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ENGLISH LANGUAGE LEARNERS: A QUANTITATIVE STUDY OF DIGITAL HOME ACCESS AND ITS RELATIONSHIP TO READING ACHIEVEMENT IN GRADES FOUR AND EIGHT

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ENGLISH LANGUAGE LEARNERS: A QUANTITATIVE STUDY OF DIGITAL HOME ACCESS AND ITS RELATIONSHIP TO READING ACHIEVEMENT IN GRADES FOUR AND EIGHT

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ABSTRACT

ENGLISH LANGUAGE LEARNERS: A QUANTITATIVE STUDY OF DIGITAL HOME ACCESS AND ITS RELATIONSHIP TO READING ACHIEVEMENT IN GRADES FOUR AND EIGHT

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Today's world is highly digitized and requires digital access and literacy for educational, professional, and personal success. Students from traditionally disadvantaged backgrounds, such as English Language Learners and those from households experiencing low-income, often face additional challenges accessing digital devices and high-speed Internet at home. Researchers have yet to fully examine how digital access relates to reading achievement among students in the U.S. K-12 public school system.

The current study used correlational secondary data analysis to examine relationships among home access to digital devices and high-speed Internet and student reading achievement outcomes. In addition, the association between digital home access of students and reading achievement was examined among students facing additional educational challenges, including English Language Learners (ELLs), students with documented disabilities, and those from households experiencing low-income. Participants in this study included a nationally representative sample of fourth and eighth grade students who participated in the 2022 NAEP reading assessment. Descriptive statistics and linear multiple regression indicated home-based digital access was associated with higher reading achievement scores among fourth and eighth grade

students. As such, policies that promote equitable digital home access may serve to bolster educational outcomes among students who have been traditionally underserved within the U.S. K-12 public school system.

Keywords: English Language Learners (ELLs), Digital Home Access, Reading Achievement, National Assessment of Educational Progress (NAEP), Rosetta Stone

DEDICATION

To my children, Isaiah, Michael, Christina, thank you for your unconditional love, support, and motivation to help me succeed in life.

To my mother, Jennie E. Combs, who always believes in me and continuously reaffirms my gifts and talents.

To my youngest sister, Brittany, thank you for a lifetime of inspiration and support.

To my oldest sister, Tanika, you truly envelop the power of literacy. Your childhood determination to stay up after bedtime and read from the reflection of the streetlight empowers me today.

In loving memory of my late husband, Mark E. Sanders, mission accomplished!

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CHAPTER 1 INTRODUCTION

The COVID-19 pandemic highlighted the digital divide, drawing attention to the magnitude of inequity between students who had reliable, high-speed Internet access, personal digital devices, and hands-on parental support during remote learning, and those who did not (Reimer & Hill, 2022). In fact, prior to the onset of the outbreak, the Pew Research Center (2022) reported some students encountered challenges completing their assignments because they lacked access to a computer or reliable Internet access at home. As students abruptly shifted from traditional face-to-face learning to remote instruction, access to suitable technology and reliable Internet connectivity became essential for student academic success (Anderson et al., 2022). In 2022, the U.S. Department of Commerce stated reliable, high-speed Internet was essential to education, livelihood, and investment in the 21st-century economy. In response, the federal government initiated the Internet for All funding opportunity (U.S. Department of Commerce, 2022). This reaffirmed the critical need for access to advanced technology for everyday life.

The National Telecommunications and Information Administration (NTIA) argued that after schools and other business institutions pivoted to online environments, families and communities that lacked access to reliable, affordable, high-speed Internet connectivity, and appropriate digital devices at home, became disconnected from those who did have access at home (U.S. Department of Commerce, 2021). Consequently, in 2022 NTIA invested $2.3 billion in funding to increase Internet connectivity. The funds were distributed to approximately 300 organizations to advance the Biden-Harris Administration's proposed goal of closing the digital divide**,** the phenomenon of those who have access to personal computer technology and Internet services at home and

those who do not (Attewell et al., 2003; Reddick et al., 2020). Large-scale government investments in advancing national Internet access initiatives led one to ponder if there is a relationship between the national digital divide and literacy achievement outcomes in U.S. public schools.

According to the 2022 Nation's Report Card, the average fourth and eighth grade public school reading scores decreased by three points compared to 2019. In fact, the average fourth grade reading score was lower than every year's prior assessment going back to 2005. The average eighth grade reading score was lower than every year's prior assessment going back to 1998. Neither fourth grade nor eighth grade reading scores were significantly different from 1992. Compared to 2019, both fourth and eighth grade reading scores declined for most U.S. states and jurisdictions in 2022 (National Assessment of Educational Progress, 2022). Moreover, throughout the 2020-2022 timeframe there were other considerations that may have also impacted the above referenced differences in reading assessment scores such as large interruptions in formal schooling, parents' abilities to support student learning at home, student and family mental health, and parental job loss (Martí-González et al., 2022). However, the current study investigated digital home access of students.

Purpose of the Study

The main purpose of this quantitative investigation was to examine the digital home access of English Language Learners (ELLs) and non-ELLs and its relationship to reading achievement in K-12 public U.S. schools. The extant literature revealed a research gap. Evidence showed ELLs, especially those from lower income households, experienced the greatest deficits to high-speed Internet access (Equity Literacy Institute,

2021a; Reimer & Hill, 2022). With the rapid pivot to online learning, digital literacy presented more advanced ways to read, write, and communicate, which required progressive 21st century competencies. Lack of access to digital devices and high-speed Internet have been cited in research, with minimal regard for ELLs and other multilingual students and families (U.S. Department of Commerce, 2023a; U.S. Department of Commerce, 2023b).

Without access to digital devices and reliable, high-speed Internet, ELLs and families experiencing low-income have faced the greatest deficiencies to global access (Equity Literacy Institute, 2021; Reimer & Hill, 2022). The present study incorporated the Equity Literacy Framework (Gorski & Swalwell, 2015). With the global shift to online communication, digital literacy is the latest form of reading, writing, and interacting. Through the theoretical lens of Equity Literacy, this study examined the relationship between reading achievement and digital home access of students.

Significance of the Study

In December 2015, Every Student Succeeds Act (ESSA) was signed by President Obama with the intention of improving U.S. public schools. This bipartisan legislation reauthorized the 50-year-old federal education law, Elementary and Secondary Education Act (ESEA), created to ensure equal opportunity for all students (U.S. Department of Education, n.d.-a). ESSA aimed to foster equity and provide critical protections for traditionally underserved students in America including ELLs (U.S. Department of Education, 2017).

In April 2016, the American Institutes for Research (AIR) reported the availability of additional instructional resources under ESSA Title III funding designed to improve

education for ELLs. States' and school districts' Title III budgets expanded by approximately $60 million to develop, facilitate, and sustain high-quality instruction to support ELLs in their English language and literacy, and math education. ESSA targeted school systems with inadequate English language instruction for ELLs. As the ELL student population grew throughout the U.S., supporting their mastery of English language and academic content was increasingly critical to their development of digital literacies. ESSA's reauthorization reignited the importance of local and state monitoring of institutional implementation of best practices and its' effect on student achievement results within today's digital society (AIR, 2016).

The urgent shift to remote learning in response to the spread of COVID-19 highlighted the digital homework gap. K-12 officials encountered the harsh reality that some students and families within their communities did not have access to reliable Internet at home—especially those from household experiencing low-income. The Pew Research Center reported many Hispanic students and students from households experiencing low-income feared they were falling behind in schoolwork (Auxier & Anderson, 2020).

A 2022 Pew Research Center survey also reported the lack of home-based digital access resulted in an inability of students to engage in online coursework. Approximately 22% of students reported they often or sometimes had to complete their homework assignments on a cellphone, and 12% said they were not always able to complete homework assignments due to lack of access to a computer and reliable Internet connection at home. The need to use public Wi-Fi for homework completion was

reported by 6% of students without an Internet connection at home (Anderson et al., 2022).

