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Blended eLearning Tools and Upper Elementary Reading Achievement

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
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Walden University
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Abstract

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MA, East Tennessee State University, 2007

BA, East Tennessee State University, 1998

Project Study Submitted in Partial Fulfillment

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Abstract

Though researchers have demonstrated that adaptive practice software is an effective tool to use with primary grade students, they have not fully established the impact blended eLearning tools have on upper elementary students in a suburban school setting. The problem facing one southeastern state district was that their schools had selected different approaches to address declining reading scores, but the district had no systematic analysis of the chosen blended eLearning tools to determine an improvement in reading growth scores among all students. The purpose of this comparative quantitative project study was to determine the influence different blended eLearning tools, Reading Plus and IXL, had on Tennessee Comprehensive Assessment Program (TCAP) TNReady English Language Arts scores of Title I fourth grade students. Siemens's connectivism provided the theoretical framework for this study. Archival data from a southeastern school district were used to examine the influence Reading Plus, IXL, and a control group had on fourth grade TCAP TNReady reading scores. The convenience and purposeful sampling included 143 fourth grade students from three Title I schools. Analysis of a one-way ANCOVA indicated that Reading Plus had greater influence on reading scores of fourth grade students. A policy recommendation paper was created as a tool to guide stakeholders in making informed decisions about selecting adaptive software tools based on evidence-based practices. The results may add to the knowledge in the field of educational technology and may be used by elementary administrators, instructional coaches, and upper elementary teachers when selecting blended learning programs to support their literacy curriculum.

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Dedication

This project study is dedicated to my dad: my role model, my hero, my guardian angel. I will miss you forever.

Acknowledgments

To my parents, who were my first teachers, thank you. Your example of hard work pushed me to persevere when the going got tough. Thank you, Mom, for the frequent calls and text messages to tell me to hang in there. You provided my little family with countless cooked meals, folded laundry, and wrapped Christmas presents to help me keep my head above water while I focused on my writing. I am eternally grateful!

I wish to thank and acknowledge my family, who patiently supported me during this long and tedious process. To my husband, Marty, who helped with tasks around the house, cooked many meals, and watched over the kids while I locked myself away to study or write. To my son, Bentley, whose encouraging words stuck with me late into the night. To my daughter, Kate, who always referred to me as Dr. Smith as a reminder of my future title. Bentley and Kate, you are my "why" in everything I do. All my hard work and long hours are for you. I strive to be the example of someone who worked hard to achieve goals.

To my sister, Misty, for your unwavering support every time we talked. You always reassured me that I could do this. It is through your rays of sunshine that I am where I am today.

I would also like to thank my coworkers for supporting me through this journey. I would especially like to thank Dr. David Timbs for his vision, support, and example. It is the Technology Teacher Leader program that led me to this journey. Thank you for allowing me to be a part of an elite group of educators.

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I am very blessed!

I can do all things through Christ who strengthens me. ~Philippians 4:13

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Section 1: The Problem

The Local Problem

In this study, I examined the influence two different blended eLearning reading software programs had on reading achievement and growth as measured by the Tennessee Comprehensive Assessment Program (TCAP) TNReady reading assessment of fourth grade students. Results from this study may support the selection of blended eLearning software programs at the elementary level in suburban schools. Blended learning is a proven method to support student achievement in reading because teachers are better able to differentiate and personalize instruction (Gulosino & Miron, 2017; Kazakoff et al., 2018; McCarthy et al., 2020; Prescott et al., 2018; Schechter et al., 2015).

Schools and educators across the nation place high regard on increasing student achievement, as proficient reading skills allow students to develop foundational skills for lifelong learning. Recent national and state achievement assessment data for reading have revealed an alarming trend. The 2019 National Assessment of Educational Progress (NAEP) report indicated that average reading scores for Grades 4 and 8 were lower than 2017 scores (National Center for Education Statistics, 2019). According to this report, fourth grade students scoring at or above NAEP proficient fell from 37% in 2017 to 35% in 2019 (National Center for Education Statistics, 2019). Similarly, eighth grade students fell from 36% in 2017 to 34% in 2019 (National Center for Education Statistics, 2019). Furthermore, the Tennessee State Report Card indicated that students in the district of this study are showing less academic growth in English Language Arts (ELA) compared to Math (TN Department of Education, n.d.). According to the principal at the study site,

the southeastern state school district quarterly checkpoint assessment data also indicated that reading lagged behind math scores in fourth grade, particularly with English language learners (ELLs), as displayed in a table for teachers to view during the checkpoint data meeting.

Digital learning provides opportunities for personalized learning pathways through a blended learning approach (Gulosino & Miron, 2017; Klaveren et al., 2017; Siddiquee et al., 2019; Terrazas-Arellanes et al., 2017). Blended learning uses face-to-face instruction and digital technology to provide students with control over time, place, path, and pace (Graham et al., 2019; Horn & Fisher, 2017; & Horn & Staker, 2015). Research studies conducted in K to 12 and higher educational settings showed blended learning to increase student engagement, satisfaction, and attainment (D'Agostino & Kowalski, 2018; Unal & Unal, 2017). Recent studies on one blended learning program, Lexia Reading Core5, indicated supportive benefits, enhancing reading skills for K to 2 students with lower socioeconomic backgrounds (Kazakoff et al., 2018; Prescott et al., 2018; Schechter et al., 2015). Likewise, Accelerated Reader, Study Island, and Achieve 3000 (other reading blended learning programs) studies showed promise in increasing reading scores of upper elementary students (Boone, 2017; Brinson, 2019; Mitchell, 2018).

Because research has indicated that blended learning interventions are improving standardized test scores, one southeastern state school district launched a blended learning initiative in 2016 to infuse technology in Grades 3 to 12 by providing students with 1:1 laptop devices, access to various software programs, and professional

development for teachers. The district's blended learning initiative focused on a personalized learning plan in upper elementary classrooms. The district modeled their personalized blended learning plan from Tennessee's Personalized Learning Task Force Report, which offered guidance to Tennessee educators on leveraging technology to provide students with pathways to success (Tennessee Department of Education, 2016).

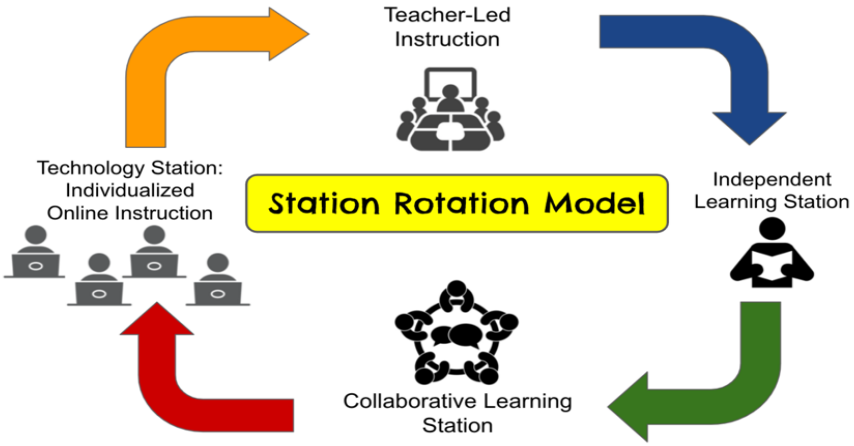
Once one to one laptops, or 1:1, was implemented in third and fourth grades in the school district, school administrators and teachers in the district began searching for software programs to use to enhance student outcomes. Because the district allowed each school to make decisions independently, elementary schools chose different programs, and some chose no programs. Reading Plus and IXL were two adaptive software programs used by two different schools in the district that required a paid subscription. Some schools chose free subscriptions that did not offer the personalized learning approach with the adaptive feature.

Reading Plus is an adaptive literacy program for struggling readers in Grades 3 to 12 (Reading Plus, 2020). According to Reading Plus (2020), the software focuses on increasing reading efficiency to help students build reading comprehension skills. According to Reading Plus, students gain 2.5 years of growth in reading in one school year by using the software. Through a teacher dashboard, educators can track student progress with data driven reports. The student portal offers a personalized approach with adaptive practice sessions for students. Reading Plus also offers a parent portal for parents to support their student's learning at home (Reading Plus, 2020). However, students in the district did not use Reading Plus at home because they were not allowed to

take home their laptop devices. Many families in the school did not have the capability to connect to the internet or the hardware to support online homework assignments. Therefore, teachers did not assign Reading Plus practice after school. Reading Plus was used during literacy stations, areas within the classroom where students engaged independently or in collaborative groups to practice and expand their literacy skills, while the teacher worked with small groups of students. Students used Reading Plus for 20 minutes per day during their time at the "technology station," where students worked individually on laptop devices using computer-aided literacy programs (see Figure 1).

Figure 1

Station Rotation Model



Another personalized learning program chosen by one of the elementary schools in the district was IXL (IXL Learning, 2021). IXL also offers an adaptive experience for students in reading, as well as other subject areas, such as math, science, social studies, and Spanish for K to 12 students. IXL aligned their skills practice with the state standards and adopted textbooks. According to IXL Learning (2021), students in IXL schools outperformed the other schools and made greater gains on standardized assessments.

Before beginning practice with the software, students are given a diagnostic assessment to pinpoint exactly what the students know so teachers know how to help the student improve (IXL Learning, 2021). In addition, the results of the diagnostic assessment allow the program to tailor an adaptive learning experience for each student. The IXL teacher dashboard provides teachers with real-time feedback on student progress and recommends areas for differentiated instruction to fill knowledge gaps (IXL Learning, 2021). IXL offers a parent portal that allows parents to see the real-time data on how their child is progressing in each subject. Parents also have access to parent videos, skills plans, an at-home implementation guide, and printable material to support their student's learning at home (IXL Learning, 2021). The elementary school in the district who purchased IXL did not require students to use the software after school because many families did not have the hardware or software to support online learning at home. IXL was used during literacy stations while the teacher worked with small groups of students. Students used IXL for 20 minutes per day during their time at the "technology station."

Despite the rapid increase in technology integration, there is a debate over which blended learning software programs have the most positive impact on student achievement (Delgado et al., 2015; Zawilinski et al., 2016). According to the supervisor of instructional technology at the study site, administrators in the district expressed a growing concern of whether the recent 1:1 blended learning initiative was impacting state achievement scores. The district's Five-Year Strategic Plan 2017 stated that the district's goal is to continue refining effective technology applications in elementary grades. According to the Tennessee Department of Education, districts across the state reported

concerns of "developing an efficient process for vetting new and expanding digital content and tools" (Owen, 2016, p. 8). The chosen software programs have independent studies to support their claims, but there is a lack of peer-reviewed research studies investigating the impact IXL or Reading Plus have on upper elementary reading achievement in suburban schools. There is a gap in the peer-reviewed practice literature about the effect IXL or Reading Plus has on declining reading scores in upper elementary students in suburban schools, thus hindering school leaders in making sound decisions on which software programs to implement. The problem facing this southeastern state district was that schools in the district selected different interventions to address declining reading scores, but the district had no systematic analysis of the chosen adaptive reading eLearning interventions to determine an improvement in reading growth scores among all students. There was limited analysis to examine if there is a statistically significant difference in TCAP TNReady ELA scores from 2017-2018 to 2018-2019 between IXL and Reading Plus, controlling for sex, district ELA yearly averages, and third grade TCAP TNReady ELA scores. This study addressed a local problem by focusing specifically on blended eLearning tools implemented to support elementary students' reading achievement.

Rationale

To ensure that all students demonstrate academic progress, the district implemented several methods to address declining fourth grade reading scores (TN Department of Education, n.d.). Despite implementing various technology tools, the principal and the supervisor of instructional technology at the study site indicated that

stakeholders in the district expressed concern about whether the technology tools utilized have been beneficial. In addition, according to a teacher at the study site, teachers have expressed frustration by the district utilizing too many software programs and not knowing which one to use for their students. Teachers felt like the district's technology department made too many changes to available platforms, causing frustration in learning how to use the new technology. Teachers at the study site indicated that they had an interest in finding an effective software program that could be used for many years. Examining blended eLearning tools concerning academic achievement was warranted to fill a systematic analysis void in the local gap of practice.

My study addressed the difference two blended eLearning software programs had on fourth grade TCAP TNReady reading scores. Implementation of the interventions was a site-based decision made by the teachers and administrators at each school. Because the interventions were implemented before this study, I evaluated the impact the software programs had on TCAP TNReady reading scores by using archival data. Although 2018-2019 was the first year of implementation at the school level, this study may support IXL or Reading Plus's implementation at the district level. The purpose of this quasi-experimental study was to study the difference in TCAP TNReady ELA scores from 2017-2018 to 2018-2019 between three schools (no blended learning, IXL, and Reading Plus), controlling for sex, ELA yearly averages, and third grade TCAP TNReady ELA scores.

Definition of Terms

Adaptive learning: An educational approach that uses computer applications with built-in artificial intelligent algorithms to interact with the learner to individualize the educational experience (Kolchenko, 2018). When students answer problems incorrectly, adaptive learning programs search the student's patterns from prior interaction and analyze them to create a tailored experience. The goal is to keep the student working within their zone of proximal development (Kolchenko, 2018).

Blended learning: Blended learning allows educators to differentiate and personalize the learning experience for each student (Powell et al., 2015). Blended learning classrooms fall into one of four models: station rotation, flex, a la carte, or enriched virtual (Horn & Staker, 2015).

Differentiated instruction: Differentiated instruction requires tailoring instruction to meet the individual needs of each student (Puzio et al., 2020). Teachers provide multiple approaches to content, process, product, or the learning environment (Tomlinson, 1995). Classrooms that offer differentiated instruction are student-centered, have ongoing assessment, and offer flexible grouping (Tomlinson, 1995).

Station rotation model: Students rotate through learning centers on a schedule where one of the stations involves the use of technology (Horn & Fisher, 2017). This model is most often used in the elementary setting where teachers use learning centers to allow time to meet with small groups of students (Horn & Staker, 2015).

Tennessee Comprehensive Assessment Program (TCAP) TNReady: A program of state-mandated end-of-year assessments for Grades 3 to 8 in math, ELA, science, and

social studies (Tennessee Department of Education, n.d.-b). There is a specifically designed TCAP TNReady test for students with learning disabilities and ELLs (Tennessee Department of Education, n.d.-b). The data from the third and fourth grade TCAP TNReady ELA scores were used for this study.

Significance of the Study

This study addressed a local problem by focusing specifically on blended eLearning tools implemented to support elementary students' reading achievement. The study is significant because fourth grade reading scores in the district have been declining over the past 2 years (TN Department of Education, n.d.). An examination of blended eLearning tools concerning academic achievement was warranted to fill a systematic analysis void in the local gap of practice. The findings in this study may help instructional technology leaders and teachers better understand how different blended learning programs meet the needs of suburban schools in increasing reading growth scores in their districts. The results may promote positive social change by helping educators make informed decisions about which supportive reading software programs may increase students' reading proficiency. This study may provide research evidence of useful blended eLearning reading tools to support the field of educational technology.

Research Question and Hypotheses

The independent variable for this quantitative study was the learning intervention with three levels: the control group with no intervention, IXL, and Reading Plus. I used TCAP TNReady reading growth scores to compare the differences between IXL and Reading Plus and the control group. The dependent variable was the 2018-2019 change in

fourth grade students' reading achievement scores from their 2017-2018 third grade reading scores. The data were matched for the same student group from 2017-2018 to 2018-2019.

Research Question (RQ): Is there a statistically significant difference in control group, IXL, and Reading Plus TCAP TNReady ELA scores from 2017-2018 to 2018-2019, controlling for sex, district ELA yearly averages, and third grade TCAP TNReady scores?

H_0: There is no significant difference in control group, IXL, and Reading Plus ELA scores from 2017-2018 to 2018-2019, controlling for sex, ELA yearly averages, and third grade TCAP TNReady scores.

H_1: There is a statistically significant difference in control group, IXL, and Reading Plus ELA scores from 2017-2018 to 2018-2019, controlling for sex, ELA yearly averages, and third grade TCAP TNReady scores.

Review of the Literature

To remain current in research-based strategies to improve literacy achievement in a blended learning environment, I read current literature and several books. I conducted this literature review using the research databases available through the Walden University Library. The materials I examined throughout this literature review include peer-reviewed journal articles, books, conference presentations, and dissertations. The search engines and databases that I used included Education Research Complete, ERIC, Google Scholar, ProQuest, and ProQuest Dissertations and Theses. The keywords and phrases I used to search for these resources included *blended learning, blended*

eLearning tools, elementary reading software, adaptive practice software at the elementary level, differentiated instruction, computer-based reading instruction at the elementary level, IXL, Reading Plus, *connectivism*, and *personalized learning*.

Theoretical Foundation

This study's theoretical framework was based on the theoretical constructs of Siemens's theory of connectivism. Connectivism has been declared the new learning theory for the digital age (Kop & Hill, 2008). According to Siemens (2005), technology has restructured the way people communicate, connect with others, and learn. Siemens posited that technology plays a vital role in creating a productive learning environment to reach all learners. Siemens argued that traditional learning theories such as behaviorism, cognitivism, and constructivism have limitations because they do not consider the impact technology has on learning. Existing theories no longer meet the needs of today's learners and anticipate the needs of future learners (Kop & Hill, 2008). Connectivism builds on older theories but takes into account new developments in technology that have occurred. According to Siemens, connectivism provides insight into the skills necessary for learners to flourish in the digital era.

In a 2005 blogsphere, Siemens and Downes initiated a new epistemology as a result of an abundance of information available on the internet and the possibility for people to connect through Web 2.0 technologies (Kop & Hill, 2008). According to Downes (as cited by Kop & Hill, 2008), knowledge is gained by the set of connections formed by actions and experience within a network. Siemens (2005) posited that knowledge resides in a distributed manner across a network, rather than in the mind of an

individual. Siemens recognized that people are social beings with a need to express thoughts, which requires externalization. It is through externalization that people construct new knowledge from distributed information across networks (Siemens, 2005).

