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Comparison Between Reading Plus and Business-as-Usual Reading Instruction Outcomes for Grade 4 Students

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This is to certify that the doctoral study by

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Walden University
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Dissertation Submitted in Fulfillment

of the Requirements for the Degree of

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Abstract

The problem that was investigated in this study was that despite existing implementation of reading instruction strategies, some students in fourth grade demonstrate reading difficulties prompting the need for additional approaches to reading instruction. The purpose of this quantitative quasi-experimental study was to investigate the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and students who participated in business-as-usual reading instruction. The theoretical foundation is applied behavior analysis, which involves using strategies derived from behaviorism theory to improve learning. Aggregated and de-identified i-Ready scores were collected for the 49 fourth grade students at the target school and 43 fourth grade students at the school providing business-as-usual reading instruction. The standardized mean difference was used to determine baseline equivalence between the Reading Plus group and business-as-usual group using the i-Ready scores at the outset of the study. An independent samples *t* test comparing the two groups on i-Ready scores at the outset and conclusion of the study was calculated to determine differences between scores of the target and business-as-usual students. Cohen's *d* was used to determine if results show practical significance. Cohen's *d* was 1.23, which indicates a large, standardized effect size, meaning that the research finding has practical significance. The findings may promote social change by addressing the reading development of many Grade 4 students; the local school has elected to use Reading Plus program for 1 year in hopes of providing additional individualized adaptive instruction for students who struggle with reading.

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Chapter 1: Introduction to the Study

With the passage of the Every Student Succeeds Act of 2015 (reauthorization of the No Child Left Behind Act of 2001), the United States Congress mandated all public schools to systematically test their third through eighth grade students in reading (U.S. Department of Education, 2015). Nearly 294,000 fourth and eighth grade students across the nation participated in the 2019 reading assessment (National Assessment of Educational Progress, 2019a). In 2019, the National Assessment of Educational Progress (NAEP) reported in the Nation's Report Card the following achievement levels for fourth graders in Reading: 35% below NAEP Basic, 31% NAEP Basic, 26% NAEP Proficient, and 9% NAEP Advanced. Average reading scores for students at both Grades 4 and 8 were reported as lower in 2019 compared to 2017. School, district, and state trend data over the last 5 years indicated that 50% of fourth grade students were scoring in the lowest 25th percentile in reading. The nation and state/district level scores showed a problem with reading achievement in the United States as more than one-third of fourth graders were found to read below the NAEP basic level. The NAEP basic level represents partial mastery of prerequisite skills that are essential for proficient work at each grade level assessed.

Reading instruction in K-12 schools has increasingly incorporated research-based strategies in phonics, fluency, vocabulary, and comprehension of narrative and expository texts (Gewertz, 2020). According to the NAEP, at the basic level, fourth graders should be able to locate relevant information, make simple inferences, identify supportive details, and interpret a word's meaning as used in the text (National Assessment of

Educational Progress, n.d.). Though there is extensive research on the effective practices to teach reading during the primary years (Schwartz & Sparks, 2019), the gap in practice was that there were inconsistencies with the implementation of research-based reading practices during the COVID-19 pandemic.

To address the gap in practice in reading instruction and to promote social change by addressing the reading development of many Grade 4 students, the local school elected to use Reading Plus program for 1 year in hopes of providing additional individualized adaptive instruction for students who struggle with reading. If the students receiving the Reading Plus program demonstrated statistically significant improvement in achievement compared to students in a comparison school who received business-as-usual reading instruction, study outcomes may offer promising evidence for the effectiveness of Reading Plus.

In Chapter 1, I address the topic of the study, the gap in practice the study will address, why the study is needed, the research problem, and the purpose of the study and research questions. I also describe the theoretical foundation, discuss the nature of the study, and define terms essential to the study. Lastly, I present the assumptions, scope and delimitations, limitations, and the significance of the study.

Background

Research over the past decade showed that students who experienced difficulty learning basic reading skills during the primary years struggle with reading in subsequent years (Denton, 2012; Solari et al., 2018; Wanzek et al., 2018). In the area of reading, the Matthew effect was proposed by Stanovich (1986) to suggest that the gap between good

and poor readers grows during the school years. This phenomenon is often described as the rich get richer and the poor get poorer and led to a focus on early reading intervention for students who are at risk or struggling with reading (Partanen & Siegal, 2014; Wanzek et al., 2018). Two approaches to early reading instruction have been found to be effective: response to intervention (RtI) instruction and systematic and explicit instruction in foundational reading skills. Both of these approaches are incorporated in the Reading Plus program that will be investigated in this study.

RtI is a multi-tiered approach that incorporates prevention efforts and early identification of struggling readers (Nakamura et al., 2019). Tier 1 involves classroom instruction using a high-quality reading program that differentiates learning to meet the diverse needs of all students; Tier 2 involves small-group instruction for students who are not making progress with classroom instruction; and Tier 3 involves individual instruction for students who are not making progress with Tier 2 instruction (Fuchs & Vaughn, 2012; Haan, 2021). Tiers 2 and 3 offer an increase in the intensity of instruction by increasing the duration of the intervention (Wanzek et al., 2018). RtI has been shown to yield positive results for struggling readers when they have been provided intensive, systematic instruction on up to three foundational reading skills in a small group setting (What Works Clearinghouse, n.d.). However, a limitation of RtI is fidelity of implementation due to inadequate professional development (Ruffini et al., 2016). The Reading Plus (2021a) program addresses the needs of students requiring individual instruction who can also benefit from classroom Tier 1 and small-group Tier 2

instruction. As the program includes embedded ongoing professional development, issues of fidelity are addressed within the program.

The term direct instruction is often used to describe instruction that is systematic and explicit (Stockard et al., 2018). According to Cooper et al. (2021), systematic and explicit instruction involve teaching a concept or skill in a sequenced manner, modeling the performance to students, offering opportunities for students to practice using the new information or skill, providing frequent and precise feedback while students are practicing, and providing opportunities to generalize to new learning situations so the new knowledge and skills become automatic. In the direct instruction approach that is rooted in behaviorism, new information is presented and modeled in a series of small steps until students acquire each new skill (Skinner, 1953). The Reading Plus program provides adaptive differentiated literacy instruction to students who struggle with reading through systematic and explicit instruction of foundational reading skills, teacher modeling, offering opportunities for the student to practice each skill, and providing feedback based on student progress.

Mastery learning is a feature of direct instruction and the Reading Plus program. Stockhard et al. (2018) described mastery learning as students mastering key concepts before moving forward to new concepts. The direct instruction approach requires that students take a placement test to determine their level of academic functioning. Following the placement test, instruction is designed to reinforce skills, check for progress, and regularly test for mastery. As student's complete activities in Reading Plus, the difficulty level of the reading material adjusts as a function of a student's progress.

Until students master key concepts, they are not allowed to move forward to new concepts.

Technology has been extensively embedded into instruction to assist and enhance literacy learning (Jamshidifarsani et al., 2018). Researchers who have investigated technology-based programs to teach foundational reading skills, such as phonemic awareness and phonics, have found promising evidence of effectiveness (Horne, 2017; Jamshidifarsani, 2018; Saine et al., 2011; Torgeson et al., 2010). The Reading Plus program (2021) is a web-based literacy intervention program that incorporates differentiated fluency, comprehension, and vocabulary activities; mastery learning; embedded reading assessments; and tools to monitor student progress. Limited evidence for effectiveness of the program has been reported by the Center for Research and Reform in Education at Johns Hopkins (2022) and What Works Clearinghouse (2010).

Though research-based practices for teaching reading have been identified (Schwartz & Sparks, 2019), the gap in practice was the inconsistencies with the implementation of research-based reading practices during the COVID-19 pandemic due to issues with virtual instruction (U.S. Department of Education, 2021). Technology has been found to be a valuable resource paired with systematic and explicit reading instruction to enhance instruction that reaches the diverse needs of all students (Yang et al., 2018). The Reading Plus program provides systematic and explicit instruction within a technology-based platform that focuses on the foundational reading skills of phonemic awareness, phonics, fluency, vocabulary, and comprehension. This study was needed to determine if implementation of the Reading Plus program will show better reading

outcomes for fourth grade students when compared to students receiving business-as-usual reading instruction.

Problem Statement

The problem was despite existing implementation of reading instruction strategies; some students in fourth grade demonstrated reading difficulties prompting the need for additional approaches to reading instruction. In the setting of the present study, this problem prompted the need for new approaches to reading instruction. As discussed previously, the NAEP reported in the Nation's Report Card the following achievement levels for fourth graders in Reading: 35% below NAEP Basic, 31% NAEP Basic, 26% NAEP Proficient, and 9% NAEP Advanced. These scores show a problem with reading achievement in the United States as more than one-third of fourth graders were found to read below the NAEP basic level (National Assessment of Educational Progress, 2019a).

Administrative leaders in a local school district expressed concern with the progress of students during the period of remote learning during the COVID-19 pandemic, particularly among students in the district's Title 1 schools as shown by the trend data in Table 1 and 2 and discussed potential strategies for accelerating progress during the 2021-2022 school year in administrative meetings. Furthermore, the district compared their trend data to the state's trend data as shown in Table 3. Data showed that both the school and district trend data was lower than the state's reading proficiency, reading growth, and reading growth for the lowest 25% trend data. After careful data review, one of these strategies involved adoption of the Reading Plus program (2021) with grade 4 students at one of the Title 1 schools, according to the meeting notes.