In 2022, fourth grade reading scores decreased for students performing at the 10th, 25th, 50th, and 75th percentiles compared to 2019. There was no significant score change reported for students who scored at the 90th percentile. Within the same year, eighth grade reading scores decreased for students across all five percentiles. The range of score declines for students who scored at the 10th and 25th percentiles were not significantly different than the declines for students at the 75th and 90th percentiles. Moreover, 33 states had lower scores compared to 2019, including a decrease in scores for students at the 75th and 90th percentiles in 4 states. In 9 states, scores decreased for students at the 10th and 25th percentiles. In comparison to 2019, only one jurisdiction had an increase in scores for students who scored at the 90th percentile, and an overall score increase on the NAEP reading assessment in 2022 (NAEP Report Card, n.d.).

The present research identified barriers that impacted student digital access at home and its relationship with reading achievement in English. The extant literature was insufficient in terms of relevant theoretical perspectives and available data to inform practice. Many studies focused solely on digital access or reading achievement for non-ELL students. The current study contributes to ELL literacy research by overcoming theoretical deficiencies and maximizing nationally representative public datasets to further our understanding of home-based digital access and its relationship with reading achievement for both ELLs and non-ELLs in fourth and eighth grades in U.S. public schools.

Research Questions

The main purpose of this quantitative investigation was to examine the digital home access of ELLs and non-ELLs and its relationship to reading achievement in U.S. K-12 public schools. The following research questions and hypotheses were addressed:

Research Question 1. Is there a relationship between digital home access of students and reading achievement in U.S. public schools in Grade 4?

H1. Digital home access of students will have a positive significant relationship with reading achievement in U.S. public schools in Grade 4.

Research Question 2. Is there a relationship between digital home access of students and reading achievement in U.S. public schools in Grade 8?

H2. Digital home access of students will have a positive significant relationship with reading achievement in U.S. public schools in Grade 8.

Research Question 3. Does ELL status, special education status, household income, and digital home access of students predict reading achievement in U.S. public schools in Grade 4?

H3. ELL status, special education status, household income, and digital home access of students will predict reading achievement, such that lack of digital home access, being an ELL, being in special education, and experiencing low household income will be associated with the lowest reading achievement scores in U.S. public schools in Grade 4.

Research Question 4. Does ELL status, special education status, household income, and digital home access of students predict reading achievement in U.S. public schools in Grade 8?

H4. ELL status, special education status, household income, and digital home access of students will predict reading achievement, such that lack of digital home access, being an ELL, being in special education, and experiencing low household income will be associated with the lowest reading achievement scores in U.S. public schools in Grade 8.

Definition of the Terms

To develop a mutual understanding of concepts presented throughout this study, the list of terms below represents operationalized definitions.

Digital Divide. The phenomenon of those who have access to personal computer technology and high-speed Internet services at home and those who do not. This phenomenon represents inequitable access to high-quality high-speed Internet, and reliable technological devices capable of advancing the quality of daily life of individuals (Attewell et al.; 2003, Reddick et al., 2020).

English Language Learners (ELLs). A subgroup of multilingual students who report one or more primary home languages other than English and are not yet proficient in listening, speaking, reading, and/or writing English. As a result, their language and literacy skills impact their performance on interdisciplinary assessments administered in English, requiring screening and identification for specialized language and literacy support services. This current study will sustain the term, English Language Learner (ELL) to clearly identify this specific class that is protected under the Federal Every Student Succeeds Act (ESSA) and receives mandated funds, specialized supports, and English language and literacy services (González, 2021; Kieffer & Thompson, 2018; O'Malley & Pierce, 1996; Sugarman & Lazarín, 2020).

Equity. Distinguishable from equality, equity is a process through which we ensure policies, practices, institutional cultures, and ideologies are actively and purposefully fair, while attending to the best interest of students and families. There is clear recognition that adjustments are required to correct imbalances that could exist due to marginalization (Reimer & Hill, 2022).

Equity Literacy. A comprehensive approach for creating and sustaining equitable schools by recognizing even the subtlest forms of bias, inequity, and oppression related to race, class, gender identity and expression, sexual orientation, (dis)ability, language, religion, immigration status, and other factors. Through Equity Literacy we prepare ourselves to understand how quantitative and experience-based disparities affect student access to equitable educational opportunities free of bias, inequity, and discrimination (Equity Literacy Framework, 2021b, para. 2).

Homework Gap. A phenomenon in which school-age children face problems completing their schoolwork at home due to the lack of access to a reliable computer and/or high-quality Internet access at home. This is more pronounced in some Black and Hispanic households, and households experiencing lower income (Auxier & Anderson, 2020; Anderson et al., 2022).

Multilingual Learner (MLL). A broad group of students who report one or more primary home languages other than English and gain proficiency in multiple languages. The term multilingual learner also highlights the asset-based approach to classification of students who speak more than one language. While ELLs are considered a subgroup of MLLs, an MLL may have never been an ELL, or could have been a former ELL who demonstrated grade-level appropriate English proficiency via interdisciplinary standardized

assessments, and successfully exited the specialized English language and literacy program. As a result, the MLL no longer receives access to specialized ELL supports and/or services (González, 2021; Kieffer & Thompson, 2018).

CHAPTER 2 THEORETICAL FRAMEWORK AND REVIEW OF RELATED LITERATURE

Theoretical Framework

Equity Literacy is a comprehensive approach to creating and sustaining equitable schools by recognizing even the subtlest forms of bias, inequity, and oppression related to race, class, gender identity and expression, sexual orientation, (dis)ability, language, religion, immigration status, and other factors. The foundations of Equity Literacy include a commitment to deepening both individual and institutional understandings of how equity and inequity operate in organizations and societies (Equity Literacy Institute, 2021b; Reimer & Hill, 2022). More than cultural competence or diversity awareness, Equity Literacy informs educators and policy makers of how disparities impact student access to equitable educational opportunities free of bias, inequity, and discrimination. Equity Literacy ensures policies, practices, institutional cultures, and ideologies are actively and purposefully attending to the interests of underserved students and families. After recognizing and understanding disparities, educators and policymakers can respond effectively and immediately. Longstanding change is cultivated by counteracting institutional and societal conditions that foster daily acts of inequity (Equity Literacy Framework, 2021a, 2021b).

A structural ideology affirms traditional prekindergarten through 12th grade schooling is positioned for only some groups to succeed (Reimer & Hill, 2022). Structural equity rejects deficit narratives and focuses on correcting the educational conditions that sustain marginalization, rather than deprecating students and families. Educators that support a structural approach understand that student achievement gaps

result from systemic barriers both in and out of school. Moreover, families who experience hardship do not lack perseverance or a moral compass (Gorski, 2018).

The Equity Literacy Framework postulates that equity does not simply imply giving every student exactly what they need to succeed on an individual level; this false perception of equity masks the larger responsibility of combating institutional bias and inequity (Equity Literacy Institute, 2021a, 2021b). In fact, Gorski (2015) argued those who embrace Equity Literacy bolster equity within their own influential circles and daily lives.

Moreover, the Equity Literacy Framework requires a structural approach to recognize and demolish inequities within the educational system. This approach fosters equitable learning environments, provides highly specified research-based support for ELLs, and develops a shared language and equitable culture community-wide (Aragona-Young, 2016; Posti-Ahokas & Janhonen-Abruquah, 2021; Reimer & Hill, 2022; Shufflebarger, 2022).

Through the theoretical lens of Equity Literacy, this study investigated home-based digital resource access to determine the relationship between digital home access and reading achievement for ELLs and non-ELL students in both fourth and eighth grades. The study was congruent with the Equity Literacy Framework because it implemented a scientific approach to gathering and analyzing data across various demographics (e.g., language status, socioeconomic status, and special education status) and examined potential inequities within the current educational system. Moreover, it addressed the existing needs identified in prior research. This study was committed to upholding the basis of Equity Literacy by committing to raising awareness for individuals

and institutions on how equity and inequity operated within society today. In addition, this study fostered knowledge, abilities, and determination for individuals and institutions to diligently identify and eliminate inequities, while actively strengthening equity at large (Equity Literacy Institute, 2021a, 2021b). The Equity Literacy Framework was integrated within the data analysis, study findings, and implications for further research.