The central tenet of connectivism is based on connections between learners, the environment, fields, ideas, and concepts to facilitate learning (Siemens, 2005). Siemens (2005) proposed eight principles of connectivism:

- Learning and knowledge rests in diversity of opinions.
- Learning is a process of connecting specialized nodes or information sources.
- Learning may reside in nonhuman appliances.
- Capacity to know more is more critical than what is currently known.
- Nurturing and maintaining connections is needed to facilitate continual learning.
- Ability to see connections between fields, ideas, and concepts is a core skill.
- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.
- Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision. (p. 8)

Today's students enter classrooms with a different mindset from a few years ago (Siemens, 2005). Technology has increased accessibility and information for learners to gain new knowledge, which forces educators to adapt their teaching methods to reach learners (Siemens, 2005). Siemens (2008) proposed that educators must assume the role

of a master artist, network administrator, concierge, and curator, guiding students to a more profound knowledge base by creating learning resources that scaffold learning. Siemens postulated that learning activities should be active, shared, and constructed together (as cited in Picciano, 2017; Siemens, 2005, 2011). Learning with digital tools is made meaningful when aligned with state standards to scaffold learning and help students understand the subject matter better. In this research study, I focused on Siemens's principles that learning may reside in nonhuman appliances and accurate, up-to-date knowledge of learning activities. Upper elementary learners in the current study are working with software tools to increase reading cognition.

Application of Connectivism Constructs in Elementary School Studies

Connectivism was introduced by Siemens in 2004, resulting in the development of the first massive open online course at the University of Manitoba in 2008 (Downes, 2019). Since its development, the theory of connectivism has evolved and has become more understood, partly because technology integration in the educational setting has grown rapidly. According to Downes (2019), connectivism is a theory of knowledge and learning that applies technology to enhance and extend online interaction with peers.

Connectivism was developed as a theory to describe digital learning. However, researchers have applied the theory to classroom environments. In a meta-analysis, Downes (2019) reviewed 44 works of literature referencing connectivism. In his research, Downes discovered that the theory of connectivism was employed both online and in the classroom from the elementary setting through college, even in professional development studies. Rice (2018) asserted that connectivist learning strategies can be used to bridge

the gap between the needs of digital natives and the traditional K to 12 educational setting. In a paper on implementing connectivism in the K to 12 classroom, Rice suggested five strategies including shifting from teacher-centered to student-centered learning, incorporating technology with readily available devices, never providing information to students that can easily access themselves, incorporating technology networks, and incorporating social networks among young learners. Although connectivism has been studied at the university setting for several years, it has not been studied at the elementary setting.

Review of the Broader Problem

Using technology to increase student achievement is not a new concept. Technology integration at the elementary level proves to have advantages and disadvantages. Researchers are discovering that increased technology integration at the elementary level may not prove to be the most beneficial method to increasing literacy achievement. The literature review is organized in themes of (a) reading in the upper elementary classroom, (b) differentiated instruction, (c) personalized learning, (d) blended learning at the elementary level, (e) computer-based reading instruction software, and (f) adaptive practice software.

Reading Strategies in the Upper Elementary Classroom

Proficient reading skills enable learners to successfully progress through their academic career and is a critical skill for lifelong learning. According to the NAEP, only 34% of Tennessee students are proficient or advanced readers by fourth grade (National Center for Education Statistics, 2019). In order to address the urgency of helping

students become proficient readers, educators need research-based strategies to guide their literacy curriculum. According to the National Reading Panel, a balanced literacy program includes instruction in phonemic awareness, phonics, fluency, guided oral reading, independent silent reading, comprehension, and vocabulary (National Reading Panel & National Institute of Child Health and Human Development, 2000; Rasinski, 2003). Through teacher education programs, preservice and practicing teachers receive training on how to approach each area of a balanced literacy program to increase literacy skills of young learners. In addition to teacher education, the National Reading Panel (2000) reported success in the use of computer programs for reading instruction. One approach that has gained momentum at the elementary level is using computer-assisted instruction and adaptive tutoring software in a blended learning environment (Staker & Horn, 2012; Wilkes et al., 2020).

Differentiated Instruction

Most educators use a differentiated instruction (DI) framework, despite the varied understanding, to support learning in the K to 12 setting to meet the diverse needs of students (Whitley et al., 2019). Whitley et al. (2019) conducted a mixed methods study with 4,875 teachers across 62 school districts who reported that DI practices influenced student achievement and engagement. Teachers who implemented DI practices were influenced by the grade level they taught; teachers in higher grades were less likely to implement DI. In addition, teachers who reported a belief in the efficacy of DI held broad epistemological beliefs that it is the responsibility of the teacher to design flexible instruction and assessment. Focus group participants reported using technology as a

strategy to differentiate instruction for their learners. Teachers reported that organizational support contributed to DI beliefs and practice. With the large number of participants indicating they use technology as a strategy to differentiate instruction, it is important for organizations to select effective reading software programs and to provide guidance for teachers on how to utilize technology tools to meet the needs of students.

Despite research showing that DI increases student engagement and achievement, teachers have reported different obstacles that prevent them from implementing a DI framework in their classroom (Whitley et al., 2019). A mixed methods study conducted by Eysink et al. (2017) found 16 elementary teachers indicated different obstacles that impede implementing DI, including lack of organizational support, lack of time and materials, and lack of knowledge and skills. Teachers in the study who received training and materials to effectively implement DI in science instruction reported increased self-efficacy. Furthermore, teachers perceived an increase in student engagement in their classroom (Eysink et al., 2017). In addition to investigating teachers' perceptions, the researchers sought to explore the instructional value of DI by comparing the difference between 214 students who received DI in science and students who received a traditional approach to science instruction. The experimental group had 95 participants, and the control group had 119 participants. Results of an independent sample *t* test showed no significant difference between the control and experimental groups on the pretest. However, students in the experimental group who received DI for 12 weeks scored higher on the posttest with an effect size of $d = .051$ between the two groups.

Differentiating instruction for learners demands more time and resources on the part of the teachers. In recent years, teachers have been relying on technology to assist them in their efforts to differentiate for all learners, particularly in reading. Some studies have shown that technology-enhanced options for differentiating reading instruction have failed to impact student achievement. The results of a study conducted by Hill et al. (2016) revealed the effects of a computer-assisted program, Achieve3000, on reading fluency and comprehension among second and third grade students. Hill et al. found no statistically significant findings of the program increasing reading achievement of elementary students. The findings from the study raise concern for using computer-assisted literacy programs to support student reading growth. However, it is important to note that the implementation process among the 32 treatment schools (N = 14,493 students) was not considered in the study, calling into question the fidelity of implementation and appropriate student usage (Hill et al., 2016).

Although Hill et al. (2016) found that Achieve3000 did not have a positive impact on reading achievement in elementary students, other studies had differing results. For example, research results from computer-assisted literacy software showed mixed results in aiding teachers to increase elementary students' reading scores and differentiate instruction. Baron et al. (2019) conducted a quantitative study to examine the effects a technology-based reading program, Lexia Core5 Reading, which claims to accelerate the mastery of reading skills for students of all abilities in preschool through fifth grade. Lexia Core5 was implemented with 594 third grade students as a supplemental technology-based instructional program for one school year. The researchers used the

assessment tool, AIMSweb, to classify students into four reader profiles: poor decoder, poor comprehender, mixed deficit, and typical reader. To monitor progress for reader profiles, students were tested in the fall before implementation of the reading program and in the spring. On the word reading subtest of the AIMSweb (R-CBM), all reader profiles made significant gains except the poor comprehenders. The Maze test results, which measure reading comprehension, showed a significant difference from the fall to the spring for all reader profiles. Students in the mixed deficit and poor comprehenders profiles increased significantly, though the poor decoders declined from the 52nd percentile in the fall to the 40th percentile in the spring. Results from the study indicated that a technology-based reading program can effectively differentiate instruction for most readers to increase reading skills (Baron et al., 2019).

Additionally, findings of a meta-analysis showed that student literacy achievement increased when teachers implemented DI using computer-adaptive software (Puzio et al., 2020). Reviewing over 20 years of literacy research, Puzio et al. (2020) found the overall effect size was +0.13 (p = .002) with 88% of the individual point estimates being positive, thus indicating that DI is an effective practice at the elementary level. Additionally, the researchers found that students have higher literacy achievement scores when the teachers receive organizational support (Puzio et al., 2020). Macaruso et al. (2020) affirmed that adaptive literacy software, Lexia Core5, used in a blended learning program in three elementary schools increased reading growth in 2217 kindergarten through fifth grade students. In a similar fashion, Prescott et al. (2018) conducted a study with 722 students who used Lexia Core5 in grades kindergarten

through fifth grade as a part of a school-wide initiative. The researchers discovered that using a blended learning approach allowed teachers to use programs, like Lexia Core5, to differentiate literacy instruction to help students overcome reading deficiencies. The main effect size was the most significant with ELL students (Prescott et al., 2018). Additionally, Prescott et al. discovered that the online component of Lexia Core5 increased reading growth by .398 across all grade levels. The results of the studies conducted by Macaruso et al. and Prescott et al. showed that Lexia Core5 significantly increased reading growth scores in students across kindergarten through fifth grades at Title I schools, particularly those identified as ELL.

In addition to providing students with targeted skills practice, the use of technology-assisted computer programs offers assessment data to guide teachers in differentiating reading instruction for students. For instance, Förster et al. (2018) conducted a quantitative study to determine the short and long-term effects of teachers using computer-assisted assessment tools to monitor student progress to address individual needs on reading fluency and comprehension. The researchers analyzed reading scores for 619 third and fourth grade students placed in a treatment group or control group. Students in the treatment group were assessed eight times throughout the study. Teachers in the treatment group used the assessment data to differentiate reading instruction for students. The results of this study showed students in the treatment group showed a significant difference in reading skills with the effect size of $d = .30$ for short-term and $d = .31$ for long-term (Förster et al., 2018). Overall, reading growth was higher for students who scored lowest on the pretest. The research results indicated that the use

of technology-assisted computer programs was an effective strategy to differentiate literacy instruction for all students, particularly low readers.

Personalized Learning

With virtual K to 12 schools emerging, course designers and educators are seeking methods to meet the needs of students with disabilities. Students with disabilities are guaranteed individualized instruction according to the Individuals with Disabilities Education Act (2004). Providing accessibility to the curriculum for students with disabilities puts great demands on educators in a virtual and blended environment. Students with disabilities often lack vocabulary and literacy skills to read complex texts (Rice, 2018). A qualitative study conducted by Rice (2018) found that course designers employ three strategies to promote accessibility and differentiate instruction, including composing clear articulations of learning objectives, promoting personalized and contextualized learning, and planning for visual and audio presentations.

One of the strategies of DI, personalized learning involves creating experiences in a computer-based environment that target student needs in an engaging way. Personalized learning in a computer-based environment involves creating experiences that target student needs in an engaging way and increases equity and accessibility for all students. Current research on personalized learning is showing promise in effectively supporting student learning (McCarthy et al., 2020).

Implementing personalized learning in the classroom involves creating individual learning paths with software systems based on student data, allowing personalized pacing with the objectives built into online modules, creating targeted skills grouping, and

providing online adaptive content and assessment (Bingham, 2017). Bingham (2017) conducted a qualitative case study at a low-income high school to investigate how its high-tech, personalized learning model evolved. Through interviews, focus group discussions, and classroom observations of 13 teachers, Bingham discovered that teachers reported that students needed more self-regulation guidance. Also, teachers reported that a computer-based environment is not necessarily helpful for learning when student autonomy has not been developed. When given the freedom to choose their own learning path while using a learning management system, students chose what they preferred to learn, rather than what they needed. To promote autonomous learning, teachers implemented a "no excuses" model to emphasize structure, self-discipline, and to increase student accountability. By implementing more structure, teachers were able to scaffold student learning and allow self-pacing, thus increasing self-regulation among students. Findings from Bingham and McCarthy et al. (2020) showed the benefits of employing digital resources with digitally-created curriculums as a way to increase student achievement through personalized learning.

McCarthy et al. (2020) also recognized the need to help students self-regulate in a personalized learning environment. This longitudinal quantitative study furthers Bingham's (2017) findings by investigating the effectiveness of a strengths-based blended personalized learning (SBPL) model in supporting student learning in the areas of math, reading, and language usage among students in grades preK-8. The researchers evaluated the SBPL model over a four-year period to allow the school district time to implement the initiative. The school district consisted of approximately 3,900 students;

64% of students were socioeconomically disadvantaged and 60% of students were Hispanic. McCarthy et al. were interested in seeing how the initiative would impact student achievement and how the change occurred longitudinally. Using standardized assessment data, the researchers found the impact of the SBPL model were positive and significant for all subjects. Students in the treatment group outperformed students in the control group by 1.22 - 1.96 points, with an effect size ranging from 0.10 to 0.12, indicating a statistically significant difference between the two groups. Research results indicated the SBPL model incorporated an important feature of assessing and adapting student work to meet individual student needs. Strengths-based planning allowed students to be an active participant in the planning process, which further increased self-regulation.

Assessment-informed instruction may aid in implementing personalized instruction and increasing student learning. However, teachers often fail to use assessment data appropriately to tailor instruction for individual student needs (Connor, 2017). Connor (2017) conducted a longitudinal, randomized control trial study with 541 high-poverty students in kindergarten through third grade. Students received personalized literacy instruction, particularly in language, decoding, and comprehension. Forty teachers used a technology tool called Assessment-2-Instruction (A2i) to assist them in interpreting standardized assessment data to guide their instruction. A2i was designed to help teachers plan and implement both face-to-face learning and a type of computer-assisted instruction called Individualizing Student Instruction (ISI). Research results

indicated that A2i/ISI had an effect size of 0.77 between the treatment and control groups.

Furthermore, third grade students in the treatment group scored a fifth grade reading level on average, compared to the control group, who averaged a fourth grade reading level. Students who received A2i/ISI all three years scored 85 percent or above in reading, and only 6% received a standard score less than 90. While more than 25 percent of third grade students in the control group scored below 85 percent, indicating reading difficulties, students who received A2i/ISI scored 85 percent or above. The study results revealed that technology tools can be an effective method for using assessment data to create personalized learning opportunities for students.

Technology can also support personalized learning environments for learners with disabilities, as Basham et al. (2016) discovered. Using mixed methods, Basham et al. investigated the design of personalized learning environments during implementation. Participants included 6,500 K to 12 teachers and students, with 20% of the student population identified with learning disabilities. Basham et al. observed and interviewed instructional staff and students. Upon realizing that the district was nearly 1:1, the researchers noticed the district purchased various technology systems to support data collection for individualized, small group, and large group instruction. Basham et al. noted that there was visible evidence of student self-regulation and classroom and system-level data usage, which enabled teachers to plan targeted skills instruction for all students. Standardized test data indicated that both learners with and without learning disabilities increased for math and reading, with the effect size of 1.05. Research findings

showed that technology-based systems supported personalized learning and increased standardized test scores for learners with and without disabilities.

Implementing a personalized learning model poses challenges for schools. Bingham et al. (2018) conducted a qualitative study with 28 school principals and teachers to investigate structural and contextual sources of implementing technology-mediated personalized learning. Similar to Basham et al. (2016), Bingham et al. used observational field notes and interviews to collect data. Analysis of the data showed inconsistencies between the attributes of the infrastructure and teacher preparation and practices which lagged behind the capabilities of the systems. While the schools' intentions were for the teachers to use personalized learning models for students to increase high stakes assessments, teachers felt they lacked training to use the software systems well. Administrators, teachers, and students acknowledged the value in personalized learning, but were hindered by the lack of systemic and structural supports.

Similarly, Kallio and Halverson (2020) conducted a qualitative study to investigate how leaders support educators and schools during curriculum redesign of core teaching and learning. The researchers interviewed leaders, academic coaches, teachers, students, and community members in 11 K to 12 schools representing a range of age, locale, size, and organizational structure. The researchers identified leadership strategies that supported teachers and learners including providing a variety of tools for technology systems. One consistent strategy employed by school leaders when implementing a new curriculum was implementing individualized learning systems, or idiosyncratic systems termed by Kallio and Halverson. Examples of idiosyncratic programs include adaptive

learning software such as Achieve3000, DreamBox, IXL, and ALEKS Math. Utilizing adaptive software freed up the teachers to meet with students individually or in small groups. Bingham (2017) and Kallio and Halverson found that leaders concerned with implementing a personalized learning models need to fully understand the challenges of providing professional development and technology tools for educators and learners to completely engage in personalized learning.

Blended Learning Approach

Blended learning integrates face-to-face instruction with online instruction (Horn & Staker, 2015). Using computers in the classroom has been used for decades. Since the evolution of technology use in the classroom, computers are being used by K to 12 students across the United States in various formats. I will discuss the historical and political contexts surrounding 21st century learning, and I will provide information on how blended learning is used in the elementary classroom.

Historical and Political Contexts Surrounding Developing 21st Century Skills

To succeed in a rapidly changing global economy, educators across the nation have shifted teaching and learning to customize the educational experience for students to develop 21st century skills that prepare them for college and future careers. In a report, *A Nation at Risk*, the National Commission on Excellence in Education asserted American schools were failing which spurred leaders in education to reform the learning standards to better equip the nation's students for college and careers after high school (United States National Commission on Excellence in Education, 1983). In 2001, President George W. Bush implemented No Child Left Behind (NCLB; United States Department

of Education, 2001). The NCLB law promised to increase the federal role to ensure all states would boost the performance and achievement of all students. With increased requirements on states and schools, NCLB touted students would be ready for the academic demands of their future (Klein, 2015).

In 2007, Barack Obama proposed a $4.3 billion Race to the Top initiative as a way for states to boost achievement to overcome stagnant achievement scores (United States Department of Education, 2009). Obama's Race to the Top initiative awarded grants to states willing to embrace new educational approaches in implementing Common Core Standards, more rigorous state testing, technology integration, and teacher evaluations (United States Department of Education, 2009). In 2013, the United States Department of Education promoted utilizing technology in education to build 21st-century skills and accelerate learning (Project Tomorrow, 2013; United States Department of Education, Office of Educational Technology, 2017). In 2015, Obama signed Every Student Succeeds Act (ESSA) advancing educational equity, maintaining accountability for students and teachers, and supporting innovation in education (United States Department of Education, 2015). Recently, the 2018 Programme for International Student Assessment (PISA) Worldwide Ranking reported U.S. 15-year-olds fell below the level of students in other industrialized nations, ranking 25th out of 78 nations (National Research Council, 2018). Despite the varied levels of rigor and innovation, educational leaders continue to search for ways to strengthen student achievement.