Table 1

School Trend Data

Year	Reading proficiency	Reading growth	Reading growth (Lowest 25%)
2015-2016	9.9%	42.4%	50%
2016-2017	18.2%	58.7%	65.8%
2017-2018	20.4%	54.2%	66.4%
2018-2019	12.1%	36.9%	48.7%
2019-2020	12.1%	36.9%	48.7%

Table 2

District Trend Data

Year	Reading proficiency	Reading growth	Reading growth (Lowest 25%)
2015-2016	25.5%	57.4%	65.9%
2016-2017	29.7%	57.1%	64%
2017-2018	32.2%	57.3%	54.5%
2018-2019	29.2%	49.3%	54.5%
2019-2020	29.2%	49.3%	54.5%

Table 3

State Trend Data

Year	Reading proficiency	Reading growth	Reading growth (Lowest 25%)
2015-2016	N/A	N/A	N/A
2016-2017	N/A	N/A	N/A
2017-2018	39.8%	60.6%	61.4%
2018-2019	41.8%	58.8%	56.2%
2019-2020	41.8%	58.8%	56.2%

Note: Due to COVID-19, no accountability data were reported for 2020-2021.

Based on fourth grade reading scores reported by the NAEP (2019), it appears that research-based instruction may not have occurred in all schools before the pandemic. Given prior research on the Reading Plus program (Tremblay et al., 2009), the

administrative leadership at the target school decided to implement the program with fourth grade students during the 2021-2022 school year. It was unknown whether the Reading Plus program could address the gap in practice in the reading instruction of many students due to virtual learning during the pandemic. This study investigated the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and students who participated in business-as-usual reading instruction.

Purpose of the Study

The purpose of this quantitative quasi-experimental study was to investigate the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and students who participated in business-as-usual reading instruction. The dependent variable was growth in reading achievement as measured by the i-Ready assessment. The independent variable was the Reading Plus program that was used with fourth-grade students at a Title 1 elementary school for one school year.

Research Question and Hypotheses

The following research question guided this quantitative quasi-experimental study:

RQ1: Is there a statistically significant difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and the students who participated in business-as-usual reading instruction?

$H_0$1: There is no statistically significant difference in fourth graders' reading achievement growth as measured by the i-Ready test for students who received Reading Plus instruction and students who received business-as-usual reading instruction.

H_A1: There is a statistically significant difference in fourth graders' reading achievement growth as measured by the i-Ready test for students who received Reading Plus instruction and students who received business-as-usual reading instruction.

Theoretical Foundation

The theoretical foundation is applied behavior analysis, which involves using strategies derived from behaviorism theory to improve learning (Cooper et al., 2021). The term applied behavior analysis was introduced by Baer et al. (1968) to describe the application of basic behavioral principles to understand and improve behavior through a focus on socially meaningful behavior, relationship between the behavior and its environment, clearly identified and described procedures, and sustainable behavioral change. The Reading Plus program reflects the key constructs of applied behavior analysis through explicit and systematic instruction, modeling, practice, feedback, and reinforcement and generalization of new skills and knowledge.

Applied behavior analysis underlies the purpose to investigate the difference in fourth graders' reading achievement growth between students in the Reading Plus program that incorporates the key constructs of applied behavior analysis and students who participated in business-as-usual reading instruction that does not include these

constructs. The framework underlies the methodology of the study as differences in student performance will be determined through measuring the influence of the dependent variable, growth in reading achievement as measured by the i-Ready assessment, on the independent variable, the Reading Plus program used with fourth-grade students at a Title 1 elementary school for one school year. A more thorough explanation of the framework will be provided in Chapter 2.

Nature of the Study

I used a quantitative quasi-experimental design in this study. This design was appropriate because quasi-experimental designs are used to investigate the effect of an intervention by comparing the average outcomes for participants who were not randomly assigned to treatment and comparison groups (Schirmer et al., 2016). I investigated whether students in the Reading Plus program perform significantly better on the i-Ready test than students receiving business-as-usual reading instruction after one year of instruction. The dependent variable was growth in reading achievement as measured by i-Ready assessment. The independent variable was the Reading Plus web-based program that will be used with fourth-grade students at a Title 1 elementary school for one school year.

Aggregated and de-identified i-Ready scores were collected for the 49 grade 4 students at the target school and 43 Grade 4 students at the school providing business-as-usual instruction. Both schools were identified as Title I schools based on census poverty estimates. Demographically, there were 59.1% (29) African Americans and 40.8% (20)

Caucasians at the target school and 69.7% (30) African Americans, 16.2% (seven) Caucasians, and 13.9% (six) Hispanics at the comparison school.

The fourth-grade students in the Reading Plus program group and business-as-usual group were administered the i-Ready reading diagnostic assessment at the beginning of the year. The students in the experimental group then received instruction with the Reading Plus program and the students in the control group received business-as-usual reading instruction during the school year. Both groups were administered the i-Ready reading diagnostic assessment again at the end of the school year.

Definitions

Applied behavior analysis: The science in which tactics derived from principles of behaviorism are applied to improve socially significant behavior and learning (Cooper et al., 2007).

At-risk reader: A student scoring in the bottom 25th percentile of a curriculum-based progress monitoring assessment (Martins & Capellini, 2021).

Business-as-usual: Classroom instruction that is normally used to teach the subject matter in a particular school setting and grade level (Peters et al., 2022).

Foundational reading skills: The foundational reading skills are print concepts, phonological awareness, phonics, word recognition, and fluency (The Common Core State Standards Initiative, 2022).

i-Ready reading assessment: An adaptive assessment that adjusts its questions to suit the student's needs. Each item a student sees is individualized based on their answer to the previous question. For example, a series of correct answers will result in slightly

harder questions, while a series of incorrect answers will yield slightly easier questions. (i-Ready Central, 2021).

Reading Plus Web-based Program: A reading intervention program that provides individualized, differentiated instruction to develop and improve foundational reading skills, reading fluency, comprehension, and vocabulary (Reading Plus, 2021).

Struggling reader: A student who reads below grade level and who lacks proficiency in one or more aspects of reading, such as decoding, fluency, and comprehension skills (McGrail et al., 2018).

Assumptions

The purpose of this section is to clarify aspects of the study that are believed but cannot be demonstrated to be true. One assumption is that the teachers received sufficient professional development on the Reading Plus program to implement instruction as it was designed. My second assumption was that the teachers implemented the Reading Plus program with fidelity. My assumptions were necessary in the context of the study because it is necessary to identify the aspects of the study that are important but cannot be verified.

Scope and Delimitation

This study involved fourth grade readers because the data reported by the NAEP (2019) showed that 34% of fourth grade students are performing below the basic level in reading both nationally and locally. Students who experience difficulty learning basic reading skills during the primary years have been found to struggle with reading in subsequent years (Denton, 2012; Solari et al., 2018; Wanzek et al., 2018). Furthermore,

fourth grade is when students are expected to transition from learning to read to reading to learn and apply foundational reading skills to comprehending increasingly complex texts (Kang & Shin, 2019). The specific local sites were selected because they are Title I schools that receive federal financial assistance due to the high percentages of children from low-income families enrolled at each school. The federal financial assistance is awarded to each school to help ensure that all the children can meet high academic standards.

Theoretical designs related to the area of study not investigated were literacy processing theory and social constructivist theory. Literacy processing theory involves familiar patterns and understandings about how students develop, use, and retain reading and writing processing skills to learn literacy (Clay, 1991). Social constructivist theory emphasizes the importance of teachers' abilities to guide student growth in constructing new knowledge (Vygotsky, 1978).

This study is potentially transferable to populations with similar demographics. However, this single study cannot make a claim for generalizability. Conducting this study with participants in two Title 1 elementary schools in one public school district is too limited to generalize to students in schools with different demographics. Only with replication would findings be potentially generalizable.

Limitations

One limitation is that the two schools that were involved in this study are in my school district. However, this limitation is mitigated in that I am not a school administrator at either school or part of central administration and in no way affiliated

with the experimental school's choice to use the Reading Plus program. Therefore, there is no conflict of interest in terms of selection and implementation of the program.

Several limitations are not possible to mitigate. One is that participants were not randomly assigned to the experimental and control conditions. Another is the possibility that the teachers' level of enthusiasm for teaching a new reading program in the experimental condition may influence the outcomes rather than the effectiveness of the Reading Plus program. Yet another is that only one school will be involved in the experimental condition and one school in the control condition. A final limitation is that the i-Ready measures align with the Reading Plus program and so could advantage students in the experimental condition. This last potential limitation is mitigated by the fact that i-Ready is used in the district with all students, kindergarten through eighth grade, so district personnel determined it is a reliable and valid measure of reading achievement regardless of reading program.

Significance

The result of this study is significant in that reading achievement is a current issue in the United States, particularly in fourth grade nationally and at the school site for this study, as discussed in earlier sections. The gap in practice was that there were inconsistencies with the implementation of research-based reading practices during the COVID-19 pandemic in the settings in which the study took place. To address the gap in practice in reading instruction, the Reading Plus program was used to provide additional individualized reading instruction for students who struggle with reading or at-risk for difficulties in reading. It was expected that reading achievement for students receiving

Reading Plus instruction will show significantly greater growth compared to students receiving business-as-usual reading instruction. The results of the study may be beneficial to the local district as well as practitioners in other school districts in determining whether the Reading Plus program has the potential to improve reading outcomes for fourth-grade students in those school settings.

Summary

In Chapter 1, I described the topic of the study, the gap in practice the study addresses, why the study was needed, the research problem, and the purpose of the study and research questions. I discussed the theoretical foundation, described the nature of the study, and defined terms essential to the study. Lastly, I discuss the assumptions, scope and delimitations, limitations, and significance of the study. In Chapter 2, I describe the literature search strategy, discuss the theoretical framework, and provide an extensive review of literature relevant to the scope and topic of the study. I also summarize what is known and not known about the topic, describe how the proposed study fills a gap in practice in the research literature, and draw conclusions about the current state of knowledge about the topic.

Chapter 2: Literature Review

The problem to be investigated in this study was that despite existing implementation of reading instruction strategies, some students in fourth grade demonstrate reading difficulties prompting the need for additional approaches to reading instruction such as the Reading Plus Program. The purpose of this quantitative quasi-experimental study was to investigate the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and students who participated in business-as-usual reading instruction.