Review of Related Literature

Research on digital access with monolingual, and non-ELL students from elementary school through middle school has demonstrated a strong relationship between digital access and student achievement outcomes (Harper et al.; Mudra, 2020; Salmerón et al.). However, few studies have examined the relationship between digital home access of students and reading achievement for both ELLs and non-ELL students. The following literature review consists of four components: (a) digital access, (b) reading achievement, (c) the relationship between digital access and reading achievement, and (d) a summary of the extant literature.

Digital Access

Digital access increased in importance as classrooms integrated more technology and Internet-based learning in both in-person (e.g., Xie 2023) and online formats (Castro & Tumibay, 2021). Socioeconomic status and geography have been identified as determinants of digital access (Claro et al., 2015). The shift to increased technology-based learning only compounded the challenges traditionally underserved students face within educational settings. Although statistics indicate most households have access to the Internet and technological devices (Pew Research Center, 2023), the requirements of digital access for successful online or hybrid learning is not as simple as it seems. There

is a wide variety in the technical specifications of devices as well as the Internet connections themselves, and merely providing digital devices and Internet access does not fully address the digital divide (Gorski, 2005; Williamson et al., 2020). Digital incompetencies need to be addressed through the explicit teaching of digital skills to parents and educators (Pena-Lopez, 2010; Xie et al., 2023). Nevertheless, many school districts have focused on simply providing devices and Internet access to address the digital divide.

For example, in a study conducted by Hill and Reimer (2022), 56 technology directors of school districts in the state of Minnesota were surveyed. The results indicated the lack of technological devices in homes during the COVID-19 pandemic was of significant concern to 23% of respondents. Fifty-three of the 54 school districts represented in the study indicated they provided digital devices to each student. Yet, the devices ranged widely in technical specifications from iPads to Chromebooks, and some schools used a one-device-to-one student policy, whereas others provided one device per family. Internet access, especially in rural areas of the state, was also of significant concern for 32% of the respondents. Some school districts provided Wi-Fi hotspot devices, whereas others paid Internet bills, and the remaining districts used phone calls to connect with students rather than email. Moreover, some districts were able to negotiate free or reduced prices for home-based Internet services for students and families.

Despite the distribution of digital devices and improving access to the Internet, many challenges remained. These included insufficient cellular and Internet services in rural areas and those with inclement weather, as well as technological challenges with Chromebooks. For example, families with multiple students who engaged in synchronous

online instruction, required multiple Wi-Fi hotspot devices to maintain high-speed Internet access, and many families could only obtain dial-up Internet services. In addition, students impacted by poverty could no longer access school meals, which undoubtedly impacted the quality of the child's learning experience. Native American families, and other multilingual families including ELLs, were disproportionately impacted by the sudden reliance on the shift to online learning. Respondents insisted the educational system was inequitable by design. The authors reported a critical need for education leaders to be trained on Equity Literacy (Hill & Reimer, 2022).

Although the study by Hill & Reimer (2022) examined an unplanned response to a pandemic as opposed to a planned transition to online learning, this study was a great example of how the provision of digital access for education can look widely different—even within one state. In addition, it illustrated a new digital device and Internet access are not all that are needed for successful learning. Families could have access to both devices and the Internet and still have inadequate skills for successful online learning.

In another study, Reddick et al. (2022) examined access to and affordability of Internet services (i.e., high-speed Internet) in San Antonio, Texas. San Antonio is the 7th largest city in the U.S., and more than half of the residents are Hispanic/Latinx. According to logistic regression analyses, minority households, households with lower income, and those with less education had significantly less access to Internet services at home than other groups. Controlling for all socioeconomic factors, statistical results indicated the geographical location within San Antonio was the greatest predictor of broadband Internet access. Low-income districts in both rural and urban areas were less likely to have access to broadband Internet services. These results emphasize that

although rurality is often a barrier to high-speed Internet (e.g., Hill & Reimer, 2022), barriers to digital access still occur in large cities throughout the United States, and disproportionately affect families from low socioeconomic backgrounds. As such Reddick et al. (2022) emphasized the need for city representatives to identify and address local barriers to city-wide high-speed Internet access.

Another aspect of students' digital home access is the caregiver's familiarity with digital devices and their digital skills. Chen et al. (2019) examined parental perceptions of young ELLs' (aged 9-15 years) language learning experiences through mobile technology. Six immigrant families with diverse backgrounds living in the Midwestern United States were interviewed. These families had access to a wide range of digital devices, including laptops, iPads, mobile smartphones, digital cameras, printers, and MP3 players. Results indicated that although all parents were motivated to provide support for their children, parents with greater education possessed greater digital skills. This was especially true for parents working in the field of education that reported advanced proficiency in career-based and content-specific digital skills and were able to model their technological expertise for their children. Parents with less education were more likely to be anxious about technology and required their child's help to use it appropriately. For example, one family reported using mobile phones for only text messaging and phone calls. Another parent reported limited technology use due to work demands and concerns with their use of the English language (Chen et al., 2019).

Although only six Midwestern families participated in the study, and the results may not be fully generalizable to the larger ELL population, the study provided a culturally diverse examination of technological perceptions. The results from this

qualitative study suggest the parents of ELL students desire to support their child's digital learning, but, depending on education, access to resources, and their own digital skills, parents may be able to provide support in varying degrees.

Chen et al. (2019) argued technology integration in ELL homes was also heavily influenced by families' sociocultural backgrounds and perceptions, and as such, further support the supposition that the digital divide in the educational realm must be addressed by device distribution, high-quality Internet access, and training for users to develop digital proficiency. For students to be fully supported in their online or technology-based learning, caregivers must have their own digital skills. The authors recommended the investigation of parents' perceptions of technology usage within homes to provide equitable educational access to all students.

In addition to digital access, teachers' perceptions of digital integration barriers including access to classroom resources also influence student digital learning. Xie et al. (2021) reported teachers' challenges overcoming internal and external barriers to providing digital learning resources within the classroom. Internal barriers included developing a cohesive vision for technology, implementing relevant professional development, and fostering positive beliefs and attitudes regarding technology. External barriers included limited access to high-quality technology and reliable high-speed Internet. The authors examined the effect of internal and external barriers on teachers' perceptions of their digital abilities and digital value, as well as their integration of digital educational resources. Framed by Ertmer's (1999) description of barriers to technology integration, 301 in-service middle and high school teachers from one Midwestern state and 18 U.S. schools participated in this quantitative study. Results revealed the most

effective way to integrate digital resources into the classroom was to have teachers focus on their technology vision and commitment to professional development (i.e., internal barriers), as opposed to focusing on the physical resources available (i.e., external barriers; Xie et al., 2021).

Sari (2020) noted the integral role students also play in the implementation and success of advanced technology within education. The integration of optimal advanced digital media and high-speed Internet significantly increased student engagement in their study. ELLs became active participants in collaborative groups through discussion, while sharing their comments and ideas in a meaningful way. Advanced technology strengthened responsive educational practices and ELL student achievement.

Analyzing the behaviors of learners during online activities is one of the most efficient ways to improve online learning. Sari's (2020) mixed methods study explored virtual ELLs' perceptions of their online learning, factors impacting their online participation, and roles within the online learning environment. These ELLs were enrolled in an online academic reading course in the second half of their school year. Through scientific inquiry, Sari (2020) engaged 165 undergraduate students from the English Literature Department and the English Education Department in Indonesia. The exploratory research design consisted of three instruments including questionnaires, online interviews, and online observations. The questionnaire data was analyzed using mean score and standard deviation (SD). Interview data was transcribed verbatim and analyzed using qualitative content analysis. Online observations analyzed ELLs' participation by tallying output visible online.

