CAUSAL-COMPARATIVE STUDY OF THE EFFECTS OF CLASSWORKS™ AS A TIER II INTERVENTION ON MIDDLE SCHOOL STRUGGLING READERS

by

Tammy Small

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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APPROVED BY:

Meredith Park, EdD, Committee Chair

Craig Courbron, EdD, Committee Member

Reginald Kimball, EdD, Committee Member

ABSTRACT

The purpose of this causal-comparative study was to investigate the effects of Classworks™ as a Tier II intervention on middle school struggling readers as part of a Response to Intervention system. This study sought to determine whether the Classworks™ intervention administered in a small group twice per week during a supplemental reading class would improve reading skills as measured by the MAP Growth Test after 12 weeks. Two groups of students (Grades 6–8) from four middle schools in a suburban, South Carolina school district were used in the study. Archival data were analyzed with a Multivariate Analysis of Variance (MANOVA) to determine the impact of the independent variable, the Classworks™ intervention program, on the dependent variables. The dependent variables were the overall reading Rasch Unit (RIT) scores, RIT scores in the area of literary text: meaning and context, scores in the area informational text: meaning and context, and scores in the field of vocabulary as measured by the MAP Growth Test designed by Northwest Evaluation Association (NWEA). Results showed a statistically significant difference between the treatment group and the comparison group for reading. Findings caused the rejection of the null hypotheses for the areas of overall reading, informational text: meaning and context, and vocabulary. No statistically significant difference was found between groups for literary text: meaning and context, which led to an acceptance of the null hypothesis that stated there would be no statistically significant difference between the treatment and comparison groups in MAP Growth Reading RIT scores in the area. The study implicated that Classworks™ could be effective as a small group, Tier II reading intervention for middle school struggling readers.

Keywords: reading, intervention, Classworks™, RTI, Tier II, NWEA, MAP Growth

Dedication

This dissertation is dedicated to my Lord, Jesus Christ, and my family. Many times I thought that I should quit and give up on my dream of earning my doctorate, but by the grace of God, and through much prayer, I was urged to continue. My husband, Glaysen Small, never allowed me to quit or give up on my dream. He encouraged me to finish every semester. I also dedicate this dissertation to Cassidy and Glaysen Noah Small, my children. My children have seen me working on my doctorate as they were growing up, and they have expressed a desire to pursue their doctorates. Finally, this dissertation is dedicated to my mother, Sherilyn Hicks, who raised me to believe that I could do anything in life through education.

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List of Abbreviations

Adequate Yearly Progress (AYP)

Analysis of Variance (ANOVA)

Elementary and Secondary Education Act (ESEA)

English Language Arts (ELA)

Every Student Succeeds Act (ESSA)

Individualized Education Plan (IEP)

Individualized Learning Path (ILP)

Individuals with Disabilities Education Act (IDEA)

Individuals with Disabilities Education Improvement Act (IDEIA)

Institutional Review Board (IRB)

Integrated Learning System (ILS)

Interactive Educational Systems Design (IESD)

Learning Strategies Curriculum (LSC)

Multivariate Analysis of Variance (MANOVA)

National Assessment of Educational Progress (NAEP)

National Center for Education Statistics (NCES)

National Institute of Child Health and Human Development (NICHHD)

National Reading Panel Report (NRPR)

No Child Left Behind (NCLB)

Northwest Evaluation Association (NWEA)

Oral Reading Fluency (ORF)

Rasch Unit (RIT)

Response to Intervention (RTI)

South Carolina Department of Education (SCDE)

South Carolina Ready (SC Ready)

CHAPTER ONE: INTRODUCTION

Overview

Chapter One contains a brief overview of the background, historical and social context, and an overview of the theoretical framework. Chapter One also presents the problem that drove this investigation along with the purpose of the research, the research questions and hypotheses, and the professional significance of the study. Finally, the key terms are defined.

Background

According to the 2015 National Assessment of Educational Progress (NAEP) results, only 34% of eighth-grade students read at or above the proficient level. One of those states was South Carolina, where 28% of eighth-grade students scored at or above the proficient level, and 29% scored below basic (National Center for Education Statistics [NCES], 2015). Despite the call to focus on reading proficiency, the percentage of proficient readers in eighth grade has not changed, and, in fact, in South Carolina, the rate of proficient readers dropped from 29% to 28% from 2013 to 2015 (NCES, 2013, 2015). In light of this crisis throughout the nation and South Carolina, middle schools wrestle with the issues of meeting the needs of their students and increasing reading proficiency of struggling readers (Clemens et al., 2019; Clemens, Simmons, Simmons, Wang, & Kwok, 2017; Hock, Brasseur-Hock, & Deshler, 2014; Kim, Capotosto, Harty, & Fitzgerald, 2011; Lee & Yoon, 2017; Shippen, Miller, Patterson, Houchins, & Darch, 2014).

