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Effects of Lexia Reading Core5 on Non-ELL Upper Elementary Students' Reading Comprehension

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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
the review committee have been made.

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Walden University
2024

Abstract

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Comprehension

by

Jane Jordan Carroll

Ed.S., Lincoln Memorial University, 2010

MA, Cambridge College, 1998

BS, Armstrong State University, 1996

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Education

Reading. Literacy and Assessment

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Abstract

Students at an elementary school in urban Georgia scored below grade level in comprehension on the state's end-of-the-year assessment. School leadership implemented Lexia Core5, a blended learning program. The purpose of this quantitative study was to determine the effect of the Lexia Reading Core5 program on the reading comprehension skills of non-ELL upper elementary students performing below grade level in reading comprehension. The theoretical framework was comprised of elements of Thorndike's theory of learning connectionism and Gagne's aptitude treatment interaction because Lexia Core5 allows students to practice skills to reinforce reading development and engages students in a trial-and-error style of learning. The research questions were used to detect any statistically significant differences in the overall reading achievement scores between nonparticipants and participants of fourth- and fifth-grade non-ELL students who used Lexia Core5 intervention during the 2017-2019 school years. A Mann-Whitney U test was used to evaluate if there was a statistically significant difference between the mean analysis of the state test scores (n=8). The results indicated no statistically significant difference in the state reading scores ($p > .05$). Results may encourage positive social change in school districts by encouraging additional professional development, support, and opportunities to collaborate with peers on effectively using computer-assisted instruction. Through this instruction, educators will provide interventions that will eventually reduce achievement gaps in reading comprehension of non-ELL upper elementary students reading below grade level.

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Dedication

First, giving all honor and praises to God, whose favor, grace, and mercy made this doctoral journey possible. God gave me the patience and strength of tenacity to keep going during times of doubt and insecurity. To my wonderful praying family who supported me throughout this process: My Husband, Dr. Edward, Carroll, children Edward III (Caprice), daughters Danielle (Tajada), and Dr. Jordan Ashley, you all believed in me and knew I could before I did. To my mother, Arabelle Jordan, thank you for your strength. Thank you; all are my MVPs.

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The road to completing a doctoral degree is challenging; however, with the help of a unique group of people, I got through this process. I am grateful to my committee members, Dr. Nancy Williams and Dr. Amy White, for their guidance through this challenging process. Thank you, Dr. Perrine Taylor and Dr. Yolanda Beavers, for your time, support, and technical abilities. I will never forget you!

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Chapter 1: Introduction to the Study

According to Groover et al. (2019), comprehension is a cognitive process that necessitates communication between the reader and the text. The National Institutes of Health (2022) stated that understanding of what you read is essential to improving your reading abilities. It emphasized that every child has the mental ability to begin to read (National Institute of Health, 2022). However, to support their potential for reading comprehension, certain students require extra help, as stated by Campbell et al. (2022). Differentiated instruction is supported by computer-based applications that allow for the creation of personalized learning profiles and real-time data production. When students require extra help because they lack core skills, differentiation in reading instruction can be extremely important.

Blended learning, which has been gaining momentum in elementary schools for over 50 years, is characterized by the integration of digital technology with teacher-led instruction (Fletcher, 2018). Students may use digital tools at home or in the classroom as they choose. Instructors can modify their lessons to fit the requirements of certain students, especially those who are struggling academically, by using online activities. Because of this flexibility, educators are able to provide individualized teaching based on real-time performance data provided by the digital component (Macaruso et al., 2020).

Lexia Core5 offers a blended learning strategy, according to Cambium Learning Group (2023), that blends offline resources and digital components with organized, methodical exercises to help teachers prepare their classes. The offline resources consist of Lexia Lessons®, which are accessible to students when they encounter difficulties

with skills in the digital component, and Lexia Skill Builders®, which are pencil-and-paper exercises that students complete on their own to develop automaticity and generalize skills outside of the digital component (Macaruso et al., 2020).

This chapter presents the background, problem statement, the purpose of the study, and research questions with hypotheses. The theoretical framework, nature of the study, definitions, and assumptions are also detailed. The final areas covered are the scope and delimitations, limitations, significance, and study summary.

Background

During the 2017- 2018 and 2018 -2019 academic years, fourth and fifth-grade students in an urban school district in Atlanta, Georgia, scored below grade level, specifically in reading comprehension on the Georgia Milestones Assessment System (GMAS) demonstrated in Figure 1 (Georgia Department of Education, 2020). According to GMAS administration data, this elementary school had a higher percentage of beginning-learners than the district- and state-wide scores. Furthermore, the school's performance in the distinguished and proficient categories fell short of the state average. Teachers were made aware by these findings that these pupils could require additional comprehension practice to advance to the following grade level (Administrator, personal communication, February 2020). Reading comprehension achievement needs to be encouraged and elevated, according to the school's College and Career Ready Performance Index (CCRPI), a tool for school development (Georgia Department of Education, 2019). This study is needed to determine if the computer-assisted program Lexia Reading Core5 affected the reading comprehension skills of upper non-English

language learner (ELL) elementary students performing below grade levels in reading

comprehension.

Figure 1

Georgia Milestone Assessment System

Beginning Learners	Developing Learners	Proficient Learners	Distinguished Learners
• **do not yet demonstrate proficiency** in the knowledge and skills necessary at this grade level/course of learning, as specified in Georgia's content standards.The students need substantial academic support.	• **demonstrate partial proficiency** in the knowledge and skills necessary at this grade level/course of learning, as specified in Georgia's content standards.The students need additional academic support.	• **demonstrate proficiency** in the knowledge and skills necessary at this grade level/course of learning, as specified in Georgia's content standards. The students are prepared for the next grade level.	• **demonstrate advanced proficiency** in the knowledge and skills necessary at this grade level/course of learning, as specified in Georgia's content standards.The students are well prepated for the next grade level or course and are well prepared for college and career readiness.

Problem Statement

This study addressed the problem of non-ELL upper elementary students

performing below grade levels in reading comprehension. According to Robert Gagne

(1985) remedial model allows the teacher to provide a building block of knowledge that

will close the achievement gap. Macaruso et al. (2019) chronicled the gap found in the

research literature. They suggested studies would benefit from examining Lexia Core5

with upper elementary students. Prescott et al. (2018) investigated the blended learning

program Lexia Core5 with a study examining implementing a blended learning program

for literacy instruction across kindergarten through Grade 5 students. The results

indicated that students who used the program outperformed those who did not. The

results also suggested that there is a benefit of a blended learning approach to literacy

instruction for diverse students when beginning instruction in early grades, thus improving the reading skills of students.

Additional updated studies are needed to address the literature gap about practice, focusing on whether the computer-assisted Lexia Core5 affected the reading comprehension skills of non-ELL upper elementary students performing below grade levels.

Purpose of the Study

The purpose of this quantitative study was to determine the effect of the Lexia Reading Core5 program on the reading comprehension skills of upper non-ELL elementary students performing below grade levels in reading comprehension. The research site was a school district in Atlanta, Georgia. The participants were fourth and fifth-grade non-ELL students who scored below grade level, specifically in reading comprehension on the GMAS (Georgia Department of Education, 2020). The independent variable for this study was participation (or not) in the treatment group comparing Lexia Core5. The dependent variable is the GMAS performance of fourth and fifth-grade non-ELL students.

Research Questions and Hypotheses

The two research questions and hypotheses were similar because two different grade levels were used in this study. I did a quasi-comparison because I was interested in the growth between low-performing students who were at 0% -30 % of their grade level and received the intervention of Lexia Core5 in 2017 with those students in 2016 before

the intervention was introduced. The GMAS summative comprehension test is administered annually to fourth and fifth-grade students during the Spring.

RQ1: To what extent, if any, does a significant mean difference exist in the overall reading achievement scores as measured by the 2017 standardized GMAS between the lower 35% of non-ELL fourth-grade students who participated in the computer-assisted Lexia Core5 intervention and those lower 35% non-ELL fourth-grade students who did not participate in the intervention during the 2016 school year?

$H_0$1: There is no statistically significant difference in the overall reading achievement scores as measured by the 2017 standardized GMAS between the lower 35% non-ELL fourth grade students who did and the lower 35% non-ELL who did not participate in the computer-assisted Lexia Core5 intervention during the 2016 school year.

H_a1: There is a significant difference in the overall reading achievement scores as measured by the 2017 standardized GMAS between the lower 35% non-ELL upper fourth-grade students who did and the lower 35% non-ELL who did not participate in the computer-assisted Lexia Core5 intervention during the 2016 school year.

RQ2: To what extent, if any, does a significant mean difference exist in the overall reading achievement scores as measured by the 2017 standardized GMAS between the lower 35% of non-ELL fifth-grade students who participated in the computer-assisted Lexia Core5 intervention and those lower 35% non-ELL fifth-grade students who did not participate in the intervention during the 2016 school year?

$H_0$2: There is no significant difference in the overall reading achievement scores as measured by the 2017 standardized GMAS between the lower 35% non-ELL fifth-grade students who did and the lower 35% non-ELL who did not participate in the computer-assisted Lexia Core5 intervention during the 2016 school year.

H_a2: There is a statistically significant difference in the overall reading achievement scores as measured by the 2017 standardized GMAS between the lower 35% non-ELL fifth-grade students who did and the lower 35% non-ELL who did not participate in the computer-assisted Lexia Core5 intervention during the 2016 school year.

Theoretical Foundation

Two theories supported this study. First, there was Thorndike's (1913) theory of learning connectionism. This approach included Thorndike's work law of effect and the revised law of exercise. The two constructs influenced the acceptance of the reinforcement theory. Thorndike's theory assisted in the development of computer-assisted instruction (Thomas, 1970). This theory was appropriate to this study and the research questions because Lexia Core5 allows students to practice skills to reinforce reading development and provides instant feedback as they work through the various levels, engaging in a trial-and-error type of learning. The law of effect states that when a modifiable connection between a situation and a response is made and accompanied or followed by a satisfying situation, that connection's strength is increased; when made and accompanied or followed by an annoying situation, its strength is decreased (Thorndike, 1913).

The law of exercise refers to connections that become strengthened with practice and weakened when practice is discontinued.

The other theory aptitude-treatment interactions were thought to improve instruction by considering each student's differences (Preacher and Sterba, 2019). Different instructional procedures may lead to the same learning outcomes in interaction with aptitudes (Salomon, 1971). According to Salomon (1971), Robert Gagne's (1965) remedial model allows the teacher to provide a building block of knowledge to close the achievement gap and increase non-ELL students reading comprehension (Salomon, 1971).

Nature of the Study

The variables included in this research study were the independent variable - participation in Lexia Core5, and the dependent variable: the non-ELL, fourth and fifth-grade students. The methodology for this quantitative study was a quasi-experimental research design that included using a Mann-Whitney U test to compare reading achievement scores among non-ELL upper elementary students who received the computer-assisted Lexia Core5 intervention and students who did not. The mean for each group was computed and should help determine if one group of upper elementary students did or did not outperform the other. I used student test scores from the standardized Georgia Milestones Assessment at the end of 2016 and 2017. The years and grades included were 2016 and 2017, with the lower 35% of non-ELL fourth and fifth-grade students who received the intervention in 2017 and students who did not in 2016.

Definitions

Adaptive learning environment: An adaptive learning environment is an instructional design where personalizing the environment and instructional process includes different instructional parameters such as a sequence of tasks, task difficulty, time, type of feedback, the pace of learning speed, and reinforcement plan (Villesseche et al., 2019).

Aptitude treatment interaction: Aptitude treatment interaction is an instructional practice for students with varying aptitudes in which teachers may use different instructional procedures to individualize teaching (Salomon, 1971).

Blended learning: Blended learning generally applies to online and in-person learning experiences when instructing students (Macaruso et al., 2020).

The College and Career Ready Performance Index (CCRPI): The CCRPI is Georgia's annual tool for measuring how well its schools, districts, and state prepare students for the next educational level. It provides a comprehensive roadmap to help educators, parents, and community members promote and improve college and career readiness for all students (Georgia Department of Education, 2022).

English language learners, also ELL (non): Non-ELL students are those who need help communicating fluently or learning effectively in English often come from non-English-speaking homes and backgrounds. They typically require specialized or modified instruction in both the English language and in their academic courses (Cho et al., 2019).

Georgia Milestone: Georgia Milestone is a school year-end assessment tool representing a single system of summative assessments spanning all three levels of the state's educational system (Georgia Department of Education, 2022).

Every Student Succeeds Act of 2015 (ESSA): The ESSA is legislation demonstrating the commitment of the United States government to advance equality in education by increasing the autonomy of state agencies in policymaking (Chu, 2019).