Key results revealed most ELLs reported positive responses towards their online learning engagement. Active learner, problem solver, and knowledge seeker were the three main roles identified. Interviews revealed that ELLs experienced barriers to completing the online academic reading course. From a content perspective, ELLs reported the number of required tasks and the content from the academic reading course as barriers. From a digital access perspective, ELLs reported unreliable Internet connections and limited Internet data as the major barriers to online participation and engagement. The author acknowledged that access to high-speed stable Internet access was critical to enrich ELLs' motivation and improve student achievement outcomes during online learning. Sari (2020) recommended further research as the results may not generalize to the broader population of international students outside of Indonesia.

Traditionally underserved groups, including racial and ethnic minorities, as well as those from low socioeconomic backgrounds have faced challenges within the education system. These groups are also disproportionately impacted by the digital divide (Claro et al., 2015). Despite attempts to address this disparity (e.g., distribution of devices; Hill & Reimer, 2022), addressing student challenges requires multi-faceted solutions that addresses the various internal and external barriers including teacher attitudes, parental perception, sociocultural backgrounds, community, and geography, among others.

Reading Achievement

Although education has often been considered a solution to overcoming poverty, research has shown that poverty is a barrier to educational outcomes. Research indicates that as poverty increases, student educational performance, including literacy, declines (Casserly et al., 2021). Although the relationship between educational performance and

poverty is extremely complex and requires multi-faceted approaches, national policies aimed at improving the education system (e.g., No Child Left Behind) do little to nothing to help students facing socioeconomic challenges (Ladd, 2012). As such, state-level and district-level approaches to reducing educational barriers are likely critical to address these obstacles effectively. For example, family literacy programs have significant effects on emergent literacy skills among young children; one difficulty for children from households experiencing low household income is the inability for many parents to provide literacy support at home (Fikrat-Weavers, et al., 2021).

The implementation of family-based literacy programs is an excellent example of how to identify and address roadblocks faced by underserved students. Historically, large urban schools educate a disproportionate number of students confronted with socioeconomic hurdles impacting student achievement, including poverty (Casserly et al., 2021). To examine whether large urban schools had incorporated measures to address poverty-based educational disparities, researchers of the Council of Great City Schools examined student reading and math achievement scores on the National Assessment of Educational Progress. Results indicated many large urban school districts showed significant improvements in educational outcomes and their reading achievement scores exceeded their predicted scores. To further understand why some districts were improving and others were not, site visits to six districts with improvements in scores were conducted. Qualitative research indicated several factors were consistent across the excelling districts and likely contributed to improvements in student achievement outcomes. The responsible factors were predominately educator-focused: collaboration among educators, differentiation of professional development, and strong leadership of

educators with high academic expectations of students. Additional strategies included community investment and engagement as well as identifying opportunities within the specific challenges named (Casserly et al., 2021). These results suggest the importance of the school district's role in identifying and addressing the historical and sociocultural factors that impede upon student success, and the need to invest in educators to promote higher educational achievement outcomes among traditionally underserved student populations.

A systematic review and meta-analysis indicated literacy differentiation is another effective approach to improving reading outcomes (Puzio et al., 2020). Although there are many approaches to differentiation, the authors suggested effective differentiation meets students where they are in their learning and requires educators to have a deep understanding of their students' interests, strengths, and weaknesses. As such, understanding the sociocultural background of students and the barriers they face may be an integral part of literacy differentiation and promoting literacy outcomes through cultural inclusivity.

Wulff and Zhang (2021) conducted a study that discovered differentiation of reading instruction was not significantly associated with improved reading outcomes. They analyzed the 2019 NAEP reading performance and differentiation data obtained from eighth grade students in public schools. In some cases, differentiated instructional approaches were associated with worse student literacy outcomes. The authors concluded differentiation served as a classroom management tool, rather than a method to improve student reading achievement (Wulff & Zhang, 2021). Nevertheless, the data did not include information about how differentiation was used—just the extent to which

teachers utilized it within the classroom. As such, this may provide further support for the supposition that literacy differentiation must be culturally and individually responsive to be effective. Future research should examine literacy differentiation with culturally inclusive approaches for traditionally underserved students.

Culturally appropriate literacy differentiation may be one way to address a lack of motivation for learning or 'resistance to schooling'. This phenomenon is a complex issue among some traditionally disadvantaged students and could emerge through self-fulfilling prophecies, an attempt at maintaining self-esteem after repeated academic failures, exposure to racial stereotypes in the classroom, and sociocultural backgrounds that differ from classroom peers (Phalet et al., 2004; Psycher & Lozenski, 2014).

Zhang et al. (2020) examined data from a nationally representative sample of 139,000 eighth grade students that completed the 2015 Grade 8 NAEP Reading Assessment. Results indicated student reading motivation was significantly associated with student reading achievement when controlling for gender, race/ethnicity, socioeconomic status, ELL status, and disability status. School climate was also associated with student reading motivation. There was an observed achievement gap between ELLs and non-ELLs, such that non-ELLs had significantly higher literacy scores. After controlling for ELL status and socioeconomic status, NAEP reading scores for White and Hispanic students were not significantly different. This suggested the gap between White and Hispanic/Latinx students was largely due to ELL status and household income. Despite the association between higher levels of reading motivation and higher levels of reading achievement, this association was not present for ELLs. As such, this further suggested household factors, including income and parental support,

likely had a stronger association with student outcomes than individual levels of motivation, despite the importance of motivation in learning. These results indicated the lack of achievement could not be merely attributed to individual student factors. Nevertheless, bolstering motivation, improving school climate, and addressing sociocultural barriers, may help to promote higher student achievement outcomes.

Much of the existing research examines student performance based on their status as an ELL but not both current and former ELLs (i.e., multilingual students) in analyses (Keiffer & Thompson, 2018). Data from the NAEP reading assessments indicated the NAEP reading achievement of multilingual students significantly improved from 2003 to 2015. Multilingual student reading achievement improvement during this time was two to three times greater than that of English-only speakers. Multilingual students were one-third to one-half of a grade level closer to English-only speakers in 2015, as compared to 2003. It is not immediately clear how these improvements occurred. The authors offered many possibilities, including increased attention to the needs of ELLs, increased certification requirements of teachers to support ELLs, state and district policy changes, among several others. One additional possibility the authors did not provide was the increase in household Internet access and digital use between 2003 and 2015. According to Pew Research Center, in 2000, only 1% of households had a broadband Internet connection, whereas this number increased to 66% in 2015 (53% among Hispanic/Latinx households; Pew Research Center, 2023). Internet, more broadly, was used by 82% of Hispanic/Latinx households in 2015. Although this was arguably not the only explanation of improvement, it may have helped to support ELLs, as discussed in the following section.

Digital Access and Reading Achievement

Some researchers and policymakers have been concerned the increase of digitalization may present a negative impact on student literacy achievement. Salmerón et al. (2022) analyzed fourth and eighth grade 2017 NAEP assessment data to examine the association between screen time and reading comprehension assessment scores (n = 149,400). Results demonstrated a positive association between teachers' incorporation of digital tools and students' reading achievement. There was a positive relationship among student usage of digital devices to support reading projects and reading comprehension in both fourth and eighth grade. Moreover, digital practices such as Internet usage for schoolwork positively correlated to reading comprehension skills. Yet, there were also negative relationships between digital usage and specific reading skills, including vocabulary, and reading achievement in both fourth and eighth grades. The frequency of use of digital devices at school among fourth graders was negatively related to reading achievement. Although this data was correlational, it suggested that effective use of technology, such as finding specific information for a project, rather than just access to technology more broadly, may be important. Further, the significant negative association between screen time and literacy-specific skills indicated that technology use was not automatically associated with improved literacy outcomes, and in some contexts, may not be the appropriate mode of instruction (Salmerón et al., 2022).

Further research is required to understand the nuances of the relationships between digital use and literacy outcomes. Failure to do so could put an additional burden on students from traditionally disadvantaged backgrounds through an expectation that increasing digital access will undoubtedly improve their performance. This could also

undermine other approaches that have been shown to be effective including targeted differentiated instructional practices. In addition, it is important to differentiate between technological access within the classroom and within the home, which may be associated with different outcomes. A positive correlation between student technological proficiency and reading achievement may be explained by both home and school digital literacy practices (Salmerón et al., 2022); further research is needed.