As a means of addressing the specific weaknesses of students struggling in the general education classroom, Response to Intervention (RTI) was introduced as a direct result of the reauthorization of the Individuals with Disabilities Education Act (IDEA) in 2004 (Fuchs & Fuchs, 2015; Fuchs, Fuchs, & Compton, 2012; Tran, Sanchez, Arellano, & Swanson, 2011). The

implementation of RTI has varied over time in both methods of delivery and level of intensity. Prior studies have examined how to utilize an RTI system to improve the reading abilities of elementary and primary students (Edmonds et al., 2009; Fore, Riser, & Boon, 2006; Wanzek & Vaughn, 2008), but limited research exists on using RTI to improve reading skills at the middle school level (Burns Hodgson, Parker, & Fremont, 2011; Fuchs & Fuchs, 2015; Johnson & Smith, 2008; Kim et al., 2011).

Historical Context

In 1965, the Elementary and Secondary Education Act (ESEA) began became the beginning of contemporary federal education legislation. The legislation gave federal aid to disadvantaged students in K–12 public schools to strengthen school libraries, state departments of education, and education research. The promise of federal money helped the push for the desegregation of schools, especially in the south. Later, reauthorizations provided funding for bilingual and special education (Casalaspi, 2017; Nelson, 2016).

In 2001, the reauthorization of the Elementary and Secondary Education Act became commonly referred to as the No Child Left Behind (NCLB) Act. This act initiated a focus on assessment and accountability in standardized education. Since the implementation of the NCLB Act in 2001, the focus of education shifted from instructional strategies to standardized testing. Districts across the country searched for ways to help students and schools make Adequate Yearly Progress (AYP). The lofty goal of NCLB was that all students would be proficient in reading, writing, and math by the end of the 2013–2014 school year (Beers, 2007; Dennis, 2012). The NCLB Act remained in place for 14 years until the Every Student Succeeds Act (ESSA) passed in December 2015 (Nelson, 2016).

In 2011, the Obama administration created a system for states to apply for a flexibility waiver after the goal of every student reaching proficiency in reading, writing, and math by the end of the 2013–2014 school year proved unattainable. At that time, the passage of new federal legislation became a priority (Casalaspi, 2017; Egalite, Fusarelli, & Fusarelli, 2017). ESSA was not merely a reauthorization of ESEA as had been in the years since its inception in 1965. ESSA shifted focus from equal opportunities to improving performance on standardized tests for all student populations represented as demographic subgroups. ESSA also put specific limits on the federal education institutions and the executive branch to restore states' rights to choose standards, standardized tests, and accountability measures (Dynarski, 2015; Egalite et al., 2017; Nelson, 2016). However, ESSA kept the requirement for states to report accountability and student performance for Grades 3–8 and in particular courses in high school (Egalite et al., 2017).

Social Context

Students identified as struggling readers are more likely to drop out of high school (Hock et al., 2014; Vaughn, Roberts, Schnakenberg, et al., 2015). The importance of reading proficiency and the attainment of a high school diploma relates to life outside of school. Without targeted and effective intervention, students identified as struggling readers may never develop the critical reading skills necessary for productive adult life (Hock et al., 2014). In fact, between October 2017 and October 2018, 527,000 young people dropped out of high school in the United States (U.S. Department of Labor, 2019). This number may be related directly to the number of adolescents reading below grade level (Dennis, 2012).

Additionally, the dropout rate directly correlates to the unemployment rate, which illustrates the dire circumstances of this reading crisis in the United States. In 2018, the

unemployment rate for people ages 16–24 who did not complete high school was 13.7%, as compared to 6.6% for those with at least a bachelor's degree (U.S. Department of Labor, 2019). With the difference in the unemployment rate between dropouts and those with a bachelor's degree more than doubled, the need for reading intervention is directly related to dropout prevention (Hock et al., 2014).

Theoretical Framework

From the efforts of Norbert Weiner and later Claude Shannon, the information-processing theory was born. Using the early research of Weiner in the area of cybernetics, Shannon developed a communication model and related it to automatic processing. With the development of inferential statistics and the groundwork of Weiner and Shannon, cognitive science came to fruition (Xiong & Proctor, 2018). Parkay, Hass, and Anctil (2010) applied the information-processing theory to the learning process, which includes the reading process. With reading, the researchers suggested the teaching of strategies to students and allowing time to practice until each strategy becomes automatic.

Further, Gentile (2018) asserts that the information-processing theory is concerned with the process of learning. The focus on the process assists practitioners in determining where the difficulty lies in order to intervene appropriately for struggling readers. The information-processing approach ties the concepts of thinking and memory to the process of learning. Information enters the brain through the sensory memory, passes through the working memory, and is sent to the long-term memory where processes such as the use of strategies to read become automatic (Driscoll, 2015; Gentile, 2018; Laberge & Samuels, 1974; Miller, 2011; Parkay et al., 2010; Slavin, 2012). Recent studies examine the strategies of activating prior knowledge and subsequently providing a lexical representation for the student's memory to access, allowing

students to retrieve the information and process the learning through the working memory by applying strategies (Driscoll, 2015; McKeown, Crosson, Moore, & Beck, 2018; McMaster et al., 2015; Miller, 2011).