Literature Search Strategy

I searched the following databases to identify pertinent research literature: ERIC and Education Complete. I selected articles based on their content addressing the current study's research questions, hypotheses, and contribution toward filling the gap in the existing literature. The key terms that I used included *Reading Plus, i-Ready, fourth grade reading instruction, reading achievement, applied behavior analysis, reading interventions, web-based technology, core reading approaches,* and *web-based reading programs.* I also used Google Scholar as an additional database. The criteria I applied were that the studies were published within the past 5 years or were seminal studies, peer-reviewed, and available as full-text articles.

Theoretical Foundation

The theoretical foundation is applied behavior analysis, which involves using strategies derived from behaviorism theory to improve learning (Cooper et al., 2021). The

term applied behavior analysis was introduced by Baer et al. (1968) to describe the application of basic behavioral principles to understand and improve behavior through a focus on socially meaningful behavior, relationship between the behavior and its environment, clearly identified and described procedures, and sustainable behavioral change. The Reading Plus program reflects the key constructs of applied behavior analysis through explicit and systematic instruction, modeling, practice, feedback, and reinforcement and generalization of new skills and knowledge.

Applied behavior analysis underlies the purpose to investigate the difference in fourth graders' reading achievement growth between students in the Reading Plus program that incorporates the key constructs of applied behavior analysis and students who participated in business-as-usual reading instruction that does not include these constructs. Applied behavior analysis serves as a foundation for the methodology of the study as differences in student performance will be determined through measuring the influence of the dependent variable, growth in reading achievement as measured by the i-Ready assessment, on the independent variable, the Reading Plus program used with fourth-grade students at a Title 1 elementary school for 1 school year.

Applied behavior analysis was first described in 1968 with the inaugural issue of the *Journal of Applied Behavior Analysis* (Cooper et al., 2021) and since then, has typically been used to address behavioral issues that interfere with learning and has become a keystone of instruction for students with autism spectrum disorder (Fisher et al., 2021; Luiselli, 2017). Applied behavior analysis has been primarily geared toward the direct teaching of developmentally appropriate skills (i.e., those that same-aged typically

developing peers exhibit) and interventions to improve behaviors that interfere with social and academic functioning (Luiselli, 2017).

The seven dimensions of applied behavior analysis are generality, effective, reproducible, applied, analytic, and behavioral (Cooper et al., 2021). Generality means that the behavior change lasts over time, occurs in other environments, and spreads to other behaviors. Effective means that the behavior change has immediate and long-term benefits for the individual. Reproducible means that the procedure used for changing the behavior is replicable by others. Applied means that the behaviors selected for change are socially significant. Analytic refers to a functional relation between what is manipulated and a reliable change in the targeted behavior. Behavioral means that the behaviors selected for change must be the specific behavior in need of improvement and is measurable and observable.

The publisher of Reading Plus makes claims for each principle of applied behavior analysis. Reading Plus incorporates generality because it can be implemented in Grades 3-12 in any school in the United States. Reading Plus can be deemed effective if students are successful in mastering or improving reading skills during use of the program and if the program is implemented with fidelity. The program is reproducible because it is intended as a supplement to the core reading curriculum that can be reproduced from classroom to classroom. Reading Plus is applied in that improving the reading achievement of struggling readers is a socially significant educational goal. The program analytic is in that there is a functional relationship between instruction in each new skill and the learning of that skill, which is assessed through continuous collection of

data on student performance. Reading Plus is behavioral in that the skills are sequenced to build on skills previously learned and are specific skills in need of improvement based on continuous assessment.

An example of a study using applied behavior analysis as the framework was conducted by Boudreaux-Johnson et al. (2017) in which they compared two reading approaches with at-risk fourth grade students, close reading, and Collaborative Strategic Reading. Close reading involves teachers choosing short complex texts for students to read multiple times with a different emphasis with each reading, engaging the students in discussions, and students annotating the texts. The Collaborative Strategic Reading intervention involves steps of teacher modeling guided reading, and independent practice (Boudreaux-Johnson et al., 2017). Applied behavior analysis underlies Collaborative Strategic Reading and not close reading. Of the six students that were tested, four students indicated a higher Daze score trend in reading comprehension achievement using the Collaborative Strategic Reading strategy from pre to post-test. The authors found that the Collaborative Strategic Reading intervention was more effective as opposed to the close reading approach (Boudreaux-Johnson et al., 2017). Applied behavior analysis helps explain the findings because explicit and systematic instruction, modeling, practice, feedback, reinforcement, and generalization of new skills and knowledge appeared to influence better reading outcomes for at-risk students compared to close reading.

Literature Review Related to Key Concepts and Variables

I found two patterns in the research literature on the literacy learning of struggling and at-risk children at the middle elementary level (Grades 3-5) and instructional approaches, interventions, and strategies for improving their reading achievement. One pattern involves assessment and identification, and the second pattern involves instructional approaches designed to improve their reading achievement. Given research showing that students who demonstrate reading difficulties in the early grades tend to fall increasingly further behind their peers during later grades, often referred to as the Matthew Effect (Stanovich, 1986), a considerable body of research has focused on instruction aimed at struggling and at-risk readers.

Assessment and Identification of Struggling and At-Risk Readers

Characteristics of Struggling and At-Risk Readers

A struggling reader is characterized by below-grade reading performance and lack of proficiency in one or more aspects of reading, such as decoding, fluency, and comprehension skills (McGrail et al., 2018; Silverman et al. 2021). Struggling readers are commonly identified as reading at the lower quarter of grade-level comprehension (Donegan & Wanzek, 2021) or scoring in the bottom 25th percentile on a curriculum-based progress monitoring assessment (Martins & Capellini, 2021).

The middle elementary level is often referred to as the point at which students' transition from learning to read to reading to learn (Kang & Shin, 2019). One difficulty observed during this period is reading motivation. Reading motivation is defined as the individual's personal goals, values, and beliefs in relation to the text, processes, and

reading outcomes (Hebbecker, 2019). It has been found that reading motivation is correlated with reading achievement (e.g., Abuses Heidt, 2022; Huang et al. 2022; McBreen & Savage, 2022; Svrcek & Wang et al. 2020). Through the self-determination theory (Deci & Ryan, 1985), the authors posited that intrinsic and extrinsic motivation influence reading behavior. Intrinsically motivated students read because they enjoy reading and extrinsically motivated students read because they are driven by external factors such as grades, rewards, punishment, and the need to outperform their peers (Hebbecker, 2019). Students who are intrinsically motivated are more likely to put in the effort to learn adequate reading strategies to develop a deeper understanding of the text. Low levels of self-efficacy, self-concept, no interest in reading, and a lack of reading outside of school have been found to contribute to students lacking reading motivation (Gilson et al. 2018). The constructs of self-determination theory would indicate that students who lack motivation are less likely to learn adequate reading strategies.

Another common issue contributing to the reading difficulties of third through fifth grade readers is the increase in complexity of text during these grade levels (Amendum et al. 2017; Arya et al. 2017). A text can be deemed complex based on sentence length, grammatical complexity, and vocabulary difficulty. Characteristics include words with multiple meanings, figurative language, unfamiliar language, and culture- or content-specific language (Amendum et al. 2017; Arya et al. 2017).

Another struggle common among students in Grades 3-5 involves difficulties with comprehension due to issues with background knowledge and vocabulary development (Akram et al. 2022; Elleman & Oslund, 2019). According to Kaefer (2020), the science

of reading perspective conveys that background knowledge is essential for reading comprehension. For students to sufficiently comprehend a text, they must be able to form a mental representation of the information contained in the text. When students lack background knowledge, they struggle with comprehension and drawing appropriate inferences. Students with more background knowledge consistently outperform their peers with less background knowledge (Elleman & Oslund, 2019). Vocabulary is also a necessary component in building comprehension (Akram et al. 2022). One researcher found that by the end of second grade, disadvantaged students could lag 2 years behind their peers (Elleman & Oslund).

Unlike the struggling reader who has already exhibited reading difficulties, the at-risk reader demonstrates potential difficulties. For example, to be eligible to participate in a Reading Recovery intervention, Clay (1970) used the criteria of reading in the lowest 20th percentile reading achievement in the first-grade classroom and remain in Reading Recovery until achieving the level of performance of their classmates in the middle percentile. Others have defined at-risk reader as experiencing social, economic, or environmental conditions often associated with school failure (Lara et al., 2018; Morrissey & Vinopal, 2018; Pallas, 1989), unsuccessful instructional or social interactions in school (Clay, 1991), and language learning challenges, such as those experienced by English learners (Soland & Sandilos, 2021).

Identification and Assessment Approaches for Struggling and At-Risk Readers

Accurate and thorough identification and assessment of struggling and at-risk readers are essential for providing effective reading interventions. Assessments for

emergent and novice readers include the foundational skills of phonemic awareness, word recognition, letter knowledge, and phonic skills as well as fluency and comprehension (Stahl et al. 2020). When students are identified as struggling or at-risk, assessments are designed to identify strengths and weaknesses in the five key components of reading development originally noted by the National Reading Panel (2000): phonemic awareness, phonics, fluency, vocabulary, and comprehension. Given the role of motivation in the reading achievement of students in Grades 3-5, motivation is also considered an important area of assessment for students who are at-risk or struggling (Zhang et al. 2020).

Brief fluency screening tests have been found to effectively identify students' word reading fluency difficulties. For example, Martins and Capellini (2021) used a 1-minute fluency measure with third through fifth grade students for each of four passages, two narratives and two expository passages. Results showed the following rates of correct words per minute to be acceptable: 86 or more words per minute for third graders, 104 or more words per minute for fourth graders, and 117 words or more per minute for fifth graders. Inadequate ranges for words per minute were 56 for third graders, 74 for fourth graders, and 87 for fifth graders. Rasinski and Padak (2005) used similar rates of correct words per minute to be acceptable: 80-140 words per minute for third graders, 90-140 words per minute for fourth graders, and 100-150 words per minute for fifth graders for 3-minute reading assessments.

