feel sometimes the chromebooks are used in place of teachers teaching" and "is the teacher really teaching or having all assignments on the chrome book?" Some parents were concerned with the amount of passive learning, such as the overuse of videos. One parent stated, "having students watch a you tube video vs actually talking and teaching is a miss." Another parent shared, "I feel in middle school the teachers became too dependent on it. My son didn't receive a[s] much teaching.... more video links as instruction."

Parents Desire Balance Between Technology and Traditional Methods

In five out of the 25 comments about teaching and teaching methods, parents pointed out that there needs to be a balance between use of the devices and use of other teaching methods as well. As one parent lamented, “I would encourage a more balanced online assignment/ lectures/ projects; more hands on activities with an actual manual/notebook to improve the efficiency of a student being in class.” One parent shared, “although I believe technology and Chromebooks are important, I also believe old school textbooks serve a purpose as well. I don't believe either should be discarded and both should be utilized.” Two parents also wanted access to textbooks, but not in physical format. One parent shared, “if kids are using chromebooks, all of their text books should be preloaded.” In contrast, another parent shared, “I do wish they had access to more material for studying on the chomebooks...such as a text book or study notes...instead of all the paper that is issued.” In contrast, another parent preferred their child not having all of his notes on the device because, “I feel having a textbook and written notes help to solidify what he is learning in class. It’s too easy for him to just google his answers.” In addition to wanting students to use textbooks, several parents shared that they felt children still needed to know how to do certain things with actual books. One parent felt that “children should have to learn to research manually.” These statements by parents seem to support the notion that while parents value and appreciate children’s use of devices, use of a variety of teaching methods, including technology and more hands-on methods is optimal for parents. This collection of statements also seems to indicate that while parents want a balance between technology and other methods, what that balance is varies greatly by parent.

Use of Learning Management Systems On Chromebooks

One of the main functions of the school-issued devices is to allow students and teachers to create and submit assignments online, as well as communicate and monitor grading and

attendance. These tasks are accomplished using learning management systems (LMS) such as Schoology, Powerschool, Clever and Canvas. Many teachers also utilize Google tools such as Google Classroom and Google Sites as well. About 20% of the responses related to the use of the LMS. Some parents felt very positive regarding the use of LMS. One parent stated, “the chrome book isn’t what makes school life so convenient at home, however access to canvas and other compatible programs does.” Another parent shared, “remarkable tool to give kids so many options and the ability to complete work and at ease to submit work to teachers.” Other parents felt that the devices made communicating with teachers easier for their child. One parent stated that it, “benefits my child having access to communicate in a time efficient manner with instructors.” In addition to making schoolwork easier for students to manage, parents the LMS helped them to keep up with their child’s work. One parent shared, “I think it has allowed me as a parent be more aware of the work they are completing in class so I can help them at home and encourage them to complete missing work” and another parent felt that “it helps because sometimes as a parent you are able to see that the work is being turned in.” From the parent perspective, it seems that being able to monitor students’ work and grades online is viewed as helpful and beneficial.

Some parents felt that teachers needed better training, or more updated training with technology because they felt that not all teachers were very competent at using the learning management systems. In about 20% of the responses regarding teaching and teaching methods parents felt that teachers need updated training. For example, one parent stated, “how logical is it if curriculum is scanned sometimes upside down and the children have to prop their chrome book upside down to read the wrongly scanned documents?” Another parent shared, “I've observed that my child is not learning as much as she potentially could through computer based

learning due to knowledge gaps with technology that many (not all) of the teaching staff has." One parent shared that some teachers don't post grades or answer emails in a timely manner. The parent commented, "all teachers need to respond to messages from the students, some teachers do this very well but a few refuse and this absolutely shows in the students performance and interest." These comments seem to reveal a difference between teachers not necessarily the actual devices and learning management systems themselves.

Parents also expressed a desire for consistency among teachers regarding the learning platforms. One parent commented, "the teachers have stuff on Google classroom, schology, click here and sends to other apps. They don't all use Schology so it looks like things are overdue or not turned in." Even within the same learning platform, some parents found that the differing ways teachers set up their pages could be confusing. One parent shared, "every one of my child's teachers use and set up their schoology page differently and helping my ADD student navigate each different page is time consuming and problematic." Another parent shared a similar sentiment stating, "every teacher should set up their schoology pages and alerts the same way - better enforcement of grading timelines by admin." While teachers may all make use of technology in ways that work best for them, it appears that from a parent perspective consistency is desired.

Theme 2: Issues with Chromebook Capabilities and Technical Issues

There were 20 responses shared by parents relating to hardware or software. One specific concern related to hardware affected students who were in dual enrollment classes or attended the governor's school. In this district, high school students have the option to enroll in dual enrollment courses that are offered through a community college in the area or apply to attend

the regional governor's school. Regarding their child enrolled in dual enrollment classes one parent shared,

> our daughter is taking duel enrollment classes through the local community college[3] and is not able to correspond with her local community college teachers or access her virtual local community college classes using the chrome book. We had to purchase a separate lap top, which she is not able to take to school. This year she has 4 straight hours of study hall, and she can't use that time to complete her work.

Similarly, another parent shared, "Governors School uses different computers so they have to switch between the two (very minor issue)." While this parent noted that it was a minor issue, the problem seemed to be more significant for the parent of the child in dual enrollment classes. Based on these two comments, it seems that it might be beneficial for the school division to consider this issue and seek ways to address it in the future.

In three of the 20 comments about devices parents felt that the device was limited in some of its capabilities and not as functional as a traditional laptop or desktop computer. One parent stated, "Chrome books are like a baby step into tech and don't prepare students for the standard programs used in the professional world." Echoing that sentiment was a comment by another parent who said, "I feel that the Chromebook is a useful beginners tool to learn tech fundamentals but students should progress to platforms that are able to run more programs as they develop." There were four comments from parents who expressed concern that the software programs their students needed for class were not loaded onto the devices. For example, "there are some classes that he uses computers in that require additional software that is not installed on

[3] The phrase "local community college" was inserted in place of the name of the community college which was used in the original quote to prevent sharing identifying information about the study location.

his computer which I think is silly." Another parent shared, "not having the software required for the class i.e. photography." Without knowing the specific programs to which the parents are referring, it is possible that it is not a Chromebook issue, but instead a licensing issue for the software. However, it still seems to be an issue that would make using the devices more effective if resolved. One additional thought was shared by a parent regarding an application that many coaches use to correspond with players. The parent stated, "she can't access the BAND app on her Chromebook." Many students access such apps on their smart phones, but for students who do not yet have a device this could be an issue. Also, students are prohibited from using their cell phones during the school day except at certain periods such as lunch and class changes. Therefore, this could also be an issue for students who have phones but who are following the rules.

Technical difficulties accounted for 40% of the comments regarding hardware and software issues, with the majority of those problems concerning the device charger. Five out of the eight comments concerning technical difficulties expressed frustration that their child's charger either didn't work or got lost or stolen and they were responsible for placing it. One parent stated, "her charger malfunctioned and would no longer work." Another parent shared, "someone is always taken his charger and I always having to pay at the end of the school year for another changer." The other three comments related to technical difficulties related to devices that did not function properly, were in poor condition, or consistently had problems. One parent stated, "Chrome books are a good idea. However, the laptop my son gets is usually beat up and/or missing a key. They have the appearance of not being taken care of." Another parent shared, "Chromebooks choice is not ideal due to the continued technological challenges with breakdowns, etc." Still another parent shared that, "the Chromebook isn't always functioning

correctly." Because of issues with malfunctioning devices a few parents expressed the desire for their child to have the same Chromebook throughout high school. For example, one parent expressed, "wish she was issued 1 to keep for the duration of HS career. She had a brand new chromebook last year turned in excellent and issued a poorly maintained machine this year." Another parent suggested that students be able to put a deposit down on a device at the beginning of high school and then keep the device until graduation, at which point they could get a refund for returning it in good condition. Another technical issue that several parents shared was not being able to email their children. One parent shared, "the only issue i have is i cannot email my child and they receive it or vice versa. but i do understand why." Devices can only receive messages from emails within the county school system for safety reasons. Even though they seemingly understood why that was the case, it was still frustrating for parents.

Theme 3: Parent Perceived Benefits to Having a School-Issued Device

Throughout the open-ended responses, parents listed many benefits to having the device. There were 50 responses relating to parents feeling grateful for the device because they perceived benefits to having the device. Some of the benefits that were mentioned included not being able to afford a device if it were not issued by the school, having the same device at home and at school, and making it easier to submit assignments and keep up with schoolwork.