Blended Learning at the Elementary Level

With the rapid adoption of 1:1 devices among elementary schools, teachers have developed new methods for delivering course material. Through a blended learning approach, educators personalize education to meet the individual needs of students. Horn and Fisher (2017) defined blended learning as combining face-to-face instruction with online learning. Blended learning classrooms are more student centered and allow teachers the opportunity to leverage their time more efficiently (Moore et al., 2017). Blended learning also provides the opportunity to increase student-teacher and student-student interaction, as well as for teachers to assess student learning more effectively. The Clayton Christensen Institute (2016) identified four models of blended learning: station rotation model, flex model, a la carte model, and enriched virtual model. Of the four blended learning models, the station rotation is the fastest growing model among elementary schools (Horn & Fisher, 2017). In the station model, educators use stations to differentiate instruction with greater precision using the aid of technology-assisted programs. The station rotation model suits the elementary classroom since it is a natural approach to hands-on learning with traditional learning centers. Using blended learning in the K to 12 setting is a fairly new pedagogical approach and there is not a vast amount of research at the elementary level or with ELLs.

Since blended learning is a fairly new pedagogical approach at the elementary level, Moore et al. (2017) saw the need for professional development among teachers. The authors designed a 16-week professional development program for preservice and in-service teachers, called Mastering the Blend, which helped K to 12 educators enhance

face-to-face instruction by implementing a variety of technology tools in a blended learning environment. The program's aim was to help teachers develop skills needed to design, develop, and facilitate student-centered learning. Moore et al. later conducted an evaluation of the program by asking participants to complete a survey and write a blog about their reflections of blended learning and their growth throughout the training. Moore et al. used the iNACOL Blended Learning Teacher Competency framework to guide their interpretations of teachers' attitudes and perceptions about blended learning. Findings indicated the participants gained a better understanding of the importance for group interactivity and the need to build relationships among peers before initiating collaborative assignments. Participants reported that the Mastering the Blend program helped them gain the most instructional design skills. Overall, Moore et al. reported that teachers' perceptions and attitudes about blended learning increased by the end of the professional development program.

Since Moore et al. (2017) reported that teachers were better able to manage their time through blended learning, D'Agostino and Kowalski (2018) conducted a qualitative study to further investigate teachers' knowledge, attitudes, and perceptions of their schools before and after implementing a blended learning program. The pilot program focused on five components: DI, blended learning, data-driven instruction, teacher PLCs, and instructional coaching. D'Agostino and Kowalski conducted paired sample t-tests to analyze survey data from 33 teachers in five private schools. Teacher knowledge and attitudes toward program components showed significant differences between before and after implementation with medium to large effect sizes. Specifically, teachers reported

high levels of satisfaction due to the ability to use data to differentiate instruction and increase student autonomy and active learning. Research findings from D'Agostino and Kowalski agreed with Moore et al. that teachers are better able to manage their time and are better equipped to differentiate instruction for students through using a blended learning approach rather than a traditional face-to-face approach.

Turner et al. (2018) took their research in a different direction, working to determine differences in perceptions and attitudes of various grade spans about the benefits of blended learning. The researchers used quantitative measures to analyze survey results of 460 K to 12 public school teachers' perceptions of the benefits of blended learning for instructional delivery and student production. The majority of the participants (54%) were elementary teachers. Findings indicated that elementary teachers have a positive perception of blended learning as a means to increase student engagement and achievement. In addition, study results indicated a significant positive correlation between teachers' perceptions of the benefits of blended learning and their use of the approach for instructional delivery (Turner et al., 2018).

These studies provide clear evidence that blended learning is useful to teachers; additional studies reviewed benefits for students (D'Agostino & Kowalski, 2018; Moore et al., 2017; Turner et al., 2018). Coll and Treagust (2017) conducted a qualitative case study to analyze a blended learning approach to determine the benefit on student learning outcomes. The blended learning program, called Learning Experiences Outside School (LEOS), was established to increase student engagement during and after school. The researchers conducted interviews and observations with 11 teachers who used Moodle for

their learning management system. The teachers reported using Moodle as a means to increase student collaboration and communication. Through these interviews and observations, Coll and Treagust found that Moodle had a positive influence on students' attitudes. In addition, results from an internal student assessment indicated that blended learning promoted better learning outcomes. Coll and Treagust asserted that using Moodle helped motivate students and linked learning to the real world by increasing a social presence in the classroom.

In a meta-analysis review of technology-enhanced language learning, Ledesma and Sandoval (2017) found that blended learning benefitted teachers and students with flexibility and independence, resulting in increased motivation and positive learning attitudes. The use of technology in literacy instruction showed promise for enhancing instruction and learning attitudes. Ledesma and Sandoval also advocated for careful planning and selection of technology tools.

Pace and Mellard (2016) added to Coll and Treagust's qualitative data on the blended learning and student achievement. The researchers evaluated the effects of a blended learning approach versus a traditional face-to-face approach in an ELA course for 495 sixth grade students, focusing on gender status, disability status, and student reading efficacy. The research results indicated that the treatment group outperformed the control group (students who received a traditional face-to-face approach) in reading achievement as measured by the Northwest Evaluation Association (NWEA) MAP assessment, indicating that a blended learning approach may have greater effect on reading achievement that a traditional face-to-face approach.

To investigate the benefits blended learning may have on reading, Terrazas-Arellanes et al. (2017) conducted a quantitative study to examine content-specific assessment scores in middle school students. The researchers analyzed scores for 1,876 sixth grade students as a whole and by subgroups (ELLs, students with learning disabilities, and general education students) to determine the effect Project ESCOLAR (E-text Supports for Collaborative Online Learning and Academic Reading) had on science scores. Findings indicated PBL-based collaborative online learning units increased science knowledge for middle school ELLs, SWLDs, and general education students due to the amount of language support and scaffolding provided on an individual level. The study's findings indicated that the use of E-texts support individual student reading in content areas.

Selecting effective software programs for independent student practice needs more consideration in the elementary classroom. Schechter et al. (2015) explored the need for intentionally selecting blended learning programs to meet students' needs during literacy independent work time. In a quantitative study, the authors examined the effects of using Lexia Core 5, a blended learning program, on low-SES first and second grade students throughout one school year. Forty-seven students in the treatment group received Core5, which was both teacher-led and technology-based, and 41 students in the control group received the same reading instruction without the blended learning component. While both groups showed gains, the treatment group showed moderate gains in vocabulary and significant gains in comprehension with an effect size of .52. Schechter et al. conducted further analysis of the ELL students' performance, showing the treatment

group gained more than one standard deviation from below the norm mean to above the norm mean, indicating ELL students showed the most growth during the treatment period. By the end of the study, ELL students in the treatment group closed the achievement gap and scored identically to non-ELL students in the control group. Schechter et al. maintained that blended learning can be an effective approach to reinforce reading skills of low-SES and ELL students.

To further Schechter et al.'s (2015) investigation on Core5, Prescott et al. (2018) used a quantitative approach to examine a school-wide implementation of a Lexia Reading Core5 in a Title I urban school for Grades K to 5. Reading performance of 641 students was tested before and after the study using the Group Reading Assessment and Diagnostic Evaluation (GRADE). Seventy percent of the students from the participating school qualified for free/reduced lunch and 18.4% of the students were ELLs. Pretest and posttest results using GRADE indicated that all students gained in reading skills, especially students in early grades. According to Prescott et al., 26.6% of reading growth correlated with the number of levels of Core5 students completed. Students in kindergarten, first, and second grades showed significantly higher reading growth than students in upper elementary grades. In addition, student gains were found to be similar across various types of students. Based on Schechter et al. and Prescott et al.'s studies, a blended learning approach can provide supportive benefits for students with diverse backgrounds, including students from low-SES or ELLs.

Macaruso et al. (2020) sought to investigate more participants to expand the results from Schechter et al. (2015) and Prescott et al. (2018). Macaruso et al. examined

the effects of blended learning as a form of reading instruction in kindergarten through fifth grade classrooms in six schools. The six schools used Wonders, a packaged reading curriculum and Reading Plus, an online supplemental software program. Treatment schools implemented Core5 to supplement the ELA curriculum. Prior to implementation of Core5, 2,217 students in the treatment schools performed significantly lower than 1,504 students in the control schools. Students in all six schools completed the NWEA MAP reading test in the fall 2016 and spring 2017. Study results revealed a significant effect size of 14.8 in the treatment group, indicating higher reading achievement for students who received blended learning in addition to the traditional reading program. Students in the treatment school with the highest number of students receiving free/reduced lunch gained 13.70 points, which exceeded the whole treatment group gains (13.61). Findings about Core5 showed that blended learning is an effective approach for literacy growth for all students, especially those in lower income schools (Macaruso et al., 2020; Prescott et al., 2018; Schechter et al., 2015).

Similar to Schechter et al. (2015) and Prescott et al. (2018), Wilkes et al. (2020) examined Core5 with a larger participant pool of kindergarten and first grade students. Wilkes et al. measured the impact Core5 had on early literacy growth and addressed previous limitations by increasing the sample size and including control students. In a quasi-experimental design, Wilkes et al. compared 283 treatment students with 237 control students in an urban school district using traditional instruction. The sample included 16.1% in special education (SPED), 49.7% classified as ELLs, and 80.5% qualified for free/reduced lunch. All students in the study were given a pretest using a

Dynamic Indicators of Basic Early Literacy Skills (DIBELS) common reading assessment. Study results indicated treatment students scored significantly higher on the spring DIBELS than students in the control group, with standard error of 8.45. The results indicated Core5 contributed to reading gains for the students in the treatment group. Like previous studies conducted on Lexia Core5, Wilkes et al. found that utilizing a blended learning approach outweighed traditional instruction alone.

Results from elementary schools that implement blended learning revealed the significant impact on reading achievement for all students, including ELLs and low-income schools. Studies showed that teachers were better able to differentiate instruction and leverage their time to meet with small groups and individual students (D'Agostino & Kowalski, 2018; Pace & Mellard, 2016; Terrazas-Arellanes et al., 2017). Additionally, blended learning increased student attitudes, motivation, and engagement (Coll & Treagust, 2017; Ledesma & Sandoval, 2017; Turner et al., 2018). Despite these gains, Ledesma and Sandoval (2017) noted that blended learning programs must be carefully selected to ensure students' individual needs are met. The most widely studied blended learning program, Lexia Core5, showed increased reading achievement in elementary students (Macaruso et al., 2020; Prescott et al., 2018; Schechter et al., 2015; Wilkes et al., 2020).

Computer-Assisted Reading Instruction

Although there is a limited base of research on using computer-assisted learning software to target reading delays, the results showed positive effects of closing achievement gaps in elementary learners. To investigate the use of computer-based

interventions with elementary students, Messer and Nash (2018) conducted a randomized control trial study to determine the effect of computer-based reading programs on the reading achievement of elementary students. Six schools participated in the study for 10 months with 78 students identified as needing additional support due to poor reading progress. Assigned to randomly selected experimental and control groups, students in the experimental group received 45 minutes per week of online tutorials using a multimedia Trainertext phonics program (Messer & Nash, 2018). At the beginning of the intervention, both groups of students were reading far below average. After the intervention, the experimental group had mean scores close to average. The effect size between pre- and posttest was 0.80, indicating the intervention was effective in increasing standardized test scores. A comparison of reading gains between groups revealed the intervention group had significantly higher gains in reading, thus showing Trainertext can be beneficial intervention strategies for students needing additional support in reading.

Trainertext was not the only computer-assisted intervention that was found successful. Brinson (2019) conducted a qualitative study to gain insight into third grade teachers' views on the reading intervention program Achieve3000 to improve reading achievement in Floridian students. While scores were not tracked, coded teacher interviews and focus group responses showed teachers felt Achieve3000 was a useful resource to increase reading proficiency, prepare students for state assessments, and allow teachers to differentiate assignments for various ability levels.

Rather than focusing on teachers’ views of reading software programs, Kaman and Ertem (2018) conducted a mixed-method study to gain insight of student perceptions.

The researchers analyzed results from a survey they created called, Error Analysis Inventory, Reading Comprehension Scale, and Reading Attitude Scale. The researchers interviewed 30 fourth grade students in four primary schools to investigate the effects of digital text readings on reading comprehension, fluency, and attitude. Quantitative results indicated that students showed long-term improvement in reading fluency, but only short-term effects on comprehension; qualitative results indicated that students were eager and excited about reading digital texts.

Similar to Kaman and Ertem's (2018) findings of increased fluency from reading digital texts, Bennett et al. (2017) sought to examine the effects of a supplemental computer software program to enhance oral reading fluency and comprehension. The researchers studied second grade, African American urban students who showed reading and special education risk. The supplemental program used culturally relevant material delivered through computer-assisted instruction (CAI) to offer repeated reading instruction. Based on AIMSweb data, all participants who received the treatment intervention reached their fluency criterion of 60 correct words per minute (CWPM), which was slightly higher than the benchmark goal set by DIBELS Next. At the conclusion of the intervention, Bennett et al. interviewed students and teachers to get their perspective of the program. Students indicated a preference for reading on the computer and a desire to continue. In addition, students felt more competent at reading stories on paper. Teachers also reported an increase in students' fluency. Teachers' responses supported reading intervention programs for struggling readers in primary grades.

Expanding on primary grade findings about computer-assisted literacy instruction, Storey et al. (2020) conducted a comparative study to examine the effects of a computerized supplemental literacy program, Headsprout Early Reading (HER). This program, along with Special Education Needs Coordinator (SENCO), delivered supplemental literacy program for students with below average scores on standardized reading tests. Participants were randomly selected to either the HER (n = 17) or SENCO-delivered (n = 15). After a 7-month intervention period, students pre- and posttreatment assessment scores showed students in the HER group scored significantly higher for word/non-word recognition (d = 0.96), sentence reading (d = 1.53), and Dolch sight words (d = 2.65). The researchers' results found that Headsprout provided struggling readers with an effective intervention program to increase early literacy skills (Storey et al., 2020).

Like Headsprout, Study Island is a literacy skills program that targets more advanced reading skills for older students. Mitchell (2018) conducted a quantitative study to determine the impact Study Island had on third grade Illinois Standards Achievement Test (ISAT) reading scores for 316 students at an elementary school. Results from archival data indicated a significant difference in reading scores before and after the implementation of Study Island, with more considerable significance between year one and year three.

In a mixed-methods study, Stork et al. (2018) examined the efficacy of digital activities and tools. Specifically, the researchers studied the impact that digital activities and tools had on literacy achievement at a literacy festival for students in grades one

through eight. Through interviews and surveys, the researchers discovered that students and teachers perceived using digital tools as a way to increase motivation, engagement, creativity, and collaboration, leading to increased student achievement.

Adaptive Practice Software

Educational software is now expanding into programs that offer students more personalized and individualized access to educational curriculum. Intelligent tutoring systems, computer programs that personalize learning for students, guide students through the learning process, targeting additional practice in areas where students have learning gaps. Adaptive CAI has the ability to adjust the starting point and the path a student takes with the learning material (Kazakoff et al., 2018; Kolchenko, 2018; Macaruso et al., 2020; Shamir et al., 2017). Researchers recognized that CAI programs feature different strengths (Shamir et al., 2018). Several studies demonstrated that the use of adaptive computer-based software can be effective in increasing reading skills in elementary students (Kazakoff et al., 2018; Macaruso et al., 2020; Shamir et al., 2017, 2018; Xu et al., 2019).

In a meta-analysis of 19 peer-reviewed studies comprising approximately 10,000 students, Xu et al. (2019) examined the effectiveness of intelligent tutoring systems (ITS) compared to traditional K to 12 instruction on improving reading comprehension. Although the use of ITS produced a small effect size when compared to human tutoring, the overall effect size on reading comprehension was 0.60, indicating a large effect size. When compared to traditional reading instruction, the findings of the meta-analysis indicated that ITS produced greater gains than a traditional approach to literacy

instruction with an effect size of 0.86, indicating higher reading comprehension levels with the use of ITS.

Kazakoff et al. (2018) conducted a two-year quantitative study to examine whether Lexia Core5 Reading, supported improved reading development. The researchers studied both ELLs and non-ELLs in 64 K-5 elementary schools. AIMSweb results showed gains for all students in kindergarten, second, third, fourth, and fifth grades. The first grade ELLs outperformed non-ELLs in reading gains, demonstrating a possible method for closing a skills gap between ELLs and non-ELLs.

In a longitudinal study, Macaruso et al. (2020) extended Prescott et al.'s (2018) research design by exploring the impact Lexia Core5 Reading had on low-SES kindergarten students. Macaruso et al. sought to determine the program's impact on summer slide, measuring standardized reading scores from the spring of one school year to the fall of the next school year. Reading performance was assessed using GRADE instrument in the spring and fall of 68 students' kindergarten, first, and second grade years (Macaruso et al., 2020). Teachers in the district used Daily 5 as the framework for ELA instruction. In addition, Core5 was implemented as an adaptive online component during literacy centers. Students' performances on the GRADE showed significant reading gains overall, despite a slight decline each fall, indicating evidence of summer slide. The main effect size over the course of three years was 3.471, demonstrating the longitudinal impact Core5 had on reading gains of elementary students.

Shamir et al. (2017) examined the early literacy computerized adaptive software program named the Waterford Early Reading program (ERP), which targets early reading

concepts of kindergarten and first grade students. Shamir et al.'s quantitative study determined the impact of the Waterford ERP had in addition to an existing reading curriculum for three elementary schools. Placed in three sample groups, each group used the program for different amounts of time throughout the school year ranging from 600 minutes to more than 1,000 minutes. First grade students took the STAR (Standardized Test for the Assessment of Reading) early literacy assessments at the beginning, middle, and end of the year. Kindergarten students took the DIBELS reading assessment. Findings revealed a significant difference between treatment and control groups in both grade levels, indicating greater gains for students who used the Waterford ERP than for students who did not (Shamir et al., 2017). In addition, students who used Waterford ERP for more than the 1,000 recommended minutes had higher gains than those who used the program less. Shamir et al. concluded that Waterford ERP is an effective method for teaching early literacy skills to K to 1 students.