On the other hand, the behavioral learning theory relies on conditioning. The behavioral learning theory began with the research of John Watson and B. F. Skinner (Parkay et al., 2010). Watson's classical conditioning describes learning as stimuli prompting a response, whereas Skinner's operant conditioning asserts that only positive responses are conditioned. Watson and Skinner's early approaches to learning relied on the stimulus-response learning theory, which falls under the behavioral umbrella (Watson, 1913, 1916, 1925; Parkay et al., 2010; Skinner, 1958). Skinner later rejected the stimulus-response theory to focus more on the reinforcement as the determining factor for a conditioned response (Skinner, 1958). The research related to middle school reading interventions suggests that building on strengths and the conditioned responses impacted struggling readers in the areas of comprehension, vocabulary, and fluency (Clemens et al., 2019; Fisher & Frey, 2014; Kim et al., 2017).

Problem Statement

With the recent increase in implementation of school-wide RTI programs and the fact that limited research exists at the middle school level concerning reading Tier II interventions, middle schools need data to support implementing a web-based intervention program as a Tier II intervention. Burns et al. (2011), who studied small group, Tier II intervention, and its effect on reading comprehension, suggested further study of small group interventions is needed to determine the impact of various research-based or evidence-based interventions on reading comprehension with middle school struggling readers.

A gap exists in the literature concerning Tier II interventions using web-based intervention programs for middle school struggling readers (Cheung & Slavin, 2013; Given, Wasserman, Chari, Beattie, & Eden, 2008; Joseph & Schisler, 2009; Kim et al., 2011; Shippen, Morton, Flynt, Houchins, & Smitherman, 2012; Slavin, Lake, Chambers, Cheung, & Davis, 2009). This study will attempt to determine whether the computer-based, integrated learning system, Classworks™, as a Tier II intervention results in improvements in standardized test scores (MAP Growth) on measures of overall reading comprehension, literary or informational text comprehension, and vocabulary. Previous studies did not examine the impact of computer-based programs on the separate components of types of text or vocabulary (Graves, Duesbery, Pyle, Brandon, & McIntosh, 2011; Johnson & Smith, 2008; Kim et al., 2011). The problem is that considering the call for effective interventions and the growing use of technology-based reading interventions, there is a lack of research to show the effects Classworks™ has as an intervention for struggling readers at the middle school level.

Purpose Statement

The purpose of this causal-comparative study was to determine whether using Classworks™ as a small group, Tier II reading intervention yields statistically significant improvement in overall reading scores and the specific areas of literary text comprehension, informational text comprehension, and vocabulary as measured by the MAP Growth Test (a nationally norm-referenced assessment), for middle school students identified as struggling readers in South Carolina. The independent variable was defined as a Tier II reading intervention using the Classworks™ program in small groups (12–15 students) over 12 weeks for periods of 40 minutes at least twice per week. Each intervention session consisted of students logging into the Classworks™ program and working on the assigned units in the

Individualized Learning Path (ILP) in one of the five prescribed areas: vocabulary; literary text: meaning and context; literary text: language, craft, structure; informational text: meaning and context; or informational text: language, craft, structure. The dependent variables of overall reading, literary text comprehension, informational text comprehension, and vocabulary were measured using the MAP Growth test and analyzed to determine the effects of the Classworks™ Tier II intervention.

Significance

When examining the model of an RTI program, schools must decide which interventions or programs to use (Johnson & Smith, 2008). Many of the options available for middle school small-group intervention are based on research for use with younger struggling readers. Some computer-assisted, integrated learning systems are research-based but have not been adequately studied for middle school struggling readers (Cheung & Slavin, 2013; Given et al., 2008; Messer & Nash, 2018; Shippen et al., 2012). This study added to the current body of knowledge by examining the impact of the computer-assisted, integrated learning system, Classworks™, at the middle school level. Research directed towards improving elementary and primary age student reading abilities focusing on how to implement the RTI tiered interventions and progress monitoring persist (Edmonds et al., 2009; Fore et al. 2006; Wanzek & Vaughn, 2008), but limited research exists regarding middle schools on this topic (Clemens et al., 2017, 2019; Young, 2014).

As middle and high schools begin to explore the implementation of an RTI system, the need for research-validated interventions becomes more evident (Clemens et al., 2017, 2019; Fuchs & Fuchs, 2015; Hock et al., 2014; Johnson & Smith, 2008; Kim et al., 2017; Lee & Yoon, 2017; Shippen et al., 2014). Interventions that have proved effective in elementary schools

cannot be assumed to produce the same results in higher grades due to differences in scheduling, differences in student response to materials, variations in core content curriculum, and lack of funding available for intervention specialists at those levels (Dennis, 2012; Hock et al., 2014; Kim et al., 2011; Shippen et al., 2014). Studies of computer-assisted and teacher-led reading intervention programs suggest the need for more research at the middle school level (Cheung & Slavin, 2013; Clemens et al., 2019; Fogarty et al., 2017; Given et al., 2008; Scammacca, Roberts, Vaughn, & Stuebing, 2015; Shippen et al., 2012).