Preparing Students for the Future

Many parents acknowledged that technology will be a critical part of their child's success after school and were grateful to have devices to prepare students for the future. There were seven responses specific to preparing children for the future. One parent stated, "thank you for providing this so that my child may continue to adapt to the ever evolving digital world."

Another parent commented that they felt the device, “is helping my child to prepare for work and school after graduation.” While another shared, “we are at the point in this world where a basic level of understanding of computers and new technology is necessary in order to function daily.” Still another parent commented, “the Chromebook helps my child to learn about technology which is essential in everyday and business applications.” The common theme seemed to be that students need to learn how to use technology and devices such as the Chromebook in order to be prepared for life after graduation.

Not Having to Purchase a Device

Four parents shared that they were grateful to have a device because it reduced the financial burden on them to provide a device. One parent stated, “I think they’re very useful and it’s definitely convenient to have them to use both at school and at home because I don’t think we’d be able to afford a laptop on our own.” Another parent referred to having to provide multiple devices stating, “we appreciate having the Chromebooks. If we didn't, our children would struggle with access to a device as we only have one laptop for them to share.” Three other parents recognized that while they could afford a device, other families may not be able to. “I appreciate the school providing these tools for our children. Most families probably couldn’t afford chromebooks for all of their children and it’s a blessing to have this type of resource available for our kids!” One parent even commented that having school-issued devices was more equitable saying, “I think the Chromebook is a very important part of learning for everyone now days. Many students in this county would not be able to afford their own computer. The chromebook gives everyone equal access to technology.” These comments summarize the feelings shared by many of the parents in their open-ended responses.

Chromebook Helps Students Be More Efficient

Eight responses from parents acknowledged that having the same device both at home and at school helped their child be more efficient and made it easier to keep up with their schoolwork. One parent noted that having a device helped their child be more efficient, stating, "the chromebook allows my child to keep track of assignments and study materials far easier than without having a chromebook and relying on paper folders and text books." Another parent commented that, "it has been nice that they have a computer and can work on the same assignments at school and at home." Having the devices was also helpful when students missed school, as expressed by one parent who shared that they were, "grateful for this resource - my student has regular absences due to a chronic disease, and the Chromebook helps her keep up with her work." While this parent felt that having a device was helpful for their child with a chronic illness, some parents wished that more lessons were made available online for when students were out, especially during times of quarantine. One parent stated, "it would be useful if teachers could record or live stream their lessons especially with covid and all the quarantines that are happening so that our children's learning is not affected." While this comment may primarily relate to the current COVID-19 pandemic, it is likely that the devices could have some role to play in the future beyond the pandemic.

Use of Device to Pursue Personal Interests

When asked to comment on ways that students used their devices, some parents mentioned in the open comments that their children used them for personal and school-related interests that were not directly related to assignments but were still beneficial. Two parents specifically mentioned that their child used the device for researching colleges. One parent noticed that their child used the device for "editing photos for photography." A different parent said that their child used the device "to enter photo contests and use Google Chrome extensions

and apps for personal creative projects." Another parent shared that their child utilized her device in a multitude of ways, including to "search for primary and secondary sources of information regarding Church teachings. Take part in Civic activities. Check the weather. Get updated on the local, state, national, and world news. Express herself creatively by writing stories." Even though the devices were provided for school related tasks, it seemed that students also made use of them in emancipatory ways as well.

Theme 4: Physical, Social and Digital Literacy Concerns

There were 58 responses that were coded for some type of concern shared in the open-ended responses. Many of these echoed concerns that were found in the literature regarding parents' perceptions of children's technology use and many of them also elaborated on items from the Likert style questions. Roughly 33% of the concerns regarded physical aspects related to devices, while about 31% of concerns were related to monitoring and off-task behavior. Students' lack of digital skills accounted for about 14% of concerns, as did social concerns, and screen time accounted for about 7% of concerns.

Parent and Teacher Ability to Monitor Student Use and Off-Task behavior

Concerning monitoring use of devices, about 44% related to parents' ability to monitor students and about 28% related to how teachers were able to monitor students. The other 28% were concerned with general off-task behaviors. Regarding their child's use at home one parent shared, "I often am overwhelmed by trying to put parameters around and monitor said parameters for my children." Another parent shared, "I do question the abilities of adolescents to safely monitor their online activities." As worrisome as it might have been for some parents to monitor children at home, other parents shared concerns about how teachers monitored students

on devices while at school. One parent said, “I do not like the fact that most teacher allow students to watch or play things on their Chromebook when they finish work instead of other alternatives like reading.” Another parent was concerned about what students were doing on devices while teachers were teaching. A parent shared, “my children come back with stories of other students watching You Tube, playing games, or sending messages in the middle of class when the teacher is instructing.” Observations like this made some parents wonder if software could provide a solution to this problem. One parent suggested, “the school should have some type of program monitoring system that allows the teacher to see all students and what program or site they are on and the ability to close or lock the student out of that site.” Some parents were worried about off-task behaviors in general, with comments such as, “it’s easy for students to get distracted” or “I have noticed time wasting among my child and her friends while using the Chromebook.” These comments suggest that parents are worried about their own ability to monitor student behavior, as well as teachers’ ability to monitor behavior and off-task behavior in general.

Lack of Student Training & Digital Skills

Eight separate responses reported being concerned with the apparent lack of digital skills students possessed. Two parents specifically mentioned that students needed instruction in keyboarding. One parent pleaded, “please teach them how to type.” Speaking of devices, another parent said, “they are key to future success though I wish proper keyboarding was more strongly encouraged.” Some parents discussed the need for children to receive basic technology instruction. One parent suggested, “I think students could use a technology course in middle school possibly 6th grade focusing on how to use Schoology or Google Apps for Education. Also to learn basics on saving, downloading, uploading, webcam, annotation tools, Readspeaker tools,

etc." Another parent echoed this sentiment saying, "he does not have much instruction on how to use the school programs." It was not only students who parents felt could use some training. Parents might benefit from training as well. As one parent shared, "students and parents could have used more training (or any) regarding how to use certain programs." These statements all detail ways that parents feel instruction for students and parents would be beneficial.

Online safety was another concern voiced by some parents. In addition to being taught technical skills such as keyboarding or how to navigate learning management systems, parents felt that children needed more instruction in online safety. One parent stated, "I believe their should be more teaching in that area but needs info out their to children about detecting scams. That is a big worried for parents." Another parent shared, "thorough knowledge of risks should be taught to children in the beginning of their school years to prevent compromising their safety." It appears that while technical skills are important, parents are also concerned about children developing the tools they need to navigate the internet and online environments safely.

Physical Concerns

Of all of the concerns, the most commonly mentioned were physical concerns. These included: eye strain, handwriting, sedentary habits and heavy bookbags. Four parents specifically commented about handwriting and penmanship. For example, one parent stated, "let me be kids and have to write (which will help perfect their penmanship) and writing helps with memory vs more screen time." Another parent was worried that their child wasn't learning cursive writing, sharing, "I believe they (students) need to learn to spell and write, half of them can't even sign their signature!" In addition to handwriting and penmanship, five parents mentioned headaches and eye strain due to too much screen time. One parent commented, "it's easy to have too much screen time when school is through a screen. This causes my child to have headaches and sore

eyes." Another parent was worried about the size of the print on devices, saying "the print on the chromebook especially on test is way too small both of my kids struggle to read it even with decent vision." Four parents shared their aversion to heavy backpacks, including a parent who stated, "I don't like the added wait in my middle school student's book bag when lockers cannot not be used to lessen the weight of carrying notebooks and binders." Three parents shared about their worry that kids were becoming more sedentary. One parent shared, "Concerned of my son becoming sedentary, visual issues from lots of screen time." Together, all of these concerns indicate that while parents appreciate all that devices can offer they are also concerned that using devices for school adds additional screen and sedentary time that may be detrimental to students' overall heath.

Social Aspects

There were eight comments where parents mentioned being concerned about time spent on devices contributing to a lack of social skills. One parent stated, "the use of computers on a daily basis in school weakens a students ability to read, communicate and interact. It deteriorates the relationships between the student and the teachers." Others had similar feelings such as, "I feel they are missing out on basic human interactions" including, "not knowing the proper way to interact with people face to face; loss of appropriate verbal communication skills." Some parents specifically noted that they felt being online added to the problem of bullying. One parent said, "I don't like that kids can message each other. Can lead to bullying. Kids should only be able to message their teachers." The issue of online etiquette and cyber-bullying is an area that could also be addressed with digital citizenship training, as discussed in a previous section.