Lexia Core5: Lexia Core5 is a computer-assisted reading instruction program for pre-kindergarten through fifth-grade students. (Lexia Learning, 2022). As students advance through the 21 lessons, the program targets gaps in skills (Lexia Learning, 2022).

Reading comprehension: Reading comprehension is the connecting of prior knowledge and language skills to create meaning and connection in texts. The reader actively extracts essence from the text and constructs the meaning from prior knowledge (Grover et al., 2019).

Science of reading: Science of reading is a phrase representing the accumulated knowledge about reading, reading development, and best practices for reading instruction obtained using the scientific method (Petscher et al., 2020).

Assumptions

The first assumption made in this study is that not all students completed the GMAS assessments to the best of their abilities. The study also assumes that students may not have consistently followed the weekly usage recommended by Lexia Core. Furthermore, when using secondary data from the public website provided by the state, it

is assumed that the correct student-level test scores are submitted for analysis. Quantitative studies may not always give the entire account but only a snapshot of how students' reading comprehension skills have changed (Rahman, 2017).

Scope and Delimitations

The study's scope was regarding the possible effects that Lexia Core5 would have on the reading comprehension of non-ELL upper elementary students. The researcher will not examine the impact of Lexia Core5 on kindergarten to third-grade students. The study was not expanded to students of other grades because other grades did not participate in taking the GMAS. Additionally, students' reading comprehension was measured using a single assessment.

Limitations

Limitations on research are weaknesses within a research design that may influence the outcomes and conclusions of the research (Vargas & Mancia, 2019). One limitation that likely affected study results was that the format of Lexia Core 5 could distract students and lead them to consider the program as a novelty instead of an actual aid in assisting instruction and learning. Students may guess through problems instead of retaining the information. Participants in this study were fourth and fifth-grade students from the research site. Another limitation was that there needed to be a way to ensure or measure the fidelity of the Lexia program's implementation.

Significance

The study may add to the existing literature on how teachers in fourth and fifth grades teach reading comprehension using Lexia Core5 to mitigate the challenges of non-

ELL students reading below grade level. The study may also help Georgia's students, teachers, and curriculum planners make informed decisions on what type of computer-assisted instruction would augment the current curriculum to improve the comprehension skills of upper elementary students. The students may have more opportunities for higher education and a wide range of job choices, contributing to positive social change.

Summary

The problem addressed through this study was that non-ELL upper elementary students were performing below grade levels in reading comprehension. Few peer-reviewed, scholarly studies have included low-performing and non-ELL students (Prescott et al., 2018). This quantitative study was valuable in determining the effect of the Lexia Reading Core5 program on the reading comprehension skills of upper non-ELL elementary students in the fourth and fifth grades. In Chapter 2, I will discuss the literature on learning connectionism, aptitude-treatment interactions theories, reading comprehension, Lexia Core5, computer-assisted instruction, and blended learning. I will also discuss literature on ESSA, non-ELL students, and achievement gaps.

Chapter 2: Literature Review

This study addressed the problem of non-ELL upper elementary students performing below grade levels in reading comprehension. The purpose of this quantitative study was to determine the effect of the Lexia Reading Core5 program on the reading comprehension skills of upper non-ELL elementary students performing below grade levels in reading comprehension. Students struggling to read by the end of third grade face significant long-term challenges. Third grade marks the shift from learning to read to reading to learn. Students struggling with reading comprehension are at greater risk of falling behind in all other subjects. They are less likely to attend college or secure a living wage job (United States Department of Education, 2022). Therefore, more research is needed during the upper elementary school years about improving their reading comprehension skills.

This chapter outlines the relevant scholarly professional literature related to this research study. Chapter 2 begins with the Literature Search Strategy and the key terms used. The discussion of the Theoretical Foundation included theories from Thorndike's (1913) learning connectionism and Robert Gagne's (1985) aptitude-treatment interaction. Information is also provided on the key concepts and variables considered in this literature review. The adaptive learning environment and key technologies of online computer-assisted instruction systems are also discussed. The chapter then transitions into discussing the science of reading and structured literacy. Lexia Core5 concludes the discussion of the chapter.

Literature Search Strategy

Multiple databases were used during the search strategy to support this quantitative study. These databases included the Walden Library, EBSCO, SAGE, ProQuest, PsycINFO, National Institute of Early Education Research, and Taylor and Francis Online. The literature review for this study encompassed a variety of search words and phrases correlated with the study's purpose, problem statement, and research questions. The following key terms were used to search peer-reviewed articles in the academic databases: *reading comprehension, adaptive learning environment, aptitude treatment interaction, educational technology blended learning, computer-assisted instruction, lexia core five, structured literacy*, and *science of reading*.

These key terms were selected based on the focus and connection of the theoretical framework, the problem, and the purpose of this study. All efforts were made to locate current and relevant peer-reviewed, full-text articles, with a low percentage of articles written before 2018 and most published between 2018 and 2023. Based on the keywords used, older peer-reviewed journals were deemed appropriate due to the historical significance of the study and were used as supporting sources.

Thorndike's (1913) theory of learning connectionism and Robert Gagne's (1965) theory of aptitude-treatment interactions were the theories that provided support for this research. Thorndike's work, which highlighted the concepts of the law of effect and the revised law of exercise, provided links between the framework that was presented and the research technique. The adoption of the reinforcement theory was impacted by the two conceptions (Thomas, 1970).

This theory was appropriate to this study because Lexia Core5 allows students to practice skills to reinforce reading development. It provides instant feedback as they work through the various levels, engaging in trial and error and selection and connection. Thorndike established the theoretical foundation, leading to advocates and developers of automated and computer-assisted instruction (Thomas, 1970).

The influence of these general principles supported the concept of auto-instructional devices that shaped the design of the symbolic programming languages constructed for computer assisted learning. When this theory is applied to actual pedagogical situations, the learning task is broken down into minute stimulus-response bonds. A question or problem is presented to the learner, which the student must answer appropriately. If the answer is correct, it is reinforced with the same statement or signal of approval, and the next question or problem is presented. As with Lexia, when students complete activities, a standard, non-scaffolded step automatically advances to the next level (Macaruso et al., 2020).

Thorndike's (1913) law of effect states that when a modifiable connection between a situation and a response is made, and a satisfying situation follows it, that connection's strength increases; however, if accompanied by an unsatisfying situation, its strength decreases (Thomas, 1970). Lexia Core5 can adjust students' reading levels based on the student's performance, thus scaffolding activities and providing teachers with feedback on how to differentiate instruction as needed. Thorndike's development of the law of exercise emphasizes the importance of knowledge of results in learning. The mere repetition of a stimulus and response connection only facilitates the learning of that

lesson when there is confirmation of the appropriateness of the response. Learning

requires both practice and rewards.

The principle of reinforcement and punishment is elaborated upon in Thorndike's

(1913) law of effect. In 1905, Thorndike created the law of effect and the concept of

reinforcement through his puzzle box studies with cats. According to his theory, the law

of effect is divided into two sections. First, action that results in a pleasurable outcome

will probably be reinforced again. The second is that it is less probable for punishment to

reduce conduct that is accompanied by a negative consequence (Thomas, 1970).

In addition, Robert Gagne's (1965) aptitude-treatment interactions focused on a

series of events needed during the instructional design of educational technology.

Learning can be classified as requiring internal and external events. Within these learning

categories, instructional supports are needed to facilitate learning. The internal process

consists of reception, expectancy, retrieval to working memory, selective perception,

semantic encoding, responding, reinforcement, retrieval and reinforcement, retrieval, and

generalization. The external events are demonstrated in Figure 2. Different capabilities

and needs require different conditions for learning. Lexia Core 5 is a flexible, adaptive

learning program that can be modified for various circumstances and academic needs.

The emphasis is placed on the learner and teachers doing everything possible to ensure

students capture, retain, and use the information taught.

Figure 2

Gange 9 Events of Instructions

gain attention	elicit performance	provide feedback
inform learners of objectives	provide learner guidance	assess performance
stimulate recall of prior learning	present stimulus	enhance retention and transfer
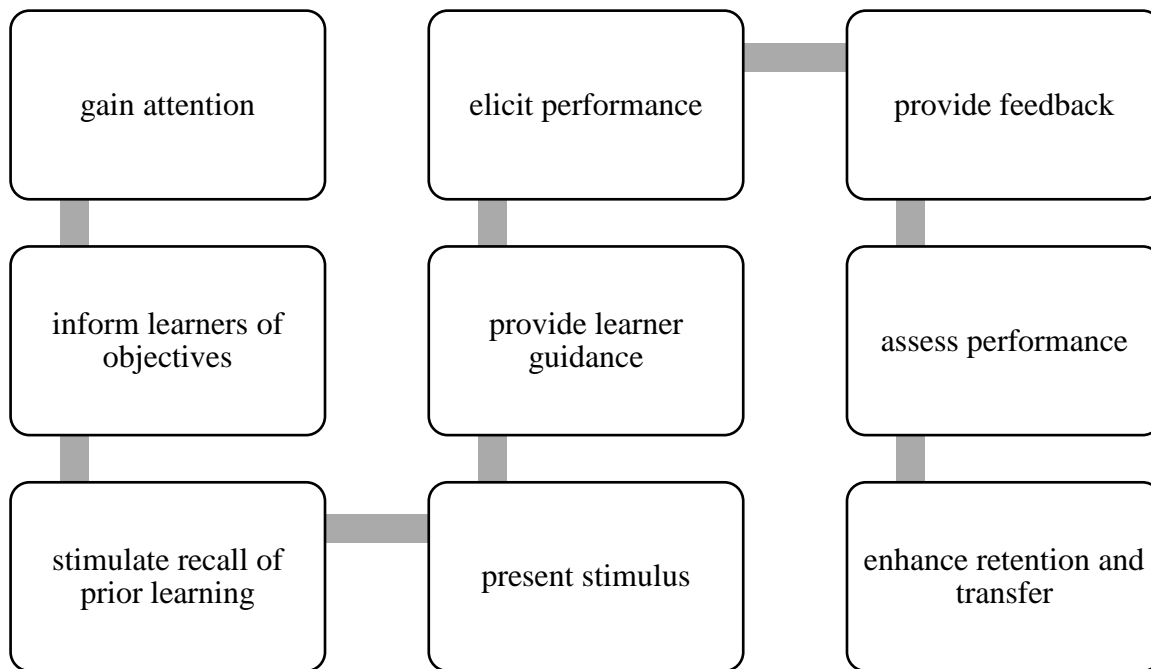
Literature Review Related to Key Concepts and Variable

Key concepts and variables considered in this literature review relate to using the Lexia Core5, a computer-assisted program used in blended learning. The literature selected for this chapter was identified by searching databases accessible through the Walden University Library. Search terms used for compiling the information included adaptive learning environment, computer-assisted instruction, blended learning, the science of reading, reading comprehension, and Lexia Core5.

Researchers such as Jamshidifarsania et al. (2019) explained that reading is the substance of academic life. When students face reading impairments, it can lead to life-long disabilities that affect their quality of life in numerous ways. Reading is a complex and multifaceted process and can be challenging for some individuals to master. Over the

years, efforts have been made to increase reading standards. However, many students are not reading at upper elementary grade levels. Despite all the attempts to raise the standards of reading instruction over the years, students need to read at their appropriate grade level when they reach the upper elementary grades. Based on the results of GMAS students in fourth and fifth grades are reading below their current grade.

Pindiprolu and Marks (2020) conducted an exploratory study that examined the effects of two parent-implemented computer-based reading programs on the reading skills of 20 students at risk of failing reading. Their perspective follows the belief that reading literacy in the earlier grades is an essential prerequisite for later academic success. Students with reading difficulties/disabilities at the end of third grade are less likely than their reading-proficient peers to succeed in content areas and graduate from high school. Pindiprolu and Marks proposed that word recognition and comprehension are two crucial subskills that are involved in reading literacy. Based on data, a large number of pupils in today's schools need to improve their reading skills. For instance, according to the 2017 National Assessment of Educational Progress scores, 65% of students in grades four through eight performed below the "proficient" level in reading (National Center for Education Statistics, 2018).

This era in U.S. education policy was marked by changes like the ESSA and No Child Left Behind. The goal of these educational initiatives was to close the achievement gap amongst students. When a set of students performs much better than other groups on average in their academic achievement, there is an achievement gap. Grade point averages and results on standardized tests are used to evaluate students' academic

success. Because education is sometimes referred to as the great equalizer—a notion first expressed by education pioneer Horace Mann in 1848—accomplishment gaps have long been of concern to educational scholars and practitioners (Hung et al., 2020).