ESSA (2015) requires that opportunities for success in reading be afforded to all subgroups, including those struggling to perform at the proficient level on state assessments reported for federal accountability (Egalite et al., 2017). This legislation prompted South Carolina to enact legislation to mandate the use of intervention strategies to assist these struggling readers. For example, the Read to Succeed Act (2014) mandated the creation of a state reading plan, which districts and schools used as a guide for outlining plans to reach all readers, including interventions provided by a qualified instructor. The study contributes to the knowledge base about reading intervention at the middle school level.

Research Questions

For this study, the following research questions were investigated:

RQ1: Does the Classworks™ Tier II intervention program improve overall reading skills for middle school struggling readers as measured by the MAP Growth Reading Test?

RQ2: Is there a difference in MAP Growth Reading RIT scores in overall reading between students in the Classworks™ Tier II intervention treatment group and students in the comparison group?

RQ3: Is there a difference in MAP Growth Reading RIT scores for the areas of literary text: meaning and context; informational text: meaning and context; and vocabulary between students in the Classworks™ Tier II intervention treatment group and students in the comparison group?

Definitions

Definitions of important terms used throughout this proposal follow.

1. *Classworks™* – a computer-based Integrated Learning System (ILS) used for individualized instruction and remediation or intervention in reading, language arts, and math. For this research, the focus is on the reading portion of the program (Interactive Educational Systems Design, 2014).
2. *Common Core State Standards* – a set of national standards that were written with the goal of adoption by each state, creating a single national set of standards from which all state standards would be written (Common Core, 2010).
3. *MAP Growth* – a computer-adaptive assessment created by the Northwest Evaluation Association that is nationally norm-referenced. The MAP Growth reading assessment provides an individual score for the following: overall reading; literary text: meaning and context; literary text: language, craft, structure; informational text: meaning and context; informational text: language, craft, structure; and vocabulary in the form of a Rasch Unit (RIT) score (NWEA, 2012).
4. *Rasch Unit* (*RIT*) – an equal-interval scale score given to show which level of test question complexity an individual student can answer 50% of the time (NWEA, 2013a).

5. *Response to intervention* (RTI) – a 3-tiered system of interventions and progress monitoring for struggling students. The system is used as a means to monitor student mastery of taught content and provide intervention (in increasingly intensive steps) if necessary (Fuchs et al., 2012; Fuchs & Fuchs, 2006, 2015).
6. *South Carolina College and Career Ready Standards in English Language Arts* – the state standards adopted for implementation in 2015 developed by the South Carolina Department of Education (SCDE). The SCDE divides the standards into six strands: Inquiry-Based Literacy, Reading Literary Text, Reading Informational Text, Writing, Communication, and Disciplinary Literacy (SCDE, 2015a, 2015b).
7. *Struggling readers* – defined as those who score two to four years below their grade level on standardized reading assessments or below the 30th percentile on a norm-referenced assessment (Fuchs et al., 2012; Fuchs & Fuchs, 2015; Jones, 2009; Shippen, Houchins, Steventon, & Sartor, 2005).
8. *Tier I* – the first level of intervention provided by the classroom teacher in the form of differentiated instruction (Fuchs et al., 2012; Fuchs & Fuchs, 2006, 2015; Searle, 2010).
9. *Tier II* – the second level of intervention, which typically is provided in a small group setting (four to eight students) as a pull-out session, or in a whole-class environment (15–18 students) for those students still struggling after being taught using differentiated instruction (Fuchs et al., 2012; Fuchs & Fuchs, 2006, 2015; Searle, 2010).

10. *Tier III* – the third level of intervention, which is in the form of intensive one-on-one instruction. Usually, this level of intervention results in or accompanies a student qualifying for special education services (Fuchs et al., 2012; Fuchs & Fuchs, 2006, 2015; Searle, 2010).

Summary

The researcher presented an overview of the background, historical, and social context for the study. Also, the chapter included a discussion of the problem, purpose, and significance of the study. The candidate explained the definitions for academic terms specific to the research. In Chapter Two, the author will ground the study in theory and the historical context and explain related research.

CHAPTER TWO: REVIEW OF THE LITERATURE

Overview

This literature review includes a discussion of Response to Intervention (RTI) implementation and interventions that increase reading achievement in struggling adolescent readers. Also included is an explanation of the information-processing and behavioral learning theories. Studies of specific interventions and their impact on reading performance in struggling readers appear in five sections: fluency-focused, comprehension-focused, overall reading, vocabulary-focused, and computer-assisted. Finally, this review encompasses a discussion of the process and strategies involved in the Classworks™ Tier II intervention.

Introduction

Because of the current focus on student achievement and high-stakes testing, there has been a wave of discussion on the most effective ways to teach reading. The strategy has been to focus interventions towards elementary level students; however, recent reports from the National Assessment of Educational Progress (NAEP) establish a significant need for reading response in middle schools for struggling readers (Conley, 2008; Graves et al., 2011; Johnson & Smith, 2008; Kim et al., 2010). Common instructional strategies for struggling adolescent readers such as pre-teaching vocabulary, repeated readings, questioning, making connections, and providing background knowledge involve intervention in the areas of fluency, vocabulary, and comprehension (Dennis, 2012; Hock et al., 2014; Kim et al., 2017; McMaster et al., 2015; Powell & Gadke, 2018; Shippen et al., 2014; Vaughn, Roberts, Schnakenberg, et al., 2015).