Shamir et al. (2018) extended their previous research on this adaptive computer-assisted instruction program. In another study, the researchers examined the impact Waterford ERP had on 3,247 kindergarten and first grade students' reading skills. Analysis of the Texas Primary Reading Inventory assessment revealed students who used Waterford ERP scored significantly higher in six out of eleven literacy strands, including letter name identification ($d = 0.74$), letter to sound linking ($d = 0.51$), inferring word meaning ($d = 0.34$), linking details ($d = 0.49$), recalling details ($d = 0.30$), and listening comprehension ($d = 0.58$). Further examination of the effects of Waterford ERP curriculum and student demographics revealed higher gains in ELL students, indicating

the potential of Waterford ERP to close the achievement gap between ELL and non-ELL students. Overall, findings further supported the claim that adaptive CAI programs improve reading skills more than traditional classroom instruction (Shamir et al., 2018).

Luo et al.'s (2017) also supported the effectiveness of the adaptive CAI program called IStation. Using mixed-methods with three teachers and 98 students, Luo et al. explored the impact IStation had on third grade reading improvement scores as measured by the STAR reading test and IStation scaled scores. IStation was implemented school-wide to supplement the regular literacy instruction to assess deficits in phonemic awareness, phonics, fluency, vocabulary, and comprehension. Students received individualized remediation in areas of deficit, as indicated on the beginning assessment. Results from the STAR test indicated an increase in reading scores from September to January for students in Tier 1, 2, and 3. The correlation between the IStation scaled scores and STAR scores was shown to be highly significant, indicating that IStation has a positive effect on STAR scores (Luo et al., 2017). Survey results also revealed an increase in motivation among students. Furthermore, teachers perceived IStation to have a positive effect on improving reading comprehension.

Similar to the assessment feature in IStation, many adaptive computer-based software programs have built-in assessments to pinpoint student reading deficits, which guides teachers in planning individual instruction and intervention for students. Mitchell et al. (2018) conducted two studies to assess the validity of Lexia Core5's embedded performance measures of Assessment Without Testing (AWT) with MAP and Smarter Balanced Assessment Consortium (SBAC). There was a significant correlation between

AWT and MAP as well as between AWT and SBAC; both correlations falling in the medium (.4 - .6) range. Research results indicated Core5's AWT is a valid assessment to estimate students' ability to reach end-of-year benchmark targets. Mitchell et al. (2018) discovered AWT technology gathered student performance data without requiring a separate testing event, was easily implemented, and served as a criterion- and norm-referenced assessment data, thus helping teachers maximize their time during classroom instruction.

In addition to helping teachers maximize their time, adaptive software helped teachers quickly identify students who needed more intervention or scaffolding. Sutter et al. (2020) investigated the predictability of an adaptive computer-based reading assessment for measuring second grade students' reading achievement on standardized tests including IStation's Indicators of Progress for Early Reading (ISIP-ER) and STAR. Analysis of 428 second grade students' scores indicated a strong correlation between the scores on the December ISIP-ER assessment and the end-of-year STAR reading scores, with an effect size of .67. Research results indicated computerized adaptive tests may be used to predict end-of-year reading scores and to identify students at risk, thus offering teachers the opportunity to intervene and adjust instruction accordingly prior to state mandated high-stakes standardized tests (Sutter et al., 2020).

Implications

The purpose of this project study was to examine the impact two different blended eLearning tools have on TNReady TCAP scores of fourth grade students. By analyzing the state assessment data of the treatment schools and control school, I gained insight into

the effectiveness of the implemented programs. The findings of the data collection and analysis will guide administrators, technology leaders, and teachers on possible solutions to improving literacy skills of upper elementary students. After completing this project study, I will share the information gathered with district administrators and curriculum coaches to explain my findings. The information gathered will also be shared with colleagues in district-level and school-level committee meetings and professional conversations. District technology coaches and reading coaches can purchase software for the entire district that aligns to supporting all upper elementary students' reading achievement.

Summary

The literature confirms that using literacy software programs in blended learning classrooms has benefits and increases student achievement (Kazakoff et al., 2018; Kolchenko, 2018; Macaruso et al., 2020; Mitchell, 2018; Prescott et al., 2018; Shamir et al., 2017; Storey et al., 2020). Educators are better able to meet the needs of individual learners by allowing technological tools to aid in assessing student performance, providing real-time data, supporting student learning, and planning for whole group and small group instruction (D'Agostino & Kowalski, 2018; Mitchell et al., 2018; Pace & Mellard, 2016; Terrazas-Arellanes et al., 2017). Moreover, students in blended learning classrooms are more motivated and engaged, thus increasing achievement (Bennett et al., 2017; Kaman & Ertem, 2018; Stork et al., 2018).

To differentiate instruction in reading, teachers often meet with small groups of students during literacy stations. In a blended learning classroom, teachers are better able

to maximize their time by using literacy software programs to support student learning while meeting with small groups of students (D'Agostino & Kowalski, 2018; Pace & Mellard, 2016; Sutter et al., 2020; Terrazas-Arellanes et al., 2017). Using supportive resources, like CAI and adaptive software programs, targets student performance with real-time feedback. Adaptive software programs can mimic human tutoring by scaffolding learning and providing a sequence of content each student needs to progress (Xu et al., 2019). Using adaptive learning software personalizes struggling students' learning experience and advanced students (Basham et al., 2016). Research shows adaptive software programs can increase student achievement and has the potential to close the achievement gap, particularly with low-SES and ELL students.

The literature reflects qualitative, quantitative, and mixed-methods studies that investigated using blended eLearning tools to increase reading achievement (Kazakoff et al., 2018; Macaruso et al., 2020; Prescott et al., 2018; Schechter et al., 2015; Shamir et al., 2018; Wilkes et al., 2020). While there is evidence of adaptive software increasing reading achievement at the elementary level, there is limited research on how blended eLearning tools, such as IXL and Reading Plus, affect reading achievement and upper elementary students' growth. More investigation is needed to better understand whether literacy software programs benefit upper elementary students. In Section 2, I will discuss the methodology of the study, the research design and approach, the setting and sample, instrumentation and materials, data collection and analysis, assumptions, limitations, scope and delimitations, and protection of participants' rights.

Section 2: The Methodology

Research Design and Approach

The methodology is the researcher's approach to answer the RQs (Burkholder et al., 2016; Butin, 2010). The methodology provides a foundation and procedures for conducting social research (Frankfort-Nachmias & Leon-Guerrero, 2018). For this study, a quantitative quasi-experimental design was employed. Like an experimental design, a quasi-experimental design compares groups scores on a dependent variable but lacks the randomized assignment of a pure experimental design (Burkholder et al., 2016). According to Ary et al. (2006), quasi-experimental research is appropriate in an educational setting because it is not ethically possible to assign students to a treatment group. A quasi-experimental design was the best choice for this study because I reached a reasonable conclusion even though I did not have full control of the participants' groups (see Ary et al., 2006).

The research design provides researchers with a framework offering detailed plans for answering the RQs (Burkholder et al., 2016; Butin, 2010). The design serves as a guide for the researcher throughout different research stages, including collecting, organizing, analyzing, and interpreting the data (Frankfort-Nachmias & Leon-Guerrero, 2018). Thomas (2017) asserted that researchers should choose a research design appropriate to the RQ. In a qualitative study, researchers gather feelings and opinions through observations, surveys, and photographs (Butin, 2010; Golafshani, 2003). Quantitative research is about collecting numerical data to answer RQs and hypotheses (Burkholder et al., 2016; Thomas, 2017). Quantitative research methods are used to

compute the relationships between research variables (Babbie, 2017; Thomas, 2017). I used a quantitative quasi-experimental approach using a one-way ANCOVA on the score gains (change) with the beginning scores as one of the covariates. To answer the RQs of this study, I used quantitative methods to pinpoint the amount of growth students show from TCAP TNReady data as a result of using different eLearning tools.

For the research evaluation design, I conducted a project study in the policy recommendation genre because I looked at the impact two blended eLearning software tools had on reading scores, using archival data. Archived relevant data were available and were used in this quantitative quasi-experimental design study. Data for the current study were examined from one point in time (2017-2018) to another (2018-2019). The TCAP TNReady test is administered in April each school year. The selected years were the most valid and current test scores available. Due to the Covid-19 pandemic, schools were not in session during the testing period for the 2019-2020 school; therefore, no test data were available. I used archived matched data sets from the April 2018 TCAP TNReady reading assessment to the April 2019 TCAP TNReady reading assessment. The chosen covariates selected for this study were sex, ELA yearly averages, and the third grade TCAP TNReady ELA scores. Based on the literature review, I discovered that boys often tend to score lower in reading achievement than girls (see Pace & Mellard, 2016). Therefore, sex was included as my first covariate. According to Frankfort-Nachmias and Leon-Guerrero (2018), extraneous variables occur naturally and can cause changes in the dependent variable; as such, they must be controlled to determine the effect the independent variable has on the dependent variable. Students' ELA yearly averages could

cause changes in reading test scores. Therefore, ELA yearly averages were included as a covariate to help me determine the impact the treatment may have on students' test scores. The final covariate, third grade TCAP TNReady ELA scores, was chosen to help me have more robust research findings (see Burkholder et al., 2016).

Using a quasi-experimental research evaluation design is consistent with research in educational technology to advance the knowledge of effective blended eLearning reading software programs. I examined the difference of TCAP TNReady ELA scores between three groups (control, IXL, and Reading Plus) after a 1-year implementation of a blended eLearning literacy program. Implementation of the interventions was a site-based decision made by the teachers and administrators at each school. Because the interventions were implemented before this study, I evaluated the impact the software programs had on TCAP TNReady reading scores by using archival data. Although 2018-2019 was the first year of implementation at the school level, this study may support IXL or Reading Plus's implementation at the district level. The purpose of this quasi-experimental study was to study the difference in TCAP TNReady ELA scores from 2017-2018 to 2018-2019 between IXL and Reading Plus, controlling for sex, ELA yearly averages, and third grade TCAP TNReady ELA scores.

Setting and Sample

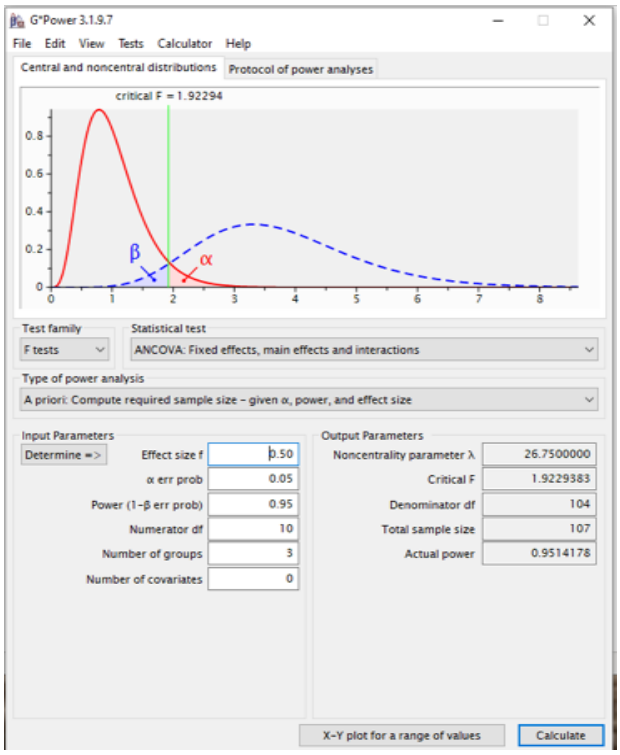
Population is the group of all the individuals, objects, or groups in which the researcher is interested (Frankfort-Nachmias & Leon-Guerrero, 2018). According to Thomas (2017), researchers can learn about a population by studying a sample and generalizing from the sample to the whole population. The target population for my study

was three Title I elementary schools in Upper East Tennessee. Pseudonyms were used for the names of the schools in the current study. In the 2017-2018 school year, North Ridge School served 235 students, where 51.1% were White, 31.9% were Black/African American, 15.7% were Hispanic, 10.2% were ELL, 16.2% were students with disabilities, and 61.7% were economically disadvantaged. In the 2017-2018 school year, South View School served 344 students. Of the population, 64.8% were White, 14% were African American, 18.6% were Hispanic, 10.2% were ELL, 14.2% were students with disabilities, and 42.7% were economically disadvantaged. In the 2017-2018 school year, Woodmont School served 388 students. Of the population, 65% were White, 6% were African American, 21% were Hispanic, 14% were ELL, 15.8% were students with disabilities, and 63% were economically disadvantaged.

My study's target population size was approximately 150 fourth graders in 2017-2018 from three elementary schools in a southeastern school district. The approximate population size is 50 students per school. To determine the minimum sample size, I conducted an a priori power analysis using the statistical software G*Power, Version 3.1.9.7 (see Faul et al., 2009). Assuming the medium effect size (f = .50), α = .05, and two predictor variables, the result of the G*Power Analysis (Figure 2) suggested a minimum sample size of 107 participants total to achieve a power of .95. The following graphic demonstrates that with a sample size of 150, the study met the sample size requirements of the power at the .05 level.

Figure 2

Power Analysis



Sampling and Sampling Procedures

Sampling is the method of selecting participants for a study (Thomas, 2017). The convenience and purposeful sampling approach was used for selecting participants for this study. According to Babbie (2017), purposeful sampling is appropriate to use when the researcher is knowledgeable about the research population and its elements. Patton (2015) asserted that selecting participants using a purposeful sampling strategy allows researchers to focus on quality information to answer the research questions. Thomas (2017) added that in purposive sampling, the researcher investigates a population of interest but has no affiliation to the group. Convenience sampling is used when a

researcher wants to study a population with easy access to provide insight into the group (Babbie, 2017).

I examined the TCAP TNReady ELA test scores of fourth grade students from North Ridge School, South View School, and Woodmont School (pseudonyms) that are stored in the school district's student information service database, PowerSchool. The TCAP TNReady ELA test scores were generated in April 2018 and April 2019. The students' scores on the third grade TCAP ELA assessment were paired with their fourth grade TCAP ELA assessment scores. For anonymity, I received the data with student identifiers instead of names. Transient students who had incomplete data were excluded from the study.

This study's treatment schools were selected because they had similar demographics and used IXL Reading and Reading Plus blended learning reading software programs for literacy support. The control school, Woodmont School, was selected because the school had similar demographics and state report card scores as the two treatment schools in years 2017-2018 and 2018-2019. The control school did not use any form of blended learning programs for reading. The projected sample of this study was approximately 50 fourth grade students from North Ridge School, 50 students from South View School, and 50 students from Woodmont School in a southeastern school district in 2017-2018. I selected this sample because they were given the TCAP ELA third grade assessment in 2016-2017 and the TCAP ELA fourth grade assessment in 2017-2018. The treatment schools were selected based on their use of one of two blended learning reading programs during the 2017-2018 school year, IXL or Reading Plus. There

were no other schools in the district using the two blended learning programs that met the criteria. To equate the groups, the third grade TCAP TNReady ELA score was used as a covariate to find comparisons and ensure homogeneity between the three groups.

Adaptive, Blended Learning Reading Intervention/Treatment

The school district where this study was conducted allowed schools to make decisions of which blended learning programs would best supplement their reading curriculum based on their own needs. Because site-based decisions were made at the schools in my study, I examined two different supplemental literacy programs at two Title I elementary schools and used one Title I elementary school as the control group.

Administrators and fourth grade teachers at South View selected Reading Plus as their blended learning program. Administrators and fourth grade teachers at North Ridge selected IXL as their blended learning program. Both schools were looking for programs that could be used in their blended learning classrooms where students had access to their own laptop devices. The software programs were used as supplemental support to the primary literacy curriculum during literacy centers. All schools in the southeastern school district used *Journeys* (Baumann, 2014) for their reading textbook adoption, which did not offer an integrated technology component. Fourth grade teachers were concerned about increasing student TCAP TNReady achievement and growth scores, so they investigated ways to differentiate instruction. Teachers were looking for ways to use technology to aid in individualizing independent reading practice. Teachers and administrators chose Reading Plus and IXL because they offered personalized learning opportunities for students, diagnostics, and instant feedback for teachers to monitor

progress. Both schools implemented the programs in August 2018 and used them for the 2018-2019 school year. Fourth grade students at both schools only used the software programs at school.

Taylor created the online version of Reading Plus in the early 2000s (Reading Plus, 2020). Reading Plus (2020) provided support for building fluency in silent reading, vocabulary development in context, decoding, extensive reading, and comprehension enhancement. Reading Plus was redesigned by reading researchers to include a component to increase student motivation. South View School teachers selected Reading Plus for its ability to personalize instruction through adaptive practice. During the 2018-2019 school year, South View School was the only elementary school in the district to use Reading Plus.

Similarly, North Ridge School needed a supplemental program for students to use for independent practice in their blended learning classrooms. North Ridge School chose IXL because it targeted ELA, math, science, and social studies. Formerly known as Quia Web, IXL algorithmically generated questions to provide students with targeted practice to increase critical thinking (IXL Learning, 2021). IXL provided teachers with real-time feedback on student progress. Teachers and administrators at North Ridge School identified IXL as a program to implement because IXL also offered textbook alignments with their reading and math textbook adoption. Students were given a diagnostic assessment to determine their reading level at the beginning of the intervention. North Ridge School implemented IXL in August 2018 and used it during the 2018-2019 school

year. Reading Plus and IXL were paid for by the school district where the study was conducted. Walden University did not sponsor the intervention programs.

Instrumentation and Materials

Questar developed the TCAP TNReady test from 2016-2019 (Tennessee Department of Education, n.d.-a). TCAP TNReady ELA assessment was a criterion-referenced, standards-based assessment given to students in Grades 3 to 8 during a 2-week testing window between April to May each school year. The timed standardized test included ELA, math, science, and social studies. The ELA portion of the test included four subparts that required students to read closely, analyze text, answer text-dependent questions, provide a written response to a prompt, and demonstrate command of the English language (Tennessee Department of Education, n.d.-a).

Administered annually, the TCAP TNReady test evaluated students' understanding of written expression, conventions, reading comprehension for literature, reading comprehension for informational text, and vocabulary. The four subparts totaled 48 to 84 items, allowing 216 minutes in total. Items on the TCAP TNReady test included multiple-choice questions, text-evidence selected responses, multiple select items, writing prompts, and editing tasks (Tennessee Department of Education, n.d.-b). The Tennessee Department of Education released all testing times for the assessment. Students with Individual Education Plans and 504 Plans received extended time for each assessment.