After combining 4 decades of research, Oakhill (2020) came to the conclusion that readers need to understand word meanings in order to comprehend a book. They also found that understanding the network of meaning links between words and having quick access to word semantic representations are important contributing variables. Since comprehension occurs in real-time, it is imperative to quickly ascertain the right meanings and associations of words. Failure to do so will result in the reader moving on from the text, missing the chance to use semantic information to promote integration and inference. Reconstructing the writer's mental world is the aim of the reader, according to Nation (2019) and Castles et al. (2018). It demonstrated that the depth rather than the breadth of vocabulary knowledge was a crucial determinant of inferences about global coherence. Even after accounting for literal memory for the text and word reading proficiency, this association persisted.

Cravalho et al. (2020) highlighted using a multicomponent intervention to develop the reading skills and performance of grades fourth to eighth students identified with a high-functioning autism spectrum disorder. Reading intervention targets should include vocabulary, fluency, and comprehension. Reading intervention elements involve explicit vocabulary instruction, repeated reading with sentence-level comprehension, question-answering relationships, and main idea summarization. As noted by Calkins (2019) and Head et al. (2018), to understand the text and increase cognitive load, readers

must think and speak aloud as they read. The theory behind the benefits of fluency intervention is that readers free up cognitive resources to address the meaning of the text instead of requiring cognitive effort when pupils display sufficient speed with word recognition and accurate punctuation. This allows students to focus on reading comprehension.

Connor (2019) and Connor et al. (2022) explored how to tailor training to avoid reading difficulties by utilizing technology and evaluation. A program called Assessment-2- Instruction (A2i) was created to help teachers of students in kindergarten through third grade by offering them individualized or personalized literacy education. Using 556 kindergarten kids from 14 schools, 448 third-grade students from seven schools, and 568 second-grade students, the researcher carried out a randomized controlled trial. Over the course of a school year, kindergarten students' reading comprehension improved significantly.

Connor (2019) and Connor et al. (2022) explored how to personalize training to avoid reading difficulties by utilizing technology and evaluation. A program called Assessment-2- Instruction (A2i) was created to help teachers of students in kindergarten through third grade by offering them individualized or personalized literacy education. Using 556 kindergarten kids from 14 schools, 448 third-grade students from seven schools, and 568 second-grade students, the researcher carried out a randomized controlled trial. Over the course of a school year, kindergarten students' reading comprehension improved significantly. While the control group's reading level was in fourth grade, the pupils who took part in A2i/personalized education for all 3 years

reached a fifth-grade reading level. Teachers can provide interventions to address pupils'
academic deficits more quickly if they identify the issues early on. Students can increase
their reading comprehension with the use of technology-based resources such as
computers, tablets, smartboards, and software. Schools are investing in software tools to
raise the general academic performance of their students. In order to improve
students' reading comprehension, the school district where the current study was done
also bought Lexia Core5, a technology-based reading intervention.

In a cluster randomized controlled experiment, Hurwitz and Macaruso (2021)
examined the efficacy of a blended learning program for a group of struggling readers
who were enrolled in two schools' extra literacy classes. According to the study's
findings, students in courses using the target program outperformed those in control
classes when it came to their post-test scores on a standardized literacy evaluation. Paper-
based resources are the mainstay of most reading interventions, but politicians and
educational leaders are growing more hopeful that technology may offer students in
English Language Arts (ELA) and other areas excellent training. Kazakoff et al. (2018)
state that there are various methods that instructional technology can display content.
Personalized scaffolding (hints, corrective feedback, etc.) can be provided, prompts or
films can be incorporated methodically to give background knowledge on new concepts,
and a judgment-free environment can be created to practice skills frequently. Compared
to traditional modes of education, these programs give struggling readers the chance to
participate in active learning and feel successful as they progress toward skill
competency, which increases their motivation.

Research like that of Fogarty et al. (2020) and Bennett et al. (2017) looked at computer-assisted programs as an additional intervention. Bennett et al. investigated its impact on 10 second-grade students using multicomponent and technology-mediated treatments. The outcomes demonstrated the beneficial effects of computer-assisted programs in addition to repeated reading tactics. Because the Lexia Core5 computer-assisted functions as a supplemental intervention to improve the oral reading comprehension of below-grade readers, this type of instruction was crucial to the current study. Furthermore, Fogarty et al. (2020) explored how a technology-mediated intervention affected students' comprehension and knowledge of academic language in 200 third-grade children and 24 teachers. The results of these studies indicated that using technology-based vocabulary and comprehension to augment training can have a good effect. The findings from these studies provided primary kids who were reading below grade level with examples of how to use technology and the necessary settings to improve their reading comprehension. The findings back up the use of Computer Assisted Instruction (CAI) as supplemental education, which has a good impact on pupils' reading abilities.

An empirical study by Hudson et al. (2020) examined the impact of oral reading fluency interventions on students' reading comprehension and fluency. According to the study's findings, therapies should comprise one-on-one sessions with a model of accuracy and fluency in word reading. According to Hudson et al. (2020), this study is in favor of employing treatments for upper elementary pupils who are having reading challenges. Two separate studies (Prescott et al., 2018; Kazakoff et al., 2018) looked into the usage

of blended learning programs. In 2020, Macaruso et al. conducted research on Core 5 using kindergarten and first-grade pupils. Students that used the software performed better than those who did not, according to the data. It was in favor of combining teacher-assisted activities with computer-assisted learning. Students receiving blended learning treatment demonstrated statistically substantial increases on a standardized reading exam, with benefits consistent across grade levels and ethnic groups, according to Macaruso et al. (2020).

Council et al. (2019) assessed how Reading Races-Reading Relevant and Culturally Engaging Stories affected the fluency and comprehension development of elementary school pupils. According to the test findings, when a computer-assisted program was implemented consistently, the kids showed continuous improvement. For students who are reading below grade level, it can be beneficial.

A 3-year longitudinal study of sixty-eight kindergarten children' reading performance from the beginning of kindergarten through the second grade was carried out by Macaruso et al. (2019). The findings demonstrated that the students' progress was noteworthy. The goal of the Girli and Ozbek (2017) study was to find out if third- or fourth-grade children' reading abilities were enhanced by a computer-aided tablet intervention program. The outcomes back up the application of computer-assisted interventions for third and fourth graders. According to Zhou et al. (2018), computer-assisted instruction plays a crucial role in modernizing education. Lexia Core 5, for example, is a computer-assisted instruction program that provides a modern information technology-assisted teaching mode to supplement traditional classroom instruction.

Several studies that used evidence-based approaches were examined by Snyder and Huber (2019). A few of the research offered evidence in favor of integrating systematic instruction practices into CAI initiatives. These practices make sense since kids can learn academic knowledge through methodical instruction on its own. The literature provides strong support for teaching students a range of abilities through systematic instruction. Effective intelligent tutoring systems (ITSs), a computer-based learning environment, have been shown to enhance students' reading comprehension in K–12 classrooms, according to research by Xu et al. (2019). This approach gave the student instant feedback in addition to differentiated instruction. CAI programs incorporate evidence-based methods for teaching academic subject along with corrective feedback and reinforcement. Lexia Core 5, among other technological improvements, provides remedial feedback on several levels depending on how students respond and computer-adaptive education.

Roberts et al. (2018) researched into the efficacy of an after-school computer-assisted reading intervention program for upper elementary school kids who struggled with comprehension. The results of the study showed that, if applied outside of the classroom, computer-assisted programs can have distinct effects than those related to enhancing reading comprehension. Similarly, Hudson (2019) assessed how early literacy lessons provided on an iPad and self-monitoring affected older students with developmental difficulties. The study's findings showed conflicting outcomes. In terms of early reading skills, two participants demonstrated an increase in accurate responses. The third participant's percentage of right responses, however, did not change. The study's

participant results are crucial since they demonstrated that not all student reading below grade level would consistently receive the necessary support from the application of (CAI).

Rao (2019) discussed and described blended learning as a new concept of teaching and learning that combines traditional and independent study methods to create a hybrid teaching method. This method offers a combination of education and educational technology. It is also believed to be an effective combination of different modes of delivery, teaching models, and learning styles. Blending learning does not depend solely on the teacher as the instruction leader. Wirawan and Kristiani (2022) studied the advancement of technology, communication, data, and the internet with Indonesian educators who wanted to use it as a source of positive learning media to support the teaching and learning process. This study's findings showed that using blended learning provides many sources for educators and relevant activities for students.

Likewise, the goal of Rombot et al. (2021) was to enhance blended learning's capacity for reading comprehension. Students in international schools in the fifth grade made up the study's population. The stages from early investigations to field experiments were reflected by the research and development findings that were documented. According to the study's findings, blended learning gives students additional opportunities to read the material again and increases post-test scores, with an average score over the required minimum passing mark. The studies by Rombot et al., Wirawan and Kristiani (2022), and Rao (2019) are significant to this one because they show how blended learning helps students become active learners as they acquire more knowledge

from the internet during online learning. Teachers can more easily construct digital activities because it normally provides convenient access from anywhere at any time.

Four computer-based reading texts were examined by Gozukcuk and Günbas (2020) for the purposes of before-, during-, and after-reading activities. Their goal was to see how students' reading comprehension was affected by these computer-based reading texts. Students in the fourth grade in elementary schools (n = 60) were randomly allocated to one of two environments for reading: traditional reading (n = 29) or computer-based reading (n = 31). The groups finished a pretest, activities to be done before, during, and after reading, as well as a post-test. The post-test scores of the computer-based group were considerably higher than those of the traditional group, according to the results. The ultimate results of the study showed that giving students reading assignments with multimedia accompaniment improved their reading comprehension.

Computer-assisted programs can raise kids' reading performance levels, according to Campbell et al. (2022). There is proof that reading achievement is increased in upper-elementary classes when the unique learning demands of reading pupils are met. Through the creation of personalized learning profiles and real-time data production, computer-based applications can facilitate differentiated training. When students require more instructional support and lack core abilities, differentiation in reading instruction can be very important.

Baron et al. (2019) investigated the effectiveness of using educational technology to differentiate student instruction. Five hundred and 44 third graders from a midwestern

U.S. school district made up the participants. The AIMS web progress monitoring tool was used by the researchers to generate reader profiles. Mixed deficiency (271 students), poor decoder (44 students), poor comprehension (45 students), and typical reader (234 students) were the reader profile categories. For these students, a mixed learning approach to reading curriculum was implemented, using Lexia, a technology-based learning platform, together with the conventional text Treasures. According to the study, Core 5 increased goal web performance and successfully differentiated online training for many reader profiles. The results of this study are contributing to the development of instructional best practices that facilitate the quick identification of and successful intervention for every student. Additionally, the instructional technology program aids students in enhancing their comprehension and word reading skills. To improve students' experience in a tailored learning environment, this study will look at the Lexia Core5 reading program and its effects on reading performance. Adaptive learning has been demonstrated to be far more effective than traditional learning environments, such as classroom settings (Romero & Ventura, 2020). The enormous difficulty of large-scale personalization for the real-world human learning process must be addressed by an adaptive learning environment.

Adaptive learning instructions are found in tutoring systems in a variety of ways. A growing number of students, tens or hundreds of thousands of them annually, use some of the more effective tutoring systems (Minn, 2022). Two adjustments are necessary for an adaptive learning environment to flourish: the capacity to organize adaptive learning

materials in accordance with each student's unique skill competency and the capacity to deliver accurate, timely, and effective feedback during problem-solving.

Peng et al. (2019) claim that as modern technologies have advanced, personalized learning has become more adaptive. Personalized adaptive learning, a redesigned teaching approach, is predicated on data collected by an automated system. It gives students real-time learning environments and tailors the activities and content to the requirements and characteristics of the students. Presently, technologies that can be customized for each person while also enabling teachers to use blended learning have been developed. A machine-learning exchange is not attempting to take the place of the teacher-student relationship. According to Villesseche et al. (2019), one of the initial components of adaptive learning is monitoring. Because adaptive refers to the ability to carry out this activity, it assesses learners' skills and modifies their learning tactics to improve performance. Since learners tend to overestimate their competencies when monitoring themselves, it is imperative to set up an external monitoring environment.