With the implementation of RTI programs becoming more widespread in middle schools, researchers provided a framework in the form of a three-tiered system of interventions to assist struggling readers on an individual basis. Classroom teachers provide Tier I instruction within

the classroom based on the core curriculum and state standards. Intervention at this tier involves differentiated instruction. Tier II requires small-group instruction to address specific areas of concern or weaknesses. Tier III involves intervention provided on an individual basis and may result in intensive assistance for the student (Fuchs et al., 2012; Fuchs & Fuchs, 2006; Jimerson, Burns, & VanDerHeyden, 2016; Johnson & Smith, 2008; Mellard, McKnight, & Jordan, 2010; Prewett et al., 2012; Searle, 2010). However, even with the framework, the struggling students could not read well enough to meet proficiency levels on standardized assessments (NCES, 2013, 2015, 2017, 2019), and they could not seem to catch up to their peers in the areas of reading achievement within the regular classroom. According to the most recent results on the NAEP test, only 34% of eighth graders read at the proficient level (NCES, 2019), whereas, in 2017, that number was 36% (NCES, 2017, 2019). In South Carolina, only 29% of eighth graders in 2019, 30% in 2017, and 28% in 2015 read at or above the proficient level (NCES, 2015, 2017, 2019). Educators need to know what interventions are useful and how to monitor progress to determine whether more intensive (Tier II) interventions delivered in a small group, pull-out setting, or a Tier III (one-on-one) intervention are necessary (Mellard et al., 2010; Pressley & Allington, 2015; Prewett et al., 2012).

Using RTI effectively in middle schools involves the monitoring of the progress of students to determine the effectiveness of the Tier II interventions to determine which interventions would impact student achievement in the area of reading. According to a white paper on the Curriculum Advantage Inc. website by Interactive Educational Systems Design, Inc. (IESD), Classworks™ is a computer-assisted Integrated Learning System (ILS) used as an intervention program for students in grades K–12 experiencing difficulties in the areas of literary text comprehension, informational text comprehension, and vocabulary (IESD, 2014).

Classworks™ is considered an ILS because it provides instruction, maintains student progress records, and makes decisions on which instructional units are assigned to pinpoint areas of weakness linked to the screening system used (IESD, 2014). For this research, the screening system is the reading MAP Growth test by Northwest Evaluation Association (NWEA). MAP Growth is a national norm-referenced reading assessment that is computer-adaptive and delivers scores in the areas of overall reading, comprehension of literary and informational text, and vocabulary (NWEA, 2015).

The direct link between NWEA and Classworks™ comes in the form of their formalized agreement, which allows districts to directly upload data from each administration of MAP Growth for each student to create an Individual Learning Pathway (ILP) in all areas identified as MAP Growth goal descriptors. The goal descriptors are literary text: meaning and content; literary text: language, craft, and structure; informational text: meaning and content; informational text: language, craft, and structure; and vocabulary. All of these areas combine to produce an overall reading composite score in the form of a Rasch Unit (RIT) score (NWEA, 2013b). The ILP will be discussed in the Classworks™ section of the review.

Theoretical and Conceptual Frameworks

When looking at the concept of the Tier II pull-out intervention and the design of the Classworks™ program for this research, the information- processing and the behaviorist theories provide a framework for the proposed research. Information-processing theory stems from cognitive science (Parkay et al., 2010; Xiong & Proctor, 2018). In terms of theories of learning, Parkay et al. (2010) explained that behavioral and cognitive approaches are two of the significant education theories used today.

Information-Processing Theory

The information-processing theory dates back to the researchers known as the "fathers of the Information Age," Norbert Wiener and Claude Shannon (Xiong & Proctor, 2018). The early research of Wiener began with the study of cybernetics. Shannon further developed Wiener's theory of communication and the automatic process with a communication model. This model showed the fundamentals of the information-processing theory in its most basic form. The model had five essential elements: information source, transmitter, channel, receiver, and destination (Xiong & Proctor, 2018). At the time of the work of Wiener and Shannon, inferential statistics was developed to quantify the differences seen in experimental research. With the self-regulation and communication ideas and models, along with the development of inferential statistics, the concept of cognitive science was born (Xiong & Proctor, 2018).

According to the information-processing theory, the role of the teacher is that of a facilitator or guide in the learning process (Parkay et al., 2010). As related to information-processing, a teacher teaches the children strategies that they can then learn and begin to apply—until the processes become automatic. For instance, a teacher is to show a reading strategy such as questioning and then guide the students through practice using the approach (Gentile, 2018; Parkay et al., 2010). For students to access their sensory and working memories, the assignment must call for students to focus on the task at hand. Focusing helps students to engage and train their brains for processes of learning to become automated, such as with the necessary skills of reading (Gentile, 2018).