The test questions undergo a thorough four-step evaluation process to ensure the reliability and validity of the TCAP TNReady test. Vendor consultants from Educational Testing Service (ETS) write test items that align with Tennessee state standards. After the

test items are written based on the state specifications, the Tennessee Educator Item Review process occurs where items are reviewed for content and bias. The committees are comprised of educators, administrators, supervisors, and counselors represented by grade level or grade bands. Committee members can accept test items, revise, or reject items. After that, ETS reviews and revises items based on feedback from the Content and Bias committees. Once revisions have been made, the test questions are field-tested and reviewed for validity. According to ETS (2012), once validity is established, test items are added to the operational assessment, then reviewed by the Tennessee Department of Education. The final step is administering the assessment by schools across the state (Tennessee Department of Education, n.d.-b).

Student achievement for the TCAP TNReady ELA is categorized into four performance levels, with a maximum point value of 450. The scale scores were provided, which correlated with achievement performance levels: Level 1- Below; Level 2 - Approaching; Level 3 - On Track; and Level 4 - Mastered (Tennessee Department of Education, n.d.-c). Cut scale scores, or cut-off points dividing test results, were used to assign students to different achievement levels.

Based on the performance levels provided by TCAP TNReady ELA, the state reading assessment was the most appropriate choice of instrumentation selection for this study because I looked at the achievement and growth of fourth grade students. Achievement scores are determined by the points students earn on the assessment, and growth scores are determined by subtracting students' fourth grade achievement score with their third grade achievement score. The TCAP TNReady ELA test was the most

consistent test administered to the students of this study. The TCAP TNReady test was the best instrumentation choice to answer the research questions for this study.

Reliability and Validity

Validity in research refers to the description or reflection of accurate findings in a study. According to Burkholder et al. (2016), the validity of a study refers to the study's methods and instruments' trustworthiness. There are several types of validity issues in research studies, including external and internal validity (Burkholder et al., 2016). External validity refers to the extent to which research findings can be generalized across contexts (Babbie, 2017). According to Burkholder et al., threats to external validity of a study include interactions of causal relationship with sample units, treatment variations, types of outcome measures used, settings in which the treatment was observed, and context-dependent mediation. When interpreting results from quantitative research studies, one must consider the generalizability of the research design. Researchers can ensure external validity by thinking carefully about ways a research study may apply to other settings (Burkholder et al., 2016). Establishing external validity was accomplished by completing a thorough review of literature. Literature reviews provide researchers with a foundation to build a new study, highlight gaps in previous research, and offer ways to build on to previous studies. On the other hand, *internal validity* refers to a causal inference made between independent and dependent variables (Babbie, 2017; Burkholder et al., 2016; Shadish et al., 2002).

Addressing internal and external threats when designing a research study allows a researcher confidence in quality results. The first step in mitigating threats within

research is to be aware of possible concerns that may arise. Understanding the research question(s), creating relevant methodological frameworks, and selecting the best research design to answer the question aid in ensuring experiment results are valid (Burkholder et al., 2016). Threats to external validity were addressed by conducting a thorough literature review and using commonly known reading software programs, increasing generalizability. Threats to internal validity were addressed by using a state-wide standardized assessment and conducting statistical analysis of the assessment scores.

According to Babbie (2017), construct validity is based on the reasonableness of relationships between variables. In this study, I determined the possible influence of IXL and Reading Plus on fourth grade TCAP TNReady growth scores. Possible threats to construct validity for this study was whether the program has been implemented with fidelity and student program usage. To minimize threats to construct validity, I ran a one-way ANCOVA test controlling for ELA yearly averages, sex, and third grade TCAP TNReady ELA scores. To ensure construct validity, I described all the constructs in the study with accuracy and made inferences about the constructs that best represent this study. Possible threats to statistical conclusion validity would be type I or type II error in the statistical test, leading to incorrect conclusions about the relationship between the variables. To minimize a threat to statistical conclusion validity, I avoided performing multiple *t* tests, which increases the chances of having a type I error.

Data Collection and Analysis

According to Burkholder et al. (2016), there are many ways to collect data for a quantitative study. However, all methods of data collection pose a challenge for the

researcher. I planned to use archival data from a southeastern school district. Using archival records provides rich data to answer the research questions (Burkholder et al., 2016). The Director of Accountability and School Improvement for the selected public-school district directed the Supervisor of Assessment and Testing to provide me with 2017-2018 and 2018-2019 TCAP TNReady Reading archival data for my study. The archival data request included deidentified matched data sets for fourth grade students from the three Title I schools.

To gain access to the archived data for this quantitative study, I submitted a formal written request for archived TCAP TNReady fourth grade reading data to the district's Director of Accountability and School Improvement. The written request to collect archived data included the educational purpose of the request and validated approval with Walden University's Institutional Review Board (IRB). I requested that the archived data be provided in the form of a digital spreadsheet file with deidentified matched data sets. I received one spreadsheet that included school identifier, student identifier, 2017-2018 third grade TCAP TNReady ELA scores, 2018-2019 fourth grade TCAP TNReady ELA scores, ELA yearly average, and sex. The digital file was stored in a password-protected laptop. I will destroy all data after three years by deleting the files from my password-protected laptop.

In compliance with Walden University's IRB, the researcher obtained permission before beginning this study through a letter of cooperation sent to the district’s Director of Accountability and School Improvement (pseudonym). Upon approval, I sent a letter to the school district's Supervisor of Testing, Educator Evaluation, and Response to

Intervention (pseudonym) to request access to archived TCAP TNReady ELA scores and data. The Supervisor of Testing, Educator Evaluation, and Response to Intervention provided one spreadsheet of deidentified TCAP TNReady ELA scale scores for the 2017-2018 and 2018-2019 school years. Data were transferred into Microsoft Excel without identifiable information. Transient students with incomplete data were excluded from the study. Demographic data was accessed through the school district's PowerSchool database. I requested nominal scale data such as a school identifier, student identification number, and sex for each student. I requested interval scale data that included TCAP TNReady ELA scores for 2017-2018 and 2018-2019 and yearly ELA averages for each student. Archived TCAP TNReady data for 2017-2018 and 2018-2019 represent the best source of data since there is no test data for the 2019-2020 school year due to the Covid-19 pandemic.

The dependent variable was the 2018-2019 change in fourth grade students' reading achievement scores from their 2017-2018 third grade reading scores. The independent variable for this study was the learning intervention with three levels: the control group with no intervention, IXL, and Reading Plus. The covariates were ELA yearly averages, sex, and third grade TCAP TNReady ELA scores. Data analyses were conducted using a Statistical Package for Social Sciences (SPSS) v27. Once homogeneity of variance was established, I conducted a one-way ANCOVA, controlling for sex, district ELA yearly averages, and third grade TCAP TNReady scores (covariates) to determine if there was a statistically significant difference in TCAP TNReady reading growth scores (third grade scores vs. fourth grade scores) for fourth grade students

between the three groups. Data were analyzed at the .05 significance level to determine if one treatment was more effective than the other (Wagner, 2016). All TCAP TNReady ELA test data were scrubbed to deidentify student names from test scores provided. I received one spreadsheet that included a school identifier, student identification number, ELA yearly averages, third grade TCAP TNReady reading scores, fourth grade TCAP TNReady reading scores, and sex. Matched student data sets using the fields provided were included in the spreadsheet file. Students who had no matched data or those who received a zero were excluded from the analysis.

Data analyses were conducted using SPSS v27 and managed for the research question as follows:

1. To check assumptions for ANCOVA, I ran data checks, such as histograms and descriptive statistics, to give insight into distribution and sample size. Assumptions for ANCOVA are independent observations, normality, homogeneity of variance, homogeneity of regression slopes, and linearity. For independent observations, I ran a histogram look for any outliers in the values of the dependent variable and covariates. For normality assumption, I looked at the Shapiro-Wilk test which indicated that there is a normal distribution between the dependent variable and independent variable. Using a scatterplot, I was able to determine if there is a linear relationship between the covariate and the dependent variable for each level of the independent variable. I ran a test of between-subjects effects test to ensure it met the assumption for homogeneity of regression slopes

at the significance level of .05. Finally, to test for homogeneity of variance, I ran a Levene's test to confirm there was equal variance across samples.

2. In response to the research question, regarding the influence of interventions on the TCAP TNReady ELA growth scores, I ran a one-way ANCOVA test without covariates first to see if the homogeneity of slopes held. I then ran a one-way ANCOVA with covariates (sex, ELA yearly averages, and third grade TCAP TNReady scores) to test the null hypothesis.

Assumptions, Limitations, Scope, and Delimitations

Following are my study's assumptions, limitations, and scope and delimitations. Assumptions were made that enabled me to conduct my study, but could not be proven (Burkholder et al., 2016). Limitations outlined were constraints beyond my control that could have had an impact on the outcomes of this study (see Burkholder et al., 2016). The scope and delimitations are outlined, which describes the defining boundaries of the study (Burkholder et al., 2016).

Assumptions

I assumed that teachers implemented the reading software programs, IXL and Reading Plus, with fidelity, giving students ample time to engage with the software. Furthermore, I assumed that practice with the programs only occurred during school and not at home. These assumptions are necessary because the research questions and hypotheses addressed the relationship between the implementation of the programs and reading achievement and growth. The amount of time spent utilizing the program, teacher experience, and level of home support was not a part of the investigation.

Limitations

The use of convenience and purposeful sampling approach has disadvantages, as it can increase researcher bias and decrease generalizability (Jager et al., 2017). I used homogenous convenience sampling to mitigate this limitation (see Jager et al., 2017). The results may only be generalized to the population within this one small, decentralized school district in a suburban area. To address sampling limitation and minimize external threats to validity, I selected schools in a district where I am not employed (see Thomas, 2017). According to Burkholder et al. (2016), researcher bias is unintentional subjectivity to the research topic or participants. By choosing two schools in the district where I am not employed and have no connections, I minimized researcher bias (see Babbie, 2017; Burkholder et al., 2016). Another potential limitation could be the use of archival data. According to Burkholder et al., archival data is a source of rich data, but the collection and coding methods could pose limitations. To minimize the potential limitation of archival data use, I used the most current archival data available (for the 2017-2018 school year and 2018-2019 school year).

Additional limitations of this analysis include the limited accessibility to state assessment data due to the Covid-19 pandemic. Students did not take state assessments due to school closures in the spring of 2020. Additionally, I had difficulty selecting similar schools with the small suburban school district. Out of eight elementary schools in the district, only six of the schools meet the Title I criteria. Out of the six Title I elementary schools, two of the schools did not use blended learning.

Scope and Delimitations

This study focused on the impact two different blended eLearning software programs have on fourth grade TCAP reading achievement and growth scores among all students. Literacy software was chosen for this study to fill a gap in the research demonstrating the relationship between the use of literacy software and state achievement scores. This study's target population was fourth grade students who attended two different elementary schools in a fully accredited Southeast U.S. public school district.

To obtain the necessary data and ensure that each group within the population is represented, I used two types of sampling: convenience and purposeful. Convenience sampling is a process in which the researcher selects samples based on what is easily accessible (Frankfort-Nachmias & Leon-Guerrero, 2018). Purposeful sampling is used when the researcher is knowledgeable about the research population, its elements, and the purpose of the study (Thomas, 2017). This study may be generalized to upper elementary populations using a blended learning approach or using supplemental blended eLearning tools because I used commonly known reading software programs used to support the reading curriculum.

Protection of Participants' Rights

What is considered ethical in research is a matter of what a community of people agrees is right and wrong. In social research, participation should be voluntary and should not harm those participating. Social researchers have ethical obligation the research community and subjects in the study. Many researchers may be subjected to seeking prior approval from an IRB to ensure the subjects' rights and interests will be protected

(Babbie, 2017). The IRB follows guidance from the Belmont Report, which specifies ethical principles of justice, beneficence, and respect for persons (Endicott, n.d.; National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1978).

Ethical issues must be addressed to ensure the safety of research participants (Babbie, 2017). I obtained archival data for this study, eliminating any interactions or possible harm to human subjects. Before collecting data, I participated in CITI Human Subjects Training, in which I learned about ethical procedures to protect human subjects. Additionally, I obtained IRB approval (07-22-21-0766687) from Walden University and the school district in which this study was conducted. Since I used archival data from previous assessments, there were no ethical concerns about recruitment, use of incentives, or intervention activities.

The archival data obtained was deidentified for anonymity. I was given the student data in a spreadsheet, which was stored on a password-protected laptop. The spreadsheet included school identifier, student identifier, third grade reading scores, fourth grade reading scores, sex, and ELA yearly average. Documents pertaining to the data will be destroyed from the laptop after three years. To eliminate ethical issues of conducting the study within my work environment, I selected schools where I am not employed. I did not receive information about which teacher each student had because the data was scrubbed of personal information.

Data Analysis Results

As outlined earlier in this section, this project used previously collected data, which was TCAP TNReady scores for 2017-2018 and 2018-2019. For the purpose of this study, the following research question and hypotheses were tested. Is there a statistically significant difference in control group, IXL, and Reading Plus TCAP TNReady ELA scores from 2017-2018 to 2018-2019, controlling for sex, district ELA yearly averages, and third grade TCAP TNReady scores?

H_0: There is no significant difference in control group, IXL, and Reading Plus TCAP TNReady ELA scores from 2017-2018 to 2018-2019, controlling for sex, ELA yearly averages, and third grade TCAP TNReady scores.

H_1: There is a statistically significant difference in control group, IXL, and Reading Plus TCAP TNReady ELA scores from 2017-2018 to 2018-2019, controlling for sex, ELA yearly averages, and third grade TCAP TNReady scores.

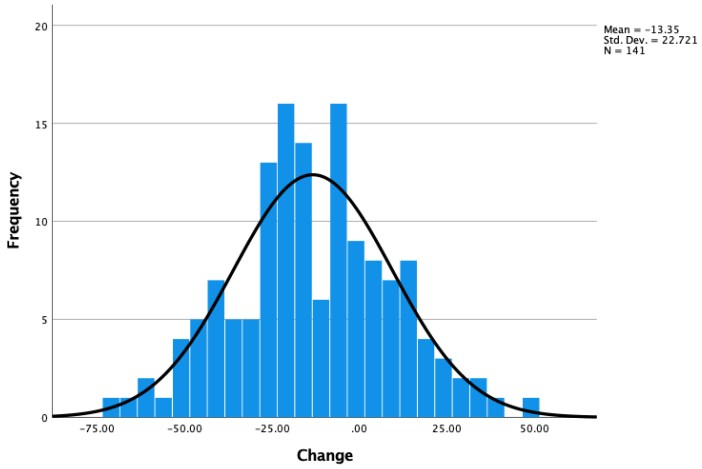
Once the data was obtained from the school district, the data were statistically analyzed using a one-way ANCOVA controlling for third grade TCAP TNReady scores, sex, and fourth grade yearly ELA averages. Using a one-way ANCOVA allowed me to determine if there were any significant differences in the control group and two treatment groups that used IXL and Reading Plus. ANCOVA is a commonly used test to compare the effect of two or more treatments while controlling for covariates that may have an impact on the dependent variable (Thomas, 2017; Wagner, 2016). A significance level of $< .05$ was used to determine if one treatment was more effective than the other.

The analysis of covariance (ANCOVA) is a statistical test used to control for the effects of a confounding variable (covariate) on the relationship or association between a predictor and outcome variable. With ANCOVA, the covariate is measured at a continuous level. The predictor variable can represent independent groups or levels of a categorical variable. The outcome is continuous with ANCOVA.

Just like with other independent group comparisons, there are certain statistical assumptions that must be met before an ANCOVA is employed. I ran five assumptions including independent observation, assumption of normality, homogeneity of variance, homogeneity of regression, and linearity. The first assumption I tested for was the assumption of independent observations. Specifically, this test refers to the similarity of ELA scale scores between the three schools. Through independence of observation, I looked for outliers within the ELA scores between schools. As shown in Figure 3, the bell shape indicates a normal distribution with no outliers. Based on the 68-95-99.7 Rule of normal distribution, the data in Figure 3 show that approximately 99.7% of the population is located within three standard deviations from the mean (Moore et al., 2013). With the normal curve, I assumed the groups had similar ELA scale scores. I then moved on to test the assumption of normality.

Figure 3

Distribution of ELA Scores



The second assumption tested the covariate and the dependent variable to meet the assumption of normality. This test ensures the dependent variable is normally distributed within each subgroup and enhances the robustness of the ANCOVA test (Frankfort-Nachmias & Leon-Guerrero, 2018). Running a Shapiro-Wilk test for normality was best suited for this study since there was a small sample size. Based on the results of the Shapiro-Wilk Test (Table 1), the *p* value for each school was greater than 0.05, indicating the data was normal. Thus, the assumption of normality was met.

Table 1

Test of Normality

	Kolmogorov-Smirnov [a]			Shapiro-Wilk		
School name	Statistic	*df*	Sig.	Statistic	*df*	Sig.
Woodmont	.098	57	.200	.980	57	.484
North Ridge	.078	28	.200	.979	28	.833
South View	.054	56	.200	.993	56	.984

a. Lilliefors Significance Correction

The third assumption was the homogeneity of variance between the independent groups. When I interpreted the SPSS data output for the ANCOVA, I looked in the Levene's Test of Equality of Error Variances (Table 2). I tested the hypothesis that the group variances are equal. This is the test for homogeneity of variance. This is the *p* value that is interpreted. If the *p* value is less than 0.05, then the research has violated this assumption and should be checked for outliers or run non-parametric tests. If the *p* value is more than .05, then the research has met the assumption and researchers continue with the analysis. In this research, with an $F = 0.620$ and a *p* value of 0.539 which is greater than 0.05 this assumption was not violated. The high *p* value in the sample results is consistent with a true null hypothesis (H_0: There is no significant difference in control group, IXL, and Reading Plus ELA scores from 2017-2018 to 2018-2019, controlling for sex, ELA yearly averages, and third grade TCAP TNReady scores.)