ElSabagh (2021) stated that adaptive e-learning changes the level of instruction dynamically based on student learning styles and personalizes instruction to enhance or accelerate a student's success. Directing instruction to the personalizing each sufficient path of learning so that every student can participate in the learning process (Hussein & Al-Chalabi, 2020). Normadhi et al. (2019) stated that within the adaptive learning environment, the personal traits of the learner could be identified either explicitly or implicitly. A unique trait is an underlying characteristic that defines a learner as an individual. Personal traits in the cognition learning domain category are the most

frequently used and widely applied in adaptive learning systems. Cognition is related to a pattern of information processing that uses rational thought to create and gain knowledge during learning. Cognitive style influences learner attitudes, values, and social interactions, which do not indicate the content, or the information representation compared with learning style. Personality type is a random behavioral characteristic of learners that involves their preferences for using their mental capacities to perceive and judge information. Working memory capacity guides learners to understand the learning process further and reflects the limited capacity of a learner's working memory. Prior knowledge is the learners past knowledge, facts, or ideas applied to a new learning situation to integrate new knowledge.

Studies by Xiaoyu and Tobias (2023) and White (2020) on the effectiveness of adaptive learning technology (ALT) in online education were thorough and well-rounded, involving surveys and interviews with students. According to the studies, there are four benefits associated with ALT: In addition to addressing the diversity of student backgrounds and expertise, it makes effective use of class time by identifying areas that require more support, maintains content relevance, and permits dynamic material. ALT might not work well in every academic area, though. According to the findings, there may have been ALT system design problems that prevented students from succeeding (Dounas et al., 2019). The performance of learners can be impacted by their diverse learning objectives, learning styles, and changing rates of learning advancement over time.

Furthermore, the adaptation model of KLSAS, or Knowledge and Learning Style

based Adaptive System, which is predicated on two important learner characteristics—knowledge level and learning style—was assessed by Dhakshinamoorthy and Dhakshinamoorthy (2019). The observations were made based on how two distinct groups of students performed on the test. It was discovered that, with the development of information and communication technology, the extension of e-learning and the adaptive learning environment have become more significant in the current educational landscape. Learning is improved by the outcomes based on the chosen learner attributes. The more student attributes taken into account during system construction, the more effective the adaptive systems become.

A hybrid kind of technology has drawn more attention in the past 10 years, claim Gomez and Jeong (2019). One kind of scaffolding mechanism using a variety of educational resources is blended technology. Flexibility in terms of time and location is just one of the many benefits that technology-enhanced education offers students (Vladova et al., 2021). These systems are easily integrated into educational programs, like the time and location of the current research study.

Key Technologies of Online Computer-Assisted Instruction System

Hashim (2018) presented a new technology called game-based learning. This new technology goes beyond just using internet and digital games in the classroom. Games are useful resources for modeling real-world situations and building concepts. Gamers can improve their learning through numerous intelligences and get new knowledge by playing games. Games and software available online could be used in education. Lexia

Core5 offers individualized, game-based online learning that lets students push themselves while giving them independent practice to apply what they've learned.

Digital game-based learning (DGBL) also can advance equity in STEM education for students in grades K–12. However, there are not many professional development methods available to help teachers advance equity and acquire DBGL expertise, and there aren't many teachers who are experts in the subject. During a DGBL workshop series inspired by culturally responsive pedagogy, Villa et al. (2023) conducted a professional development to investigate teacher acquisition of technological, pedagogical, and content knowledge for games (TPACK-G). Pre- and post-surveys, as well as interviews, were employed in this mixed methods pilot project to look into changes in teachers' (n = 9) perceptions of DGBL, operationalizations of equity, and cultural relevance. The results of the study indicated an increase in teachers' TPACK-G, and the teachers' broadened notions about the variety of uses of digital games in STEM education were corroborated by the results of the interviews and questionnaires. Enough opportunities for professional growth are essential for any computer-assisted education system to succeed in teaching teachers.

Reading Comprehension and Adaptive Learning Environment.

Villesseche et al. (2019) conducted research on reading comprehension. Reading material that is below grade level presents comprehension challenges for students. The researchers examined a case study containing information spanning five years and 2700 schools. These findings revealed that there are two different comprehension levels in a text, and readers must be able to master both by comprehending both explicit and implicit

information. The reader must be able to make connections between explicit and literal information, fill in the blanks with knowledge or draw conclusions—that is, infer certain elements from text details or from making sure that a text is consistent with their general knowledge—in order to comprehend a text and create a coherent mental picture of the situation it describes.

Knowledge and abilities that connect word reading and comprehension are crucial for reading comprehension, according to Duke et al. (2021). Graphing phonological, semantic cognitive flexibility (GSF), a type of executive function, is one such ability. GSF is the capacity to address the transition simultaneously and flexibly between a word's letters and sounds (graph phonological) and its meanings (semantic). They discovered a correlation between readers' reading comprehension and their GSF.

The Science of Reading

A substantial amount of gold-standard research compiled over five decades by cognitive scientists and other reading specialists is referred to as the "science of reading." It explains how reading is acquired as well as the best approach to teach reading. Reading science elucidates the precise abilities that need to be taught, what approaches to reading teaching are most effective, and how to best support students who struggle with reading.

Petscher et al. (2020) contend that reading comprehension is a complicated task that requires a multitude of cognitive resources and prior knowledge. Consequently, interventions that solely target one or more of these components are likely to have a limited impact. As mentioned by Duke and Cartwright (2021), reading science is always changing and evolving, much like any other scientific field. A variety of instructional

strategies, from teaching words alone to teaching students to use context to understand the meanings of new words, have been used in certain studies to improve comprehension. Research by Duke, Cartwright, and colleagues as well as Petscher et al. (2020) using meta-analyses has shown that integrating literacy and knowledge-building strategies improves elementary school students' vocabulary and comprehension results. Additional study on strategies that affect vocabulary and comprehension education was prompted by the findings.

The increasing body of research on efficient reading techniques should inform reading teaching and treatments (Barnes et al., 2023; Castles, 2018; Petscher et al., 2020; Shanahan, 2020; Strauss, 2018). Better reading comprehension is supported for younger students when they are taught how to make use of comprehension techniques and the text's organizational structure to comprehend, learn, and remember information. Teaching older students how to use comprehension strategies, explicitly teaching them important vocabulary, giving them opportunities for in-depth discussions of texts, and teaching them foundational reading skills when they don't already know them, all improve their reading comprehension. These instructional strategies are also useful for students who struggle with reading significantly (Petscher et al., 2020).

In the first year of the research, Chiu (2018) carried out a longitudinal study including 305 prekindergarten pupils who advanced to Grade 3 5 years later. The capacity for linguistic comprehension of the reader is utilized for reading comprehension. The fundamental structures of spoken and written languages in the majority of languages overlap significantly. According to this study, reading comprehension at the conclusion

of elementary school is predicted by language comprehension abilities from early childhood. Before entering school, the developmental prerequisites for proficient reading are present. As a result, variations in how these skills are developed among kids predict subsequent variations in reading proficiency and assist in identifying early pupils who may struggle with reading. Multisensory approaches are widely used in reading instruction and have strong clinical backing for helping students who struggle with reading develop their reading skills. These approaches use a variety of senses (such as sight, hearing, touch, and movement) to help students make systematic connections between language, letters, and words.

Structured Literacy

The science of reading served as the inspiration for structured literacy (SL). It transforms evidence into useful applications for the classroom and provides guidance on the best ways to present it. According to Webster (2021), SL has been shown to help all students reach deep comprehension levels and become competent, self-assured readers. SL is made up of teaching strategies and material. Phonology, sound-symbol correlations, syllables, morphology, syntax, and semantics are examples of SL content elements. A cumulative, methodical, explicit, and diagnostic methodology of instruction is used to deliver these topic pieces (Webster, 2021).

According to Plante (2020), students who are reading below grade level can improve their reading skills by implementing SL. The lessons are cumulative and methodical, offering new concepts while introducing spiraling back to review earlier ones. Pupils learn morphology, sounds, and syllable concepts and regulations. Students

acquire fluency through oral and contextual reading in addition to phonological awareness to develop comprehension abilities. The teacher continuously evaluates and modifies the lectures to match the needs of the students. The lessons are both diagnostic and prescriptive. Instead of a set scope and sequence, a proposed set of abilities tailored to each student's unique learning requirements for encoding and decoding is provided (Plante, 2020).
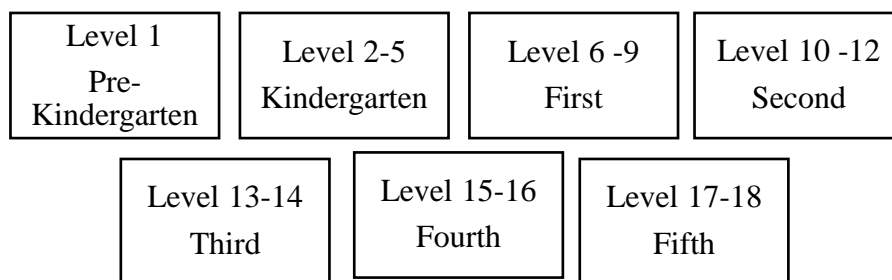
Lexia Core5

Lexia Core5 is an evidence-based software application designed to give pupils extra help with reading. Students complete exercises in Core 5 that span skills from Pre-K through fifth grade and are arranged into 18 levels. In order to provide each learner with a customized learning environment, the adaptive blended learning application scaffolded activities in accordance with Georgia Common Core state requirements (Lexia Learning, 2022). The program's goal is to help students of all skill levels become proficient readers more quickly. Six strands of reading skills—phonological awareness, phonics, structural analysis, automaticity/fluency, vocabulary, and comprehension—are covered by the exercises in the Lexia Core5 program (Lexia Learning, 2022). According to Lexia Learning (2022), there is an 80% accuracy association between Lexia Core5 and widely used benchmark and progress monitoring examinations. The program assists students in bridging reading comprehension gaps and achieving grade-level learning objectives.

There is an online component and an offline component to the Lexia Core5 reading curriculum. The online portion consists of organized, customized, and

entertaining educational activities that resemble games. The teacher-led classes and self-directed skill-building exercises comprise the offline resources. Offline resources are created by the application using the data on student performance. Figure 3 illustrates the eighteen levels of the online component, which correspond to grade-level reading skilled content. Prekindergarten is Level 1, kindergarten is Levels 2–5, first grade is Levels 6–9, second grade is Levels 10–12, third grade is Levels 13–14, fourth grade is Levels 15–16, and fifth grade is Levels 17–18.

Figure 3

Lexi Core5-Levels Specific to Grade Level Reading

Level 1 Pre-Kindergarten	Level 2-5 Kindergarten	Level 6 -9 First	Level 10 -12 Second
	Level 13-14 Third	Level 15-16 Fourth	Level 17-18 Fifth

Students are given access to a quick screening tool at the start of the online program to help them identify their appropriate Lexia Core5 learning level. Depending on their proficiency, students may work on material that is on, above, or below the grade level. To advance to the next level of the curriculum, students must understand the topic with 90% to 100% correctness. Every lesson in the Lexia Core5 levels will be differentiated based on the skills of the students. Students can study and practice skills at the location and speed of their choice using Lexia Core5. In order to read to learn rather than just to read, this aids students (Lexia Learning, 2019).

Students start the unit in standard mode; if they make one or two mistakes, they are immediately switched to the more organized guided mode. The pupil will go back to ordinary mode if they succeed. Students are put in direct instruction mode if they keep making mistakes. The subject matter is directly taught to the student in the direct instruction approach. Additionally, the computer generates an offline resource lesson for the material of difficulty so that the teacher can provide the student with additional support. It also notifies the teacher in a report.

Summary and Conclusions

This chapter included an overview of the study, including focus, problem, and purpose. Information regarding the literature search strategy was presented along with the theoretical foundation. The literature review included information on Thorndike's (1933) theory of learning connectionism and Robert Gagne's (1965) aptitude-treatment interactions which framed this study. The two constructs influenced the acceptance of the reinforcement theory (Thomas, 1970). In addition, the reinforcement theory to be specific, personalized adaptive learning could be constructed from the following four aspects: learner profiles, competency-based progression, personal learning, and flexible learning environments.

The growth of the implementation of Structured Literacy™ Instruction in schools is encouraging. Through educational technology, educators can address challenges related to using this practice with small groups, easily address differentiation, and gain documented examples of student work to demonstrate growth. Additionally, students can learn how educational technology can be an effective tool for access and engagement.

The principals have formed the design for computer-assisted programs. The literature review focused on key concepts of the study, which embrace reading comprehension, and how the use of technology-based reading interventions can help to improve students' reading comprehension. Connor (2019) mentioned that implementing personalized instruction improves student academic performance.

A successful adaptive learning environment requires providing highly specific, immediate, and effective feedback like that found with the Lexia Core5 computer-assisted program. Plante (2020) stated that within SL, providing systematic and cumulative lessons is key to impact reading gains for students reading below their current grade level. The lessons should also provide spiraling reviews of concepts while introducing new ones. After a thorough review of information regarding blending computer-assisted learning with teacher-assisted activities. This study will fill the gap in literature by focusing on whether the computer-assisted Lexia Core5 affects the reading comprehension skills of non-ELL upper elementary students performing below grade levels.