Prior knowledge has been found to assist in translating knowledge into schemata or concept blocks within the memory and recovered for use in the learning process. Laberge and Samuels (1974) explained that the capacity of people to process many things at once allows

people to perform complex processes involved in reading automatically. Further, the visual representations and phonological processes involved in reading help in the learning process. If there is a visual code in the mind that can attach to a sound, the brain can begin to read words with those letters and sounds together with practice until the reading becomes accurate and automatic (Laberge & Samuels, 1974). Gentile (2018) asserts that platforms requiring students to connect prior experience to new information strengthen that process to move it into long-term memory. Once information enters the long-term memory, it becomes the system of arranged knowledge used as a foundation for growth in reading by introducing curriculum and strategies requiring students to infer and elaborate (Gentile, 2018). Students then try to apply those strategies on their own while the teacher assesses the use of the strategy. After some time, information-processing theorists believe that students will begin to choose the appropriate strategy leading to a release of the student by the teacher, giving the student more control over his or her learning (Gentile, 2018; Miller, 2011).

When explaining the theory of information-processing, researchers often compare the process of learning to that of a computer processor (Gentile, 2018; Hoy, Davis, & Anderman, 2013; Miller, 2011; Parkay et al., 2010; Woolfolk, 2001). "Like the computer, the human mind takes in information, performs operations on it to change its form and content, stores the information, retrieves it when needed, and generates responses to it" (Woolfolk, 2001, p. 243). With this theory, the investigators look for changes in cognitive performance during tasks. Research connected the cognitive strategies of questioning, summarizing, and using background knowledge of the topic by engaging with newly learned information in the text (Conley, 2008). Conley (2008) stressed the importance of teaching strategies to students and helping them to apply the process when reading to understand challenging documents or writings.

When examining the processes involved in reading, the concepts of cognition as thinking and the idea of memory bring to light the information-processing model of learning rooted in cognitive science. The foundation of the theory is the idea that information enters the mind through the sensory memory, is encoded on the working memory, and is sent to the proper processing area of the long-term memory (Driscoll, 2015). The episodic buffer temporarily stores information as different representations (Miller, 2011). After processing through the working memory, which may take several trials, the knowledge may then be committed to the long-term memory, where it can later be retrieved when necessary (Driscoll, 2015; Gentile, 2018; Miller, 2011; Slavin, 2012). Although teachers cannot determine where the difficulty exists within the neurological structure or pinpoint exact cognitive processes that are lacking, reading practitioners can use the knowledge of how information is processed within the brain to strengthen reading skills.

Another aspect of the information-processing theory is the idea that strategies can be used to teach children and adolescents to make connections by providing contexts of learning. For example, if a struggling reader lacks background knowledge, it would be difficult for him or her to make connections regarding new ideas and materials, and what he or she reads would be more difficult to process (McMaster et al., 2015; Miller, 2011; Slavin, 2012). In that case, the information would not be committed to long-term memory, and the learner would fail to retrieve the knowledge accurately in a comprehension activity. However, within the context of the reading process, a struggling reader could then make connections to the episode in their working memory, making it easier to process and retrieve later (Driscoll, 2015; Slavin, 2012). Further, McKeown et al. (2018) asserted that lexical representation within the student's memory helps him or her to call the understanding of a word to the working memory.

The self-modification or self-correcting concept related to reading is part of the intervention process. Since the information-processing theory purports that people can make self-modifications, the idea of reteaching a strategy to a struggling reader through intervention could help the reader adjust. The student would be more apt to process the information he or she read after a period of retraining his or her encoding system to make connections and store it in long-term memory for retrieval (McMaster et al., 2015; Miller, 2011; Slavin, 2012). Lysaker and Hopper (2015) explained that self-correcting happens when a child reads new information and goes back to correct previous thinking to make more sense of the content in its entirety.

According to McMaster et al. (2015), reading interventions based on cognitive science should involve helping the reader to comprehend using questioning and integration of understanding. To be able to understand the material, the reader goes through a series of processes. The reader must have an idea of text within the memory already to enact these processes. The reader makes connections to background knowledge and uses the representation within his or her mind. A reader may struggle to understand what is read if he or she is unable to recall a clear image of text to his or her working or short-term memory (McKeown et al., 2018; McMaster et al., 2015). In this case, the teacher could help the student use metacognition to work backward through the reading process to determine where the errors occurred and allow time for self-correction by the student (Driscoll, 2015).

Behavioral Learning Theory

The idea of behavioral learning theory stems from the work of John Watson (1913, 1916, 1925) and B. F. Skinner (1958). Watson's central concept of learning is based on classical conditioning, which explains all learning as a "result of specific stimuli that elicited certain responses" (Parkay et al., 2010, p. 190). Further, Skinner built on the stimulus-response learning

theory by adding that only "satisfying responses are conditioned, unsatisfying ones are not" (p. 190). Skinner's theory was called operant conditioning. Skinner moved away from Watson's foundation of the stimulus-response relationship being essential in classical conditioning towards the idea that reinforcement is the key to eliciting the desired response (Skinner, 1958). Within Classworks™, the program awards badges and trophies for time-on-task, for maintaining preset mastery levels, and for the number of units completed over time. Based on Skinner's approach, students receive praise and are celebrated for successful completion of each activity and assessment through live scores and on-screen cheers. Students track their growth and achievement using the progress monitoring feature, which gives students a daily, weekly, and monthly average in each subject as well as the daily time-on-task (Curriculum Advantage, 2009).