Several assessments have been used to assess student's comprehension, phonemic awareness, vocabulary, and fluency. Many times, educators use different assessments to

assess the areas while others use one assessment to assess all of the areas. For example, Kent et al. (2019) conducted a study to investigate the accuracy of screening measures used to identify fourth grade readers who were at-risk of failing the state reading assessment where multiple assessments were used. Students were assessed using a variety of reading skills assessments such as the Gates-MacGinitie Test which measured reading comprehension, the Test of Silent Reading Efficiency and Comprehension which measured speed and accuracy, the Test of Word Reading Efficiency which measured fluency, and the Dynamic Indicators of Basic Early Literacy Skills-Sixth Edition which measured a student's ability to read connected text with speed and accuracy. Results showed that the base rate of students not achieving the state-specified proficiency levels was 50% and 43%. The researchers also found that each individual screener was a significant predictor of student outcomes on the state reading assessment.

On the other hand, Hautala et al. (2020) used one assessment to measure many areas. Hautala et al. (2020) investigated whether a game-based assessment would identify struggling readers in grades first through fourth. The assessment was administered with paper and pencil and then electronically via a game. Assessment tasks measured multiple areas such as sentence reading comprehension, word reading, pseudo word reading, word spelling, and pseudo word spelling. Results showed that the gamed-based assessment tasks worked well for identifying reading difficulties in reading fluency and reading accuracy compared to the paper-based assessment method. Zuggaramurdi et al. (2022) investigated the effectiveness of a tablet-based universal screener, Lexiland, to identify kindergarten students with reading difficulties by assessing foundational pre-literacy

skills as a means of early intervention. Assessment tasks included phonological awareness such as segmentation, blending, onset and rime, letter knowledge, rapid automatized naming, vocabulary, decoding, fluency, and comprehension. Results showed that there were 324 typical readers and 64 poor readers. The authors concluded that Lexiland can be used as a universal screener and is beneficial to attain classification accuracy for typical and poor readers.

Silverman et al. (2021) investigated the identification of reading comprehension difficulties for third grade students using beginning of first grade decoding and language predictors. Participants who scored at or below the 25th percentile on the reading comprehension composite were considered to have reading difficulties with reading comprehension. Students were tracked from first to third grade. Based on descriptive analysis, significant differences in grades kindergarten through third grade for language-related predictors were noted. The language-related predictors such as sight-word efficiency, sentence repetition, and oral discourse were identified as effective in improving the identification of reading comprehension difficulties.

Instructional Programs to Support Struggling and At-Risk Readers

Literacy Games

Digital literacy games offer the potential benefit of combining the motivational aspect of games with literacy instruction. Unsurprisingly, researchers have explored the potential of this technology to promote reading achievement among elementary level students.

Donnelly et al. (2020) used a web-based application tool that provided phonemic cues to improve reading fluency and decoding of difficult words within reading passages among 8- to 12-year-old students. The authors found that the technology-based reading game improved decoding and accuracy of pseudowords. Ronimus et al. (2019) investigated whether a short intervention of six weeks with GraphoLearn (GL) impacted the reading development of 37 female second grade struggling readers at home. Results showed the six-week intervention with GraphoLearn (GL) game carried out at home improved word reading skills but there were no significant effects found in spelling, sentence-level reading fluency, or reading comprehension. Therefore, the game was less effective than school-provided support at improving reading skills. Schimitt et al. (2018) similarly investigated the effect of PBS Kids Island, an educational website with early literacy games, played at home on the literacy development of low- and middle-SES preschool and kindergarten students. Students had access to PBS Kids Island as well as a non-assigned website with non-literacy games.

Games targeted letter awareness, letter sounds, rhyming, alliteration, phonics, phonemic awareness, and vocabulary. The results showed there were significant differences in usage of the assigned website. Significant differences between the two conditions where the experimental group outperformed the control group and nonsignificant differences in letter knowledge, letter sequencing, alliteration, phonics, rhyming awareness, and vocabulary were also found. Contrary to Rominus et al. (2019) and Schimitt et al. (2018), Uittert et al. (2021) examined the effect of Reading Turbo, a word reading efficiency game with Dutch first graders. The intervention addressed

beginning readers' word reading efficiency through repeated word reading, semantics, immediate feedback, and gaming. Results showed that the intervention significantly enhanced first graders' word reading efficiency directly after the intervention. However, the effects did not last longer than two months after the intervention. Responsiveness to the game was significant as determined by the in-game accuracy in phonological awareness, letter efficiency, and verbal working memory.

Bempt et al. (2021) investigated the impact of GraphoGame Flemish on the foundational reading skills of kindergarten students who were diagnosed as at risk for dyslexia. The games targeted auditory discrimination, visual discrimination, grapheme-phoneme coupling, phoneme blending, phoneme counting, reading, spelling, and motivation. The results showed that children who played the technology-based reading games showed significantly better letter knowledge and word decoding, but not phonological awareness compared to the children who played other types of games.

Borleff et al. (2017) similarly investigated the effect of GraphoGame on foundational reading skills, though the participants were first-grade students, the study took place in Indonesia, and no comparison group was included. Findings showed significant improvement in phonological awareness, grapheme-phoneme coupling, and decoding fluency. Zijlstra et al. (2020) investigated the effectiveness of Bouw/Build, a computer-assisted program that incorporated instruction in phonological awareness, letter knowledge, decoding, reading fluency, and reading of monosyllabic and multisyllabic isolated words two to four times a week in sessions of 15 minutes.

As with the reading game used with older students, the researchers found that the technology-based game was effective in that it had a significant impact on word, pseudo word, and text reading for 5- and 6-year-olds. Gorp et al. (2017) conducted a study to investigate whether Reading Race, a word identification game could lead to an increase in word-decoding skills for seven-year-old second grade poor readers. The participants were 64-second graders; 36 boys and 28 girls who scored in the 25th percentile on a standardized word-decoding task. Of the 64 participants, seven students had retained one year of kindergarten through second grade. The 32 students in the treatment group and the 32 students in the control group received the same intervention but at different time intervals. The control group received the same intervention as the experimental group but later so the researchers could replicate the results in the same study. Reading Race included activities on word repetition, corrective feedback, semantic retrieval, and gamification elements related to flow and decoding speed. Results showed that the treatment group performed significantly better on all measures than the control group who received business-as-usual reading instruction. Oakley et al. (2020) similarly investigated the effects that technology-based texts and apps have on literacy development for 38 five-year-old kindergarten students with low socioeconomic status and their two teachers in Western Australia. Results showed that reading growth improved significantly at both schools within one year of utilizing the program compared to annual growth during the last nine plus years.

Business-as-usual Reading Instruction and Technology-based Reading Interventions

Business-as-usual reading instruction is the term used in recent research to refer to the core approach used to teach the subject matter in a particular school setting and grade level (Peters et al., 2022). Business-as-usual reading instruction is often times characterized as teacher-centered. Recent research shows technology-based reading interventions have become an essential component of business-as-usual reading instruction in an effort to increase reading achievement in the primary grades. Technology-based reading interventions are typically student-centered.

Prescott et al. (2018) investigated the gains in reading for students in grades kindergarten through fifth who participated in business-as-usual reading instruction plus the Core5 technology-based reading intervention. Core5 provided a systematic and personalized path for reading instruction in phonological awareness, phonics, structural analysis, fluency, vocabulary, and comprehension. Significant differences in kindergarten through second grade reading growth and no significant differences in upper grades reading growth were found. Since there was no comparison group, the findings cannot be generalized. Similarly, Stein et al. (2022) investigated the effectiveness of adding two technology-based reading interventions, iStation and Lexia, to business-as-usual reading instruction. They found significant differences in measures of reading and fluency for the students in prekindergarten through grade eight who used one of the supplementary technology-based programs compared to students who received business-as-usual reading instruction only.

Wanzek et al. (2019) examined the effects of the Passport reading intervention, which provided explicit instruction and strategies for reasoning in the foundational

components of reading on fourth and fifth grade students participated in business-as-usual reading instruction and used the Passport reading intervention. Students who did use the Passport reading intervention only participated in business-as-usual reading instruction. Students in both groups had equal pre-assessment scores before implementation of the Passport reading intervention, but after its implementation, students significantly outperformed their peers who did not use the Passport reading intervention. A year later, Wanzek et al. (2020) similarly examined the effectiveness of the Voyager Passport program, which provided explicit instruction in phonics, vocabulary, comprehension, and fluency, with fourth grade students with severe reading comprehension difficulties and disabilities. Under the same conditions as Wanzek's et al. previous study, students receiving the intervention significantly outperformed their peers who did not receive the intervention.

Ven et al. (2017) similarly investigated the effects of Letter Prince, an intervention with a multicomponent reading game on the development of reading skills for primary aged Dutch students with special educational needs. The intervention provided various reading exercises such as letter knowledge, semantic categorization tasks, and letter-word identification. Results showed that the early intervention group improved significantly, and the early intervention group performed significantly better than that late intervention group. On the other hand, Macdonald et al. (2021) investigated the role of anxiety in reading assessment among struggling readers in fourth and fifth grade. Students were randomized into an intervention treatment group and into a business-as-usual treatment group. The results showed that reading anxiety did not

contribute to untimed word reading accuracy, but it did contribute to reading comprehension. The authors concluded that when students are anxious, they are unable to focus on reading long passages and to retain the information.

The problem of differentiating technology-based approaches within classrooms of students with varying needs has been addressed through the use of paraprofessionals. Council et al. (2019) investigated whether a computerized reading intervention program monitored by paraprofessionals would positively affect second grade struggling readers. Results showed consistent progress for the struggling readers; however, their growth did not equate to the growth of their peers who did not struggle with reading. Madden and Slavin (2017) similarly investigated the effect of a computer-assisted approach but used small group tutoring among first through third grade students. The intervention was Tutoring with Alphie, which requires paraprofessionals to work with no more than six students at a time. Significant differences in first grade reading growth and no significant differences in second and third grade growth were found.