Eleven different parents commented about the use of social media, though some of them were about "society's" use of social media in general. All of the comments related to social

media were negative. Comments included, “kids should not have free reign of internet use and I disagree with unmonitored social media for kids.” Another parent stated, “I like the use of technology, I do not like how much time it can eat away with the use of social media.” One parent emphatically disagreed with social media saying, “we don’t support social media in this household and we don’t plan to.” While most of these comments were related to concerns in general, they did not seem to be related to the Chromebooks specifically. These comments are not really relevant to the Chromebooks, as social media sites are blocked by the district, even when using the device at home.

Theme 5: Access to Reliable High-Speed Internet as a Barrier

The most common theme across open-ended responses was related in some form to the limited access available for many families at home, making access as a barrier the most important theme. Sixty comments related to some form of barrier due to low, slow or no internet. Some people reported having no internet at home due to either not having options for good internet or not being able to afford it. One parent stated, “due to the fact that we do not have internet at home, it is hard for my child to complete assignments and tasks.” Another parent elaborated on many of the problems they faced regarding home internet saying,

> We do not have Internet at our home. Unfortunately we can’t get it here. The only option in our location is like Hughes net and they have maxed our users in our area and we can’t sign up. Not that we could afford it anyway. We do have smart phones and this is how we check email look at schoology and PowerSchool etc. If my son is using his laptop at home he has to use his hot spot. We only have 1-2 bars service here. Once his hotspot has maxed he can not access the internet unless he goes to my mothers house. Having the

> chrome book has been a great service to us as we do not have a computer or laptop. I use my internet on my smart phone daily.

This quote summarizes what many in the county experienced with regard to internet access. Some parents also commented that the situation has improved since the county began getting access to cable internet, which happened in the spring of 2020, just as schools were closing for the pandemic.

Having access to devices through a cellular data plan was okay for some things, but still caused problems for some families. One parent shared, “our internet connection is via mobile hotspot and doesn't have the best connection. Therefore they get frustrated easily with it and don't like when they 'have to use' it to complete assignments.” Another parent discussed having to share data, “while working from home with just a hotspot it cannot support my job and her school duties.” When responding about barriers they had experienced to using devices another parent shared, “none other than our internet data runs out and slows our speed. Many times we have gone to the public library to use faster internet.” Slow connections were another problem shared by many families. One parent shared, “internet is very slow or crashes constantly. Living on a private road gives us no access to Broadband” while another shared, “in our area the connection is not reliable and is more often we receive very poor service/connecting capability.” There were endless comments that could be included to support the feelings regarding access, but all of them point to two ideas. First, access is clearly still a barrier to student use of devices at home. Second, the notion of access is nuanced and affects students’ use of devices at home in a variety of ways.

Summary of Qualitative Themes

There were five main themes and several sub-themes identified based on the open-ended responses from parents, which have been detailed in the qualitative findings. The development of the themes was based on the frequency of codes that were applied. Table 17 provides the number of codes for each main theme, the main theme and any corresponding sub-themes.

Table 17

Summary of Qualitative Themes and Sub-themes

# of Codes[a]	Main Theme	Sub-theme
25	Theme 1: Teaching and teaching methods related to use of devices	Device as a substitute for teaching and hands-on learning Parents desire balance between technology and traditional methods Use of LMS on Chromebooks
20	Theme 2: Issues with Chromebook capabilities and technical issues	
50	Theme 3: Parent-perceived benefits to having a school-issued device	Preparing students for the future Chromebook helps students be more efficient Use of device to pursue personal interests
58	Theme 4: Physical, social and digital literacy concerns	Parent and teacher ability to monitor student use and off-task behavior Lack of student training and digital skills Physical concerns Social aspects
60	Theme 5: Access to reliable high-speed internet as a barrier	

Note. [a] Number of codes refers to the number of times an open-ended comment was coded with a code related to that theme.

Summary of Findings

Most of the mixed methods findings were confirmatory, meaning that the qualitative findings were largely reflective of the quantitative findings. The qualitative findings were useful, as they allowed parents to elaborate and provide specific examples that were relevant to their lived experiences. *Race*, *access* nor *geography* were found to be statistically significant predictors of *parent perceptions* of devices in this study. However, some aspects related to *education*, such as having an advanced degree were found to be significant and having any college degree was nearly significant. *Technology acceptance* was also found to have a significant and positive relationship to parents' perceptions in both the simple linear regression and the multiple regression. Results of the multiple regression also found that parents in both the middle- and high-income groups had a negative and significant relationship to parent perceptions. The qualitative findings also suggest that parents have relatively higher levels of technology acceptance and that, while high, their perception of students' use of devices was not as high as technology acceptance for themselves.

Based on the frequency of codes, five main themes were found in the open-ended comments provided by parents: teacher and teaching methods, device issues, benefits to having a device, concerns, and access as a barrier. Under the first theme, teacher and teaching methods, parents were largely concerned that teachers were using the devices as a replacement for teaching or were using them in passive ways. The main issues regarding the device included the device not being compatible with certain courses, not having the same software as needed for courses and technical difficulties due to charger issues or other malfunctions. Many benefits to having the device were cited by parents, including helping students be more organized and efficient, preparing students for the future, providing a device that parents might not be able to

afford, and students' ability to use devices for their own purposes. Concerns expressed by parents included monitoring of student (for both parents and teachers), students' lack of digital skills, a preference for textbooks, safety and privacy concerns, physical concerns and social aspects. While type of access was not found to be statistically significant, the qualitative findings demonstrated that access to the internet was a substantial issue for many parents. This was due to no access, low or slow speeds, as well as data running out. With an eye toward equity, access appeared to be by far the largest barrier this district prohibiting device usage.

Chapter 5: Discussion, Conclusions and Recommendations

This final chapter discusses the findings in detail as they relate to the research questions and how they relate to the literature. The findings are also discussed in relation to the theoretical underpinnings of this study and their implications for equity. Limitations related to this study will also be discussed. Implications for this school district and other schools with 1:1 device initiatives will be provided, as well as implications for future research.

Parents' Overall Perceptions Based On Quantitative and Qualitative Findings

Research question one asked: how do parents feel about their child's use of school-issued devices for learning? Taken together, the quantitative and qualitative findings seem to indicate that overall, parents are pleased with the devices, but they also have some concerns, face some barriers and would like to see a balance between the use of devices and hands-on learning. Many of the concerns shared by parents reiterate the same concerns that have been shared by parents in other parent perceptions studies. Some of the difference between the parent perceptions regarding how they feel about the importance of children learning how to use devices and how they actually experience children using devices seems to indicate that parents have, to some degree, a technological deterministic view of technology. This is supported by the finding that over 90% of parents agreed or strongly agreed with the statement: *it is important that schools teach children to use technology such as the Chromebook*, but only around 75% agreed with statements such as: *the Chromebook is an important tool for my child's learning,* and *I want my child to have a school-issued Chromebook in the future*. This also seems to be supported by the higher scores of technology acceptance than parent perceptions of the Chromebooks.

Relationship Between Parent Factors and Parent Perceptions

Research question two asked: how do factors of race, income, education, access, geography and parents' technology acceptance impact parent perceptions? The literature suggests that these factors can all impact the way parents feel about their children's use of devices for learning. In order to explore these relationships, both simple regression and multiple regression analyses were conducted. In this study *race*, *type of access* nor *geography* were found to be statistically significant indicators of *parent perceptions*. As these are all factors that are found to contribute to inequities, having non-significant findings would indicate that there are no differences in parent perceptions based on these factors for our study population. That would be a good thing. However, the other possibility is that differences between the groups do exist, and this study was not able to find them.

The first variable, *race*, was not found statistically significant in either the simple regression or the multiple regression, indicating that for this study sample, *race* was not a significant factor predicting parent perceptions. The finding of statistical non-significance is likely because of the small amount of variance in the race of the respondents. The majority of the respondents (81.4%) identified as White, with 6.78% identifying as Black or African American, 0.85% Asian, 2.12% American Indian or Alaskan Native, 1.27% Hispanic or Latinx, 5.08% two or more and 2.12% missing data. With such a small amount of variance in the sample population and such small group sizes for most of the groups, there was likely not enough variance to capture differences if they existed. It seems reasonable to think, and the literature suggests, that race has historically been a factor in predicting technology access, use and outcomes (Horrigan & Duggan, 2015; KewalRamani et al., 2018; Kim & Padilla, 2020). Other studies with a larger and more diverse population, such as an urban versus rural area might find different results. Therefore, this is an area where further study might be valuable. Although, it is also possible that

the differences in technology use by race have decreased over time, as data from the online Internet/Broadband Fact Sheet[4] published by Pew Research in 2021 indicated that gaps in who uses the internet based on race have largely disappeared.