When examining a program, it is essential to look at the learning theories and the instructional methods used. According to Curriculum Advantage (2009), the instructional units for reading in the Classworks™ program stem from the Madeline Hunter Model of direct instruction. Cawelti (2003) discussed the strong impact of Madeline Hunter's instructional method. The ideas of focusing students before the lesson, direct instruction on the objective, guided practice, and independent practice helped teachers design practical lessons. Curriculum Advantage further asserts, "Using scored activities focusing on a single skill or concept, Classworks™ instructional units provide direct instruction, practice, assessment, remediation, and performance-based learning" (p. 13). This process directly ties the learning to behavioral learning theory in that the program transmits the knowledge and skill from the teacher (the Classworks™ program) to the student (Parkay et al., 2010). The Classworks™ program also implements the concept of mastery learning, which assumes that all students can learn the material with time and proper teaching (Curriculum Advantage, 2009). With mastery learning,

students take a diagnostic assessment and are prescribed activities or lessons to correct the knowledge and move the students toward mastery on the retake of the evaluation (Parkay et al., 2010).

Related Literature

Historical Context

Although there has been a focus on reading proficiency for nearly two decades, the National School Report Card has been delivered routinely since then, based on the results of NAEP testing, which began in 1971 (Perie, Moran, & Lutkus, 2005).

According to historical research by Jacobs (2008):

> We have long wanted to provide our children with the best education possible to ensure that they will grow into a critical citizenry and live the most meaningful lives that they can. By placing literacy at the heart of educational reform, the opportunity to achieve this goal is unprecedented. (p. 24)

Since current research examines middle school struggling readers, the results of NAEP for Grade 8 are essential to this study. In 1998, South Carolina's average score for Grade 8 reading was 255, which was below the national average of 261. The percentage of students scoring at or above proficient at that same time was 22%. Significant achievement gaps existed between males (17% proficient) and females (26% proficient). Also, of those students scoring at or above proficient, 31% were White while only 9% were Black and 9% were Hispanic, representing another significant achievement gap (Perie et al., 2005). Furthermore, the results of the 2015 NAEP have not shown any significant differences. While the average score for eighth graders in South Carolina rose to 260 in 2015, this score remained below the national average of 264. Even though the numbers in terms of percentage changed, the achievement gap between

males (22% proficient) and females (34% proficient) from 1998 to 2015 grew (NCES, 2015). Further, the achievement gap among White (38% proficient), Black (11% proficient), and Hispanic (17% proficient) students remained significant from 1998 to 2015 (NCES, 2015). Overall, the percentage of eighth-grade students scoring at or above proficient in South Carolina grew from 22% in 1998 to 28% in 2015 and 30% in 2017 (NCES, 2015, 2018; Perie et al., 2005).

In 2000, after reviewing and evaluating research for three years, the National Institute of Child Health and Human Development (NICHHD) released the National Reading Panel Report (NRPR), asserting that the five major components of reading were phonemic awareness, phonics, fluency, vocabulary, and comprehension (NICHHD, 2000; Shippen et al., 2014). Because the NRPR suggested that intervention in the early grades was essential to overall improvements in reading, attention and funding were geared towards programs to assist students in those grades (Coyne, Pisha, Dalton, Zeph, & Smith, 2010; Dennis, 2012).

Based on the NRPR, the overall assumption was that if students had a strong foundation in phonemic awareness, phonics, and fluency, they would be capable of making the transition to the increased demands of upper elementary, middle school, and secondary reading. Most of the text at the higher grade levels consist of reading-to-learn tasks in the content areas and critical reading for interpretation, making inferences, and evaluating skills related to literature and informational texts (Beers, 2007; Dennis, 2012; Pressley & Allington, 2015). Vaughn, Roberts, Schnakenberg, et al. (2015) discussed the shift in reading from literary texts to informational texts in secondary grades as well. However, the underlying theory of this assumption was that students who experience difficulties on grade-level appropriate tasks as they age lacked an essential skill from earlier grades (Bernhardt & Hebert, 2017; Dennis, 2012; Franzak, 2006; Hall & Burns, 2018; Paris, 2005). Research focusing on interventions has shown that those designed

to develop comprehension, vocabulary, and fluency suggest building on the individual strengths at a student's current reading level to be more effective with struggling readers in middle school (Beers, 2007; Dennis, 2012; Joseph & Schisler, 2009; Kim et al., 2011; Vaughn & Fletcher, 2010). Newer research indicates the importance of including word-level decoding and fluency along with the comprehension interventions for all struggling readers (Clemens et al., 2019; Fisher & Frey, 2014; Kim et al., 2017).