To examine the direct application of technology to support ELL literacy skills, Harper et al. (2021) examined whether incorporating the Rosetta Stone Foundations software package would increase student literacy achievement among middle school ELLs. Between 2017 and 2018, middle school students in eight urban public schools in the state of Arizona were selected to participate in an experimental study (n = 207). Ninety-nine percent of students received free and reduced lunch through the National School Lunch Program (NSLP). Twenty percent of the population were ELLs; ninety-one percent of the ELLs were Hispanic/Latinx. Students in each school were randomly assigned to the Rosetta Stone group (i.e., technology intervention) or the control group (i.e., standard curriculum).

Results indicated ELLs in the treatment group had greater improvement in English speaking and listening outcomes, compared to those in the control group. Other variables such as age and attendance had no significant effect on outcomes. The authors posited the personalized English instruction provided more opportunities for speaking practice, the ability for ELLs to proceed at their own pace, frequent automated feedback, and the space for ELLs to gauge their own learning without fear of making a mistake in front of their peers (Harper et al., 2021).

Despite technology being more widely implemented in education, the effect of technology on reading achievement is not well understood. Research seems to suggest that targeted digital interventions (e.g., Harper, 2021) are effective at improving specific skills among ELLs. Nevertheless, correlational research suggests the ratio of technological devices in classrooms has no significant relationship with reading achievement, and frequency of device use in the classroom is negatively associated with reading achievement outcomes (Salmeron et al., 2022). Further, research suggests that although technology is associated with better reading comprehension and project-related outcomes, it is negatively associated with specific literacy skills. It is also unclear how home-based and school-based digital access influences literacy outcomes. As such, future, more nuanced, research is needed to further understand the effects of technology on reading outcomes among traditionally underserved students. An expectation that digital access solely will automatically improve literacy outcomes will place a greater burden on students already combating disparities in education.

Within the United States of America, programs providing English language and literacy support services to non-native English speakers are often referred to as English as a Second Language (ESL) and more recently, English as a New Language (ENL). In the international arena outside of the United States of America, English language and literacy services to support non-native English speakers are often referred to as English as a Foreign Language (EFL). To better understand the views of young ELLs and English as a Foreign Language (EFL) teachers, Mudra (2020) conducted a study to explore their perceptions of the benefits and barriers of digital literacy. Participants included eight elementary ELL students with varying skill levels, and five EFL teachers from thirteen

different schools in one Indonesian province. Results revealed views from both ELLs and EFL teachers on the benefits and barriers to increasing English proficiency through the incorporation of advanced technology. According to the elementary ELLs, benefits of technology included improved skills in reading, writing, listening, speaking, and collaborative work. However, elementary ELLs reported inadequate Internet access due to weak signals, extended waiting periods for connectivity, the high cost of digital tools, and the complexity of the content as major hurdles to their English literacy development and motivation to continue.

EFL teachers reported access to authentic materials, and teachers as digital learners and collaborators as benefits. However, EFL teachers considered the complexity of digital tools and lack of policy support resulting in inequitable access to laptops, computers, and reliable high-speed Internet access, as major barriers to expanding ELLs' English language proficiency and reading achievement. Findings showed ELLs improved their writing skills when they incorporated social networking applications such as Facebook and WhatsApp during classroom-based learning activities and at home. The authors recommended digital literacy incorporation in teacher course preparation and curriculum integration so that teachers could assist in ELLs' effective use of applications on and offline (Mudra, 2020). To strengthen student achievement outcomes, further research is required to examine whether ELL students' and ENL teachers' perceptions in the U.S. public schools are consistent with the results of the Indonesian sample.

Summary

Technology use in education is increasing (e.g., Xie et al., 2023). Nevertheless, the increased expectation of digital access and digital skills disproportionately impacts

those students that have been historically underserved in education (Claro et al., 2015). Many national policies and school district approaches have been blanket attempts at bolstering educational outcomes that do little to address sociocultural factors that influence student achievement. The expectations of students to overcome poverty through education is an overly simplified perspective that fails to consider the various barriers that inhibit students in this endeavor, including language, parental literacy, socioeconomic status, geographic location, and teacher attitudes and beliefs, among others (e.g., Casserly et al., 2021; Fikrat-Weavers, et al., 2021). ELLs are one group of students that often face a disproportionate level of challenges to acquire English language and literacy proficiency within U.S. K-12 public schools. Although some research indicates digital access may improve educational outcomes, additional research is needed to understand these relationships through a culturally inclusive lens. The present study examined the relationship between digital home access of ELL and non-ELL students and its association with reading achievement outcomes.

CHAPTER 3 METHOD AND PROCEDURES

The following chapter on methods and procedures will review the research design, data and sample, instruments, and procedures for data analysis for each research question. This study design is both quantitative and non-experimental. The researcher chose this approach as most appropriate to examine the relationship between digital home access of ELLs and non-ELLs and reading achievement. This was accomplished through secondary data analysis of Grade 4 and Grade 8 reading assessment results from 2022 National Assessment of Educational Progress (NAEP) in the form of public-use datasets.

Data and Sample

In the Institute of Education Sciences (IES; n.d.) publication entitled *NAEP 2023 In Your School: Grades 4, 8, and 12,* IES reported NAEP has been gathering student achievement data since 1969, and has produced hundreds of reports in its history, documenting trends in the performance of 9-, 13-, and 17-year-old students in Grades 4, 8, and 12. The National Center for Education Statistics (NCES) reported that NAEP strives to present findings in the most accurate and useful manner possible with published reports designed for the public and specific audiences, while making the restricted-datasets available to researchers for secondary analyses. Moreover, the NAEP assessments have been deemed to have evidence of both reliability and validity by scholarly researchers (Edley & Koenig, 2017; Rivera, 2021). NAEP (2022) released the following statement about the validity, reliability, and professional standards for their assessments:

> The way the National Center for Education Statistics (NCES) creates, administers, scores, and reports the National Assessment of Educational Progress (NAEP)

> assessments is complex and involves several assessment design phases and stages, many of which overlap one another. This process ensures that The Nation's Report Card meets the highest standards of measurement reliability, validity, and accuracy (National Center for Education Statistics, 2022, para. 1).

The 2022 NAEP Reading Assessment data was compiled from a nationally representative sample of students instead of the entire student population using a probability sampling design. Each school and each student had a known probability of being chosen. A multistage design guided the selection, with students drawn from within sampled schools throughout the nation. School probabilities were proportionate to the approximated number of students in each grade-level assessed. To ensure sample units were equalized and representative of the sampled population, NAEP used weights to assure equal probability of selection due to the sample design. In addition, NAEP samples reflected adjustments for non-participation by assigning a weight for each sampled student.

NAEP assessed representative samples of students, including ELLs and students with documented disabilities, to ensure assessment results accurately reflected the student achievement of all students while ensuring an accurate measure of student academic achievement in the U.S. over an extended time (NAEP Report Card: n.d.). The 2022 NAEP survey data calculated the standard error for each estimate alongside the standard errors for all estimated means, medians, percentages, and totals were reported in NAEP reference tables (National Center for Education Statistics, 2022).

Results for the 2022 NAEP were based on samples drawn from 108,200 fourth grade students and 111,300 eighth grade students from 5,190 schools. The sample

represents the population of fourth and eighth grade students attending U.S. public schools, including ELLs. The current study will focus on public school students only. As a result, students from private schools, Department of Defense schools, and Bureau of Indian Education schools are excluded from the sample. Results can be generalized to fourth and eighth grade students in U.S. K-12 public schools.

Instrument

Unlike state assessments, NAEP participants including students, teachers, and principals, were asked to complete a contextual questionnaire. This data provided knowledge of students' educational experiences and factors that may have influenced learning (e.g., ELL status, disability status, household income, etc.) related to student learning (U.S. Department of Education, 2022).

NCES (2022) reported to determine the efficacy of our nation's education system, a single set of tests and standards must be assessed across the country. Currently, NAEP is the only test that provides an accurate representation of the U.S. K-12 public education system because it is the only test that is administered in the same way, asks the same questions, and is evaluated on the same scale across the nation.