While *type of home access* reported by parents was not found to be quantitatively significant in either the simple or multiple regression, the qualitative data were more revealing and did seem to indicate that access was a barrier for many participants in this study. The qualitative data seemed to stand in contrast to the quantitative findings, establishing that access was a barrier, which is discussed later in this chapter. In hindsight, satellite internet probably should not have been included in the high-speed category. This may have confounded the results and might be a reason that access was not found statistically significant but was found as a theme in the open-ended responses. It was included in the high-speed category based on the upload and download speeds. However, based on the parent comments regarding how slow satellite internet is in rural areas, it probably should have been a separate category. More than one parent commented that they had satellite internet but that it was still not consistent nor reliable in this rural community. One parent even commented that the maker of the survey must not understand how satellite internet worked in rural areas or they would not have included it with high speed. Depending on the number of respondents with satellite internet it is possible that grouping the people with satellite internet in the high-speed category affected the statistical findings. This finding also suggests that rural school districts should be wary about considering satellite internet as a stable broadband connection, as it may not be as reliable as hard-wired high-speed connections such as cable internet.

[4] Pew Research Center Internet/Broadband Fact Sheet https://www.pewresearch.org/internet/fact-sheet/internet-broadband/

The data for *geography* was based on the voting district of the respondent within the county, in an effort to gauge where within the county the respondent resided, while still maintaining anonymity. However, access to high-speed internet varies greatly within each voting district. Within my own voting district, for instance, I have access to broadband internet, while others, less than a mile away from me do not. For this variable as well, it is difficult to capture the variance quantitatively within this rural district. While it was not the focus of this study, a larger-scale study such as the study by Mardis (2016) that focuses specifically on the intricacies of rural broadband access would help to shed light on this subject. This is especially true since the qualitative findings did suggest that access was a factor that impeded students' ability to use devices at home. These seemingly divergent findings may also be related to the difficulty in measuring the construct of access. The findings from the current study regarding access are not likely generalizable to larger populations, especially urban or suburban settings. However, more studies that examine access in suburban and urban areas would be valuable.

With regard to *education*, people who self-identified as *having an advanced degree* were found to have statistically higher parent perceptions compared to those with a *high school diploma or less*. The group identifying as *having a college degree* (associates or bachelors) was close to statistically significant (t=1.933, p=.054, n=235) as well, when compared to those having a *high school diploma or less*. These results seem to indicate that parents who have obtained a college degree are more likely to have positive perceptions regarding their student's use of devices for education. This could be related to many things, including the fact that parents of a student today who also completed a college degree very likely used technology while obtaining their degree and may thus feel that technology would be beneficial to their child in education as well. Data from the Council of Economic Advisers (2015) who found that homes

where the head of household had a college degree were more likely to have a home internet connection than those where the head of household did not graduate high school also seems to support this. Hollingworth et al. (2011) also found that level of education was one factor that, when coupled with other factors such as income and occupation, could affect parents' perceptions of technology. A study that focused more specifically on parents' educational background might contribute to a better understanding of how parents' education affects their feelings about their children's technology use in general, and 1:1 devices for learning, more specifically. This also relates in large part to Selwyn's (2012) assertion that people who themselves are competent and rely a great deal on technology often view technology from a deterministic perspective. The technology privileged may be more likely to view technology as beneficial than the less technology privileged members of society.

Based on the results of the simple linear regression, *income* was not found to be a statistically significant indicator of parent perceptions individually. However, *income* was found to uniquely predict parent perceptions when accounting for the other predictor variables, based on the multiple regression. Respondents reporting income between $50,000-$100,000 and those reporting income above $100,000 were found to have lower parent perceptions than the reference category of parents with household income below $50,000 when controlling for all other factors. The idea that parents who have a higher household income have less positive parent perceptions is particularly interesting given the findings that parents with an advanced degree were found to be significant and positively predictive of parent perceptions and increase education and increased income are often linked. Therefore, future research that was able to focus on the interaction between education and income with relation to parent perceptions might be warranted.

Technology acceptance was also found to be a significant predictor of *parent perceptions* for the parents in this study. The mean technology acceptance score was very high, (M=5.288, SD=.666, min.=2, max.=6) which indicates that most parents fell within the "agree" category on the majority of statements regarding technology acceptance. Tsuei and Hsu (2019) also found that parents' beliefs about technology in general impacted their feelings regarding their child's use of technology for education. In the current study, results of the Likert scale items related to technology acceptance found that while 92.8% of parents agreed or strongly agreed that they were *comfortable using computers*, and 90.3% agreed or strongly agreed that they *know how to use computers*, only 54.2% agreed or strongly agreed feeling that they *know a lot about computers*. This could indicate that use of computers and knowledge of computers are considered differently by parents. In his dissertation study, Carr (2012) found that having parents who valued technology and were also skilled in using technology may have contributed to differences between student achievement groups. The findings of this study, considered along with the findings from Tsuei and Hsu (2019) could support the idea that both technology acceptance and use, as well as technology skills, are related to parent perceptions. A study that focused specifically on the relationship between parents' technology acceptance and parent perceptions might be able to shed some light on this topic. Based on these findings, school districts might consider technology training for parents in conjunction with their technology goals and initiatives. The idea of parent training is also discussed in more detail later in this chapter.

Parents Supportive of Devices, But Room for Improvement

Research question three was concerned with how parents observed their children using devices as well as their feelings and concerns about their child's device usage. Parents were

generally supportive of students' use of devices for education. A majority of parents (78.8%) agreed or strongly agreed that they *want their child to continue to have the device in the future*, and 73.3% agreed or strongly agreed that overall, they were *pleased with how the Chromebooks were being used*. This is consistent with findings in other studies which found that parents recognize the importance of their children learning with technology (Bate et al., 2013; Hollingworth, 2011; Keane & Keane, 2018; Ortiz, 2011; Tripp, 2011). The Likert scale items showed that parents were generally positive about their child's use of devices and also indicated that devices seem to be considered a beneficial asset for learning and that the district should probably continue the initiative. Qualitative statements from parents supported this general feeling as well, with parents indicating they were grateful for devices, felt they were a useful tool, and hoped the district continued to provide them in the future. A few parents even mentioned that they would like for the program to extend to elementary students. Many parents felt that use of the device helped their child to be more organized. Several parents also noted that their child used the device for activities that were not specific to assignments but were more related to personal uses of devices. Activities such as researching colleges and using devices for photography and personal writing were all things that could be of great benefit to students, especially those who did not have another device. These additional uses were added benefits to students having devices and seemed to promote and support parents' positive perceptions. They also speak to the way that the devices are actually being used, *in situ* by students at home.

While most parents felt that the devices were useful for students' learning, many parents also felt that students still needed to experience hands-on learning and engage with other students and teachers. This seems to point to the desire for a balance between technology and other teaching methods. One thing that might be beneficial is for teachers to communicate more

explicitly about how they make use of technology and how they expect the students to make use of technology. Even though some parents felt that teachers were using the devices as a substitute for teaching, if teachers explained how they use devices then parents might better understand how students can be on devices and also collaborate with peers. For example, when I teach lessons in the library students are often each using a device individually, or sometimes in pairs. However, I instruct them that if they are stuck, or have questions, they need to "ask three then me", meaning they have to ask three other students for help before they can ask the teacher. Many teachers I know use a similar method. In this way, students are collaborating and working with each other in the same way they would be if they were working on a math problem with manipulatives and needed help from a peer, even though each student is working on their own device.

Parents also offered suggestions for using devices to help bridge the gap when students have to miss school for various reasons. A few parents stated that it was helpful for their child to have a device due to them being out often for chronic illness. However, other parents mentioned that it would be helpful for students to be able to live stream or watch recorded lessons when they were out on quarantine, which is not currently an option. As we work toward endemic status with COVID-19, it appears that quarantines will likely be with us for the near future and potentially beyond. While there are challenges such as privacy of students and logistical issues for teachers, it would be helpful if the technology and devices we have could be used to help alleviate some loss of learning when students miss class time. Working to develop additional ways that devices can make learning more efficient and accessible seem like worthy goals for the future.