Next, I looked in the Tests of Between-Subjects Effects to test homogeneity of regression. These are the *p* values that are interpreted. If the *p* value is less than .05, then the covariate significantly adjusts the association between the predictor and outcome variable. If the *p* value is more than .05, then the covariate does not adjust the association

between the predictor and outcome variable. In my research, sex has a *p* value of 0.405, hence it does not significantly adjust this association. In this research study, boys and girls had similar change in ELA scores from third to fourth grade. High *p* values in this sample are consistent with a true null hypothesis. However, third grade scale scores have a *p* value of 0.000, hence it significantly adjusts the association between the dependent and independent variable. This test shows that the homogeneity of regression condition was met. This is depicted in Table 2.

Table 2

Test of Between-Subjects Effects

Source	Type III sum of squares	*df*	Mean square	*F*	Sig.
Corrected model	11656.831[a]	4	2914.208	7.046	.000
Intercept	5115.976	1	5115.976	12.369	.001
Sex	288.627	1	288.627	.698	.405
Grade 3 TCAP score	8123.431	1	8123.431	19.640	.000
School name	6147.124	2	3073.562	7.431	.001
Error	56251.736	136	413.616		
Total	94932.000	141			
Corrected total	69708.567	140			

After I tested between-subject effects, I looked at the *p* value associated with the "grouping" or categorical predictor variable. In this study, there was a statistically significant difference between the groups at the $p < .05$ level for the three conditions [$F(2) = 7.431$, $p = 0.001$] statistically significant difference between the different levels or

groups of school in this study (Table 3). That is to say that there was significant difference in ELA scores between the different schools.

Table 3

Estimated Marginal Means

			95% Confidence Interval	
School name	Mean	Std. Error	Lower bound	Upper bound
Woodmont	-11.768[a]	2.697	-17.102	-6.434
North Ridge	-27.361[a]	3.940	-35.153	-19.570
South View	-9.198[a]	2.746	-14.629	-3.767

Lastly, if the covariate was significant, and the grouping or predictor (independent) variable was significant, then researchers have evidence that there was a statistically significant difference between the groups or levels when controlling for the covariate (Frankfort-Nachmias & Leon-Guerrero, 2018). When improving the model with the inclusion of a covariate, there remains a significant effect of the independent variable on the dependent variable after controlling for the effect covariate (F (2, 20) = 3.56, $p < .05$). In my study, the covariate of third grade TCAP TNReady score and the independent variable (control, IXL, and Reading Plus) were significant; hence there is a statistically significant difference between the schools in this study. A post-hoc Bonferroni test (alpha level = 0.05) was performed to follow up the pairwise comparisons, which indicated that South View performed better than Woodmont (M = 2.570) and North Ridge (M = 18.163). See the results below in Table 4. The Bonferroni test was better suited for this analysis because I was comparing a small number of means;

thus, reducing the risk of making a Type II error (Frankfort-Nachmias & Leon-Guerrero, 2018).

Table 4

Pairwise Comparison

School name	School name	Mean difference	Std. Error	Sig.	95% Confidence Interval for difference Lower bound
Woodmont	North Ridge	15.593*	4.785	.004	3.994
	South View	-2.570	3.848	1.000	-11.897
North Ridge	Woodmont	-15.593*	4.785	.004	-27.193
	South View	-18.163*	4.870	.001	-29.968
South View	Woodmont	2.570	3.848	1.000	-6.757
	North Ridge	18.163*	4.870	.001	6.359

In this project study, I examined whether schools who implemented adaptive software reading programs observed significant gains among their students. Because the school district implemented various reading software programs to increase reading achievement among upper elementary students, three schools were compared based on their varied program utilization (IXL, Reading Plus, and no blended learning). South View used Reading Plus and performed better than North Ridge and Woodmont. Woodmont used no blended learning and performed better than students who used IXL. I did not expect Woodmont to perform better than North Ridge since they did not use any software programs. However, through the data collection, I learned that North Ridge had

a highly transient population. The findings of this study did not indicate a significant amount of growth for students at any of the schools. However, students that used Reading Plus performed better than students who used no software programs or IXL. The study's findings laid the foundation for the policy recommendation paper prepared for the district's decision-makers. Based on the findings, I chose a project study in the genre of a policy recommendation paper to address a local gap in practice.

Summary

Section 2 provided the results of the analysis used to determine if there is a difference in reading achievement between students in three elementary schools: no blended learning, IXL, and Reading Plus. A total of 141 students participated in the study. One group of students receiving IXL treatment (North Ridge Elementary), only had 28 participants compared to the two groups who had 56 and 57 participants. Students from the IXL school are transient, so 50 matched data sets could not be pulled to use for this study. All students in the study were given the TCAP TNReady test in third grade during the 2017-2018 school year. Participants took the TCAP TNReady test in fourth grade during the 2018-2019 school year. Data were collected and analyzed using ANCOVA analysis through SPSS v27.

A one-way ANCOVA was conducted to compare the differences of three different elementary schools in relation to the ELA scores for grade 4 while controlling for sex and previous third grade scores. Levene's test and normality checks were carried out and the assumptions met. There was a significant difference in mean change in ELA scores [F) = 7.431,

$p = 0.001$ between the schools. Post hoc tests (pairwise comparisons) showed there was a significant difference between schools 0 and 1 ($p = 0.004$) and schools 1 and 2 ($p = 0.001$). Comparing the estimated marginal means showed that the highest change in ELA scores were obtained in school 2 (South View Elementary, mean = -9.198) compared to schools 0 (Woodmont Elementary, mean = -11.768) and 1 (North Ridge Elementary, mean = -27.361).

Section 2 has included the results of descriptive statistics and analysis of the data for this study. Section 3 provides a description of this report, results in a summary of the overall study, and recommendations for refining current practice regarding educational technology.

Section 3: The Project

I selected a policy recommendation paper for my project study. This selection was based on findings that there was no comprehensive plan for evaluating and implementing blended learning tools at the elementary level. Because the district only had anecdotal analysis of these programs, exploring the impact these programs had on achievement scores compared to a control group helped fill a local gap in practice. The genre selected for this project was best suited to provide district administrators and teachers with evidence-based research (see Dagenais et al., 2012; Morrison et al., 2014; Slavin, 2020) on the best blended learning program to implement with the current literacy curriculum to improve reading achievement. The policy recommendation paper consists of a program description, data collection, quantitative data analysis, and recommendations for areas of refinement. I will disseminate the report to administrators in the district. The project may improve the selection of blended learning reading programs for upper elementary students, which could positively impact reading achievement among fourth grade students.

Rationale

The reading TCAP TNReady scores of fourth grade students were declining in comparison to math TCAP TNReady scores in the local school district, beginning in the 2015-2016 school year. To address this decline in scores, I examined the influence of the blended learning adaptive software programs implemented at two different Title I elementary schools in the district in the fourth grade. A control school that used no interventions helped determine whether the blended learning programs had any effect on

reading achievement. Findings provide the district with information to improve the selection of literacy software programs to aid in differentiating reading instruction in blended learning classrooms.

I developed a policy recommendation paper to examine the major outcomes of implementing these adaptive software programs for students in fourth grade. A policy recommendation paper best fit this study because it aligned to a local problem in which quantitative analysis (see Lange, 2019; Slavin, 2020) was needed to determine which blended learning reading program would best meet the needs of upper elementary students in the district. The policy recommendation paper addressed the need for analysis because the district did not analyze the impact of implementing the fourth grade blended learning initiative. Because teachers in the district recently began using a blended learning approach in their literacy classrooms, the district needed a closer look at test data. Furthermore, because schools in the district choose their own software programs, stakeholders needed a better understanding of which programs were most effective in helping students attain higher reading achievement levels (see See & Gorard, 2020; Slavin, 2020). By adding a control group that used only a traditional approach in using the current reading textbook adoption with no technology integration, the research outcomes helped to understand if blended learning had a positive effect on reading achievement.

The policy recommendation paper provides stakeholders with valuable data that will be disseminated throughout the district to the director of accountability and school improvement and the supervisor of instructional technology. The policy recommendation

paper includes a description of the adaptive software programs used by the district as interventions to support the adopted reading textbook. The report also offers the results of the quantitative analysis of test data on the implemented programs and solutions to improve ongoing support for students and teachers. The policy recommendation paper includes the purpose of the project study, the sample size, the data collection and analysis procedures, the results, and recommendations for future practice to improve reading achievement in upper elementary students.

Project Review of the Literature

In this literature review, I consider the data analysis in Section 2 and examine how research informs practice for this policy recommendation paper. The materials I examined throughout this literature review included peer-reviewed journal articles, books, and Walden University dissertations. The search engines and databases that I used included Education Research Complete, ERIC, Google Scholar, ProQuest, and ProQuest Dissertations and Theses. Combinations of search terms included the following: *evidence-based practice, impact of Covid-19 on student learning, district analysis, evaluation report, program evaluation report, policy recommendation paper, ongoing support, professional development, systemic change, meeting the needs of minority groups, literacy needs of ELL students, literacy needs of SES,* and *school improvement*.

Value of Evidence-Based Practice

Studies have indicated that administrators and teachers rarely consult research-based evidence to support or improve their practices (Dagenais et al., 2012; Morrison et al., 2014; Slavin, 2020). Instead, most educators rely on vendor recommendations, advice

from friends, or people they know and trust in similar schools and districts (Slavin, 2020). With a proliferation of instructional practices and technology tools becoming more available to schools, administrators and educators need to know which approaches have been robustly or independently evaluated (See & Gorard, 2020). In 2015, the ESSA established research-based evidence to help schools choose educational programs, products, and practices that focus on increasing students' literacy and numeracy skills (Fullan, 2020; Neitzel et al., 2021; Slavin, 2020). ESSA outlined strong, moderate, and promising levels of evidence to guide school leaders in choosing programs (Neitzel et al., 2021; Slavin, 2020). Additionally, ESSA offered federal funding to schools that chose evidence-based programs (Neitzel et al., 2021; Slavin, 2020). Through movements like ESSA, education leadership has started to focus on capacity building for individuals and groups to promote deeper learning linked to results (Fullan, 2020). According to Fullan (2019), leaders who possess nuance help their institutions' teachers and students foster deeper learning. Nuance allows leaders to participate as learners to see below the surface, helping the organization move forward (Fullan, 2019).

Evidence of effective programs undergo rigorous research with third-party evaluators, require careful matching of samples, have adequate sample size and duration, and undergo appropriate analyses (Slavin, 2020). In addition to evidence for ESSA, the What Works Clearinghouse (WWC) is another source educational leaders can consult for guidance on selecting programs for implementation. WWC provides reports on researched programs in several academic areas, including reading, math, and programs for ELLs (Cheung et al., 2021; Slavin, 2020). Low-performing schools seeking federal

grants for school improvement initiatives must choose evidence-based programs that meet one of the three ESSA definitions of proven programs (Neitzel et al., 2021; Slavin, 2020). Through ESSA's requirements for low-performing schools, school leaders and teachers across the United States are becoming more interested in knowing which programs offer the most significant effect size to make informed decisions (Neitzel et al., 2021). Using proven programs with students will benefit millions of children, teachers, and administrators who yearn for more effective tools to do their job well (Slavin, 2020).

In a qualitative study, Wijekumar et al. (2019) discovered that teachers felt like they did not have the autonomy or authority to change their teaching materials or practices. As a result, teachers only used the prepackaged teaching materials adopted by the school or district (Wijekumar et al., 2019). When the researchers interviewed administrators, they reported that teachers had access to professional development opportunities from textbook companies, frequent assessment to gauge student learning, and data meetings with teachers to determine which students were falling behind. One thing that stood out to Wijekumar et al. is that there seemed to be a missing piece to the data meetings: no follow-up of evidence-based practices to use with underperforming students. Because teachers felt constrained by the system, Wijekumar et al. recommended an increased focus on administrator decision-making based on researched studies defined by the WWC. Wijekumar et al. asserted that increasing student outcomes in reading requires more than just focusing on teacher preparation and practices. Instead, school leaders and districts should carefully review and research evidence-based literacy programs before implementation.

Recent policy shifts encouraging schools to use evidence-based practices can positively impact outcomes for students reading below grade level (Neitzel et al., 2021). Neitzel et al. (2021) reviewed 65 quantitative research studies that explored 51 different programs for struggling readers at the elementary level. All programs aligned within a response to intervention framework focusing on serving students at Tiers 1, 2, and 3 (Neitzel et al., 2021). Outcomes were positive for one-to-one tutoring and one-to-small group tutoring, with no difference between teachers and teaching assistants (Neitzel et al., 2021). The average effect size for one-to-one tutoring was +0.38, whereas small group tutoring had an average effect size of +0.31 (Madden & Slavin, 2017). Whole-class and whole-school approaches obtained positive outcomes as significant as all forms of tutoring (Neitzel et al., 2021). Technology-supportive approaches using adaptive software did not show positive outcomes unless adaptive software programs and human tutoring were used in conjunction (Madden & Slavin, 2017; Neitzel et al., 2021). Madden and Slavin (2017) speculated that using technology-assisted software programs in conjunction with paraprofessionals and small groups allows schools to reach large numbers of underperforming students at an affordable cost.

In the spring of 2020, schools worldwide faced structural and pedagogical challenges to provide accessible and high-quality learning opportunities for students of all backgrounds (Buckley-Marudas & Rose, 2020). The Covid-19 global pandemic required education leaders to lead and learn in unpredictable situations (Fullan, 2020). The challenges districts faced allowed for reflection and evaluation of remote learning experiences (Buckley-Marudas & Rose, 2020). There is a greater need for closing

achievement gaps due to school closures and remote learning. As such, it is imperative for education leaders and teachers to choose evidence-based programs tailored to their student population (Neitzel et al., 2021; Slavin, 2020).

Implementing Districtwide Analysis

The scholarship of learning and teaching includes researching and implementing teaching methods and evaluating the effectiveness of the strategies employed (Raffaghelli, 2017). Routinely gathering and using assessment data is a standard procedure within most school districts. Critically analyzing the impact implemented programs have on student achievement is critical to ensure effective practices are used to meet diverse student populations. Having a better understanding of student learning allows educators to improve teaching methods to meet the growing needs and expectations for improving the quality of education (Oriji & Amadi, 2016). In recent years, educational technology has developed at a rapid pace, but evaluation has not caught up to implementation. The frequent adoption of educational approaches without sound evidence is an underlying problem in education (Raffaghelli, 2017). Therefore, it is important for leaders of educational change to evaluate the most effective methods for implementing technology in K to 12 classrooms (Oriji & Amadi, 2016).

Despite the need to evaluate effective teaching methods, applying quality assurance models to determine the value of eLearning poses a challenge due to the complexity and novelty of technology integration in the educational system (Curpănaru, 2021). Schools have had to transform teaching methods to include 21st century skills, which require strengthening the infrastructure, creating single sign-on portals for students

to navigate platforms with ease, implementing learning management systems, experimenting with collaborative learning tools, digitizing learning materials, creating interactive lessons, and training teachers on how to effectively use technology (Curpănaru, 2021). With new models of learning in the eLearning environment, analysis must consider the interaction between teachers, students, content, and technology (Curpănaru, 2021). Curpănaru's (2021) quality assurance model suggested that pedagogical principles must be applied before the implementation of technology infrastructure. Once the infrastructure is in place, quality assurance of content development and application can be evaluated.

Evaluating whether digital tools promote higher student outcomes can be challenging for school districts but necessary to ensure limited resources are being used appropriately (Hollands & Pan, 2018). Some school districts have established strategies to systematically pilot new programs for a short period before deciding whether to implement the new product districtwide to demonstrate the effectiveness of educational tools (Hollands & Pan, 2018). For example, Hollands and Pan (2018) investigated the effect of two online adaptive math programs, eSpark and IXL, with 9,000 students in the northeastern United States. Results showed that students who used eSpark yielded an average gain of 0.54 on the Star Math Assessment, and those who used IXL had an average gain of 63 points. Further, for every hour spent using IXL, students gained 0.231 points on Star Math. Although eSpark had a lower cost per student, it was costlier than IXL due to the increased cost of materials, equipment, and license fees, and it required teacher training and support.

Blended tools for learning offer multiple benefits. Digital tools often cost less than traditional instructional materials and offer a personalized experience for students, while also offering benefits similar to teacher-led instruction. Digital tools with adaptive features provide several tools beyond simply allowing students to redundantly practice math skills (Hollands & Pan, 2018). Districts should consider personnel time involved in training and ongoing analysis when considering the cost of the digital tools. Furthermore, careful thought should be given to implementation to ensure students receive a personalized experience. Providing time for teacher training, including how to use data dashboards to meet individual student's needs, eases implementation and increases programs' fidelity (Hollands & Pan, 2018). Though practices for encouraging innovative use of digital technology come with possibilities and challenges, collaboration among teachers and students may increase over time and allow for deeper learning (Lindqvist, 2019). In a study on a laptop initiative in two schools over 2 years, school leaders and teachers focused more on the technology tools at the beginning of the initiative. The leaders and teachers slowly shifted their focus to pedagogy after troubleshooting technical challenges and managing student work.

Using Technology to Meet the Needs of Student Subpopulations

School districts often struggle with closing the achievement gap in reading for student subpopulations, such as students from racial and ethnic minority groups, students with 504 plans and IEPs, and students from low-income households (Lange, 2019; Madden & Slavin, 2017). Research has shown a gap in reading fluency proficiency among Hispanic and African American students, causing poor performance on state

reading tests and a struggle in comprehending grade-level texts (Allington & McGill-Franzen, 2021; Arnesen et al., 2017; Lange, 2019; Rasinski, 2003, 2019). However, a web-based tool, Fluency Tutor, showed an impact on third grade students living in a low-income, urban setting (Lange, 2019). The Lexia Core5 Reading program also improved reading gains across grade levels and ethnic categories (Macaruso et al., 2020). Additionally, a digital tablet study was found to have a positive effect on reading when used 40 minutes per week (Darling-Aduana & Heinrich, 2018). Educational technology tools like Fluency Tutor may not only increase elementary minority student achievement but also teacher efficiency. For instance, teachers using blended learning in their literacy classrooms focused on conducting small group instruction while other students are independently worked with technology (Horn & Fisher, 2017; Horn & Staker, 2015; Lange, 2019). According to Rombot et al. (2020), blended learning programs helped to solve limited time problems and provided required instructional materials to meet the needs of various learners. However, teachers needed training and support in their classrooms while students are using technology (Darling-Aduana & Heinrich, 2018).