Advancement of the NAEP reading framework was influenced by scientifically based reading research. Reading is a dynamic cognitive process involving the comprehension of written text, interpreting, and developing meaning, and incorporating meaning according to the type of text. The framework also guided the types of texts included and specific cognitive targets for assessment questions. This framework has shaped the NAEP assessment development since 2009 and guided development of the 2017, 2019, and 2022 digitally based assessments (NAEP Report Card, n.d.).

The NAEP reading assessment incorporated literary and informational texts to measure U.S. students' reading comprehension. Students read grade-level passages and answered questions based on corresponding reading passages. NAEP reading assessments were conducted in Grade 4, Grade 8, and Grade 12 across the country. Reading was assessed every two years, and writing was assessed every four years. Reading cognitive targets included the abilities to locate and recall, integrate, and interpret, and critique and evaluate (NAEP Report Card, n.d.).

Long-term trend NAEP measured student reading and was designed to provide comparability over time. Due to the long-term trend assessment, educational progress has been compared since the early 1970s. The National Assessment Governing Board, set NAEP policy, established the assessment schedule and determined the specific content to be measured (U.S. Department of Education, 2022).

NAEP was administered to students during regular school hours. The assessment took between 90 and 120 minutes to complete. Students were asked to provide contextual information, such as the classes they attended, their reading habits, and their technology experiences. The National Center for Education Statistics (2023) reported testing accommodations were provided to support student participation. More specifically, Universal Design Elements were accommodations built into the digitally based NAEP assessments and were readily available to all student participants. At the request and discretion of the individual school districts, English Language Learners and students with documented disabilities could request further testing accommodations (e.g., additional test time, one-on-one, large print version of the test, directions only read aloud in Spanish,

etc.). Individual student results remained confidential. On assessment day, all testing materials were transported to and from schools by NAEP representatives.

Due to the increased role of advanced technology within education and learning, NAEP used technology to measure and report students' technology skills. Technology-based assessments were an advancement for NAEP. The organization intended to become paperless by the end of the decade. Through these new assessments, NAEP collected data that provided in depth understanding of students' capabilities, including their critical thinking skills and levels of technological engagement (NAEP Report Card, n.d.). The U.S. Department of Education (n.d.-b) reported digitization of the 2022 NAEP reading assessments in fourth and eighth grades. Moreover, the 2022 assessment content in fourth and eighth grades were either trans adapted from the paper-based assessments or developed with the same reading framework that has driven NAEP assessment development since 2009. Although the assessment presentation had changed, the content remained the same (NAEP Report Card, n.d.).

The 2022 NAEP reading assessments in fourth and eighth grades were administered on tablets supplied by NCES. A secure, local NAEP network was used to establish a stable assessment environment free of the influence of school-based equipment or school Internet connectivity to maintain consistency across the nation's assessed schools. Touchscreen, an attached keyboard, or a stylus were available for students to interact with their tablets. Tools including annotation via an on-screen pencil or highlighter, selection of color schemes, and zoom-in were available for the digitally based reading assessments. Text-to-speech capability was available on the Directions and

Help screens. However, they were not available for the reading passages or corresponding questions.

Prior to the start of the NAEP reading assessment, students viewed an interactive tutorial which allowed them to familiarize themselves with the digital test delivery system. Prior to administering the actual assessment, the tutorial explained how to use the digital tools, how to advance through the reading passages and how to provide answers to assessment questions.

Data Analysis

After Institutional Review Board approval, the researcher accessed the 2022 NAEP reading assessment public datasets. This non-experimental secondary data analysis used public-use statistical data from the 2022 NAEP reading assessment outcomes. The NAEP Explorer was used to identify variables and analyze the 2022 NAEP reading assessment data and create statistical models. First, descriptive statistics were obtained to examine mean level reading achievement scores of students with and without digital access across the range of demographic categories, including ELL status, disability status, and household income. To answer the first research question (i.e., Is there a relationship between digital home access of students and reading achievement in U.S. public schools in Grade 4?) a linear multiple regression was used. Home-based access to high-speed Internet and home-based access to digital devices were entered as independent variables in the model. To answer the second research question (i.e., Is there a relationship between digital home access of students and reading achievement in U.S. public schools in Grade 8?) a linear multiple regression was used. Home-based access to high-speed Internet and home-based access to digital devices were entered as independent variables in the model.

To answer the third research question (i.e., Does ELL status, special education status, household income, and digital home access of students predict reading achievement in U.S. public schools in Grade 4?) a linear multiple regression was used. Home-based access to high-speed Internet, ELL status, disability status, and eligibility for free or reduced lunch were entered as independent variables in the model. To answer the fourth research question (i.e., Does ELL status, special education status, household income, and digital home access of students predict reading achievement in U.S. public schools in Grade 8?) a linear multiple regression was also used. Home-based access to high-speed Internet, ELL status, disability status, and eligibility for free or reduced lunch were entered as independent variables in the model.

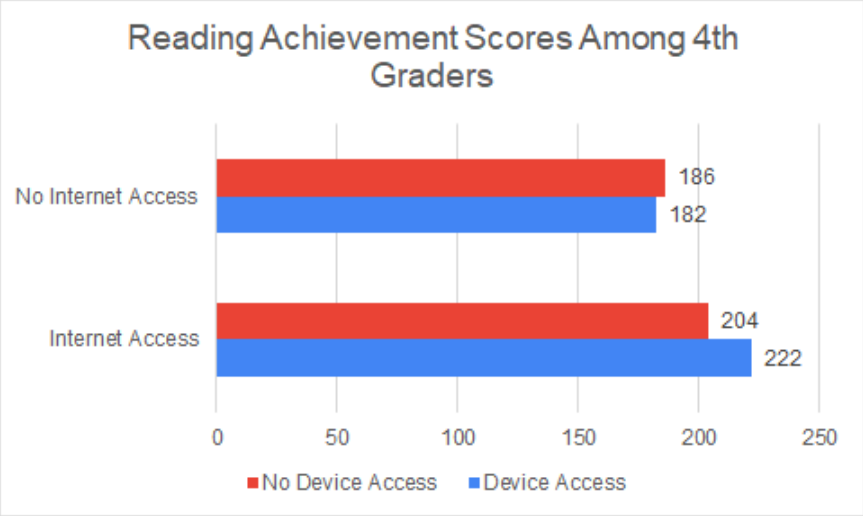
CHAPTER 4 RESULTS

Research Question 1

To answer the first research question, analyses focused on the association between digital home access of students and reading achievement, without controlling for any other demographic factors. Descriptive statistics were obtained to examine mean reading achievement scores among fourth graders with and without digital home access. As shown in Figure 1, fourth grade students with neither device nor high-speed Internet home access had the lowest scores, whereas those with both device and high-speed Internet home access had the highest scores, on average. Fourth grade students with Internet access had greater reading scores, regardless of whether they also had digital device access at home. Descriptive statistics also indicated that when high-speed Internet access was not present in the home, student access to a digital device at home was not associated with greater reading scores, on average, when compared to lack of device access (see Figure 1).

Figure 1

Reading Achievement Scores Among 4th Graders



A linear multiple regression was conducted to examine whether digital home access of students (i.e., device and high-speed Internet) significantly predicted reading achievement among 4th graders in U.S. public schools. Results from the linear multiple regression model with two predictors, device access and high-speed Internet access, indicated that digital home access significantly predicted fourth grade student reading achievement ($F(2, 11965.48) = 490.01$, $p < .001$; see Table 2). A lack of home access to high-speed Internet was associated with greater detriment to reading achievement ($B = -0.245$, $p < .001$) than lacking access to a digital device ($B = -0.102$, $p < .001$; See Table 1). Fourth grade students without high-speed Internet home access, on average, scored 36 points lower than those with high-speed Internet home access. Fourth grade students without devices at home, on average, scored 15 points lower than those with devices at home. These values indicate that, compared to those fourth grade students with home access to high-speed Internet and access to a digital device, fourth grade students without home access will have significantly lower reading achievement scores. The model accounted for 8% of the variability in reading achievement outcomes.