Need for Additional Student and Parent Training

Some parents shared that they were frustrated by teachers' differing use of technology and that their child often had trouble navigating all of the various formats and programs used by teachers on devices. Others shared that they felt some teachers made better use, or more use of technology than others. A few parents shared that devices sometimes made it harder to keep track of students' learning. This finding is echoed by parents in the Håkansson Lindqvist (2021) study as well, who complained about the structure and order of documents and assignments that were published online. Parents in the study by Jin and Schmidt Crawford (2019) also felt that teachers' differing skill with technology was a barrier to students learning with technology. However, just as students' learning styles vary, teachers' teaching styles vary as well. One of the joys of teaching is being able to structure your classroom in a way that allows you to express your creativity. Based on the similar findings from this study and parents in other studies, it seems that better communication by teachers to parents might help to alleviate parents' frustrations and still allow teachers to utilize technology that fits their teaching style. Perhaps this points to a need for parent training so that parents better understand how teachers expect their children to use devices and how and why they employ devices as they do in their classroom. Additionally, consistent organization of key course elements would help parents and students navigate different courses and levels.

Tsuei and Hsu (2019) found that the "establishment of school-parent partnerships is key in gaining parents' support for the implementation of technology-based instruction at home" (p. 465). They suggested that teachers explain to parents their use of technology and how it supports instruction and even utilize parent workshops or classroom observations to facilitate parents' understanding of how technology is used for learning. Also, as Morris (2011) found, when teachers are not involved in implementation of 1:1 device programs it can result in a disconnect

where teachers are not informed enough to be able to help students with devices when problems arise. The particular school district in this study is moving to a new learning management system, Canvas, in the 2022-2023 school year. Times of transition such as this would be an ideal time for a school system to revisit its training with teachers, parents and students. As teachers will receive training on the new system, it would be a logical time for parents and students to receive training as well. Training could be offered at back-to-school events and then followed up with additional parent nights after school begins. It could also be suggested or incorporated into teacher training for teachers to consider how they are going to communicate their expectations and use of the system with parents. Training videos could also be created and made available for parents and students to use at home when needed.

Use of Devices Not Necessarily for Higher Order Thinking

Fostering 21st century skills is a central goal for most technology initiatives in schools (ISTE 2021). In this study, parents mostly reported observing students using devices in ways that do not necessarily utilize 21st century learning and higher order thinking skills that are the goal of most technology initiatives. One such goal of many device programs, increased communication with both teachers and peers, garnered mixed feedback from parents. Some parents felt that devices allowed their child to communicate more effectively with teachers while other parents felt that teachers were not as responsive to emails from students as they should be. Again, this seems to be something that may vary due to individual teaching styles, or possibly only a few teachers. However, there is an expectation within the district that teachers check their email several times daily and that they respond to emails within 24 hours unless they are absent, or it is a holiday. Upcoming training on the new learning management system would be a good time to

reiterate this policy with teachers and for teachers to communicate their procedures with parents and students as well.

Parents also reported mostly observing their child using devices to complete and submit assignments, search the internet or for word processing. These are relatively low level of uses of technology. Parents reported observing students using technology for higher level tasks much less often. For example, only 38% of parents reported their child *collaborating with peers* often or always and only 15.7% reported their child *participating in content creation* often or always. Aesart and van Braak (2015) found that students scored much higher on lower order digital skills such as searching the internet than they did on higher order skills such as evaluating what they found on the internet. If the parents in this study are mostly observing their child using devices in ways that are lower order levels of thinking, it may indicate that devices are not being used as effectively as they could or should be. Teacher training on effective integration of technology would be beneficial to address this finding.

While teachers' integration of technology was not the focus of this study, there is a large body of research addressing this topic. Models such as the TPACK model created by Koehler et al. (2013) promote the idea that teachers' effective use of technology for student learning involves not just the use of technology, but a combination of technological, pedagogical, and content knowledge that allows them to use technology effectively in instruction. If parents' observations are indicative of the levels of technology use, then it might mean that teachers need updated training that addresses ways to effectively integrate technology into instruction. This is likely the case since technology changes constantly and new tools are available every day for teachers to use to engage students.

Some parents also expressed the need for students to have training in digital skills and citizenship. For example, one parent thought it would be beneficial for students to have a class in sixth grade to teach them how to use the device and associated programs and tools. Other parents mentioned the need for students to develop typing skills and more advanced research skills. Being safe online and watching for potential predators and scams was another area parents felt children could use more instruction. All of these things indicate that students could benefit from digital citizenship training in addition to basic technological skills training. As a school librarian I know that this is an area that needs to be addressed, as school librarians have been advocating for digital citizenship, and conducting much of this instruction in schools for many years. In my experience, digital citizenship is another area that gets "added on" to the things that teachers are supposed to be able to seamlessly integrate into their instruction, but often training is not provided about how to do this. Until school districts carefully consider their goals for device usage and incorporate them fully into teacher and student training this problem will likely persist.

Addressing Parents' Concerns

Parents had concerns about the actual device itself at times. One such concern impacted students enrolled in dual enrollment and governor's school classes who needed different hardware. Another concern was that software and apps students needed for specific classes or activities were sometimes inaccessible at home through the Chromebook. These are concerns that, if brought to the attention of the school district, could possibly be addressed. This points to the need for parents to be involved in the planning and implementation of device initiatives, as suggested by Vu et al. (2019). At this point, however, if the school district were made aware of these suggestions by parents, some of them could likely be addressed moving forward.

Continued monitoring of device initiatives, through surveys like the one in this study, or through parent advisory groups, could help pinpoint specific problems that are easily remedied and would make devices more useful for students. Coordinating with the local community colleges and governor's schools to provide a device usable at both places could be discussed as part of the continued partnership. While some of the software not being available on the Chromebook could be related to the device not being able to run the software, it could also be a licensing issue and potentially additional licenses could be obtained for students' use at home. The issue of having the same device for the entire time at the middle or high school is probably the most easily fixed of all. Sharing the findings of this study with the district may possibly resolve some of the issues moving forward. Perhaps the school district could purchase a few compatible devices for those students who need to have a different device or consider ways to provide software for students to use at home. These steps could help to ensure that having to purchase an additional device, or not having the appropriate device or software does not become a barrier to students who wish to participate in these opportunities.

Other parents were concerned about both their ability to monitor and teachers' ability to monitor students' use of devices. One parent suggested the use of monitoring software on devices that would allow teachers to redirect off-task students remotely from their computer. Some of the monitoring issue should be addressed by filters that the school system already has in place on the devices both in and out of school. However, the school continuously works to change, and update filtered content as needed. Having an easy online reporting system for students, teachers and parents could help to alleviate the burden of increased monitoring by sourcing it out to a wider audience. Monitoring was a concern found in the Jin and Schmidt-Crawford (2019) study as well, and they suggested utilizing monitoring services that would

allow parents and teachers to see what the children were spending time doing on devices and could be used as a tool to discuss time management with students. Digital monitoring programs seem like a practical tool school systems could employ to help both teachers and parents monitor students' device usage to ensure they were being used in beneficial ways. In addition to filtering and monitoring software, time management of devices could also be incorporated into digital citizenship training for students.

Parents also mentioned physical concerns such as handwriting, which was a common concern in this study and others (Bate et al. 2013; Håkansson Lindqvist, 2021; Keane & Keane, 2018). While some might argue that handwriting is not as necessary as it has been in the past, it is still a skill that most parents want students to develop and maintain. In my observation as an educator and parent, I think this concern is likely a bit overstated by parents. Several parents in this survey, and in general conversation, have mentioned how concerned they are that teachers don't teach handwriting, especially cursive writing anymore. I, and most likely every elementary teacher in the field, can attest to the fact that handwriting is still being taught, especially in the primary grades. Handwriting is still an explicit part of the state curriculum and parents just may not be aware. Another physical concern mentioned by parents was the added weight of backpacks due to carrying both books and devices. Backpack weight was also a documented concern for many parents in the Håkansson Lindqvist (2021) study. In my experience as a parent, I have worried about the physical detriment of carrying a heavy backpack. It seems that having a device would alleviate this issue somewhat, as students should not still have to carry heavy books and binders now that they are using devices. However, until digital learning materials can fully supplant traditional paper materials, which would likely involve added cost for licensing, this problem will likely persist.

Another parent concern that was mentioned frequently in the open-ended comments was social media. However, all social media is blocked on school devices both at school and at home. Most are also blocked while students are on the schools' wi-fi system. It seems though, that the school system needs to do a better job of communicating this with parents. Also, students who are using their cell phone and associated data plan cannot be controlled by the schools' wi-fi and filtering systems.