English Language Learners with Language Deficits

Conn et al. (2019) investigated the effects of an iBook on fourth and fifth grade English language learners identified as having a deficit in language. iBook includes features such as graphic organizers, letter writing, language practice, and simulations. Use of iBook yielded positive outcomes for English language learners. Fogarty et al. (2017) explored the effects of Comprehension Circuit Training, on sixth through eighth grade students identified as having reading comprehension difficulties. Comprehension Circuit Training sought to improve reading comprehension through the three stages of

reading, pre-reading, during reading, and after reading. Students who had low reading comprehension proficiency prior to using the program showed significant growth in comprehension, vocabulary, and silent reading efficacy. A few years later, Fogarty et al. (2020) continued their investigation but with third grade students identified as having a vocabulary deficit by exploring the effects of Vocabulators, which focused on receptive and expressive vocabulary knowledge, vocabulary application, and reading comprehension. Like the earlier study, students who used the program showed significant to moderate growth.

Response to Intervention

Once a student has been identified as a struggling reader, he/she will be assigned to either tier 2 or tier 3 RtI. Older struggling readers typically require a more specialized and diverse intervention approach. Tier 2 of the RtI model involves small group instruction and tier 3 involves one-on-one instruction. When a student is not responsive to tier 2 interventions, he/she proceeds to tier 3. The three tier RtI model is used to identify students who need additional learning support. Tier 1 reading instruction focuses on at-risk readers. Tier 2 reading instruction focuses on struggling students. Tier 3 reading instruction focuses on students with little to no reading capabilities. Kent et al. (2017) examined the amount, type, and quality of Tier 1 and Tier 2 reading instruction provided to nine-year-old fourth grade students in Florida and Texas who were at-risk and struggling readers and whether certain fundamentals of reading instruction predicted growth in reading skills. The study focused primarily on the first two tiers of the RtI model. Results showed that students who received Tier 1 reading instruction and some

Tier 2 reading instruction outperformed those students who received only Tier 1 reading instruction on measures of oral reading fluency and comprehension. O'Brien et al. (2019) investigated the effectiveness of tablet-based applications that provide Tier 2 literacy practice for first and second grade struggling readers in Singapore. Measures of reading decoding accuracy, fluency, and spelling were administered prior to the intervention, at the end of the intervention phase one, at the end of phase two of the intervention, and three months after the post-test. Results showed an advantage of the word-level intervention for those with poorer phonological awareness for reading fluency and a phoneme-level intervention advantage for those with poorer statistical learning ability.

Davis et al. (2021) sought to redesign a reading intervention in an after-school tutoring program for 10 students in grades 3-5 that had reading difficulties as determined by their teachers by incorporating the constructs of RtI. Ten students participated in the after-school tutoring program but only five students participated in the study along with 10 teachers who were enrolled in a literacy specialist program at a university. The intervention approach consisted of systematic modules for small groups and/or individual tier 2 reading instruction. Results showed that four out of the five participants increased by one reading level. Four students demonstrated growth in reading fluency, accuracy, and comprehension. Similarly, Roberts et al. (2021) conducted a study on upper elementary students who had been identified as having reading difficulties. Students were also identified as having behavior problems. Contrary to Davis et al. (2021), Roberts et al. (2021) study was conducted during the regular school hours rather than after-school. The authors investigated whether the RtI approach would increase reading

comprehension outcomes for fourth and fifth grade students. Participants included 108 students from six elementary schools from two school districts. Fifty-five students were assigned to the treatment group and 53 students were assigned to the condition group. Results of the study showed that students with behavior problems lower reading comprehension outcomes. Similar to Davis et al. (2021), the Tier 2 intervention occurred for 30 to 45 minutes daily in small groups. Lessons were sequenced so that lessons 1 to 40 focused on word reading skills through systematic decoding, automaticity, sight words, and passage fluency. Results showed that students with problem behaviors also had lower reading comprehension outcomes. Results also showed that students with problem behavior in the treatment group made more gains than their peers in the condition group.

Unlike Tier 1 and Tier 2 reading interventions, Tier 3 reading interventions are designed for students with little to no reading capabilities. Benner et al. (2022) also conducted a study that investigated the use of tier 3 RtI to target 5-8 grade students with extensive reading difficulties. The authors investigated the impact of a corrective reading program and Reading Excellence used during tier 3 interventions. The corrective reading program intervention is a direct reading approach focused on word recognition strategies such as decoding and comprehension. The Reading Excellence program focused on decoding, word recognition, fluency, vocabulary, comprehension, test-taking skills, content-area reading and writing, word choice, and sentence writing. Participants included 213 fifth through eighth grade students. Results showed that students who were taught using the Reading Excellence program produced statistically significant changes in

basic reading skills over the students who were taught using the corrective reading program alone.

Summary and Conclusions

Despite existing implementation of research-based reading instruction strategies, some students in fourth grade demonstrate reading difficulties prompting the need for additional approaches to reading instruction such as the Reading Plus Program. Major themes in the literature include technology-based reading strategies and interventions and struggling and at-risk readers. Research has shown that educators have implemented methods such as business-as-usual reading instruction, technology-based reading interventions, and supplemental instructional approaches. However, it is has not been determined whether technology-based interventions will improve reading outcomes for fourth grade students. This study was needed to determine if implementation of the Reading Plus program will show better reading outcomes for fourth grade students when compared to students receiving business-as-usual reading instruction. In Chapter 3, I discuss in detail the research design and rationale, methodology, threats to validity, and ethical procedures of the study.

Chapter 3: Research Method

The purpose of this quantitative quasi-experimental study was to investigate the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and students who participated in business-as-usual instruction. In this chapter, I discuss the research design and rationale as well as the role of the researcher. In the next sections of the chapter, I discuss participant selection, data collection instruments, procedures for recruitment and participation in the study and the data analysis plan. In the final sections of the chapter, I discuss trustworthiness, ethical procedures, and summarized the main points of the chapter.

Research Design and Rationale

The research design of this study is quantitative. The dependent variable in the analysis was growth in reading achievement as measured by the i-Ready assessment. The independent variable was the Reading Plus program that was used with fourth-grade students at a Title 1 elementary school for one school year compared to business-as-usual instruction with a group of fourth-grade students at a Title 1 school in the same school district.

I used a quantitative quasi-experimental design to address the research question. According to Chiang et al. (2015), quasi-experimental designs are conducted to evaluate the outcomes of a treatment. For this study, I used results from the i-Ready test (2021) before the intervention began and when it concluded to determine if the experimental

group receiving Reading Plus instruction achieves significantly higher scores than students in the control group receiving business-as-usual instruction.

Other designs were considered but rejected as not appropriate for answering the research question. A descriptive design was not considered because this study does not seek to identify key variables. A relationship design was not considered because this study does not seek to identify relationships between variables. Lastly, it was not possible to randomly assign participants to the experimental and control conditions, thus a random control trial design was rejected (Hariton & Locascio, 2018).

Qualitative designs were considered as they enable the researcher to explore a phenomenon of interest in their natural setting by examining it through the perspectives, observations, or artifacts of individuals who share contexts or characteristics (Aspers & Corte, 2019). However, qualitative designs were rejected, as the purpose of the proposed study was to investigate the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and students who participated in business-as-usual reading instruction.

Methodology

Population

The target population for this study was 92 fourth-grade students in the school district attending two elementary schools designated as Title I schools based on census poverty estimates. Demographically, there was 59.1% (29) African Americans and 40.8% (20) Caucasians at the target school and 69.7% (30) African Americans, 16.2% (7) Caucasians, and 13.9% (6) Hispanics at the comparison school. Aggregated and de-

identified i-Ready scores will be collected for the 49 fourth-grade students at the target school and 43 fourth-grade students at the school providing traditional reading instruction.

Sampling and Sampling Procedures

I used non-probability sampling for this study as selection was based on availability and convenience and so non-random methods must be used (Statistics Canada, 2021). The sample was comprised of fourth-grade students in intact classrooms receiving the Reading Plus program at one Title I school and fourth-grade students in intact classrooms receiving business-as-usual instruction in a different Title I school.

Based on a power analysis with G*Power 3.1.9.7 to determine the smallest sample size suitable to detect the effect a given test and using the standard settings for educational research (alpha = .05, power = .80, and a medium effect size), a two-tailed *t* test would require 36 data sets per group for a minimum sample of 72 overall. According to the results of the power analysis, the sample size of 49 students in the experimental group and 43 students in the control condition met the minimum expectation of at least 36 participants in each group.

Procedures for Recruitment, Participation, and Data Collection

Once I received approval from the IRB, the deidentified fourth grade test data was provided by the school district. No special permissions were needed as the data are routinely provided to administrators and teachers. Since I was working directly with the data, there was no consent required from participants; neither was there a procedure for participants exiting the study.

Archival Data

I used archival i-Ready reading data collected from fourth grade students within two elementary schools for the 2020-2021 school year, from one school district. I obtained consent by disclosing the purpose of the study, procedure, and presentation to the school superintendent and the school's board of trustees to avoid potential harm of any stakeholders. Since archival data was used, additional permission was not required. No special permissions were needed as the data are routinely provided to administrators and teachers.

Intervention

The intervention was the Reading Plus program (2021), which is a web-based literacy intervention program that incorporates differentiated fluency, comprehension, and vocabulary activities; mastery learning; embedded reading assessments; and tools to monitor student progress. The Reading Plus program provides systematic and explicit instruction within a technology-based platform that focuses on the foundational reading skills of phonemic awareness, phonics, fluency, vocabulary, and comprehension. The program was supplementary to regular classroom reading instruction.

The Reading Plus program was developed in early 2003. The Reading Plus program is intended for third through 12th grade students with learning disabilities, English learners, and students identified as at risk for reading difficulties (Reading Plus, 2021). The publisher reported that the program has been used in more than 7,800 schools with greater than 1 million students (Reading Plus, 2021).