Providing Ongoing Support for Teachers Through Systemic Leadership

The new generation of students, referred to as digital natives, benefit from computer-assisted technology in the learning process. Technology leadership is critical for increasing the quality of education in a digital learning environment. According to ISTE standards, technology leaders must possess visionary leadership, digital age culture, excellence in professional practice, systemic improvement, and digital citizenship (ISTE, 2018). Though school leaders have felt that technology was effective in the educational

process, it should not take precedence over learning objectives (Akcil et al., 2019). When technology was integrated intentionally at the school level, teachers felt technology was an effective tool for communicating and collaborating with each other and was beneficial for student use. Akcil et al. claimed that strong technology leadership is imperative for successful technology integration.

School leaders also often indirectly affect student learning since leaders are often the catalyst behind implementing new programs. Academic culture is a multi-variable construct that school leaders need to consider when increasing student achievement, such as teachers setting high attainable goals (Leithwood & Sun, 2018). Overall, administrators can impact student achievement by enhancing instructional efforts by providing teachers with resources, analyzing their effectiveness, and creating a supportive culture with organizational routines (Leithwood & Sun, 2018). Educators are responsible for implementing quality technology instructional strategies, often without proper training or support (Califf & Brooks, 2020). Program fidelity can only occur when school leaders implement the devices with intentionality (Horn & Staker, 2015; Kieschnick & Casap, 2017; Kim et al., 2018). Califf and Brooks (2020) found that educational systems need to incorporate teachers into the design and development of technology used by teachers.

In addition to providing ongoing support for early-to-adopt teachers, schools need to find ways to engage more reluctant teachers (Schechter et al., 2015). Teachers are often resistant to using technology in their classrooms for various reasons. One possible cause of teachers not effectively integrating technology is that they lack personal

technological skills to plan learning experiences for their students (Shaffer et al., 2015). Some teachers may also fear losing control of their students' learning (Oriji & Amadi, 2016). Others wonder if technology integration will require more work for the teacher (Oriji & Amadi, 2016). Thus, teachers and teacher candidates may need more professional development opportunities and ongoing support to implement technology effectively. A comprehensive plan requires a technology-rich learning environment supported by ongoing professional development, technology coaches, high-quality curriculum, and administrative leadership to support teachers (Buckley-Marudas & Rose, 2020; Fullan, 2020; ISTE, 2018).

A comprehensive program states the goals, offers hands-on experience, and provides scaffolding support from content coaches to maintain teachers throughout the year (Xie et al., 2017). Pedagogical change requires professional development activities spread over a semester, including 20 hours or more of contact time (Ciampa, 2017; Jones & Dexter, 2018; Urbina & Polly, 2017). However, before implementing a new program, teachers often only receive one-time training with no follow-up sessions throughout the year. Occasionally, teachers receive several sessions with collaborative conversations with colleagues. But training needs to include ongoing coaching throughout the year to model proper implementation (Topping, 2018). Additionally, increased time spent using the program increases student outcomes (Darling-Aduana & Heinrich, 2018; Kazakoff et al., 2018; See & Gorard, 2020; & Sutter et al., 2020), but teachers need ongoing support to ensure proper implementation of programs (Topping, 2018).

Knowledge about teachers' perceptions and attitudes is essential for designing and implementing effective professional development (Crompton et al., 2015). A study of 29 participants at five different elementary schools indicated that teachers understand what digital learning opportunities they should offer. They felt comfortable using the technology in their personal life but expressed concerns about the barriers when trying to use technology in their classrooms, such as a lack of devices, problems with the infrastructure, trouble with students logging in, the inability to monitor student usage, and a shortage of appropriate and ongoing professional development (Hawthorn, 2018). Further, teachers believed that blended learning supported their practices but experienced student disengagement and a lack of time to effectively learn and share ideas to implement new technologies (Sorbie, 2015). Based on these perceptions, teachers are better able to implement technology in their classroom when they are provided with support from their peers and curriculum coaches as well as ongoing support throughout the school year to ensure implementation with fidelity.

Taylor et al. (2020) found that teachers often integrate technology tools at a low level on Bloom's Revised Taxonomy and SAMR model, resulting in mixed levels of student engagement. In a yearlong qualitative study, Taylor et al. examined how 16 diverse third grade classrooms implemented digital technology during literacy instruction. Researchers interviewed and observed the 16 teachers in the study. In all but one classroom, teachers used digital programs like Lexia, Canvas LMS, digital texts on myON, and iReady. The theme that emerged from the data was a high level of activities at the substitution level on the SAMR model. The researchers observed higher levels of

engagement during teacher-led technology lessons or collaborative group work. However, Taylor et al. did not often observe increased levels of engagement and learning during literacy instruction. Overall, Taylor et al. noted that the computers used in the third grade classrooms were not transforming learning toward higher levels of thinking such as applying, evaluating, and creating. Teachers reported using technology to personalize learning and for differentiation. However, the researchers only observed teachers using technology to teach literacy disconnectedly that appeared to merely substitute traditional instruction. Taylor et al. recommended that teachers needed more training and support on implementing technology in their lessons to allow for a more transformative learning experience for students. Overall, Taylor et al. noted that having access to technology tools is not enough to support student learning. Instead, proper training and ongoing support for teachers are critical.

Project Description

The local problem identified in Section 1 was a lack of district analysis of selected blended learning adaptive reading programs. Several of the elementary schools used different blended learning adaptive reading programs to supplement the reading curriculum. This supplement differentiated the instruction to increase reading achievement in upper elementary students. The problem facing a southeastern state district is that schools in the district selected different approaches to address declining reading scores, but the district has no systematic analysis of the chosen blended eLearning tools to determine an improvement in reading growth scores among all students. This problem was evident in the school district after implementing a blended

learning initiative and providing third through twelfth grade students with one-to-one devices. Since blended learning programs within the school district are selected based on site-based decisions, the district did not evaluate the benefits of the various programs, causing a gap in practice. I developed a deliverable report in the Appendix, an evaluation of two reading software programs and provided policy recommendations on enhancing the district's blended learning initiative.

A policy recommendation paper can disseminate data analysis and recommendations to district policymakers to build understanding, inform practice, and aid decision-making (Wong et al., 2017). This project used only archived data because the schools in the district already implemented the blended learning reading programs before the study began. The project study narrative describes the blended learning programs, reports quantitative analysis of achievement scores, and communicates actionable steps in the form of recommendations for continued improvement in the district's blended learning initiative (see LaBelle, 2017).

The goals of the policy recommendation paper are as follows:

- To document the current practices of blended learning at the fourth grade elementary level in the area of reading in the local school district.
- To use quantitative measures to analyze the impact IXL or Reading Plus have on fourth grade students in the district as compared to a control group.
- To understand the impact of blended learning interventions (IXL or Reading Plus) on reading achievement of upper elementary students in the district as compared to a control group.

- To review the literature for best practices related to evaluating the impact of adapted learning software for reading.
- To make recommendations for using blended learning adaptive reading programs for the district's educational technology department at the fourth grade level.

The policy recommendation paper established valid findings for this project study. When conducting data analysis, I observed significant differences between the control group and the groups who used blended learning to supplement the adopted reading program. The policy recommendation paper suggests Reading Plus adaptive reading intervention program was effective in differentiating reading instruction for fourth grade students to increase growth and achievement.

Potential Barriers and Solutions

The researcher was responsible for collecting and analyzing the archival data provided by the local school district. I remained aware of my research biases and subjectivity throughout the study and consciously worked with my committee to conduct an ethical study and minimize personal bias. A potential barrier was researcher bias, because at the time of this study, I was employed as a fourth grade teacher at the school district. To prevent subjectivity, I selected elementary schools where I was not employed. By analyzing data from different schools, I was able to adhere to guidelines and standards for collecting and analyzing data (see Ary et al., 2006).

An additional barrier to the project study was the potential overlooking of covariates related to the implementation of the blended learning reading programs in the

study. I did not have access to many factors that can impact students' reading achievement, such as program usage, teacher experience, and teacher training and support before and during implementation. To complete the most thorough analysis with the data I had access to, I chose covariates that were common in research literature that applied to the demographics of the local school district to use in the ANCOVA.

Proposal for Implementation and Timetable

Because the project study involves a policy recommendation paper, implementation requires reporting the findings to appropriate stakeholders within the local school district. The study included quantitative analysis of fourth grade TCAP TNReady scores for students from three different elementary schools in the local school district. I will present the policy recommendation paper to the Director of Accountability and School Improvement and the Supervisor of Instructional Technology. According to Spaulding (2014), districts should evaluate programs that seek to improve student learning to determine the effectiveness in meeting the needs of the student population. My short presentation of the findings in the policy recommendation paper will take the form of a discussion with a visual presentation.

Roles and Responsibilities of the Student and Others

I am responsible for providing stakeholders with a written policy recommendation paper with thorough findings based on TCAP TNReady data provided by the school district. The policy recommendation paper presented to the Director of Accountability and School Improvement and the Supervisor of Instructional Technology will provide the evaluation as well as program strengths and recommendations for improving the district's

blended learning initiative. Findings may help the Supervisor of Instructional Technology make informed decisions about funding for software programs that target reading skills for elementary students.

Project Evaluation Plan

The policy recommendation paper provides stakeholders with evaluation findings on the effects blended learning had on fourth grade reading scores. The purpose of this project study was to examine the impact two different blended eLearning tools had on TNReady TCAP scores of fourth grade students. Using archival data allowed me to evaluate the effectiveness of the programs to report key findings to district stakeholders. The overall goal of conducting this research was to evaluate whether Reading Plus or IXL had any impact on reading growth scores for fourth grade students in the local school district. Key stakeholders include district leaders, administrators, curriculum coaches, and upper elementary teachers. Once stakeholders receive the policy recommendation paper, I will provide further information relating to the study's findings upon request.

Project Implications

The purpose of this project study was to examine the impact two different blended eLearning tools have on TNReady TCAP scores of fourth grade students. By analyzing the state assessment data of the treatment schools and control school, I gained a better understanding into the effectiveness of the implemented programs. The results for this study revealed that Reading Plus helped students make greater gains in reading achievement from third to fourth grade.

The literacy curriculum needs an immediate action of change to improve reading achievement and growth for upper elementary students. By implementing an adaptive software program in blended learning classrooms to support the reading textbook adoption, teachers will be better equipped to differentiate instruction more effectively. Elementary students have proven benefit from DI through supportive blended learning literacy programs. Ongoing teacher support in implementing these programs with intentionality is needed to ensure program fidelity. Using blended learning during reading instruction can change the way teachers meet the individual needs of their students. Intentional implementation of effective programs can bring change in how all students learn reading skills.

The policy recommendation paper is important to stakeholders because the validity of the results. The findings of the data collection and analysis will guide administrators, technology leaders, and teachers on possible solutions to improving literacy skills of upper elementary students. From the information gathered in the policy recommendation paper, district technology coaches and reading coaches can determine which literacy software programs to purchase for the entire district that aligns to supporting all upper elementary students' reading achievement. This study promotes positive social change through an increased understanding that can inform efforts to increase reading achievement in upper elementary students.

Section 4: Reflection and Conclusions

The purpose of the study was to compare the effect IXL and Reading Plus had on fourth grade reading scores. The results of the project study indicated that students using Reading Plus made greater gains in reading compared to students in the control group or those students who used IXL. A policy recommendation paper was developed to present the results of the project study to district stakeholders to promote an effective solution for differentiating instruction and supplementing the current reading textbook adoption to increase reading achievement among upper elementary students. The policy recommendation paper advocated implementing Reading Plus as an adaptive software program that would meet the needs of all students in the district. The project study was a small step in the right direction toward analyzing if purchased software programs have any impact on reading scores. Section 4 covers project strengths and limitations, recommendations for alternative approaches, scholarship, project development, and leadership and positive social change, reflection on the importance of the work, and implications, applications, and directions for future research.

Project Strengths and Limitations

The project study's strength was the design built on a current theoretical framework and research and supported through data collection from archival data in one southeastern school district. A quasi-experimental approach allowed me to collect data in order to analyze the effects the two blended eLearning software programs had on fourth grade reading scores (see Burkholder et al., 2016). The design of this project study addressed a local gap in practice where the district had not conducted a quantitative

analysis on the impact adaptive software programs had on upper elementary students' reading scores. Findings from peer-reviewed articles, educational journals, and textbooks published within the last 5 years supported the project study's results. Additionally, the project design fits the connectivism theoretical framework, a new learning theory for the digital age (see Siemens, 2005). Based on the connectivism, students can learn from technology in addition to teachers and peers (Siemens, 2005).

Recommendations for Alternative Approaches

I chose a policy recommendation paper for my project study because I wanted to investigate the impact of previously implemented software programs on reading scores. Administrators in the district expressed a concern about declining reading scores at the upper elementary level. Teachers in the district expressed frustration about the constantly changing suggestions of software programs to use in their blended learning classrooms. Teachers voiced an interest in wanting to know which programs offered most support to their students. Based on the project findings and project literature review, I concluded that the district could improve the reading achievement of upper elementary students in the following areas:

- adopt the Reading Plus adaptive literacy software program for the entire district
- adequately train all teachers and literacy coaches on how to use the software program
- determine the best approach to integrate the software program to support the current state-mandated reading textbook adoption

- offer more teacher support by devoting one technology instructional coach at the elementary level, and
- continue to conduct quantitative analysis to verify the chosen software program meets the needs of the students in the district.

Reading Plus research findings showed that it allows teachers to differentiate their instruction and offers real time feedback on a teacher dashboard that helps teachers plan targeted small group instruction. Personalizing the literacy experience for students can help increase engagement and boost achievement among all learners (Basham et al., 2016; Bingham et al., 2018). To adopt and implement the program with fidelity, teachers need ongoing support to ensure they have assistance in learning how to use the program, how to use the data feedback, and ways to implement time for students to practice using the software program (Kazakoff et al., 2018; McCarthy et al., 2020; Prescott et al., 2018; Schechter et al., 2015). The district needs a technology coach at the elementary level who can be in the classrooms weekly to monitor program usage and offer support to teachers on strategies for using program feedback (see Califf & Brooks, 2020).

Scholarship, Project Development, and Leadership and Change

The catalyst for my project study stemmed from the need to increase reading achievement in elementary students in one local school district. Teachers in the district needed evidence-based supplemental technology tools to support the reading textbook adoption. Ensuring students have practical tools during station rotation is critical in managing the literacy block and differentiating independent work.

As a scholar, I gained more knowledge about practical uses for educational technology in the literacy classroom. Through my studies, I found that adaptative software interventions proved to increase reading achievement in elementary students when paired with teacher-led small group instruction. Finding literature targeted for upper elementary reading instruction was often difficult. There were limited resources on adaptive software programs for reading. In my literature review, I realized that adaptive math software was an area of research more so than reading.

My academic coursework and research study have helped me become a better teacher, especially since the Covid-19 pandemic changed how we teach. As a remote teacher during the pandemic, I felt better prepared because of my education as a doctoral student in educational technology. As a practitioner, the research process has been fulfilling. I learned how to analyze research studies to determine validity and generalizability critically. I chose a current theoretical framework that appropriately supported my study. I learned how to analyze test data using statistical methods to deliver credible results through data collection and analysis. I learned better time management skills to manage my doctoral studies, my full-time teaching job, and my role as a wife and mother. My time as a doctoral student has been long but rewarding.

Reflection on the Importance of the Work

Technology integration is rapidly changing the educational landscape at the elementary level. With the district's blended learning adoption and one-to-one device implementation, educators need to ensure the software used in the classroom meets the students' needs to boost achievement. Students spend time on devices to produce and

interact with technology rather than consuming it. Programs that merely enhance a paper-pencil skills practice are not ideal because they do not personalize students' learning (Basham et al., 2016; Kallio & Halverson, 2020). Instead, adaptive software programs that collect real-time data on student learning have proven benefits of increasing reading achievement to support lifelong literacy skills (Kazakoff et al., 2018; McCarthy et al., 2020; Prescott et al., 2018; Schechter et al., 2015). The importance of the project study is the impact it has on the district's selection of blended eLearning software programs. The study showed that Reading Plus helped students show more reading achievement growth than IXL or no interventions. The policy recommendation paper was inspired by the findings and provided a detailed analysis, recommendations, and next steps to district administrators and technology and literacy coaches. The importance of the project study is significant to the field of educational technology and encourages change in one learning organization system.

Implications, Applications, and Directions for Future Research

The purpose of this comparative quantitative project study was to determine the influence two different blended eLearning tools, Reading Plus and IXL, had on TCAP TNReady ELA scores of fourth grade students. The data analysis indicated that students using Reading Plus made more significant gains than IXL or those in the control group.

In addressing the implication for social change, I provided recommendations to one southeastern school district to improve technology integration that may impact increased reading scores among upper elementary students. I provided a quantitative analysis of two different blended eLearning tools used in two different schools using

archival data from the TCAP TNReady scores. With the data analysis, I provided recommendations for the school district, including (a) ongoing analysis using test scores to determine if the adaptive software programs are meeting the needs of all students in the district, (b) critically evaluating how the adaptive software programs are being implemented in the classroom to support the current reading textbook adoption, and (c) supporting elementary teachers with ongoing professional development and in-person coaching in each of the eight elementary schools. The implementation of ongoing technology professional development provided by a technology coach can help classroom educators maintain proficient technical skills to understand how to use the software programs and teacher dashboard analytics to personalize the learning experience for students, which can enhance student success.

I completed research on technology integration at the upper elementary level in the literacy classroom at three elementary schools in the district. This study can be further extended by conducting data analysis at all the elementary schools in the district. Another recommendation for this study would be to extend the research to the middle school level to determine how students perform in reading after transitioning from fourth to fifth grade, where the curriculum, materials, and teaching strategies change. Additionally, district leaders can conduct future research at the primary grades once one-to-one device deployment is implemented. District checkpoint data can be used because the primary grades do not have TCAP TNReady scores.

Conclusion

Despite the desire to differentiate instruction for students, many educators struggle to use technology effectively in a balanced literacy program. Educators need guidance on intentionally selecting evidence-based software programs that have proven benefits to boost reading achievement. Researchers have established that adaptive software programs increased reading achievement among elementary students when implemented with fidelity (Kazakoff et al., 2018; McCarthy et al., 2020; Prescott et al., 2018; Schechter et al., 2015). This study provided updated information about the impact two different blended eLearning programs had on reading scores within the local school district.