Chapter 3: Research Method

This quantitative study aimed to determine the effect of the Lexia Reading Core5 program on the reading comprehension skills of upper non-ELL elementary students performing below grade levels in reading comprehension. A quasi-comparative research design was utilized because my goal was to investigate if there was a difference in scores between the upper non-ELL elementary fourth and fifth-grade students who received the intervention in 2017 and the scores of the students in 2016 who did not receive the intervention. This study had two variables: participation in Lexia Core5 is the independent variable (treatment), and the dependent variable is the GMAS performance of upper non-ELL elementary fourth and fifth-grade students. This chapter detailed the research design and rationale, the methodology and threats to validity, and ethical procedures.

Setting

The setting for this research is one of the lowest-performing Title I elementary schools in this urban school district in Georgia. This school consists of 52 staff members, including administrators' paraprofessionals, and teachers. A Learning Lab was developed at the beginning of the 2017- 2018 school year. One of the purposes of the lab was to provide a platform where students could use and receive further assistance in using Lexia Core5 computer-assisted instruction.

Research Design and Rationale

This study had two variables: participation (or not) in the treatment group, comparing Lexia Core5 as the independent variable, and the dependent variable is the

GMAS performance of upper non-ELL elementary fourth and fifth-grade students. For the research, a quasi-experimental comparative research design was used to measure the effect that the Lexia Core5 intervention had on the 2017 GMAS scores for fourth and fifth graders who received the intervention compared to those students who did not receive the intervention in 2016. The quasi-experimental comparative research design has a connection to the research questions because it enabled an investigation to find out to what extent, if any, a significant mean difference exists in the overall reading achievement scores as measured by the 2017 standardized GMAS between the lower 35% of non-ELL fourth and fifth-grade students who participated in the computer-assisted Lexia Core5 intervention and those lower 35% non-ELL fourth and fifth-grade students who did not participate in the intervention during the 2016 school year.

Methodology

Population

The research site serves Pre-Kindergarten through fifth-grade students. The school currently educates 492 students in pre-kindergarten through fifth grade. The following demographics were represented at the time of the study: African American 72.76%, White 4.67%, Hispanic 13.62%, Multiracial 3.66%, and Asian 4.26%. The percentage of students qualifying for free and reduced lunch is 70%.

Population Selection

The estimated sample size was 80 fourth and fifth-grade students who scored below grade level, specifically in reading comprehension on the GMAS (Georgia Department of Education, 2020). The sample was drawn because treatment was only

applied to the lower 35 % of the population from fourth and fifth grades. From these

participant groups, data were retrieved from the Georgia Department of Education

website from those students who received the treatment in 2017 and the lower 35% of

students who did not receive the intervention in 2016. Because groups existed already,

preexisting data were used. The group that received the intervention was the experimental

group, and the group that did not receive the intervention was the control group.

Intervention/Treatment

The intervention for this study was the Lexia Core5 computer-assisted instruction.

Lexia Reading Core5 created by Rosetta Stone Company (now Cambium Learning

Group). As a Focus School, the research site developed the school plan to deliver support

to address the learning needs of the students to increase their academic success. Through

the Flexible Learning Program. It offered extra academic help to students through

tutoring, remediation, and other educational support. Through this program, the school

site decided to implement Lexia Core5. The school district approved the purchasing of

the program to be used to support educators in providing differentiated literacy

instruction for struggling readers. The program has been previously used to support

students with dyslexia and English language development. The target population was

exposed to the Lexia Core5 computer-based instruction since the onset of the fourth and

fifth grade.

Implementation of the Lexia Core5 intervention was not used before at this

school. At the beginning of the 2017–2018 school year, the students were assigned to

attend the newly developed Learning Lab. The lab focused on using Lexia Core5

computer-assisted instruction. The students attended the Learning Lab Monday–Friday

for 50 minutes. During this time, the students worked on the online component of Lexia

Core5. The lessons were used when the students struggled with specific skills on the

online platform. The lessons consisted of activities that supported and built on Georgia

curriculum and Common Core Standards. The lessons also developed reading skills in six

areas: phonological awareness, phonics, structural analysis, fluency, vocabulary, and

comprehension. There were also pencil and paper tasks called Lexia Skill Builders in

which students worked independently to build their automaticity and skills beyond the

online components. All the components worked together to build skills for

comprehension. The GMAS uses four achievement levels to describe student mastery and

command of the knowledge and skills outlined in Georgia's content standards.

Archival Data

The archival data for this study was retrieved from the public Georgia Department

of Education Georgia Insights website. The data included was the GMAS End of Grade

(EOG) data for fourth and fifth grade students for the years of 2016- 2017 and 2017-

2018. The ELL status was determined by subgroups that were consolidated into subgroup

type description and names (i.e. English proficiency status and disability status). This was

the best source where this data was available to gain the information needed. The data

information was formatted in a webpage format in which I saved into a word document

for better understanding. As no personal or identifying information was included, no

permission was needed.

Instrumentation and Operationalization of Constructs

The GMAS is the primary instrument used to measure the students' performance in the reading comprehension of participants of this study. According to the State Department of Education, GMAS is the comprehensive summative assessment for Georgia School Districts. The assessment is administered with secure procedures and all data are evaluated and housed at the state level. The GMAS was introduced in 2014-2015 by the State of Georgia Educators. All Georgia public school students in Grades 3 through 8 use this instrument in each content area.

The GMAS is in place to assess federal and state legislative requirements for student's competency in ELA, math, science and social studies. The GMAS includes open-ended (constructed response) items in language arts and mathematics. It also includes a writing component (in response to passages read by students) within the language arts assessment. The range of scores for the GMAS can be found in Table 1.

Table 1

GMAS Scaled Score Ranges

Learners	Beginning learners	Developing learners	Proficient learners	Distinguish learners
Scaled score range	180 – 474	475 - 574	525 – 580	581- 830

Validity refers to whether the measuring instrument measures the behavior or quality it is intended to measure and is a measure of how well the measuring instrument performs its function (Surucu & Maslakci, 2020). The validity of evidence supporting GMAS depends on how well the assessment instrument matches the intended content

standards and how the score reports inform the various stakeholders—students, parents, and educators—about student performance. According to the State Department of Education website, several stages are associated with the test development cycle for GMAS. First, the purpose of the test is established. Next, committees of educators are formed to review the content standards and establish which concepts, knowledge, and skills will be assessed and how they will be assessed. The results of this review produce several vital documents. The key documents include test specifications of what standards can and will be measured and represented in the assessment, the content domain specifications, and how elements will be grouped into reporting categories.

Items are written by qualified, professional assessment specialists specifically for Georgia tests. Committees of Georgia educators review the items for alignment with the curriculum, suitability, and potential bias or sensitivity issues. Items that are taken are placed on field tests. Field tests, which are trial runs of the test items, are designed to help ensure that the items function appropriately and are clear for students. This is typically accomplished by embedding field test items in the operational test.

After new items have been field tested, another committee of Georgia educators examines the items again, along with the data from the field test. The committee reviews how items performed in terms of how many students selected the correct answer and how many students selected each incorrect answer. The review also includes an analysis of how different groups of students performed to detect potential bias (i.e., Did the item appear to favor one group of students over another?). Once again, the review committees can accept items as is, revise items for re-field testing, or reject items.

Accepted items are then banked for future inclusion on an operational test form. After items have been field tested and approved by Georgia educators, they appear on a functional test form. The next stage of test development consists of developing the test form students will take. Items are carefully selected for a test form based on the blueprint created by Georgia educators. Each test form must assess the same range of content and carry the same statistical attributes. When multiple test forms are used in a single administration or when a test is given in subsequent administrations (e.g., year-to-year tests), they must be equated. Equating is a statistical procedure to ensure that scores from different test versions are comparable. This is critical because it ensures students are consistently held to the same standard. Additionally, it permits one to interpret differences in test performance as the result of changes in student achievement as opposed to fluctuations in the properties of the test form. The standard-setting process is how educators decide what number of items a student must get correct (or how many total points) to meet or exceed expectations.

The final stage in test development is to produce scores and distribute results. Scores are typically reported as scale scores and performance levels. A scale score is based on a test's raw score (i.e., total points earned). Changing raw scores to scale scores is analogous to converting from the Celsius scale to the Fahrenheit scale to report temperature. Scale scores are commonly used in large assessment programs. Students, parents, and educators can consistently and meaningfully interpret results. An interpretive guide is produced to show how test scores should be interpreted.

By attending carefully to each phase of the test development process, the GaDOE can ensure that the GMAS consists of valid instruments for the uses for which the department has developed the test. The GMAS contractors produce documentation of each phase of the test development process and create various pieces of evidence. The alignment of the GMAS with the state's content standards and the reliance on input from Georgia educators at every phase of test development are critical to the test's validity evidence. Therefore, the GaDOE commissioned an independent evaluation of the alignment quality between its academic standards and the GMAS. The results of the six studies indicated that the GaDOE engaged in a test and item development process that met professional standards for quality and rigor and that the EOG and EOC assessments adequately reflected the Georgia state-mandated academic content standards. The department conducts standard operational and supplemental analyses each year to produce evidence of validity and evaluate the technical quality of the assessment system; complete documentation of the ongoing technical evaluation and maintenance of the GMAS is documented in the yearly technical report.

The GMAS has a high degree of validity evidence because they serve the purpose for which they are intended—to measure student mastery of the state's content standards. Validity is established in good part through the process of test development. The careful development from the inception of the GMAS and all steps in between, such as alignment with content standards, creation of test and item specifications, multiple reviews by educators, and careful form construction by content experts and psychometricians,

provide evidence that the GMAS are valid instruments for the uses for which the department has developed the test.

According to the State Department of Education website, the reliability indices indicate that the tests provide consistent results and that the various generalizations of test results are justifiable. These strong indicators of reliability also support test validity. For a test to be valid for a given purpose, it must also be supported by reliable measurement. Reliability is the degree to which test scores for a group of test takers are consistent and stable over time. A reliable assessment would produce regular scores if the same group of students were to take the same test repeatedly without any fatigue or memory effects. For the GMAS, Cronbach's (1951) alpha reliability coefficient is one reliability measure reported. A reliability coefficient expresses the consistency of test scores as the ratio of actual score variance to observed total score variance (i.e., actual score variance plus error variance). Cronbach's alpha measures the internal consistency over the responses to items measuring an underlying unidimensional trait. The reliability of the GMAS is consistent across forms and administrations and suggests that the assessments are sufficiently reliable for their intended purpose. The reliability indicators obtained for the GMAS suggest that scores reported to students for the school year are well estimated and provide a reliable picture of student performance.

Data Analysis Plan

Upon approval from the Walden Institutional Review Board (IRB), I assessed the data table from the archive, Georgia Department of Education Georgia Insights, Georgia Milestones (2023). Archival data was the only data source used in this analysis. Before I

began, I placed the retrieved data into an Excel spreadsheet. I reviewed the data to determine if there were any identical, missing, or extreme values in the entries to avoid skewed data.

Once this process was completed, I used the Statistical Package for the Social Sciences (SPSS) version 28. Next, the descriptive statistics were calculated, and the results were provided. Since the initial plan did not meet the normality assumption, parametric measures were inappropriate. I transitioned to a nonparametric test called the Mann-Whitney test that assessed the mean value difference between the two groups. I reported the test value t and the probability error p (using the value .05 as the significance threshold) in Chapter 4.

Threats to Validity

According to Lodico et al. (2010), internal validity refers to the number of attributed factors that could influence the independent variables or the interventions. In this study, maturation relates to changes in students' physiological well-being, growth, and developmental levels due to time. Physiological changes occur naturally and may have made cognitive gains due to exposure to other areas, instructional strategies, or settings.

The threats to external validity relate to factors that may have affected the results, and the significant external validity to this study is that the study focused on students at one research site; therefore, these findings are generalized to one school and might not apply to other schools.

Ethical Procedures

I was an Early Intervention Program (EIP) teacher at the research site in the Learning Lab. There were no research assistants for this study. I applied to Walden's IRB for approval. The IRB approval number is 02-16-23-0750256. There were no identifying names or information within the survey. The data were anonymized.

Summary

This quantitative study aimed to determine the differences in means of the Lexia Reading Core5 program on the reading comprehension skills of the two samples. The goal of this study was to examine to what extent, if any, a significant mean difference exists in the overall reading achievement scores as measured by the 2017 standardized GMAS between the lower 35% of non-ELL fourth, and fifth-grade students who participated in the computer-assisted Lexia Core5 intervention and those lower 35% non-ELL fourth and fifth-grade students who did not participate in the intervention during the 2016 school year? The GMAS is the instrument that was used to measure the students' reading comprehension performance. There is a correlation between Lexia Power Up Literacy and GMAS ELA. There were no identifying names or information within the study.