Table 1

Digital Home Access and Reading Achievement Among 4th Graders.

Digital Access Status	Std. Regression Coefficient	Std. Error	Regression Coefficient	*p*
No Internet Access	-0.245	.008	-36.249	<.001
No Device Access	-0.1021	.006	-14.908	<.001

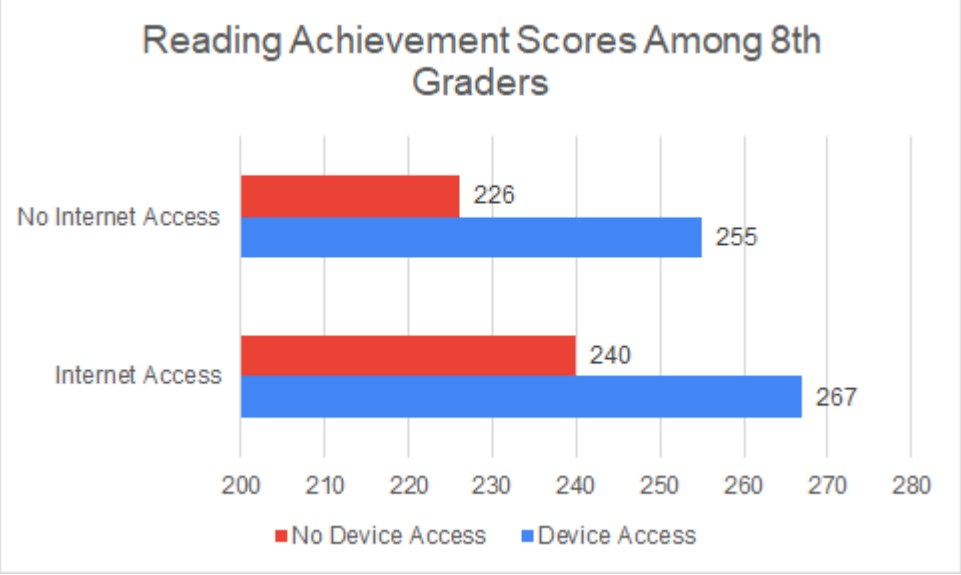
Note. Access to Internet and to a Digital Device at home were used as the reference groups in the analyses.

Research Question 2

To answer the second research question, analyses focused on the association between digital home access of students and reading achievement, without controlling for any other demographic factors. Descriptive statistics were obtained to examine mean reading achievement scores among eighth graders with and without digital home access. As shown in Figure 2, eighth grade students with neither device nor high-speed Internet home access had the lowest scores, whereas those with both device and Internet home access had the highest scores, on average. Unlike fourth graders, descriptive statistics indicated that both device and Internet access at-home were independently associated with greater reading achievement on average as determined by the mean level of reading achievement scores in each category (see Figure 2).

Figure 2

Reading Achievement Scores Among 8th Graders



A linear multiple regression was conducted to examine whether digital home access (i.e., device and high-speed Internet) significantly predicted reading achievement

among 8th graders in U.S. public schools. Results from a linear multiple regression model with two predictors, device access and high-speed Internet access, indicated digital home access of students significantly predicted reading achievement ($F(6, 18267.41) = 226.8$, $p < .001$; see Table 2). Specifically, those without home access to a digital device scored lower than those with a digital device ($B = -0.140$, $p < .001$), and those without high-speed Internet at home scored lower than those with home access to the Internet ($B = -0.052$, $p < .001$; See Table 2). Eighth grade students with a lack of home-based access to a digital device, on average, had a reading achievement score of 29 fewer points than those with a device, whereas eighth grade students with a lack of high-speed Internet home access, on average, had a reading achievement score of 11 points fewer than those with Internet home access. Nevertheless, access to both a device and the Internet at home was associated with the greatest reading achievement outcomes. The model accounted for 7% of the variability in reading achievement outcomes.

Table 2

Digital Home Access and Reading Achievement Among 8th Graders.

Digital Access Status	Std. Regression Coefficient	Std. Error	Regression Coefficient	*p*
No Internet Access	-0.052	.006	-11.145	<.001
No Device Access	-0.140	.007	-28.982	<.001

Note. Access to Internet and to a Digital Device at home were used as the reference groups in the analyses.

Research Questions 3

The third research question examined whether demographic variables, including ELL status, special education (i.e., disability) status, and household income, in addition to high-speed Internet access of students at home, predict reading achievement among fourth graders in U.S. public schools. Descriptive statistics were obtained to examine mean reading achievement scores among fourth graders with and without home-based high-speed Internet access across various demographic categories. As shown in Table 3, non-ELL students from higher-income households without a disability and with high-speed Internet access at home, had the greatest reading achievement scores, on average in Grade 4. The descriptive statistics table outlines how, when keeping all other demographic variables equal, the lack of home-based Internet access is associated with lower reading achievement scores, across all categories in Grade 4.

Table 3

Reading Scores Among 4th Graders.

School Lunch Program Eligibility	Internet Access at Home				No Internet Access			
	Disab	ELL	Both	None	Disab	ELL	Both	None
Eligible	183	198	167	218	155	175	/	192
Not Eligible	209	210	181	240	171	/	/	221

Note. Data missing from table was not available for analyses. Disab = Documented disability; ELL = English Language Learner; Both = ELL student with a disability; None = non-ELL without a disability.

Linear multiple regression was used to examine the predictive power of each of the variables of interest. The overall model was significant, F (6, 16481.1) = 1145.67, p < .001, and accounted for 29% of the variability in reading achievement outcomes (See Table 4). A lack of home access of students to high-speed Internet was the second strongest predictor in the model and was associated with, on average, a reading achievement score of approximately 28 fewer points in Grade 4. Being from a family experiencing higher income was associated with on average, a reading achievement score of approximately 22 greater points, and non-ELLs without disabilities had reading achievement scores approximately 35 points higher than students with a disability in fourth grade.

Table 4

Barriers and Reading Achievement Among 4th Graders.

Predictor Variables	Std. Regression Coefficient	Std. Error	Regression Coefficient	*p*
No Internet Access	-0.184	.006	-27.528	<.001
ELL	0.094	.010	11.610	<.001
Both	-.0608	.007	-18.072	<.001
None	.387	.007	35.100	<.001
Not Eligible for Lunch Program	0.276	.007	22.129	<.001

Note. Access to Internet, Documented Disability, and Eligibility for School Lunch Program were used as reference groups. ELL = English Language Learner; Both = Language students with a disability; None = non-ELL without a disability.

Research Question 4

The fourth research question examined whether demographic variables, including ELL status, special education (i.e., disability) status, and household income, in addition to high-speed Internet access at home, predict reading achievement among eighth graders in U.S. public schools. Descriptive statistics were obtained to examine mean reading achievement scores among eighth graders with and without Internet access at home across various demographic categories. As shown in Table 5, non-ELLs from higher-income households without a disability and high-speed Internet access, had the greatest reading achievement scores, on average. The descriptive statistics table outlines how, when keeping all other demographic variables equal, the lack of Internet access is associated with lower reading achievement scores, across all categories.

Table 5

Reading Scores Among 8th Graders.

School Lunch Program Eligibility	Internet Access at Home				No Internet Access			
	Disab	ELL	Both	None	Disab	ELL	Both	None
Eligible	228	237	214	260	212	221	/	253
Not Eligible	250	242	220	279	226	/	/	264

Note. Data missing from table was not available for analyses. Disab = Documented disability; ELL = English Language Learner; Both = ELL student with a disability; None = non-ELL without a disability.

To examine whether ELL status, special education status, household income, and high-speed Internet access at home predict reading achievement among eighth graders in U.S. public schools, a linear multiple regression model was used. The overall model was significant, F (8, 15252.47) = 529.89, $p < .001$ and accounted for 22% of the variability in reading achievement outcomes (See Table 6). The predictive power of home-based Internet access among eighth graders was lower than that of fourth graders. Lack of home access of students to high-speed Internet was the third strongest predictor in the model and was associated with, on average, a reading achievement score of approximately 13 fewer points in Grade 8. ELLs scored on average two points higher than students with documented disabilities, and ELL students with a documented disability had the largest deficit in scores. Grade 8 students from households experiencing higher income, on average, scored 16 points higher, than those that were eligible for reduced or free lunch programs.