Positive social change is necessary for the educational realm to promote the development of individuals, communities, and organizations (Walden University, n.d.). This study provided recommendations to help create social change within the district. Positive social change depends on school administrators' and educators' effectiveness and collaborative efforts. The challenge remains for a collaborative approach between administrators, technology coaches, literacy coaches, and teachers to discover innovative strategies for meeting the needs of elementary students to improve literacy skills. Once students reach the middle school level, closing the achievement gap becomes more complex (Messer & Nash, 2018; Neitzel et al., 2021; Schechter et al., 2015; Shamir et al., 2018; Slavin, 2020).

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Appendix: The Project

Policy Recommendation for Adaptive Software Programs in Upper Elementary Blended Learning Classrooms

Executive Summary

Elementary educators must improve literacy skills before students reach the middle school level, where closing the achievement gap becomes more complex (Messer & Nash, 2018; Neitzel et al., 2021; Schechter et al., 2015; Shamir et al., 2018; Slavin, 2020). Evidence of blended learning's influence on student learning at the elementary level continues to grow. Though researchers have demonstrated that adaptive practice software is an effective tool for primary grade students, they have not fully established the impact of blended eLearning tools on upper elementary students in a suburban school setting. This southeastern state district's problem was that elementary schools selected different interventions to address declining reading scores. The district had no systematic analysis of the chosen adaptive reading eLearning interventions to determine an improvement in reading growth scores among all students. Analysis of TCAP TNReady scores of upper elementary students across three schools in the district indicated that students who used Reading Plus for one year had better reading outcomes than students who used no software programs or IXL. Using an adaptive software program as a supplement to the adopted reading curriculum may assist teachers in differentiating instruction for students.

Based on findings that blended learning positively affected reading scores, it would be beneficial to consider the following recommendations:

- conduct an ongoing systematic analysis of selected programs
- critically evaluate the use of adaptive software programs
- provide ongoing educational technology support to elementary teachers by providing an additional instructional coach devoted to elementary teachers

Introduction

The problem facing this southeastern state district was that elementary schools selected different interventions to address declining reading scores, but the district had no systematic analysis of the chosen adaptive reading eLearning interventions to determine an improvement in reading growth scores among all students. There was limited analysis to examine if there was a statistically significant difference in TCAP TNReady ELA scores from 2017-2018 to 2018-2019 between IXL and Reading Plus, controlling for sex, district ELA yearly averages, and third grade TCAP TNReady ELA scores. This project study addressed a local problem by focusing specifically on implemented blended eLearning tools to support elementary students' reading achievement. The purpose of this study was to examine the difference in TCAP TNReady ELA scores from 2017-2018 to 2018-2019 between three schools (no blended learning, IXL, and Reading Plus), controlling for sex, ELA yearly averages, and third grade TCAP TNReady ELA scores.

Background

Schools and educators across the nation place high regard on increasing student achievement, as proficient reading skills allow students to develop foundational skills for lifelong learning (McCarthy et al., 2020). However, recent national and state achievement assessment data for reading show an alarming trend. The 2019 National Assessment of

Educational Progress (NAEP) report indicated that average reading scores for grades 4 and 8 were lower than 2017 scores (National Center for Education Statistics, 2019). According to this report, fourth grade students scoring at or above NAEP proficient fell from 37% in 2017 to 35% in 2019 (National Center for Education Statistics, 2019). Similarly, eighth grade students fell from 36% in 2017 to 34% in 2019 (National Center for Education Statistics, 2019). Similarly, the Tennessee State Report Card indicated that students in the district of this study are showing less academic growth in English Language Arts (ELA) compared to Math (TN Department of Education, n.d.). The southeastern state school district quarterly checkpoint assessment data also indicated that reading lagged behind math scores in fourth grade, particularly with English Language Learners (ELLs; Principal, personal communication, January 9, 2020), as displayed in a table for teachers to view during the checkpoint data meeting.

Because research indicated that blended learning interventions improve standardized test scores, one southeastern state school district launched a blended learning initiative in 2016 to infuse technology in grades 3-12. This initiative provided students with 1:1 laptop devices, access to various software programs, and professional development for teachers. The district modeled their personalized blended learning plan from Tennessee's Personalized Learning Task Force Report, which offered guidance to Tennessee educators on leveraging technology to provide students with pathways to success (Tennessee Department of Education, 2016).

Once one-to-one laptops, or 1:1, were implemented in third and fourth grades in the school district, school administrators and teachers began searching for software

programs to enhance student outcomes. Elementary schools chose different programs, and some chose no programs. Reading Plus and IXL were two adaptive software programs used by two different schools in the district that required a paid subscription.

Like other studies about reading software selection (Delgado et al., 2015; Zawilinski et al., 2016), educators debated which blended learning software programs had the most positive impact on student achievement. Administrators in the district expressed growing concern about whether the recent 1:1 blended learning initiative was impacting state achievement scores (Supervisor of Instructional Technology [pseudonym], personal communication, December 8, 2019). The district's Five-Year Strategic Plan 2017 stated that the district's goal is to continue refining effective technology applications in elementary grades. According to the Tennessee Department of Education, districts across the state reported concerns of "developing an efficient process for vetting new and expanding digital content and tools" (Owen, 2016, p. 8). Both Reading Plus and IXL have independent studies to support their claims (IXL, 2021; Reading Plus, 2020). Because there appears to be a gap in peer-reviewed practice literature about the effect IXL or Reading Plus has on declining reading scores in upper elementary students in suburban schools, hindering decisions on software programs by the schools. Examining the impact of blended eLearning tools on academic achievement fills this systematic analysis void in the local gap of practice.

The policy recommendation examined the differences that two blended eLearning software programs had on fourth grade TCAP TNReady reading scores. Because the interventions occurred before this project, I evaluated the software programs' impact on

TCAP TNReady reading scores using archival data. Although 2018-2019 was the first year of implementation at the school level, this analysis may support IXL or Reading Plus's implementation at the district level. The purpose of the project was to examine the difference in TCAP TNReady ELA scores from 2017-2018 to 2018-2019 between three schools (no blended learning, IXL, and Reading Plus), controlling for sex, ELA yearly averages, and third grade TCAP TNReady ELA scores. By analyzing the state assessment data of the treatment schools and one control school, I gained insight into the effectiveness of the implemented programs. The data collection and analysis findings will guide administrators, technology leaders, and teachers in improving the literacy skills of upper elementary students.

Evidence

To evaluate the amount of growth students showed from TCAP TNReady data because of using different eLearning tools, I used a one-way ANCOVA on the score gains (change) with the beginning scores as one of the covariates. The chosen covariates selected for this study were sex, ELA yearly averages, and the third grade TCAP TNReady ELA scores. Based on the literature review, I discovered that boys often scored lower in reading achievement than girls (see Pace & Mellard, 2016). Therefore, sex was included as my first covariate. Students' ELA yearly averages could cause changes in reading test scores. Therefore, ELA yearly averages were included as a covariate to help me determine the treatment's impact on students' test scores. The final covariate, third grade TCAP TNReady ELA scores, was chosen to help me have more robust research

findings and to ensure homogeneity between the three groups (see Burkholder et al., 2016).

I examined the TCAP TNReady ELA test scores of 141 fourth grade students from North Ridge School, South View School, and Woodmont School (pseudonyms) stored in the school district's student information service database, PowerSchool. One group of students receiving IXL treatment (North Ridge Elementary) only had 28 participants compared to the two groups who had 56 and 57 participants. This study's treatment schools were selected because they had similar demographics and used IXL Reading and Reading Plus blended learning reading software programs for literacy support. The control school, Woodmont School, was selected because the school had similar demographics and state report card scores as the two treatment schools in years 2017-2018 and 2018-2019. The control school did not use any form of blended learning programs for reading. There were no other schools in the district using the two blended learning programs that met the criteria.

Significant differences were found between the control group and the groups that used blended learning to supplement the adopted reading program. I performed a one-way ANCOVA to determine if there was a difference in the mean change scores of the three schools. The Reading Plus adaptive reading intervention program effectively differentiated reading instruction for fourth grade students to increase growth and achievement. There was a significant difference in mean change in ELA scores for at least two schools, (F (2, 136) = 7.43, p <.001), as shown in Table A1. The F statistic is simply a ratio of two variances, or a measure of dispersion or how far the data are

scattered about the mean. It essentially just compares the joint effect of all variables together. Larger values represent greater dispersion. Post hoc tests (pairwise comparisons) showed there was a significant difference between Woodmont Elementary and North Ridge Elementary ($p = 0.004$) and North Ridge Elementary and South View Elementary ($p = 0.001$).

Table 1

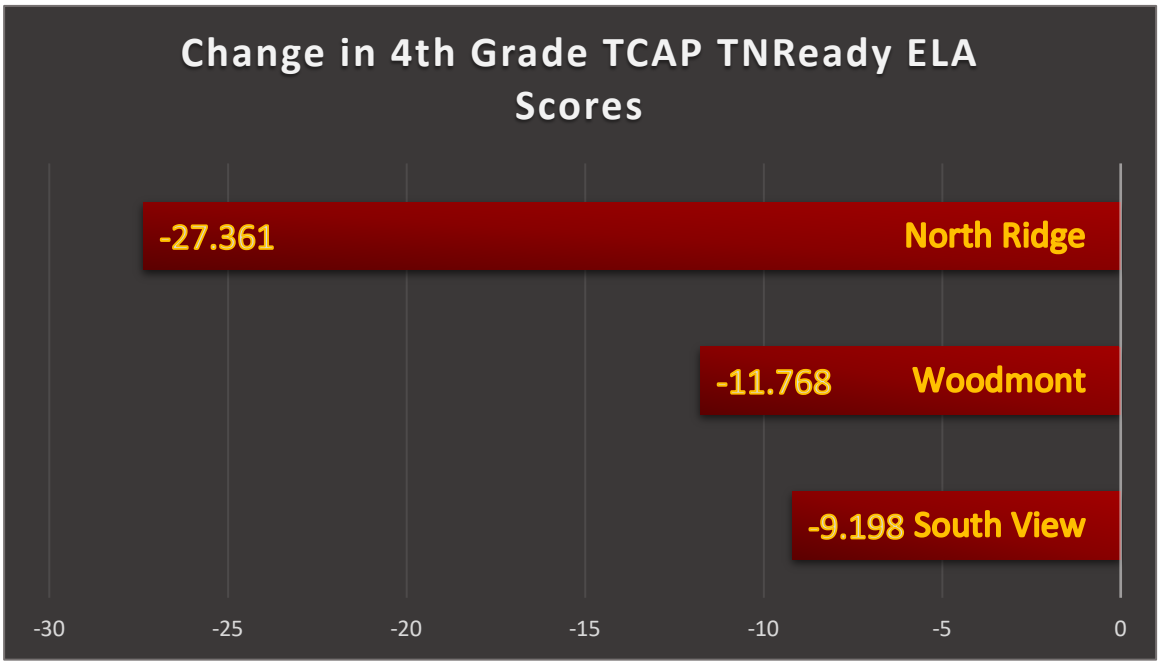
One-Way ANCOVA Test Results

	Sums of Square	*df*	Mean Square	*F* Statistic	Sig.
School Name	6147.12	2	3073.56	7.431	.001
Error	56251.74	136	413.62		

Follow-up tests demonstrated a significant difference in ELA scores between Woodmont and Northridge Elementary and between Northridge and Southview elementary. There was no significant difference between ELA mean change scores for Southview and Woodmont elementary. Figure A1 shows the estimated marginal means demonstrating the most significant change in ELA scores occurred in South View Elementary (mean = -9.198), compared to Woodmont Elementary (mean = -11.768) and North Ridge Elementary (mean = -27.361). Although significant loss was observed in all schools, South View had the least gains.

Figure 1

Estimated Marginal Means



To put it plainly, South View used the same reading program, but had better reading outcomes than Woodmont and North Ridge. This could be attributed to the use of Reading Plus adaptive software as a supplement to the regular literacy curriculum. Due to high transiency among the student population at North Ridge, students in this school need additional support to increase their literacy skills.

Recommendations

While the gains were not as expected, this is a trend we have been seeing in our district reading scores over the past several years. This problem was a catalyst for this research study. As a district, it is important to identify which schools are showing the least amount of loss to pinpoint what programs have the greatest outcome for our students. Based on findings that blended learning positively affected reading scores, it

would be beneficial for the decision-makers to consider the following recommendations to improve technology integration and ultimately increase reading scores among upper elementary students.

Recommendation 1: Conduct Ongoing Systematic Analysis

Reading Plus helped students make more significant gains in reading achievement from third to fourth grade than IXL. Conducting ongoing analysis is critical for determining which programs are meeting the needs of the students in the district.

It is recommended that district administration consult Evidence for ESSA or the What Works Clearinghouse (WWC) as a source for guidance on selecting programs for implementation (Cheung et al., 2021; Neitzel et al., 2021; Slavin, 2020). Once evidence-based programs are chosen and implemented, it is recommended that district administration conduct an ongoing analysis of district and state test scores to determine the impact of reading instructional materials on student achievement and growth (Oriji & Amadi, 2016; Raffaghelli, 2017). The data analysis findings should be communicated to curriculum coaches and teachers (Wijekumar et al., 2019). Furthermore, district technology coaches and reading coaches can determine which literacy software programs to purchase for the entire district. Based on the results of the study, and evidence from previous research (Macaruso et al., 2020; Prescott et al., 2018), I recommend choosing one adaptive software program for the district will provide consistency among the schools and a stable learning environment for transient students (Macaruso et al. 2020; Prescott et al. 2018; Schechter et al., 2015).

Data analysis can be further extended to all of the elementary schools in the district to determine if the blended learning initiative is having a positive impact on student achievement. Additionally, this study could be extended to the middle school level to determine how students perform in reading after transitioning from fourth to fifth grade, where the curriculum, materials, and teaching strategies change. Furthermore, future research can be conducted at the primary grades once one-to-one device deployment is implemented. Because the primary grades do not have TCAP TNReady scores, district checkpoint data can be used.

Recommendation 2: Critically Evaluate Use of Adaptive Software Programs

It is recommended that administrators, curriculum coaches, and the IT department monitor program usage to determine if teachers are using the selected adaptive programs with fidelity. Lack of program usage can indicate several problems, including a need for more professional development opportunities, assisting teachers in integrating the program with the state-adopted textbook, or providing more opportunities to determine if the program is meeting the needs of the student population.

This study supports previous research studies that found using literacy software programs in blended learning classrooms has motivational benefits and increases student achievement (Kazakoff et al., 2018; Kolchenko, 2018; Macaruso et al., 2020; Mitchell, 2018; Prescott et al., 2018; Shamir et al., 2017; Storey et al., 2020). Technological tools aid in assessing student performance, providing real-time data, supporting student learning, and planning for whole group and small group instruction (D'Agostino & Kowalski, 2018; Mitchell et al., 2018; Pace & Mellard, 2016; Terrazas-Arellanes et al.,

2017). Moreover, students in blended learning classrooms are more motivated and engaged, thus increasing achievement (Bennett et al., 2017; Kaman & Ertem, 2018; Stork et al., 2018).

To differentiate instruction in reading, teachers often meet with small groups of students during literacy stations. In a blended learning classroom, teachers are better able to maximize their time by utilizing literacy software programs to support student learning while meeting with small groups of students (D'Agostino & Kowalski, 2018; Pace & Mellard, 2016; Sutter et al., 2020; Terrazas-Arellanes et al., 2017). Using supportive resources, like CAI and adaptive software programs, targets student performance with real-time feedback. Adaptive software programs can mimic human tutoring by scaffolding learning and providing a sequence of content each student needs to progress (Xu et al., 2019). Using adaptive learning software personalizes struggling students' learning experience and advanced students (Basham et al., 2016). Research shows adaptive software programs can increase student achievement and can close the achievement gap, particularly with low-SES and ELL students (Kazakoff et al., 2018; Kolchenko, 2018; Macaruso et al., 2020; Mitchell, 2018; Prescott et al., 2018; Shamir et al., 2017).

Recommendation 3: Provide Ongoing Educational Technology Support to Elementary Teachers

The literacy curriculum needs immediate change to improve reading achievement and growth for upper elementary students. By implementing an adaptive software program in blended learning classrooms to support the reading textbook adoption,

teachers will be prepared to differentiate instruction (Baron et al., 2019; Kazakoff et al., 2018; McCarthy et al., 2020; Prescott et al., 2018; Puzio et al., 2020; Schechter et al., 2015). Ongoing teacher support in implementing these programs with intentionality ensures program fidelity. Using blended learning with intentional usage of evidence-based programs during reading instruction can transform the way teachers meet the individual needs of their students.

It is recommended that the district expand the Teacher Technology Leader program to include an elementary instructional technology coach to serve teachers and students. Professional development provided by a technology coach will help classroom educators maintain proficient technology skills (Califf & Brooks, 2020; Leithwood & Sun, 2018). An elementary technology coach can also help teachers gain a better understanding of how to use the software programs and teacher dashboard analytics to personalize the learning experience for students (Fullan, 2020; ISTE, 2018; Buckley-Marudas & Rose, 2020). Having one instructional technology coach devoted to serving only the elementary teachers will allow for more in-class modeling, guided planning for intentional technology use, and scaffolded support for teachers.

Conclusions

Despite the desire to differentiate instruction for students, many educators struggle to use technology effectively in a balanced literacy program. Intentionally selecting the most effective software programs boosts reading achievement among elementary students when implemented with fidelity (Kazakoff et al., 2018; McCarthy et al., 2020; Prescott et al., 2018; Schechter et al., 2015). This study provided updated

information about the impact two different blended eLearning programs had on reading scores within the local school district.

Positive social change is necessary to promote the development of individuals, communities, and organizations (Walden University, 2021). This study provided recommendations to help create social change within the district. Positive social change depends on the effectiveness and collaborative efforts between school administrators and educators. The challenge remains for administrators, technology coaches, literacy coaches, and teachers to discover innovative strategies for meeting the needs of elementary students. Elementary educators must improve literacy skills before students reach the middle school level, where closing the achievement gap becomes more complex (Messer & Nash, 2018; Neitzel et al., 2021; Schechter et al., 2015; Shamir et al., 2018; Slavin, 2020).