Addressing Barriers

Research question four asked what barriers parents had faced with their children's use of devices. The main barrier found in this study was access. Many parents shared that the county needed to do a better job of ensuring that all residents had high speed access available to them at home. Some insisted that it should be part of their tax dollars given to the county. While neither type of access nor geography within the county was found to be a statistically significant predictor of parent perceptions, it was found to be a very important factor in parents' Likert scale responses and open-ended comments. Over half of respondents (50.5%) reported lack of high-speed access as a barrier at least sometimes, and 51.6% reported slow internet being a barrier at least sometimes. Other parents reported that while they had access through satellite internet or cellular data service, the quality of that service was poor and varied based on how much data they had used and even the weather conditions. Some people reported not having consistent cell service to allow working on devices. I can personally attest to this as I have several family members and friends living in this school district who have this very issue. Now that the COVID-19 pandemic has increased awareness about the lack of rural broadband, I am hopeful that it might be addressed through broadband initiatives and federal programs in the future. However, as many rural residents can attest, they have heard these promises before. As far as

what the school district can do to address them, I think the answer is not much. During the pandemic the school did provide wi-fi hot spots to families, but when cellular service is poor where they live this is not a very viable option either. However, the school system does recognize that no access and slow internet access is a problem widely experienced by many students. The district has tried to alleviate this barrier by instituting a mandatory study period at both the middle and high school to allow students time to download and submit documents and assignments they may need to their devices during the school day.

Assessing Equity Through This Study

Becker (2007) suggests that within schools, digital equity means ensuring that access to and use of devices is not differently distributed based on student or school factors such as race, income or ability. By providing the same device to all students in both the middle and high school the school system in this study is attempting to ensure equity. They are also aware that high speed internet access at home is a potential barrier to students. In order to try and alleviate this inequity, the system has instituted strategies such as providing time and space in school buildings for students to download and submit necessary documents, files and assignments. However, based on the findings of this study, access is still a barrier that makes it difficult for some families to fully utilize devices at home. It does also appear, based on the findings of this study, that some students are also being affected by the differing ways in which teachers employ technology. While it is outside the scope of this study, in the pursuit of equity, it might be beneficial to examine how technology is being utilized by teachers in the district to make sure that the differences are truly teacher differences and are not differences based on the type of class, such as advanced or honors classes, as has been found to occur (Reich, 2019).

Hohlfeld et al. (2017) viewed the digital divide in three levels, with the third and highest level considering how students used technology to empower themselves. This study found some evidence that students were making use of devices for their own purposes, and in ways that benefit them, such as researching colleges, personal writing, and to enter photography contests. These findings seem to indicate that the availability of devices for all students is providing benefit to some students who might not otherwise have that opportunity. Even if these students would have access on other devices, the fact that they are using their school-issued device for these purposes points to the devices being helpful to students in empowering themselves.

Theoretical Implications

One of the main assumptions in Neoliberal thinking is that technology will make schools more efficient and productive. The findings of this study do seem to indicate that some parents feel use of devices has allowed their student to be more efficient. However, parents also overwhelmingly expressed the belief that they still desire face to face instruction and that relationships between students and teachers are preferable to learning on computers a majority of the time. Parents also shared in many open-ended responses, their belief that students need to interact in person with their peers, and not from behind a screen. As Picciano and Spring (2013) relate, “education, unlike other endeavors, has always been characterized as a high-touch human activity based largely on teacher-student relationships that extend over time” (p. 52). The findings shared by parents seem to loudly echo this sentiment.

Another Neoliberal ideal is that if we give all students a device then equity has been achieved and success or failure is dependent upon individual merit and hard work. The results of this study show that reliable, high-speed internet access is still a barrier to many families. Without equitable access, providing devices to all students cannot ensure equitable opportunities.

However, access to high-speed internet is not the only issue. As many parents shared, technical difficulties with devices and students' individual lack of digital skills were also factors that affected their ability to complete schoolwork using devices.

Economic limitations also have striking results for schools. Some of parents' concerns related to use of the Chromebook device being a tablet and not a fully functioning laptop, which they felt was a "baby-step" into technology. Another issue were the programs that were not able to be installed or run on the Chromebook device. These problems are both directly related to funding. In order to provide a device for every student, schools have to find a device that is not only functional but also cost effective, which has resulted in most schools resorting to tablet devices, either Chromebooks or iPads. In order to provide the higher priced fully functioning laptops that would allow students to do use more advanced technology, schools would need to spend more money. The parent concern about the inability to access the software needed for all their classes is also related to money. Google apps for education are free and easily accessible with devices such as Chromebooks. In order to provide more advanced software, such as Microsoft Word, Excel, PowerPoint, etc., schools would need to purchase licenses for every device. In addition to a more expensive device, schools would also have to find more money for the more expensive software as well. Similar costs would be associated with additional licenses needed to install the programs used for classes like photography, graphic design, design and modelling and other technology-enhanced classes. While many who promote free market capitalism and more technology in schools believe that technology can make schools more efficient, they often do not also support more funding for schools. In fact, it is often the exact opposite.

As Selwyn (2012) suggests, technology is sometimes viewed through a lens of technological determinism and is assumed to be inherently beneficial. The findings from this study suggest that while the ideal may be for students to utilize devices in ways that employ higher order thinking and high-tech skills, which is not the reality of what is happening. Parents in this study mostly report their children using devices for basic tasks such as word processing, creating presentations and completing and submitting online assignments. Based on these findings, it does not seem that the school-issued devices have been the revolutionary tool that many technological determinists perceived. Parents in this study also shared that there are a lot of factors, including teacher and student skills that are necessary to the devices to be truly transformational. Without the digital citizenship and digital skills training that they need to be successful, students are not able to use devices to their full potential. Differences in teachers' use of technology across content and levels was also a concern expressed by parents. This all points to the fact that giving students devices and expecting them to miraculously transform education is not the reality. While parents are generally positive about the devices and students' use of devices, they have not become the panacea that many proponents of technology have predicted.

With regard to acceptance and perceptions of technology, there seemed to be some discrepant findings. On the one hand, parents were very accepting of technology for themselves and also seemed to mostly believe that technology was a necessary part of modern schooling and also important for their child's future success. However, they were less positive about how devices were actually being used. There seemed to be a difference between the belief that devices should benefit students' learning and how they are actually being used for student learning. This seems to relate to Selwyn's (2010) assertion that educational technology needs to be viewed not through a lens of how it should work, but how it is working in context. It seems

that parents of students today may be finding that the promise of technology to revolutionize education and the reality of technology use for education do not always align. It also seems that more than being proponents of technology, parents may be "resigned" to the idea that technology is a given in education. This finding highlights why it is important to consider the parent perspective to evaluate students' use at home and not just the student or teacher perspective.

Limitations

In one respect, the population and sample for this study could be considered a limitation, especially if the goal was to achieve generalizability. The school district used in this study was not a very large district, therefore it was unlikely that the study would result in the kind of large sample size needed to yield generalizable quantitative findings. There were also not multiple schools from which to pull stratified random samples. In combination with the relatively small population, the lack of diversity in race and geography is an additional limitation to this study. However, my intent for this research was to conduct a study that would not just serve as my dissertation and add to the larger body of literature, but more importantly to me, would be useful and valuable to the school district involved in the study. In my opinion and experience as a 22-year veteran educator, often the most important and informative research is done by practitioners in real-world situations that can be used to inform practice and programs and that was my ultimate goal with this study.

The instrument used in the study may also be a limitation in a few ways. First, use of a researcher-created survey that asks participants to self-report may not be considered as reliable as a standardized, tested and validated survey. In addition, due to lack of access or digital skill, the use of an online survey to assess digital equity could leave out some of the very participants that are experiencing the inequities. However, the population in this survey, parents of middle

and high school students, are highly likely to have email and a device on which to answer the survey. The fact that the survey was smart phone compatible should also have helped to negate that factor.

Some of the measures put in place to help maintain anonymity of participants may also have inadvertently contributed to less valid results. First, because the surveys were distributed electronically via email and IP addresses were not collected I have no way of ensuring that a parent didn't take the survey multiple times. I also did not have any way of stopping a parent from sharing the survey with someone to whom it did not apply, such as a parent in another district, or a parent within the district who did not have a student at the middle or high school. Second, the surveys were sent to all parent emails associated with a particular student, which could allow for both parents, and even stepparents to complete the survey. However, since the goal of the research was to collect parent perspectives, and parents of an individual student may or may not have the same feelings regarding the device, this could also add to the validity of the results by allowing each parent to share their own personal views.