Reading Plus is a guided, supplementary, web-based intervention program. At the onset of each school year, all students in grades K-8 are administered the i-Ready reading diagnostic assessment. Students scoring one to three grade levels below their current grade level are identified as struggling or at-risk readers. The students complete a series of web-based activities individually with guidance from the teacher. When students demonstrate mastery, they progress to increasingly higher levels of difficulty. The recommended hours for Reading Plus instruction per week are based on the student's tier according to the RtI model. These recommendations are 45 minutes per week for students in Tier 1 (at or above grade level), 90 minutes per week for students in Tier 2 (1-2 levels below grade level), and 135 minutes per week for students in Tier 3 (3 or more levels below grade level; Reading Plus, 2021). Reading Plus also includes printable resources for teachers to use in group or individual instruction.

Instruction for the experimental group and control group began at the outset of the school year and continued until the end of the school year. The i-Ready reading test was administered at those same points in time. The deidentified test data was provided by the school district. No special permissions were needed as the data are routinely provided to administrators and teachers.

Instrumentation and Operationalization of Constructs

The i-Ready test (2021) is administered in grades kindergarten through eight in the district. Results from the i-Ready reading test before the intervention began and when it concluded, were the measures. As an employee in the school district where the study was conducted, I did not need permission to review the test data.

The i-Ready test is reported to be aligned to common reading content and skills though no validity data have been reported (i-Ready Central, 2021). Demonstrated test score reliability has been reported with reliability ranging from 0.91–0.97 and test-retest reliability ranging from 0.70–0.86 for reading through grade 5. This assessment meets the WWC 4.0 standards for an acceptable baseline and outcome measure (What Works Clearinghouse, 2017). According to Swain (2019), the reading i-Ready test correlates positively with several state and national tests including the Partnership for Assessment of Readiness for College and Careers and state testing programs in Florida, Georgia, Indiana, Michigan, Mississippi, New York, North Carolina, Ohio, and Tennessee. Since being released in summer 2011, the i-Ready test has been reviewed and approved at the state level as an assessment, instructional resource, or intervention in Arizona, California, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Indiana, Massachusetts, Mississippi, Nevada, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Tennessee, Utah, and Virginia (Swain et al., 2019).

Student performance on the i-Ready test is measured on a continuous scale of 100 to 800 (i-Ready Family Center, 2022). Scale scores are given for the following domains: phonological awareness, phonics, high frequency words, vocabulary, and comprehension (literature and informational text). Each domain is scored individually and scores from the six domains are aggregated. Overall placement scores for fourth grade range from 557 to 629. Overall, on grade level scores for fourth grade range from 557 to 578 for early fourth grade, 579-602 for mid fourth grade, and 603-629 for late fourth grade. Tables 4-7 show the reading placement for each domain (Curriculum Associates, 2018).

Table 4

Reading Placement for Phonological Awareness

PA Placement Level	Grade K	Grade 1	Grades 2-12
Emerging K	100-361	100-346	N/A
Grade K	362-426	347-426	100-426
Grade 1	427-474	427-474	427-474
Max Score	475-800	475-800	475-800

Table 5

Reading Placement for Phonics

Phonics placement level	Grade K	Grade 1	Grades 2	Grade 3	Grades 4-12
Emerging K	100-361	100-346	N/A	N/A	N/A
Grade K	362-433	347-433	100-433	100-433	100-433
Grade 1	434-490	434-490	434-490	434-490	434-490
Grade 2	491-513	491-513	491-513	491-513	491-513
Grade 3	514-533	514-533	N/A	514-533	514-533
Max score	534-800	534-800	534-800	534-800	534-800

Table 6

Reading Placement for High-Frequency Words

HFW placement level	Grade K	Grade 1	Grades 2	Grades 3-12
Emerging K	100-361	100-346	N/A	N/A
Grade K	362-418	347-424	100-409	100-409
Grade 1	419-475	425-475	410-453	410-438
Grade 2	476-490	476-490	476-490	476-490
Max score	491-800	491-800	491-800	491-800

Table 7

Reading Placement for Vocabulary, Comprehension Literature, and Comprehension Informational

Grade 4	Vocabulary	Comp. lit.	Comp. inf.
Early	557-578	552-571	557-578
Mid	579-602	572-602	579-602
Late	603-629	603-629	603-629

Data Analysis Plan

Data analysis involved the following steps. First, I calculated the standardized mean difference from the i-Ready test scores to determine baseline equivalence between the Reading Plus group and business-as-usual groups at the outset of the study. Baseline equivalence will be satisfied if the absolute value of the effect size is ≤ 0.05 (What Works Clearinghouse, n.d.).

For the next step, I conducted an independent samples *t* test comparing the two groups on i-Ready scores at the outset and conclusion of study. This test was selected as appropriate for comparing the differences between two groups on one continuous dependent variable and one dichotomous independent variable (Vogt et al., 2014). Statistical significance will be determined using a 95% confidence interval with $p < .05$. With a *t*-test for independent samples, it is assumed there will be no significant outliers, there is a normal distribution of variables in each group, and there will be equal variance of the independent variable in each group. If the independent *t*-test indicates statistical significance ($p<.05$), any observed differences in the means of the variables are unlikely due to chance and indicate rejection of the null hypothesis (McLeod, 2019).

Cohen's *d* was used to determine if results show practical significance (Vogt et al., 2014). Even if the sample populations of the groups are not homogenous or demonstrate normal distribution, the risk of either a Type I or Type II error is decreased with sample sizes above 20 or 30 cases, as in this study (Cohen, 2013). According to Cohen's general guidelines related to strength, a coefficient value greater than .5 will indicate a large or strong association (Cohen, 2013).

Threats to Validity

Internal validity refers to the extent to which intervening variables can influence findings and external validity refers to the extent to which findings can be generalized to other participants and contexts (Schirmer, 2016). Potential threats to internal validity include history, maturation, testing, instrumentation, statistical regression to the mean, researcher bias, selection, and mortality. In the current study, one threat to internal validity was testing. Students in grades kindergarten through eight are administered the i-Ready assessment three times a year: at the beginning, middle, and end of the year. Repeated exposure to the i-Ready assessment may affect test-taking behavior and scores. There is no threat to history, maturation, instrumentation, statistical regression, researcher bias, selection, and mortality. Potential threats to internal validity that cannot be addressed during the study are discussed in the limitations.

Potential threats to external validity include nonrandom assignment to groups, treatment variations, testing differences, reactivity, contextual differences, specificity of variables, and feasibility. In the current study, one threat to external validity was non-random assignment to groups. Students were assigned to groups based on the school they

are attending. Therefore, groups may not be equivalent, and these differences may influence results. Another threat to external validity was treatment variations. As no information about instruction for teachers in the treatment group will be provided, such as coaching and fidelity checks, it was not possible to confirm fidelity to the components of Reading Plus instruction. Therefore, the results may reflect variations in how the intervention was delivered rather than the intervention itself. Testing differences can also be a threat to external validity. The i-Ready assessment is the only assessment being used to measure reading equivalence prior to and after the intervention. Therefore, the results were obtained with one type of test only. There was no threat to reactivity, contextual differences, specificity of variables, and feasibility. Potential threats to external validity that could not be addressed during the study are discussed in the limitations.

Ethical Procedures

I sought approval from Walden's Institutional Review Board (IRB) and did not collect data until I received approval. As data was collected by the school district central office as part of regular instruction and distributed to administrators and teachers, consent was not needed for the i-Ready test data. Recruitment and consent were not needed for participation in the study, as Reading Plus instruction and business-as-usual instruction was part of the regular curriculum.

The data was kept in an electronic password-protected zip file. The only individuals with access to the data were the building administrator at both sites, district level administrators, teachers who work with both the treatment and control group, and myself. Data will be destroyed within five years of completion of the study.

The two schools that were involved in this study are in my school district. However, this limitation is mitigated in that I am not a school administrator at either school or part of central administration and in no way affiliated with the experimental school's choice to utilize the Reading Plus program. Therefore, there is no conflict of interest in terms of selection and implementation of the program.

Summary

I used a quantitative quasi-experimental design to address the research question. Data was collected from the i-Ready test at the outset and conclusion of the school year from students receiving Reading Plus instruction in one Title 1 school and students receiving business-as-usual instruction in a different Title 1 school in the same school district. Statistical analysis involved an independent samples *t* test and Cohen's *d* if statistical significance between the groups is found. In Chapter 4, I describe data collection, intervention fidelity, and results of the study.

Chapter 4: Results

The purpose of this quantitative quasi-experimental study was to investigate the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and students who participated in business-as-usual reading instruction. The following research question guided this quantitative quasi-experimental study:

RQ1: Is there a statistically significant difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and the students who participated in business-as-usual reading instruction?

$H_0$1: There is no statistically significant difference in fourth graders' reading achievement growth as measured by the i-Ready test for students who received Reading Plus instruction and students who received business-as-usual reading instruction.

H_A1: There is a statistically significant difference in fourth graders' reading achievement growth as measures by the i-Ready test for students who received Reading Plus instruction and students who received business-as-usual reading instruction.

In this chapter, I describe data collection, intervention fidelity, and results of the study.

Data Collection

I received Walden's IRB approval on March 17, 2023 (03-17-23-0979966). I began the data collection process on March 27, 2023, through the district email portal. The beginning and end of the year fourth grade i-Ready reading data was readily available and was provided by each school principal on March 27, 2023.

Based on the data received, 49 fourth graders completed the beginning and end of the year fourth grade i-Ready reading assessment at the target school. Students at the target school received one year of Reading Plus instruction. Forty-three fourth graders completed the beginning and end of the year fourth grade i-Ready reading assessment at the business-as-usual school. There were no discrepancies in data collection from the plan presented in Chapter 3.