Chapter 4: Results

The purpose of this quantitative study was to determine the effect of the Lexia Reading Core5 program on the reading comprehension skills of upper non-ELL elementary students performing below grade levels in reading comprehension. There were two research questions that guided this study because two different grade levels were used in this study. The questions asked: To what extent, if any, does a significant mean difference exist in the overall reading achievement scores as measured by the 2017 standardized GMAS between the lower 35% of (fourth, fifth) grade non-ELL students who participated in the computer-assisted Lexia Core5 intervention and those lower 35% non-ELL (fourth, fifth) grade students who did not participate in the intervention during the 2016 school year?

$H_0 3$: There is no significant difference in the overall reading achievement scores as measured by the 2017 standardized GMAS between the lower 35% of non-ELL (fourth, fifth)-grade students who did and the lower 35% of non-ELL who did not participate in the computer-assisted Lexia Core5 intervention during the 2016 school year.

$H_a 3$: There is a statistically significant difference in the overall reading achievement scores as measured by the 2017 standardized GMAS between the lower 35% non- ELL fifth grade students who did and the lower 35% non-ELL who did not participate in the computer-assisted Lexia Core5 intervention during the 2016 school year.

Data Collection

Once the University IRB approval was granted, I accessed the Georgia

Department of Education Georgia Insights, Georgia Milestones (2023) website to retrieve

the archival data for the GMAS End of Grade (EOG) data for fourth and fifth grade

students for the years of 2016 - 2017 and 2017 - 2018. The data chart represented,

included the number of participants for each grade level and year. The participant data

were divided into the GMAS Categories. Each category was calculated and presented in

the form of percentages. I used the data that was available and divided each grade level

(fourth and fifth) into two reporting categories for the 2016 - 2017 and 2017- 2018 school

year as shown in Table 2.

Table 2

Percentages of Scores for GMAS

School year	Grade	Number of participants	Beginners	Developing	Proficient	Distinguish
2016	4th	74	28	49	20	3
2017	4th	84	25	24	39	12
2016	5th	88	26	35	33	6
2017	5th	74	20	49	27	4

Intervention Fidelity

The intervention for this study was the Lexia Core5 computer-assisted instruction.

The target population was exposed to the Lexia Core5 computer-based instruction since

the onset of the third, fourth, and fifth grade. At the beginning of the 2017–2018 school

year, the students were assigned to attend the newly developed Learning Lab. The lab

focused on using Lexia Core5 computer-assisted instruction. The students attended the

Learning Lab Monday–Friday for 50 minutes. During this time, the students worked on

the online component of Lexia Core5. The lessons were used when the students struggled

with specific skills on the online platform. The lessons consisted of activities that

supported and built on Georgia curriculum and Common Core Standards. There were

also pencil and paper tasks called Lexia Skill Builders in which students worked

independently to build their automaticity and skills beyond the online components. All

the components worked together to build skills for comprehension.

Data Analysis

For this quantitative study, I initially performed an independent sample t-test. I

considered six assumptions (Statistical Laerd, 2015); the first four assumptions were met.

The fifth assumption states that the dependent variable should be normally distributed for

each independent variable group. I conducted a Shapiro-Wilk test to check for normal

distribution. In the Shapiro-Wilk test, if the Sig. Value in the output is more significant

than .05 (p > .05), and the data distribution is assumed to meet the normality assumption.

If the Sig. Value is less than .05 (p < .05), the assumption of normality is violated.

Normality was assessed for each group in the comparison. The results for both grade

levels indicated nonnormality because the significance levels were less than the given

threshold of .05. Due to this violation, it was appropriate to use the nonparametric test

Mann-Whitney U. The Mann-Whitney U test is a rank-based nonparametric test that can

be used to determine if there are differences between two independent samples when the

sample distributions are not normally distributed (Statistical Laerd, 2015). The Mann-

Whitney U test is the nonparametric equivalent of the two-sample independent t-test. I considered four assumptions (Statistical Laerd, 2015).

The first assumption was having a dependent variable measured at the continuous or ordinal level. The GMAS exam performance is an example of a continuous dependent variable. The dependent variable for this study was student scores on reading comprehension on the GMAS. The second assumption was that the independent variable could consist of two or more categorical independent groups. The independent variable for this study was (participation/intervention) (or not/control) in the treatment group comparing Lexia Core5. The third assumption was having independence of observations. There was no relationship between the participants in either of the groups since the participants who received the intervention during the 2017 - 2018 school year were in third and fourth during the 2016 - 2017 school year. The fourth assumption states that the researcher must determine whether the distribution of scores for both groups of the independent variable has the same or a different shape. The distribution of the scores for both groups of the independent variable has the same shape as seen in Figures 4 and 5. Since this assumption was met, I determined (1) whether there was a statistically significant median difference in the two groups of the independent variable in terms of the dependent variable and (2) whether I could accept or reject the null hypothesis. The results for each research question corresponded to each grade level. These results were accurate for both research questions.

Figure 4

Fourth Grade Mann-Whitney U Test
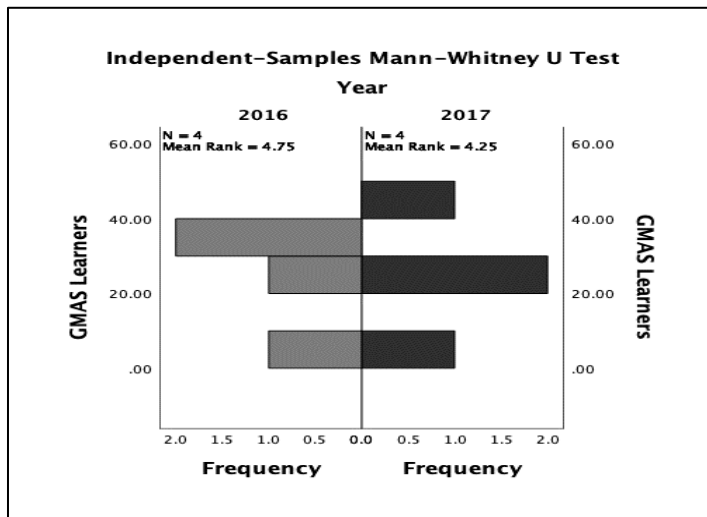
Figure 5

Fifth Grade Mann-Whitney U Test
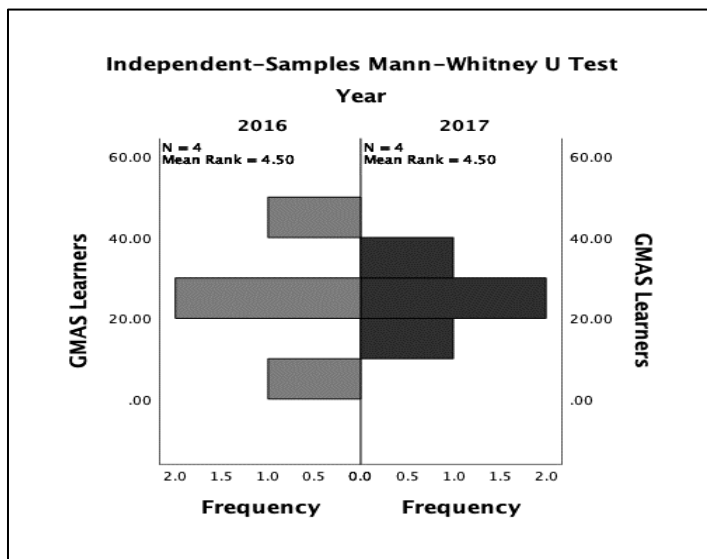
Results

I conducted the Mann-Whitney U Test using SPSS to evaluate if there was a statistically significant difference between the mean of GMAS scores between students in 2016 who did not receive the computer assisted Lexia Core5 intervention and the students who did receive the intervention in 2017. The mean analysis of students in 2017 with the intervention was numerically the same for both groups than students who did not receive the intervention in 2016.

Research Question 1 Results

A Mann-Whitney U test was used to determine if there were differences in GMAS scores between students in 2016 who did not receive the computer-assisted Lexia Core5 intervention and those who received the intervention in 2017. Distributions of the GMAS scores for students in 2016 and 2017 were similar, as assessed by visual inspection. GMAS scores were not statistically significant between students in 2016 (Mdn = 29.5) and 2017 (Mdn = 23.5), U = 7.00, z = -0.289, p = .886. The median scores are shown in Table 3. The null hypothesis was retained for the first research question, as seen in Tables 4 and 5.

Table 3

Fourth Grade Median Scores

Year	GMAS learners
2016	29.5000
2017	23.5000
Total	26.5000

Table 4

Fourth Grade Hypothesis Summary

Null hypothesis	Test	Sig.	Decision
The distribution of GMAS Learners is the same across categories of Year Groups.	Independent Samples Mann-Whitney U Test	.886	Retain the null hypothesis.

Table 5

Fourth Grade Mann-Whitney U Test Summary

Total N	8
Mann-Whitney U	7.000
Test Statistic	7.000
Standard Error	3.464
Standardized Test	-.289
Asymptotic Sig.(2-sided test)	.773
Exact Sig. (2=sided test	.886

Research Question 2 Results

A Mann-Whitney U test was run to determine if there were differences in GMAS scores between students in 2016 who did not receive the computer assisted Lexia Core5 intervention and the students who did receive the intervention in 2017. Distributions of the GMAS scores for students in 2016 and students in 2017 were similar, as assessed by visual inspection. GMAS scores were not statistically significant different between students in 2016 (Mdn = 29.5) and 2017 (Mdn = 23.5), U = 8.00, z = -.000, p = 1.00. The

median scores are shown in table 6. The null hypothesis was retained for research

question two as seen in Tables 7 and 8.

Table 6

Fifth Grade Median Scores

Year	GMAS learners
2016	29.5000
2017	23.5000
Total	26.5000

Table 7

Fifth Grade Hypothesis Summary

Null hypothesis	Test	Sig.	Decision
The distribution of GMAS Learners is the same across categories of Year Groups.	Independent Samples Mann-Whitney U Test	.1.000	Retain the null hypothesis.

Table 8

Fifth Grade Mann-Whitney U Test Summary

Total N	8
Mann-Whitney U	8.000
Test Statistic	8.000
Standard Error	3.464
Standardized Test	.000
Asymptotic Sig.(2-sided test)	1.000
Exact Sig. (2=sided test	1.000

Summary

All assumptions were evaluated before the Mann Whitney test was performed to answer the posed research questions. All four of the assumptions were met. The null hypothesis was retained for both research questions. There was no statistically significant difference in the GMAS reading scores of students who participated in the computer-assisted Lexia Core5 intervention and those lower 35% non-ELL (fourth, and fifth) grade students who did not participate in the intervention during the 2016 school year. This stands as one research study. To accurately answer the research questions further studies should be conducted to determine if this blended learning intervention should be combined with another computer assisted programs that address other aspects of comprehension skills. Other options for future studies will be discussed in Chapter 5.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this study was to determine the effect of the Lexia Reading Core5 program on the reading comprehension skills of upper non-ELL elementary students performing below grade levels in reading comprehension. Comparing the reading achievement scores among non-ELL upper elementary students who received the computer-assisted Lexia Core5 intervention and students who did not should help determine if one group of upper elementary students did or did not outperform the other.

In this chapter, I present my interpretation of findings along with the interpretation of findings in the context of the theoretical framework. Limitations of the study that arose are shared. Recommendations for further research grounded in this study's strengths and limitations and potential effects for positive social change are also discussed.

Interpretation of the Findings

In this section, I offer my understanding of the findings concerning the peer-reviewed literature shared in Chapter 2; this study indicated no statistically significant difference in the GMAS reading scores of students who participated in the computer-assisted Lexia Core5 intervention compared to those who did not. The focus of this quantitative study aimed to determine the effect of the Lexia Reading Core5 program on the reading comprehension skills of upper non-ELL elementary students performing below grade levels in reading comprehension. This study was needed to determine if the computer-assisted program Lexia Reading Core5 affected the reading comprehension

skills of upper non-ELL elementary students performing below grade levels in reading comprehension.

Lexia Core5 provides a blended learning model that combines systematic, structured activities within the digital component and offline materials for teachers to plan their lessons. The tasks called Lexia Skill Builders® are available for students to tackle independently to build automaticity and generalize skills beyond the digital component (Macaruso et al., 2020). Prescott et al. (2018) suggested that additional studies that included low-performing and non-ELL students were needed. This current study filled the research gap in the literature by focusing on whether the computer-assisted Lexia Core5 affected the reading comprehension skills of non-ELL upper elementary students who were performing below grade levels.