Table 6

Barriers and Reading Achievement Among 8th Graders.

Predictor Variables	Std. Regression Coefficient	Std. Error	Regression Coefficient	*p*
No Internet Access	-0.060	.006	-12.823	<.001
ELL	0.018	.010	2.805	<.001
Both	-0.060	.007	-20.2164	<.001
None	0.327	.007	41.445	<.001
Not Eligible for Lunch Program	0.228	.007	16.525	<.001

Note. Access to Internet, Documented Disability, and Eligibility for School Lunch Program were used as reference groups. ELL = English Language Learner; Both = ELL students with a disability; None = non-ELL without a disability.

CHAPTER 5 DISCUSSION

ELLs and their non-ELL counterparts from families experiencing low-income in the U.S. K-12 public school system face increased barriers to educational achievement, including reading comprehension (Zhang et al., 2020). These same students are less likely to have digital access at home (Attewell et al., 2003; Chen et al., 2019; Mudra, 2020; Reddick et al., 2020; Reimer & Hill, 2022), which places them at an even greater disadvantage. The increase in technological use in the classroom requires digital skills to develop both in and outside of the classroom (Chen et al., 2019; Harper, 2021; Salmerón, et al., 2022; Sari, 2020; Xie et al., 2021). The current study results provide more information about how home-based digital access, one of the many barriers that can be practically addressed by both short- and long-term policy, influences reading achievement among public school students—including those experiencing other educational challenges including ELLs, and those with disabilities.

Results support the study hypotheses that digital home access significantly predicted reading achievement among fourth and eighth grade students in U.S. public schools. The grade-level of the student seems to play a role regarding which type of home access—digital devices or the high-speed Internet—is most associated with reading comprehension. For Grade 4 students, high-speed Internet access at home is associated with greater reading comprehension scores, but overall, access to digital devices at home alone was not associated with greater reading comprehension scores. The highest reading achievement scores were among Grade 4 students with access to both digital devices and the Internet at home. For Grade 8 students, both access to digital devices and to high-speed Internet at home were singularly associated with greater reading achievement

scores, and digital device access at home was most important in terms of predicting greater reading comprehension. These results offer a novel contribution outlining the importance of digital access at home among Grade 4 and Grade 8 students in U.S. public schools. Although previous research provided some evidence that digital use in the classroom was associated with increased reading achievement (Salmerón et al., 2022), the importance of home-based digital access for reading comprehension had yet to be examined in the literature.

Investigating demographic variables beyond digital home access, including household income, disability status, and ELL status, provided further understanding of barriers to reading achievement. For those students that have both ELL and disability status, come from households experiencing low income, and lack digital home access, reading comprehension is significantly lower, on average, supporting Hypotheses 3 and 4 of this study. The findings illustrate the additive nature of a child's sociodemographic background on predicting reading achievement. It is important to note, however, that digital home access of students plays a significant role in reading achievement even among those with both disability and ELL status, indicating that although students may have learning barriers that cannot be avoided, providing digital home access to students, on average, will significantly improve reading achievement among students in the U.S. K-12 public school system. These results are consistent with previous research indicating an observed achievement gap between ELLs and non-ELLs, as a function of income (Zhang et al., 2020). Research also suggests that household factors such as income and parental support, are likely to have a stronger association with student reading score

outcomes than individual levels of motivation, despite the importance of motivation in learning (Keiffer & Thompson, 2018).

According to Keiffer and Thompson (2018), minority households, households experiencing lower income, and those with less education had significantly less access to high-speed Internet services at home than other groups, contributing to low reading achievement scores among students. These findings were also confirmed in previous research by Hill and Reimer (2022) who reported low-income districts in both rural and urban areas were less likely to have access to high-speed Internet services at home leading to low reading achievement scores. Further, prior research indicated that although rurality is often a hindrance to high-speed Internet at home, access challenges still occur in large cities throughout the United States and disproportionately affect families experiencing low socioeconomic status, leading to students obtaining the lowest reading achievement scores respectively (Reddick et al., 2022). Although all limitations cannot be addressed immediately, digital home access can be provided to students, and future research and policy should consider the ways in which digital devices and high-speed Internet access can be made available to all students at home. The results of the current study suggest home-based digital access is associated with higher reading achievement scores across various demographics of students, including those from household experiencing both high and low income, ELL and non-ELLs, and students with and without documented disabilities.

Limitations of the Study

The current study focused on secondary analyses using correlational, non-experimental datasets. As such, causal claims regarding digital home access and reading

achievement outcomes cannot be made. Nevertheless, the current findings provide a foundation for future experimental work and elucidate the probable importance of digital home access for students. In addition, limitations with the NAEP Explorer data analysis tool were present—including different survey reporting questions for fourth and eighth grade students, as well as a limited number of independent variables that could be added to statistical models. Moreover, although the sample was a nationally representative sample, the findings may not generalize to all students, including those in other grades, in private schools, or those with specific demographic or socioeconomic backgrounds. The criteria for ELL classification also varies across the United States. During the school registration process, individual states may use varying home language surveys and assessment measures to determine if a student qualifies for ELL status resulting in receiving specialized ESL academic programs and supports. Finally, it is important to note that previous research found negative relationships between classroom digital device use and reading achievement (Salmeron et al., 2022). Thus, it is important that researchers use experimental methodology to examine the impact of digital access on learning outcomes, and to assess potential differences between classroom and home-based use of technology.

Recommendations for Policy and Practice

The Equity Literacy Framework provides a comprehensive approach to promoting equitable education in public schools (Equity Literacy Institute, 2021a, 2021b). It emphasizes the need for both increased awareness and targeted solutions to inequity. Inequitable access to digital devices and reliable high-speed Internet access have been cited as major barriers to expanding ELLs' English language proficiency and reading

achievement (Mudra, 2020). The results from the current study can be understood within the broader framework of Equity Literacy and suggest that policies addressing digital home access may have the ability to improve reading achievement. This policy-based approach is consistent with the comprehensive approach of Equity Literacy engagement—including the identification of educational barriers through the lens of broader societal issues, rather than as the responsibility of individual students. Reading achievement scores examined in the current study suggest there are multiple correlates of reading achievement, including demographic factors and home-based digital access. Digital home access is as important as socioeconomic, developmental, or native-language background factors that impact student reading achievement. In fact, solutions to digital home access of students can be more readily addressed both in the short and long-term by schools, districts, and policymakers. Policy should consider ways in which digital device access, high-speed Internet access, and multilingual technical support can be made readily available to all students and families at home.

Conclusion

The current study examined digital home access of students, household income, ELL status and disability status, and their associations with reading achievement among a nationally representative sample of fourth and eighth grade public school students in the U.S. Results indicated a lack of digital home access was associated with lower reading achievement scores. In addition, there were additive effects of income, digital home access, and student learning status, such that the lowest reading achievement scores were obtained by ELLs with a disability, from households experiencing low-income, and household that lacked digital home access. Unlike other barriers to student learning, such

as disability status, providing digital access at home can be addressed both short and long-term to promote better reading achievement outcomes for ELL students. Further experimental research is needed to develop appropriate policy initiatives to combat inequity within the U.S. public school system.

APPENDIX A IRB APPROVAL MEMO

RB #: IRB-FY2023-300

Title: ENGLISH LANGUAGE LEARNERS: A QUANTITATIVE STUDY OF DIGITAL HOME ACCESS AND ITS RELATIONSHIP TO READING ACHIEVEMENT IN GRADES FOUR AND EIGHT

Creation Date: 4-1-2023

End Date:

Status: Approved

Principal Investigator: Schalea Sanders

Review Board: St John's University Institutional Review Board

Sponsor:

Study History Submission Type Initial

Key Study Contacts

Review Type Exempt

Role Co-Principal Investigator

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