Potential threats to external validity included nonrandom assignment to groups, treatment variations, testing differences, reactivity, contextual differences, specificity of variables, and feasibility. In the current study, one threat to external validity was non-random assignment to groups. Students were assigned to groups based on the school they were attending. Therefore, groups may not be equivalent, and these differences may influence results. Another threat to external validity was treatment variations. As no information about instruction for teachers in the treatment group was provided, such as coaching and fidelity checks, it was not possible to confirm fidelity to the components of Reading Plus instruction. Therefore, the results may reflect variations in how the intervention was delivered rather than the intervention itself. Testing differences can also be a threat to external validity. The i-Ready assessment is the only assessment being used

to measure reading equivalence prior to and after the intervention. Therefore, the results will be obtained with one type of test only. There was no threat to reactivity, contextual differences, specificity of variables, and feasibility. Potential threats to external validity that cannot be addressed during the study are discussed in the limitations.

Treatment and Intervention Fidelity

The treatment was administered as planned and there were no challenges that prevented planned implementation as described in Chapter 3. There were no adverse events related to the intervention.

Data Analysis

Data analysis involved the following steps. First, I calculated the standardized mean difference from the i-Ready test scores to determine baseline equivalence between the Reading Plus group and business-as-usual groups at the outset of the study. Baseline equivalence will be satisfied if the absolute value of the effect size is ≤ 0.05 (What Works Clearinghouse, n.d.).

For the next step, I conducted an independent samples *t* test comparing the two groups on i-Ready scores at the outset and conclusion of study (Vogt et al., 2014). This test was selected as it is appropriate for comparing the differences between two groups on one continuous dependent variable and one dichotomous independent variable. Statistical significance was determined using a 95% confidence interval with $p < .05$. With a *t*-test for independent samples, it is assumed there will be no significant outliers, there is a normal distribution of variables in each group, and there will be equal variance of the independent variable in each group. If the independent *t*-test indicates statistical

significance ($p<.05$), any observed differences in the means of the variables are unlikely due to chance and indicate rejection of the null hypothesis (McLeod, 2019).

Cohen's *d* was used to determine if results show practical significance (Vogt et al., 2014). Even if the sample populations of the groups are not homogenous or demonstrate normal distribution, the risk of either a Type I or Type II error is decreased with sample sizes above 20 or 30 cases, as in this study (Cohen, 2013). According to Cohen's general guidelines related to strength, a coefficient value greater than .5 will indicate a large or strong association (Cohen, 2013).

Results

Demographics

I used non-probability sampling for this study as selection was based on availability and convenience and so non-random methods must be used (Statistics Canada, 2021). The sample was comprised of fourth-grade students in intact classrooms receiving the Reading Plus program at one Title I school and fourth-grade students in intact classrooms receiving business-as-usual instruction in a different Title I school.

All 92 participants identified as fourth grade reading students. The majority of the participants were male (*n*=48, 52.2%), then female (*n*=44, 47.8%; Table 8). The majority of the participants were Black (*n*=59, 64.1%), then White (*n*=44, 47.8%), and Hispanic (*n*=6, 6.5%; Table 9).

Table 8

Participant Demographic Characteristics as a Percentage of the Sample (Gender)

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Male	48	52.2	52.2	52.2
	Female	44	47.8	47.8	100.0
	Total	92	100.0	100.0	

Table 9

Participant Demographic Characteristics as a Percentage of the Sample (Race)

		Frequency	Percent	Valid percent	Cumulative percent
Valid	Black	59	64.1	64.1	64.1
	White	27	29.3	29.3	93.5
	Hispanic	6	6.5	6.5	100.0
	Total	92	100.0	100.0	

Descriptive Statistics

During 2021-2022 school year, fourth graders at the experimental school within one rural Mississippi school district used the Reading Plus program. Fourth graders at the other elementary school received business-as-usual reading instruction. Fourth graders at both elementary schools were given an i-Ready Reading pretest and posttest to measure reading achievement growth.

The standardized mean difference was calculated to determine the baseline equivalence at the outset of the study. Table 10 shows the pretest i-Ready Reading mean and standard deviation for the experimental group. The unadjusted mean scaled score of

the i-Ready pretest for the 49 students in the experimental group was *M* = 533.22. The standard deviation was *SD* = 44.512; thus, the standardized mean difference was *SMD* = 11.9. The *SMD* indicates a large size effect. Table 11 shows the pretest i-Ready Reading mean and standard deviation for the business-as-usual group. The unadjusted mean scaled score of the i-Ready pretest for the 43 students in the business-as-usual group was *M* = 488.07. The standard deviation was *SD* = 63.076; thus, the standardized mean difference was *SMD* = 7.7. The *SMD* indicates a large size effect. The mean of the target school and business-as-usual school indicates that reading achievement at the business-as-usual school was slightly lower than the reading achievement at the target school.

Table 10

Pretest i-Ready Reading Mean and Standard Deviation for the Target School

	N	Mean	Std. deviation
Pretest	49	533.22	44.512
Valid N (listwise)	49		

Table 11

Pretest i-Ready Reading Mean and Standard Deviation for the Business-As-Usual School

	N	Mean	Std. deviation
Pretest	43	488.07	63.076
Valid N (listwise)	43		

I calculated an independent samples t-test and compared the target and business-as-usual group at the outset and conclusion of the study. Table 12 shows the results of the independent t-test to sample assuming unequal variances at the outset of the study. The mean of the target group was slightly higher than the business-as-usual group. The mean of the target school and business-as-usual school indicates that reading achievement at the business-as-usual school was slightly lower than the reading achievement at the target school. On the other hand, the business-as-usual group had a slightly higher variance than the experimental group. The t-statistic was 3.91. The p-value was 0.00. A p-value that is <.05 indicates that the null hypothesis should be rejected.

Table 12

t-Test: Two-Sample Assuming Unequal Variances

	Target	Business-as-usual
Mean	533.2244898	488.0697674
Variance	1981.302721	3978.637874
Observations	49	43
Hypothesized mean Difference	0	
df	74	
t Stat	3.915982067	
P(T<=t) one-tail	9.93227E-05	
t Critical one-tail	1.665706893	
P(T<=t) two-tail	0.000198645	
t Critical two-tail	1.992543495	

Table 13 shows the results of the independent t-test to sample assuming unequal variances at the conclusion of the study. The mean for the target group was slightly higher than the business-as-usual group. The mean of the target school and business-as-

usual school indicates that reading achievement at the business-as-usual school was slightly lower than the reading achievement at the target school. On the other hand, the business-as-usual group had a slightly higher variance than the experimental group. The t-statistic was 4.39. The p-value was 3.33, which is higher than .05. However, a p-value that is >.05 indicates that no significant difference exists, and no effect was observed.

Table 13

t-Test: Two-Sample Assuming Unequal Variances

	Target	Business-as-usual
Mean	554.7346939	509.3953488
Variance	1882.69898	2917.768549
Observations	49	43
Hypothesized mean Difference	0	
df	80	
t Stat	4.397993219	
P(T<=t) one-tail	1.66663E-05	
t Critical one-tail	1.664124579	
P(T<=t) two-tail	3.33326E-05	
t Critical two-tail	1.990063421	

Cohen's d was calculated to show practical significance. Table 14 shows the Cohen's d results at the outset of the study. Cohen's d was 1.23. 1.23 means that group 1 participants were 1.23 standard deviations higher than group 2, which interpreted as a large, standardized effect size. A large effect size means that the research finding has practical significance.

Table 14

Cohen's d at the Conclusion of the Study

	Mean	SD	N
Target	554.7347	43.39008	49
Business-as-usual	509.3953	54.01637	43
M1-M2	45.33935		
Pool SD	36.62309		
Cohen's d	1.237999		

Summary

In this chapter, I summarized the results of the fourth grade i-Ready Reading pretest and posttest for the 2021-2022 school year. Results of this study indicate that reading achievement at the business-as-usual school was slightly lower than the reading achievement at the target school at the outset of the study. The standardized mean difference indicated a large size effect. At the conclusion of the study, results indicate that reading achievement at the business-as-usual school was slightly lower than the reading achievement at the target school at the outset of the study. However, reading achievement at the business-as-usual school increased by 21.33. Based on the p-value of 3.33 at the conclusion of the study, which is slightly higher than .05, indicates that we cannot conclude that a significant difference exists, and no effect was observed. The results from the independent t-test at the conclusion of the study (i.e. students using the Reading Plus program [M = 544.734] and students receiving business-as-usual reading instruction [M = 509.395] with a p-value of 3.33) supports the null hypothesis that there is no statistically significant difference in fourth graders' reading achievement growth as

measured by the i-Ready test for students who received Reading Plus instruction and students who received business-as-usual reading instruction. Lastly, the results from Cohen's d indicate a large, standardized effect size meaning that the research finding has practical significance. The purpose of this quantitative quasi-experimental study was to investigate the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and students who participated in business-as-usual reading instruction. In Chapter 5, I interpret the findings, discuss the limitations of the study, and offer recommendations for further research.

Chapter 5: Discussion, Conclusion, and Recommendations

This quantitative quasi-experimental study involved investigating the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and students who participated in business-as-usual reading instruction. For this study, I used deidentified pre-posttest student data from the i-Ready Reading assessment scores. Hypotheses were tested using the standardized mean difference, independent samples t-test, and Cohen's *d*. This quantitative quasi-experimental study showed there were no statistically significant differences in terms of the i-Ready Reading post-test scores between the business-as-usual students and the target students who participated in the Reading Plus program for one year.

The results of the study provided insight into how technology-based supplemental reading programs such as Reading Plus effects fourth grade reading achievement. I worked to present original research and empirical data so that elementary administrators and educators in rural Mississippi can determine if allocating funds and professional development resources to implement Reading Plus into the fourth-grade classroom is a meaningful practice. This chapter includes a summary of my study, interpretation of findings, limitation of the study, recommendations for further studies, and information regarding potential for positive social change.