Thorndike's (1913) work law of effect and the revised law of exercise theory were appropriate to this study because Lexia Core5 allows students to practice skills to reinforce reading development and provides instant feedback as they work through the various levels, engaging in a trial-and-error type of learning. The law of effect implies that students associate their behaviors and circumstances with positive or negative consequences. It advocates that an effective learning environment should incentivize correct responses, fostering a reinforcement-based pedagogy. Satisfying learning activities leads to consolidation and strengthening of the connection, whereas dissatisfaction, annoyance, or pain leads to the weakening or stamping out of the connection. The law of effect signifies that if the response satisfies the subject, they are learned and selected, while those not meeting it are eliminated. Teaching, therefore, must

be pleasing. The educator must obey the tastes and interests of the students; in other words, the greater the satisfaction, the stronger the motive to learn.

Thorndike's law of exercise refers to connections that become strengthened with practice and weakened when practice is discontinued. Thorndike's development of the law of exercise emphasizes the importance of knowledge of results in learning (Thomas, 1970). In this current study, it is possible that students' connections did not elicit strengthening of the behavior but created avoidance behavior. The mere repetition of a stimulus and response connection only facilitates the learning of that lesson when there is confirmation of the appropriateness of the response. The law of exercise can be simultaneous with drill or practice, which helps increase learning efficiency and durability. The connections are strengthened with practice, and the connections are weakened when practice is discontinued.

In addition, Robert Gange's (1985) nine events of instruction are transferred to the computer-assisted instruction of Lexia Core 5. Gagne's nine events of instruction is a highly organized, action-oriented methodology that empowers educators with a solid framework to increase teaching efficacy in virtually any setting. Lexia Core5 computer-assisted program is flexible enough to be modified for various circumstances and simple enough to be readily incorporated into current reading interventions. The emphasis is placed on the learner and teachers doing everything possible to ensure students capture, retain, and use the information taught.

The results of this study could not confirm whether the computer-assisted Lexia Core5 affected the reading comprehension skills of non-ELL upper elementary students

who were performing below grade levels. Wilkes et al. (2020) studied Core5 with kindergarten and first-grade students. The results of their studies indicated that students who used the program outperformed those who did not. Cravalho et al. (2020) emphasized that a multicomponent intervention that includes vocabulary, fluency, and comprehension should be used. Reading intervention elements involve explicit vocabulary instruction, repeated reading with sentence-level comprehension, question-answering relationships, and main idea summarization. Calkins (2019) and Head et al. (2018) stated that it is essential for readers to verbalize and think while reading to find the meaning of the text and to stimulate cognitive load. Perhaps students in this study needed to receive more opportunities during small group instruction to ensure they were given the opportunity to receive explicit vocabulary and reading strategies instruction during guided reading.

Previous studies confirm the results of this current study. The results of Dounas et al.'s (2019) study concluded that ALT may only be effective in some subject areas. The results indicated that design flaws in the ALT system could have led to a lack of student success. Learners have different learning styles, learning goals, and varying progress of their learning over time that can affect the learners' performance. Hudson (2019) evaluated the effects of iPad-delivered early literacy lessons and self-monitoring on students. The study results indicated that two participants showed increased correct responses in early literacy skills. However, the third participant showed no change in the percentage of correct answers, showing that the use of (CAI) may not consistently achieve the needed support for all students reading below their current grade level.

Roberts et al. (2018) investigated the effectiveness of an afterschool reading intervention that used a computer-assisted program with upper elementary-grade students with reading comprehension difficulties. The study's findings revealed that using a computer-assisted program may yield a different outcome than improving reading comprehension. Likewise, the current study's findings showed no statistically significant difference in the GMAS reading scores of students who participated in the computer-assisted Lexia Core5 intervention compared to those who did not participate. The results are inconclusive and do not necessarily prove whether the intervention of Lexia Core5 did or did not improve the GMAS scores.

The findings of this study extend knowledge concerning what Plante (2020) stated concerning SL. In SL, the lessons are systematic and cumulative. The lessons provide spiraling back of concepts for review while introducing new ones. Students are taught concepts, rules for sounds, syllables, morphology, and phonological awareness, and provide practice through contextual reading to build comprehension skills. The design and structure of Lexia Core5 includes activities that cover six strands of reading skills: phonological awareness, phonics, structural analysis, automaticity/fluency, vocabulary, and comprehension (Lexia Learning, 2022). The explicit and systematic approach to literacy and language instruction builds upon prior learning sequentially—from simple to complex—ultimately with the hopes of improving and providing students with critical literacy concepts that strengthen students' relationship with learning and transitioning ownership of learning.

Limitations of the Study

A limitation of this study was that the population under study was only from one elementary school. As a result, the study sample of the experimental group and the traditional group were relatively small compared to the greater population. A larger sample may yield a different result. Statistical theory states as sample size increases, the probability of detecting statistical significance increases as well (Statistical Laerd, 2015). Typically, studies with small samples struggle to detect statistically meaningful results.

Another limitation is that there was not a measure of whether the program was implemented with fidelity, which could affect the results. The implementation of an effective intervention should follow the program model to ensure there is a transition from research to practice. When considering usage, it would be necessary for a checklist to track students' usage weekly.

Recommendations

There is a need for a qualitative study to analyze and understand the opinions or experiences of teachers who use Lexia Core5. This study or project would look closer at how teachers are trained in using the program. Within the study or project, teachers will be provided with professional development sessions to make them aware of the connection between Thorndike's (1913) development and the law of effect. Teachers will have access to Lexia Academy, an eLearning platform designed to help educators maximize the implementation of Lexia products and connect these products to meaningful classroom instruction.

Implications

This current study aims to determine the effect of the Lexia Reading Core 5 program on the reading comprehension skills of upper non-ELL elementary students performing below grade levels in reading comprehension, which contains implications for positive social changes. First, curriculum planners and school administrators can make informed decisions on what type of computer-assisted instruction would augment the current curriculum to improve the comprehension skills of upper elementary students. The study can help teachers facilitate and teach students how to think and use feedback constructively. This will prepare students to understand the mindset it takes to receive feedback as they increase comprehension skills and develop lifelong critical thinking skills. The students who use Lexia Core5 are given opportunities to make decisions concerning their learning as they engage in various levels to improve reading comprehension skills. These skills can lead students to complete higher education and be equipped for various jobs and career choices, contributing to positive social change.

Conclusion

The problem addressed through this quantitative study was designed to determine the effect of the Lexia Reading Core5 program on the reading comprehension skills of upper non-ELL elementary students performing below grade levels in reading comprehension. I conducted a Mann-Whitney test, and the findings of this study indicated no statistically significant difference in the GMAS reading scores of students who participated in the computer-assisted Lexia Core5 intervention.

Providing our students performing below grade level with practical, research-based instruction and interventions is troublesome. Students' skill levels vary greatly, and the challenge of addressing each student's unique needs requires the flexible application of differentiated instructional resources such as computer-assisted instruction similar to Lexia Core5. Adaptive computer-assisted instruction may provide teachers with an effective tool for differentiating literacy skills instruction. Using technology-based reading interventions can help students improve their reading ability.

References

Barnes, Z. T., Fields, R. S., Cartwright, K. B. (2023). A special educator's guide to the science of reading. *Preventing School Failure: Alternative Education for Children and Youth*. https://doi.org/10.1080/1045988X.2023.2243847

Bennett, J. G., Gardner, R., Cartledge, G., Ramnath, R., & Council, M. R. (2017). Second-grade urban learners: Preliminary findings for a computer-assisted, culturally relevant, repeated reading intervention. *Education and Treatment of Children, 40*(2), 145–186. https://files.eric.ed.gov/fulltext/EJ1145196.pdf

Campbell, L. O., Howard, C., Lambie, G. W., & Gao, X. (2022). The efficacy of a computer-adaptive reading program on grade 5 students' reading achievement scores. *Education and Information Technologies*. https://doi.org/10.1007/s10639-022-10953-5

Castles, A., Rastle, K., & Nation, K. (2018). Ending the reading wars: Reading acquisition from novice to expert. *Psychological Science in the Public Interest: A Journal of the American Psychological Society*, *19*(1), 5-51. https://doi.org/10.1177/1529100618772271

Chiu, Y. D. (2018). The simple view of reading across development: Prediction of grade 3 reading comprehension from prekindergarten skills. *Remedial and Special Education*, *39*(5), 289–303. https://doi.org/10.1177/0741932518762055

Cho, H., Wang, C., & Christ, T. (2019). Social emotional learning of refugee English language learners in early elementary grades:

Teachers' perspectives. *Journal of Research in Childhood Education, 33*(1), 40–55.

https://doi.org/10.1080/02568543.2018.1531449

Chu, Y. (2019). What are they talking about when they talk about equity? A content analysis of equity principles and provisions in state Every Student Succeeds Act plans. *Education Policy Analysis Archives, 27*(158), 1–30. https://doi.org/10.14507/epaa.27.4558

Connor, C. M. (2019). Using technology and assessment to personalize instruction: Preventing reading problems. *Prevention Science*, *20*(1), 89–99. https://doi.org/10.1007/s11121-017-0842-9

Connor, C. M., May, H., Sparapani, N., Hwang, J.K., Adams, A., Wood, T.S., Siegal, S. (2022). Bring assessment-to-instruction (A2i) technology to scale: Exploring the process from development to implementation. *J Educ Psychology*, *4*(7), 1495–1532. https://doi.org/10.1037/edu0000758

Cravalho, D. A., Jimenez, Z., Shhub, A., & Solis, M. (2020). How grades 4 to 8 teachers can deliver intensive vocabulary and reading comprehension interventions to students with high-functioning autism spectrum disorder. *Beyond Behavior, 29*(1), 31–41. https://doi.org/10.1177/1074295620907110

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16* (3), 297–334.

Dhakshinamoorthy, A., & Dhakshinamoorthy, K. (2019). KLSAS—An adaptive dynamic learning environment based on knowledge level and learning style. *Computer Application in Engineering Education, 27*(2), 319–331. https://doi.org/10.1002/cae.22076

Dounas, L., Salinesi, C., & El Beqqali, O. (2019). Requirements monitoring and

    diagnosis for improving adaptive e-learning systems design. *Journal of*

    Information Technology Education: Research, *18*(1), 161–184.

    https://doi.org/10.28945/4270

Duke, N. K., & Cartwright, K. B. (2021). The science of reading progresses:

    Communicating insights beyond the simple view of reading. *Reading Research*

    Quarterly, 56(S1), 1–20. https://doi./10.1002/rrq.411

Duke, N. K., Ward, A. E., & Pearson, P. D. (2021). The science of reading

    comprehension instruction. *The Reading Teacher, 74*(6), 663–673.

    https://doi.org/10.1002/trtr.1993

Elleman, A. M., & Oslund, E. L. (2019). Reading comprehension research: Implications

    for practice and policy. *Policy Insights from the Behavioral and Brain Sciences,*

    6(1), 3-11. https://doi.org/10.1177/2372732218816339

ElSabagh, H. A. (2021). Adaptive e-learning environment based on learning styles and its

    impact on development students'engagement. *International Journal of*

    Educational Technology in Higher Education, 18(1), 1–21.

    https://doi.org/10.1186/s41239021002894

Fletcher, J. D. (2018). Adapting learning with digital tutoring. *Technology, Instruction,*

    Cognition & Learning, 11(1), *51*–72.

Fogarty, M., Coyne, M. D., Simmons, D. C., Henri, M., Kwok, O., Ware, S. M., Dalton,

    K., Williams, K. A., & Wang, H. (2020). Effects of technology mediated

    vocabulary intervention for third-grade students with reading difficulties. *Journal*

of Research on Educational Effectiveness, 13(2), 271–297.

http://doi.org/10.1080/19345747.2019.1698086

Gagne, R.M. (1985). *The conditions of learning and theory of instruction* (4th ed.). Holt,

Rinehart & Winston.

Georgia Department of Education. (2023). Georgia Insights, Georgia Milestones.

https://georgiainsights.gadoe.org/Dashboards

Georgia Department of Education. (2019). Georgia Milestone Assessment System.

https://www.gadoe.org/Curriculum-Instruction-and-

Assessment/Assessment/Pages/Georgia-Milestones-Assessment-System.aspx.