In reading through the open-ended comments some parents shared that their feelings and experiences with the devices were different based on different children's use of the devices. Some parents shared that while one child did well with the device, another child may have struggled. In designing the survey, I considered some options to try and address this. I considered asking parents to complete one survey per child, but that seemed like an inconvenience for parents, especially if they had several students between the middle and high school. I also considered adding questions to ask the grade level of their child or asking about ability levels of the child (such as if they were identified as gifted or had an IEP), which would have offered a better picture of how devices are experienced by differently abled students. Ultimately though I

decided that simply asking about the grade level would still not allow the parent to really differentiate which child they were discussing in the surveys and open-ended questions and the additional length to the survey would not be worth the additional insight that I might be achieved. That is a limitation to this study that could be addressed by future studies.

Implications for Future Research

One very interesting finding that came from this research was that, as proposed by Tsuei and Hsu (2019), there does seem to be a significant relationship between parents' technology acceptance and parent perceptions of their children's use of devices. While this study did not find factors such as race to be a factor, it did find that parents' technology acceptance and education and income were factors impacting parents' perceptions of devices. Since this study found a relationship between parent's technology acceptance and parent perceptions, it might be worth investigating what factors affect parents' technology acceptance, similar to the study by Hollingworth et al. (2011). Therefore, future studies that focus specifically on how parent factors such as race, income, geography and education affect parents' technology acceptance might be helpful in understanding levels of adoption and acceptance of technology by parents. This study also seemed to uncover discrepant findings between how parents' education and income predicted parent perceptions. Higher levels of education are typically associated with higher levels of income. However, the findings from this study indicate that while higher levels of education were positively associated with parent perceptions, higher levels of income were negatively associated with parent perceptions. Based on these findings, future research that focuses on how education and income specifically relate to parents' perceptions of technology might be informative.

In my original proposal for this study, I considered utilizing follow-up interviews instead of open-ended responses. My thought was that follow-up interviews could be used to further investigate interesting findings. Since I am one researcher working alone, who also works full-time and parents a teenager, I decided to utilize open ended responses instead of using follow-up interviews for practical purposes. However, future studies with a more flexible timeframe or more researchers would be able to accommodate a mixed methods study using follow up interviews instead of open-ended responses. I think this would be valuable because it would allow the researcher to delve more deeply into parents' feelings, and to follow up on findings. It might also be a way to learn more about how different students in the same family experience devices without asking parents to complete multiple or longer surveys.

Finally, it is clear that there are a variety of factors that impact true equity. These include teacher and student factors in addition to parent perspectives. I chose to focus on parent perspectives because this was an area that I found to be lacking in the literature and because it was important to me. Other factors that impact equity include how devices are used both inside and outside of school buildings. Based on my findings in the current study, I would be interested to conduct a follow-up study that incorporated teacher and student perspectives, as well as classroom observations of technology use and evaluation of artifacts such as lesson plans and technology help requests, just to name a few. A large study, which encompassed the myriad of factors impacting students' experience with technology for learning would likely be able to offer much better picture of equity that included access, use and outcomes.

Implications for This School Division and Others

Based on the findings from the current study, from a parent perspective it seems that the benefits to the 1:1 initiative outweigh the barriers for most users. Most importantly, access

remains a barrier and any district, particularly rural districts, using devices need to be aware of that and ensure that students who do not have access at home have opportunities at school to use devices and are not penalized for their inability to use devices at home. However, this study has also provided some valuable information that the district can use to strengthen its 1:1 program moving forward. First, teachers would likely benefit from on-going training not only in use of the learning management systems, but also in ways to better integrate technology into instruction. Part of this training could emphasize how teachers should communicate with parents how they will utilize school-issued devices to support instruction. It might also be beneficial to consider transitioning to one LMS, which I believe may already be happening with the migration to Canvas in the coming school year for this district. However, based on my experience both delivering and attending staff development over two decades, I would recommend surveying teachers to see what kind of training they need or want and offering a variety of training to meet their needs, as one size fits all training will not be very helpful. It might also be helpful to consider installing monitoring software on all Chromebooks. However, I would include that in the survey of teachers to see if they feel that would be beneficial or useful before purchasing.

In addition to teacher training, it appears that some parents would like to have, or at least would benefit from some parent training. A good time to offer this might be during the sixth-grade orientation for parents at the middle school and during the ninth-grade orientation for the high school. Students would also benefit from digital skills training with the Chromebook and also digital citizenship in general. As recommended by one parent, it seems reasonable to make this a part of curriculum for all sixth graders, possibly during their mandatory study hall block, or part of exploratory electives. It also seems pretty clear that digital citizenship needs to be more explicitly considered as part of the curriculum. While the state Department of Education issued

new guidance on digital learning integration in 2020, the disruption of education due to the pandemic has resulted in disruptions in implementation of that process. As school districts move back into normalcy, revisiting how digital learning is integrated and ensuring that it is being addressed will be very important considerations moving forward.

With regard to the devices themselves, it seems there were several findings that would be easy to remedy and might make things better or easier for parents and families. First, I recommend issuing one device at the beginning of middle school and allowing students to keep the same device throughout their middle school years. They could still turn the devices in at the end of every school year for updates but be re-issued the same devices in the fall. Since all of the devices are managed using barcodes, it would be easy to implement this small change. While I am sure that cost is a very important consideration, it might be beneficial to consider using Chromebooks with younger students and during high school or senior high, consider phasing in a more fully functioning laptop device that runs programs such as Word and Excel or that can run programs such as those needed for classes like art or graphic design at the high school.

At this point in the device roll-out it is too late to involve parents in the planning process. However, moving forward, it would be valuable to include parents in the planning if the program is extended to the elementary level. It is not too late to bring middle and high school parents on board by inviting them to join an advisory committee, and also continuing to send out surveys such as the one used in this study periodically. Most importantly, the school needs to continue to monitor the access issue and advocate for additional access in homes throughout the county.

Conclusion

While this study may not be widely generalizable, it still provides important information from the parent perspective, which is often left out of the conversation. When compared to other studies on parent perceptions the findings from this study are largely similar, which serves to support this data as being representative of parents' experiences in general. It seems clear from both my study and others that parents need to be included in the decision-making process prior to implementation of device initiatives. Communication also seems to be key to the success of students' use of devices. Increased communication would help device initiatives be more successful in two ways. First, if parents are involved and feel like they have a say in the process they are more likely to support and understand the program. Second, parents are the ones actually at home working with their students, and as such they are better able to provide information about the practical nature of device usage.

Also, once the 1:1 initiative is in place it is necessary to monitor and evaluate the outcomes of the program for students and families to ensure that the program goals are being met as intended and also to evaluate how families are experiencing the program. Revisiting the outcomes of the program to identify potential areas of weakness, room for growth, and problems that can be solved will make it more likely to be successful and also more likely to meet the program goals. Offering ongoing training for students, parents and teachers would also help to contribute to the success of the 1:1 initiative moving forward. Thinking toward the future and hoping that access at home becomes less of an issue, it would be worthwhile to constantly re-evaluate whether moving toward more electronic textbooks would make sense for the district. While it is impossible to predict what the future holds as we move forward from pandemic to endemic status, I do think that educators have learned some lessons during virtual and remote learning, quarantining, and all of the other things we have endured during this pandemic. My

hope is that educators can use some of the things we learned from the pandemic, such as better use of devices, and employ them for education in all times. For example, the flexibility offered by devices for students to learn outside of the four walls of a school building has serious implications for how we can utilize devices moving forward, especially if the issue of access is also addressed.

Epilogue and Concluding Thoughts

One thing that I think might also have impacted this study a bit, due to the timing, is related to the current culture and discussion between parents and schools. When planning this study, I was very mindful that parents' recent experience with the COVID-19 pandemic and school closures might affect their perceptions of devices. I was afraid that parents would be unable to separate their experience with the "device" over the last few years from their experiences with "virtual learning" during school closures. To address this, I tried to carefully word the survey introduction and survey questions to focus on devices and not virtual learning. I explicitly stated in the introduction, "when answering the questions, please try to think about your child's overall experience using Chromebooks, separate from your experience with remote or hybrid learning during the pandemic." I thought that since most of the parents had the devices prior to the pandemic, they would be able to separate the two if reminded to do so. Based on the parent responses I think they did a very good job with this. Several parents even referred to the differences by saying things such as, something was a problem during the pandemic, but not a problem with normal use of devices.

The thing that I could not have anticipated when planning this study was the level of discourse that would be reached in the nation, and specifically in Virginia around two issues: equity in education and curriculum. This survey was sent out in October 2021, which happened

to coincide with the governor's race taking place in Virginia. Education became a key issue between the two candidates for governor and the debate over curriculum and what one candidate termed "divisive concepts" such as critical race theory brought a level of attention to what is being taught to students in public schools that could not have been anticipated. I think this likely colored some of parents' perceptions even more than the pandemic. For example, many of the comments about still wanting to use textbooks also included comments about feeling like use of textbooks and paper and pencil made the curriculum more transparent and easier for parents to understand what their kids were actually learning. I think that some of this commentary was likely linked to the feeling by some parents that schools are trying to hide what they are actually teaching from parents, which was a common talking point during the election. In reality though, I think having all of the information about assignments and grades available to parents via technology is actually much more transparent than teachers keeping grades in a traditional gradebook and students turning in paper assignments.