Interpretation of Findings

The results of this quantitative quasi-experimental study showed there were no statistically significant differences in terms of the i-Ready Reading post-test scores

between the business-as-usual students and the target students who participated in the Reading Plus program for one year. These results did not align with part of the research discussed in Chapter 2. Several research studies reviewed in Chapter 2 supported the use of technology-based programs to increase reading achievement and saw great gains from their use (Bempt et al., 2021; Borleff et al., 2017; Donnelly et al., 2020; Gorp et al., 2017; Oakley et al., 2020; Prescott et al., 2018), Ronimus et al., 2019; Schimitt et al., 2018; Stein et al., 2022; Uittert et al., 2021; Ven et al., 2017; Wanzek et al., 2019; Wanzek et al., 2020; Zijlstra et al., 2020). Major themes in the literature included technology-based reading strategies and interventions and struggling and at-risk readers. Research has shown that educators have implemented methods such as business-as-usual reading instruction, technology-based reading interventions, and supplemental instructional approaches. However, whether technology-based interventions will improve reading outcomes for fourth grade students has not been determined. Results from this study add to the research on the effect of technology-based reading programs on reading achievement at the elementary level. The results from this study can also be used to help elementary administrators and educators determine if the Reading Plus program should be used in fourth grade reading classrooms to supplement reading instruction and increase reading achievement.

For this study, I used the applied behavior analysis theory as the theoretical framework to investigate the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and students who participated in business-as-usual reading instruction. The

term applied behavior analysis was introduced by Baer et al. (1968) to describe the application of basic behavioral principles to understand and improve behavior through: a focus on socially meaningful behavior, relationship between the behavior and its environment, clearly identified and described procedures, and sustainable behavioral change. The Reading Plus program reflects the key constructs of applied behavior analysis through explicit and systematic instruction, modeling, practice, feedback, and reinforcement and generalization of new skills and knowledge. Applied behavior analysis underlies the purpose to investigate the difference in fourth graders' reading achievement growth between students in the Reading Plus program that incorporates the key constructs of applied behavior analysis and students who participated in business-as-usual reading instruction that does not include these constructs. In this study, I developed one research question and corresponding hypotheses and used the standardized mean difference, an independent sample t-test, and Cohen's *d* to analyze the data.

RQ1: Is there a statistically significant difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the online Reading Plus program and the students who participated in business-as-usual reading instruction?

$H_0$1: There is no statistically significant difference in fourth graders' reading achievement growth as measured by the i-Ready test for students who received Reading Plus instruction and students who received business-as-usual reading instruction.

H_A1: There is a statistically significant difference in fourth graders' reading

achievement growth as measures by the i-Ready test for students who received Reading Plus instruction and students who received business-as-usual reading instruction.

Administrators from the schools investigated in this study identified the type of instruction each fourth-grade teacher provided during reading: business-as-usual reading instruction and business-as-usual reading instruction accompanied by a supplemental approach, the Reading Plus program. I used Baer's (1968) applied behavior analysis theory to frame my research because it aligned with the constructs of the Reading Plus program: explicit and systematic instruction, modeling, practice, feedback, and reinforcement and generalization of new skills and knowledge.

Analyzing the results from the independent samples t-test, I was able to answer the research question. The results from the independent samples t-test at the conclusion of the study (i.e. students utilizing the Reading Plus program [M = 544.734] and students receiving business-as-usual reading instruction [M = 509.395] with a p-value of 3.33) supported the null hypothesis that there is no statistically significant difference in fourth graders' reading achievement growth as measured by the i-Ready test for students who received Reading Plus instruction and students who received business-as-usual reading instruction. Therefore, I concluded that there were no statistically significant differences in terms of the i-Ready Reading post-test scores between the business-as-usual students and the target students who participated in the Reading Plus program for one year. Results from this study did not support the applied behavior analysis theory because it did not support that there was a significant difference in terms of the i-Ready Reading post-

test scores between the business-as-usual students and the target students who participated in the Reading Plus program for one year.

Limitations of the Study

In this study, I investigated the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the technology-based Reading Plus program and students who participated in business-as-usual reading instruction. This selection limited generalization to other grade levels. The results may only be representative of fourth grade students in a similar population. For this research study, I focused solely on the subject area of reading using a supplemental technology-based program, Reading Plus. Four limitations pertain to this study. One limitation is that the two schools that were involved in this study are in my school district. However, this limitation was mitigated in that I am not a school administrator at either school or part of central administration and in no way affiliated with the experimental school's choice to utilize the Reading Plus program. Therefore, there was no conflict of interest in terms of selection and implementation of the program.

Several limitations were not possible to mitigate. One is that participants were not randomly assigned to the experimental and control conditions. Another is the possibility that the teachers' level of enthusiasm for teaching a new reading program in the experimental condition may influence the outcomes rather than the effectiveness of the Reading Plus program. Yet another is that only one school was involved in the experimental condition and one school in the control condition. The final limitation is that the i-Ready measures align with the Reading Plus program and so could advantage

students in the experimental condition. The final limitation was mitigated by the fact that i-Ready is used in the district with all students, kindergarten through eighth grade, so district personnel determined it is a reliable and valid measure of reading achievement regardless of reading program.

Recommendations

The findings of this study add to the research on the effect of technology-based supplemental reading programs on reading achievement at the elementary level. The results from this study showed there were no statistically significant differences in terms of the i-Ready Reading post-test scores between the business-as-usual students and the target students who participated in the Reading Plus program for 1 year. The first recommendation for future studies would include conducting research on fourth grade reading students in different population areas. The results from this study are only representative of fourth grade students in a rural setting in Mississippi. Further research should be conducted to analyze the effect that the Reading Plus program has on fourth grade reading students from different locations, including participants from urban and suburban areas.

This study was conducted to investigate the effects of the Reading Plus program on fourth grade reading achievement using a quantitative quasi-experimental approach. Further research could be performed utilizing a mixed methods approach. This type of study allows a researcher to utilize quantitative and qualitative data. A mixed methods approach would allow researchers to investigate the effect of the Reading Plus program on fourth grade reading achievement scores and students' perception of learning in

reading. In addition to using a mixed methods approach to collect quantitative data, the approach could be utilized to collect qualitative data such as observing teacher instructional practices within the two instructional settings and compare teacher perceptions about teaching reading. A mixed methods approach could provide a broader and more in-depth study.

Implications

The Reading Plus program was used at the target school for 1 school year. The results from this study showed there were no statistically significant differences in terms of the i-Ready Reading post-test scores between the business-as-usual students and the target students who participated in the Reading Plus program for 1 year. After examining the results from this study, I have identified potential implications for social change at the organizational and individual levels.

At the organizational level, school leaders can use data from this study and from previous research studies to support if the Reading Plus program increases fourth grade reading achievement. As school leaders work to allocate funds to increase fourth grade reading achievement prior to the start of school, using the results from this study may help support the district and school's instructional goals and aid in choosing the most effective instructional methods. Although this study showed that there were no statistically significant differences in terms of the i-Ready Reading post-test scores between the business-as-usual students and the target students who participated in the Reading Plus program for 1 year, there are other studies that have shown that technology-based supplemental reading programs have been effective. Knowledge of the effect of

technology-based supplemental reading programs on reading achievement may support positive change by helping school district administrators make informed decisions regarding how to increase fourth grade reading achievement scores. The results of this study will be shared with the administrators at both schools that participated in this study as well as district administrators so they may use the findings to determine if the Reading Plus will be a program that they continue to purchase to increase reading achievement scores. If purchased again, the findings of this study can be used by school and district administrators to monitor the effect of the Reading Plus program on fourth grade reading achievement scores. The data collected from this study can be used by reading educators as the initial data and they can continue to review the data from i-Ready Reading scores over time.

A possible implication for positive social change at the individual level could be that if teachers received extensive professional development prior to implementing the Reading Plus program, there may be more buy-in from teachers. Sancar et al. (2021) emphasized that professional development is crucial to improving student outcomes. Extensive professional development will provide teachers with a sense of confidence in implementing the program, a sense of urgency, and buy-in. This shift can create positive social change by empowering teachers and equipping them with the knowledge necessary to implement the Reading Plus program with fidelity. This can lead to improvements in the delivery of reading instruction and student learning. Additionally, doing so will increase the chances of higher reading achievement scores.

The applied behavior analysis theory may also help support positive social change by allowing teachers to understand the constructs needed to implement effective reading practices. The applied behavior analysis theory requires teachers to provide explicit and systematic instruction, model, practice, provide feedback, and reinforcement and generalization of new skills and knowledge. These constructs can be implemented during small groups as well as whole group reading instruction. Additionally, the students can be active participants in their learning by ensuring that they integrate learned reading concepts as they complete their Reading Plus lessons. Doing so will help close the reading achievement gap that fourth grade students are experiencing. The applied behavior analysis theory allows students to practice repeatedly and receive feedback and reinforcement.

Educators have a plethora of resources that claim to increase reading achievement. A recommendation for practice for school administrators and educators is to continuously review and analyze up-to-date research studies on instructional practices so that informed decisions regarding reading instruction can be made. This is an ongoing process because additional research studies will continue to be conducted on reading instructional methods and technology-based supplemental reading programs.

Conclusions

In this study, I investigated the difference in fourth graders' reading achievement growth as measured by the i-Ready test between students who participated in the technology-based Reading Plus program and students who participated in business-as-usual reading instruction. The literature reviewed in this study showed significantly

positive outcomes reading achievement (Bempt et al., 2021; Borleff et al., 2017; Donnelly et al., 2020; Gorp et al., 2017; Oakley et al., 2020; Prescott et al., 2018), Ronimus et al., 2019; Schimitt et al., 2018; Stein et al., 2022; Uittert et al., 2021; Ven et al., 2017; Wanzek et al., 2019; Wanzek et al., 2020; Zijlstra et al., 2020). However, this study yielded a different outcome; there were no statistically significant differences in terms of the i-Ready Reading post-test scores between the business-as-usual students and the target students who participated in the Reading Plus program for 1 year. The continuous challenges for educators include meeting the various needs of students receiving reading instruction and ensuring that they are implementing the best instructional practices to improve reading achievement. Since there is not much research on the Reading Plus program and other technology-based reading programs are continuing to transform classrooms by shifting from traditional whole-class teaching, further research is needed on the effect of the Reading Plus program on fourth grade reading achievement.

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