Georgia Department of Education. (2020). Governor's Office of Student Achievement.

https://schoolgrades.georgia.gov/reference

Georgia Department of Education. (2022). Understanding the Georgia Milestone

Achievement Levels. https://www.gadoe.org/Curriculum-Instruction-and-

Assessment/Assessment/Documents/Milestones/Parents/Understanding_the_Geor

gia_Milestones_Achievement_Levels.pdf

Girli, A., & Ozbek, A. B. (2017). The effectiveness of a tablet computer-aided

intervention program for improving reading fluency. *Universal Journal of

Educational Research, 5*(5), 757–764. https://doi.org/10.13189/ujer.2017.050508

Gozukcuk, M., & Günbas, N. (2020). Computer-based reading texts to support fourth

graders' reading comprehension. *GIST Education and Learning Research Journal*,

21, 47-68. https://files.eric.ed.gov/fulltext/EJ1285653.pdf

Grover, V., Uccelli, P., Rowe, M., & Lieven, E. (2019). *Learning through language:*

Toward an educationally informed theory of language learning. Cambridge

University Press. https://doi.org/10.1080/13670050.2020.1718596

Hashim, H. (2018). Application of technology in the digital era education. *International*

Journal of Research in Counseling and Education, *2*(1), 1–5.

https://doi.org/10.24036/002za0002

Head, N.C., Flores, M., & Shippen, M, (2018). Effects of direct instruction on reading

comprehension for individuals with autism or developmental disabilities.

Education and Training in Autism and Development Disabilities, *53*(2), 176-191.

Hudson, A., Koh, P.W., Moore, K.A., & Binks-Cantrell, E. (2020). Fluency interventions

for elementary students with reading difficulties: a synthesis of research from

2000–2019. *Education Sciences, 10*(3). https://doi.org/10.3390/educsi10030052

Hudson, M. E. (2019). Using iPad-delivered Instruction and self-monitoring to improve

the early literacy skills of middle school nonreaders with development disabilities.

International Journal of Special Education, 34(1), 182–196.

https://files.eric.ed.gov/fulltext/EJ1237171.pdf

Hung, M., Smith, W.A., Voss, M.W., Franklin, J.D. Gu, Y., Bounsanga, J**.** (2020).

Exploring student achievement gaps in school districts across the United States**.**

Education and Urban Society. *52*(2), 175–193.

https://doi.org/10.1177/0013124519833442

Hurwitz, L. B., & Macaruso, P. (2020). Measuring the impact of a blended learning

model on early literacy growth. *Journal of Computer Assisted Learning*, *36*, 595–609.

https://doi.org/10.1111/jcal.1249

Hurwiz, L. B., & Macaruso, P. (2021). Supporting struggling middle school readers: impact of the lexia powerup literacy program. *Journal of Applied Developmental Psychology, 77*(1), 80-97. https://doi.org/10.1016/j.appdev.2021.10132

Hussein, A., & Al-Chalabi, H. (2020). Pedagogical agents in an adaptive e-learning system. *SAR Journal of Science and Research. 3*(1), 24–30. https://doi.org/10.18421/SAR3104

Jamshidifarsania, H., Garbayab, S., Limc, T., Blazevica, P., & Ritchiec, J.M. (2019). Technology-based reading intervention programs for elementary grades: An analytical review. *Computers and Education*, *128* (1), 427-451. https://doi.org/10.1016/j.compedu.2018.10.003

Kazakoff, E.R. Orkin, M., Bundschuh, K., Schechter, R. (2018). Fostering engagement in educational technologies through developmental theory and program data. *In End-User Considerations in Educational Design,* 99-122.

Kazakoff, E. R., Macaruso, P., & Hook, P. (2018). Efficacy of a blended learning approach to elementary school reading instruction for students who are English learners. *Educational Technology Research & Development*, *66*(2), 429–449, 21. http://doi.org/10.1007/s11423-017-9565-7

Laerd Statistics. (2015). Statistical tutorials and software guides. https://statistics.laerd.com

Lexia Learning. (2019). https://www.lexialearning.com

Lexia Learning. (2022). Lexia Core5 Reading. https://www.lexialearning.com/core5

Lodico, M.G., Spaulding, D.T., & Voegtle, K.H. (2010). *Methods in educational*

research: From theory to practice 28. John Wiley & Son.

Macaruso, P., Wilkes, S., Franzen, S., & Schechter, R. (2019). Three-year longitudinal study: Impact of a blended learning program—Lexia Core5 reading—on reading gains in low SES kindergarteners. *Computers in the Schools*, *36*(1), 2–18. https://doi.org/10.1080/07380569.2018.155888

Macaruso, P., Wilkes, S., & Prescott, J. E. (2020). An investigation of blended learning to support reading instruction in elementary schools. *Educational Technology Research and Development, 68*, 2839–2852. https://doi.org/10.1007/s11423-020-09785-2

Minn, S. (2022). AI-assisted knowledge assessment techniques for adaptive learning environments. *Computers and Education: Artificial Intelligence, 3*, 100050–100062. https://doaj.org/article/ecf1057b703c4747a26bd3b6ff055337

Nation, K. (2019). Children's reading difficulties, language, and reflections on the simple view of reading. *Australian Journal of Learning Difficulties*, *24*, 47-73. https://doi.org/10.1080/19404158.2019.1609272

National Center for Education Statistics. (2018). 2017 Reading results. https://www.nationsreportcard.gov/reading_math_2017_highlights/files/infographic_2018_reading.pdf

National Institute of Health. (2022). Report of the national reading panel. https://www.nichd.nih.gov/publications/pubs/nrp/findings

Normadhi, N.B.A., Shuib, L., Nasir, H.N., Andrew, B., Idris, N., Vimala Balakrishnan, V. (2019). Identification of personal traits in adaptive learning environment:

Systematic literature review. *Computers & Education, 130* (3) 168-190.

https://doi.org/10.1016/j.compedu.2018.11.005

Nuankaew, P., Nuankaew, W., Phanniphong, K., Imwut, S., & Bussaman, S. (2019).

Students model in different learning styles of academic achievement at the

University of Phayao, Thailand. *International Journal of Emerging Technologies*

in Learning, *14*(12), 133-157.

https://doi.org/10.3991/ijet.v14i12.10352

Oakhill, J. (2020). Four decades of research into children's reading comprehension: a

personal review. *Discourse Process, 57*(5-6), 402-419.

https://doi.org/10.1080/0163853X.2020.1740875

Peng, H., M., S. & Spector, J.M. (2019*).* Personalized adaptive learning: an emerging

pedagogical approach enabled by a smart learning environment. *Smart Learning*

Environments, 6(9). https://doi.org/10.1186/s40561-019-0089-y

Petscher, Y., Cabell, S. Q., Catts, H. W., Compton, D. L., Foorman, B. R., Hart, S. A.,

Lonigan, C. J., Phillips, B. M., Schatschneider, C., Steacy, L M., Terry, N. P.,

Wagner, R. K. (2020). How the science of reading informs 21st-century education.

Reading Research Quarterly, 55(1) 267–282. https://doi.org/10.1002/rrq.352

Pindiprolu, S. S., & Marks, L. J. (2020). Preventing summer reading slide: examining the

effects of two computer-assisted reading programs. *Rural Special Education*

Quarterly, *39* (3), 116-127. http://doi.org/10.1177/875687052091428

Plante, S. L. (2020). Enhancing structured literacy instruction with educational

technology. *Assistive Technology Outcomes & Benefits*, *14*(1), 129-134.

https://www.proquest.com/scholarly-journals/enhancing-structured-literacy-instruction-with/docview/2440938776/se-2

Preacher, K. J., & Sterba, S. K. (2019). Aptitude-by-Treatment Interactions in Research on Educational Interventions. *Exceptional Children*, *85*(2), 248-264. https://doi.org/10.1177/0014402918802803

Prescott, J. E., Bundschuh, K., Kazakoff, E. R., & Macaruso, P. (2018). Elementary school-wide implementation of a blended learning program for reading intervention. *Journal of Education Research*, *111*(4), 497–506.

Rahman, M. S. (2017). The advantages and disadvantages of using qualitative and quantitative approaches and methods in language testing and assessment research: A literature review. *Journal of Education and Learning*, *6*(1), 102–112. http://doi.org/10.5539/jel.v6n1p102

Rao, V. C. (2019). Blended learning: A new hybrid teaching methodology. *Journal of Research Scholars and Professionals of English Language Teaching, 13*(3), 1–7. https://eric.ed.gov/?id=ED611486

Roberts, G., Capin, P., Roberts, G. J., Miciak, J., Quinn, J.M., & Vaughn, S. (2018). Examining the effects of after-school reading interventions for upper elementary struggling readers. *Remedial and Special Education*, *39*(3) 131-143. https://doi.org/10.1177/0741932517750818

Rombot, O., Boeriswati, E., & Suparman, A. (2021). The development of blended learning model for reading comprehension learning of bipa students in grade V elementary school. *Elementary Education Online*, *20*(5), 1155–1164.

https://doi.org/10.1016/j.appdev.2021.101329

Salomon, G. (1971). Heuristic models for the generation of aptitude-treatment interaction hypotheses. *Review of Educational Research, 42*(3), 327-343. https://doi.org/10.3102/00346543042003327

Shanahan, T. (2020). What constitutes the science of reading instruction? *Reading Research Quarterly*, *55*(S1), S235-S247. https://doi.org/10.1002/rrq.349

Snyder, S., & Huber, H. (2019). Computer assisted instruction to teach academic content to students with intellectual disability: A review of the literature. *American Journal on Intellectual and Developmental Disabilities, 124*(4), 374–390. https://doi.org/10.1352/1944-7558-124.4.374

Thomas, E. O. (1970). Optimizing computer-assisted instruction by applying principles of learning theory. https://eric.ed.gov/contentdelivery/servlet/ERICSERVLET?accno=ED105899

Thorndike, E. L. (1913). The psychology of learning. *Ed Psycho. 2*. Teacher College.

United States Department of Education. (2022). Every Student Succeeds Act. https://www.ed.gov/essa

Vargas, M.A.O., Mancia J.R. (2019). The importance and earnest of the researcher in pointing out the study limitations. *Rev Bras Enferm*, *72*(4):832-833. http://dx.doi.org/10.1590/0034-7167-2019-720402

Villa, A.M., Sedlacek, Q.C., Pope, H.Y. (2023). I dig STEM: A teacher professional development on equitable digital game-based learning. *Educ. Sci. 13*(964). https://doi.org/10.3390/educsci13090964

Villesseche, J., Le Bohec, O., Quaireau, C., Nogues, J., Besnard, A. L., Oriez, S., De La

Harye, F. D., Noel, Y., Lavandier, K. (2019). Enhancing reading skills through

adaptive learning. *Interactive Technology and Smart Education, 16*(1), 2–17.

https://doi.org/10.1108/ITSE-07-2018-0047

Vladova, G., Ullrich. A., Bendor, B., & Gronau, N. (2021). Students' acceptance of

technology-mediated teaching-how it was influenced during the covid-19

pandemic in 2020: A study from Germany. *Frontiers in Psychology*, *12* (636086).

Webster, D. W. (2021). Implementing structured literacy translating the science of

reading into practice. *Perspectives on Language and Literacy*, *47*(2), 7–9.

https://www.proquest.com/scholarly-journals/implementing-structured-literacy-

translating/docview/2671903038/se-2

White, G. (2020). Adaptive learning technology relationship with student learning

outcomes. *Journal of Information Technology Education: Research*, *19* (113130).

https://doi.org/10.28945/4526

Wirawan, M. Y., & Kristiani, P. E. (2022). The use of blended learning in teaching

reading. *Acitya*, *4*(1), 40–48.

https://doi.org/article/fe0c07c139744ac3a5ae938b543ea49a

Xiaoyu, Z., & Tobias, T.C. (2023). Exploring the efficacy of adaptive learning

technologies in online education: A longitudinal analysis of student engagement

and performance. *International Journal of Science and Engineering Applications*

12(12), 28 - 31. https://doi:10.7753/IJSEA1212.1007

Xu, Z., Wijekumar, K., Ramirez, G., Hu, X., & Irey, R. (2019). The effectiveness of

intelligent tutoring systems on K-12 students' reading comprehension: A meta-

analysis. *British Journal of Educational Technology, 50*(6), 3119-3137.

Zhang, J. (2021). Computer-assisted instruction system under artificial intelligence

technology. *International Journal of Emerging Technologies in Learning*, *16*(5),

4–16. https://doi.org/10.3991/ijet.v16i05.20307

Zhou, W., Shi, L., & Chen, J. (2018). Design and implementation of the online computer-

assisted instruction system based on object-oriented analysis technology.

International Journal of Emerging Technologies in Learning, 13(10), 183–195.

https://doi.org/10.3991/ijet.v13i10.9462