It is my sincere hope that increased communication between schools and parents will help to alleviate some of the issues that have become public discourse. I think that 1:1 device initiatives have a key role to play in making curriculum more accessible to parents and students in the future. However, I also do not think that schools and parents are as far apart as some people would like us to believe. Completing this study in my own community, in the school district in which I teach and live has been a valuable personal experience for me. I hope that it will also open the door to more discourse and parent involvement in this district and others moving forward.

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Appendix

1:1 Chromebook Parent Survey

Hello: You are invited to participate in our 1:1 Chromebook Parent Survey. This research survey is open to all parents of students in middle or high school who have used a school-issued Chromebook. There are 16 questions in this survey, which should take approximately 10-15 minutes to complete. When answering the questions, please try to think about your child's overall experience using Chromebooks, separate from your experience with remote or hybrid learning during the pandemic. Your participation in this study is completely voluntary. There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you can withdraw from the survey at any point by closing the survey and exiting your web browser. No identifiable information will be collected and your survey responses will be strictly confidential. If you have questions at any time about the survey or the procedures, you may contact Joy Washington at s2jmwash@vcu.edu or Dr. Valerie Robnolt at vjrobnolt@vcu.edu. Thank you very much for your time and support. Please start with the survey now by clicking on the Continue button below.

1. Please indicate the race/ethnicity with which you identify: (check all that apply)
    1. American Indian or Alaska Native
    2. Asian
    3. Black or African American
    4. White or Caucasian
    5. Hispanic or Latinx
    6. Native Hawaiian or other Pacific Islander
    7. Two or more races
    8. Other _____

2. What is the highest level of education you have completed?
    1. did not complete high school
    2. high school
    3. vocational training, apprenticeship, trade certification or license
    4. some college
    5. college degree (associate degree or bachelor's degree)
    6. graduate degree (masters, EdD, PhD, MD, JD, etc.)

3. Please indicate your level of yearly household income:
    1. below $25,000
    2. $25,000-50,000
    3. $50,000-75,000
    4. $75,000-100,000
    5. $100,000-150,000
    6. above $150,000

4. Which of the following best describes the type of internet access you have at home?
    1. don't have internet access at home
    2. low speed (such as dial-up)
    3. high speed (such as DSL, Fios, satellite, etc.)

4. access through mobile data (such as a smartphone, tablet, or hot spot)
5. don't know

5. Please select the [redacted] County voting district in which you reside.
    1. 5th district: (vote at [redacted] Volunteer Fire and Rescue)
    2. 4th district: (vote at [redacted] High School)
    3. 3rd district: (vote at [redacted] Volunteer Fire and Rescue)
    4. 2nd district: (vote at [redacted] Administrative Building or [redacted] Memorial Church)
    5. 1st district: (vote at [redacted] Auditorium)
    6. Don't know
    7. reside outside of the county (tuition student)

6. Please respond to the following statements regarding your use of technology:

	No opinion	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I use technology every day for personal use such as email, paying bills, online shopping, etc.	❑	❑	❑	❑	❑	❑
Our family owns at computer, tablet or other device (not including smart phones).	❑	❑	❑	❑	❑	❑
Use of computers is a major part of my job.	❑	❑	❑	❑	❑	❑
I feel comfortable using computers.	❑	❑	❑	❑	❑	❑
Having a device (smart phone, tablet, computer, etc.) makes my life easier.	❑	❑	❑	❑	❑	❑
I think computers are important in today's world.	❑	❑	❑	❑	❑	❑
I can usually figure out how to do what I need to do with computers.	❑	❑	❑	❑	❑	❑
I rely on computers to get things done.	❑	❑	❑	❑	❑	❑
I know a lot about computers.	❑	❑	❑	❑	❑	❑

7. Please describe your feelings about technology and computers for your personal use.

8. Please indicate your feelings about the following statements regarding your child's use of their school-issued Chromebook:

	No opinion	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The Chromebook is an important tool for my child's learning.	❑	❑	❑	❑	❑	❑
Using the Chromebook for schoolwork helps my child to be successful.	❑	❑	❑	❑	❑	❑
It is important that schools teach children how to use technology, such as the Chromebook.	❑	❑	❑	❑	❑	❑
Having a Chromebook has helped my child learn.	❑	❑	❑	❑	❑	❑
I want my child to have a school-issued Chromebook in the future.	❑	❑	❑	❑	❑	❑
The teachers ask students to use Chromebooks in ways that are beneficial to their learning.	❑	❑	❑	❑	❑	❑
My child is comfortable using their Chromebook to complete schoolwork.	❑	❑	❑	❑	❑	❑
My child is more motivated to complete homework using the Chromebook.	❑	❑	❑	❑	❑	❑
Being able to use the same device at home and in school has helped my child be more organized.	❑	❑	❑	❑	❑	❑
Overall, I am pleased with how the Chromebooks are being used.	❑	❑	❑	❑	❑	❑

9. Please describe your overall feelings about your child's use of their school-issued Chromebook.

10. The following list asks about ways your child might use their school-issued Chromebook. Please indicate how often your child uses the device for each of the following:

	Don't know	Never	Rarely	Sometimes	Often	Always
Word processing/typing (Word, Google docs, etc.)	❑	❑	❑	❑	❑	❑
Data and spreadsheets (Excel, Google sheets, etc.)	❑	❑	❑	❑	❑	❑
Creating presentations (slides, videos, photos, etc.)	❑	❑	❑	❑	❑	❑
Searching for information on the internet	❑	❑	❑	❑	❑	❑
Completing homework assignments (Schoology, Clever, Google classroom, Canvas, etc.)	❑	❑	❑	❑	❑	❑

Working on assignments with peers	❑	❑	❑	❑	❑	❑
Communicating with teachers	❑	❑	❑	❑	❑	❑
Watching school-related videos, tutorials, etc.	❑	❑	❑	❑	❑	❑
Sharing ideas with others via blogging, podcasting, commenting on videos, etc.	❑	❑	❑	❑	❑	❑
Leisure or entertainment activities such as playing games, listening to music or watching videos	❑	❑	❑	❑	❑	❑

11. Please list any other ways you have observed your child using their Chromebook.

12. The following are barriers that could affect students' ability to use their school-issued Chromebooks. Please indicate how often you have experienced the following:

	Don't know	Never	Rarely	Sometimes	Often	Always
Lack of access to the internet to complete schoolwork at home	❑	❑	❑	❑	❑	❑
Internet that was too slow to complete assignments or access content	❑	❑	❑	❑	❑	❑
Running out of data	❑	❑	❑	❑	❑	❑
Having enough devices in your home for everyone	❑	❑	❑	❑	❑	❑
Restrictions placed on the devices by the school district (such as filters)	❑	❑	❑	❑	❑	❑

13. What other barriers have you faced regarding your child’s use of their school-issued Chromebook?

14. The following are concerns that some parents might have regarding their child's use of school-issued Chromebooks. Please indicate how often you are concerned about the following:

	No opinion	Never concerned	Rarely concerned	Sometimes concerned	Often concerned	Always concerned
Being off-task/distracted, using the Chromebook for non-school activities	❑	❑	❑	❑	❑	❑
Accessing inappropriate content/activities	❑	❑	❑	❑	❑	❑
Threats from others online (such as online predators or cyber-bullying)	❑	❑	❑	❑	❑	❑
Too much time in front of a screen	❑	❑	❑	❑	❑	❑
Loss of physical activity	❑	❑	❑	❑	❑	❑
Less time spent interacting in person with family and friends	❑	❑	❑	❑	❑	❑
Ability to monitor child's online activities	❑	❑	❑	❑	❑	❑
Ability to help child with online assignments	❑	❑	❑	❑	❑	❑
Teacher/school district expectations for how/how often students use Chromebooks	❑	❑	❑	❑	❑	❑
Chromebook getting lost, stolen or damaged (including parts such as the power cord)	❑	❑	❑	❑	❑	❑
Concerns about privacy/data collection	❑	❑	❑	❑	❑	❑

15. Please provide more detail regarding concerns you have about your child's use of school-issued Chromebooks.

16. Is there anything else you would like to say about your family's experience having a school-issued Chromebook at home?