Due to federal accountability regulations set in place by ESEA and with the anticipation of changes through new legislation, South Carolina passed Act 284 in 2014. S.C. Code Ann. § 59-155-110 is commonly referred to as the Read to Succeed Act (2014). Act 284 required not only that classroom instruction is evidence-based, but also that interventions be evidence-based to ensure that all students become skilled and capable readers and writers. The Read to Succeed Act (2014) insisted that interventions be provided to help students in Grades K–12 develop skills to understand texts on grade level. The goal set forth by the legislative act was that 95% of all students read on grade level (Read to Succeed Act, 2014).

As a result of the regulations outlined in Act 284 2014, the Office of School Transformation for the South Carolina Department of Education (SCDE) developed the South Carolina State Reading Plan. The South Carolina Legislature approved the plan, and it took effect in June 2015. The policy outlined the intervention process and explicitly mentioned a multitiered system of support approach for reading. The South Carolina State Reading Plan provides an overview of RTI and a three-tier system to assist struggling readers. From the State Reading Plan, districts and then schools in South Carolina developed their own District Literacy Plan and School Literacy Plan based on reliable data, including a system to monitor the progress made by each student and a plan for interventions as needed (SCDE, 2015a). This policy makes

decisions about programs used to intervene vital to the accountability process for districts and schools. All programs must be research-based according to the South Carolina State Reading Plan (2015) and The Read to Succeed Act (2014). Although most programs cite research as a basis for their product, those such as Classworks™ have limited empirical data or studies to show the effectiveness of the intervention.

Response to Intervention

RTI's three-tier system provides a method for evaluating the level of intervention needed for individual students and monitoring their progress in reading in relation to their peers (Bernhardt & Hebert, 2017; Mellard et al., 2010; Pressley & Allington, 2015; Searle, 2010). According to Searle (2010), the Individuals with Disabilities Education Improvement Act (IDEIA) required the implementation of supplemental support or interventions as soon as a teacher notices a potential struggle for students with or without disabilities. ESEA and subsequently ESSA paved the way for the implementation of multitiered systems of supports using the RTI process to meet the requirements of IDEIA. In other words, teachers must identify areas of weakness in struggling readers and provide classroom interventions (Tier I) as soon as possible. Research-validated responses can be made available to students within the classroom, in small-groups, and when necessary, on a one-on-one basis, rather than waiting for children to fail and diagnosing them as having a disability (Bernhardt & Hebert, 2017; Fuchs & Fuchs, 2006; Searle, 2010).

According to Fuchs and Fuchs (2006), RTI was developed to identify students who are struggling with reading, specifically those scoring in the bottom 25th percentile in comparison to peers. Once the teacher identifies the students using this criterion, the teacher employs a classroom intervention, and then students are monitored for progress. This first level of

intervention, Tier I, is administered in the general education classroom by the classroom teacher. This kind of mediation involves differentiated instruction, such as modifying assignments based on the individual student's reading level or area of weakness. Tier I interventions may also include changing instructional delivery for different learning styles in the classroom (Fuchs et al., 2012; Fuchs & Fuchs, 2006, 2015; Pressley & Allington, 2015; Searle, 2010).

A student is referred for Tier II intervention if he or she does not make improvements after the implementation of classroom interventions (Fuchs et al., 2012; Fuchs & Fuchs, 2006; Pressley & Arrington, 2015; Searle, 2010). Further, research asserts that struggling students may receive more intensive instruction at Tier II using a pull-out or push-in model (Fuchs & Fuchs, 2006). Delivery of Tier II interventions typically occurs outside of the regular classroom, in the form of a pull-out class taught by a reading specialist or interventionist. The small group intervention for reading should involve a focus on improving necessary literacy skills such as fluency, word study, comprehension, phonemic awareness, and writing (Hall & Burns, 2018). The pull-out class is usually limited to 10–12 students and divided into groups of three to six students (Fuchs & Fuchs, 2006, 2015; Pressley & Allington, 2015; Searle, 2010).

If a student does not respond to the interventions at the first two levels, the specialist or instructor provides Tier III, one-on-one assistance. This failure to respond poses an issue for schools in terms of who will provide this level of intervention, the time required, and personnel, which ultimately equates to training and costs (Pressley & Allington, 2015). Fuchs and Fuchs (2019) reiterated the need for intensive research-based interventions to help struggling students who are not responsive to interventions. In light of these subsequent issues, effective Tier II interventions potentially limit the costs and necessity for several intervention specialists for Tier III interventions (Fuchs et al., 2012; Fuchs & Fuchs, 2006; Searle, 2010). The levels of

intervention are not exclusive; they are continuous (Jaeger, 2016; Pressley & Allington, 2015; Prewett et al., 2012; Searle, 2010). Burns, Scholin, Kosciolek, and Livingston (2010) stressed the importance of progress monitoring activities as an integral part of determining whether the child is responding to interventions. Further, Bernhardt and Hebert (2017) contended it is essential for schools to develop progress monitoring assessments that are quick and delivered weekly as part of their RTI processes.

School-wide RTI Implementation in Middle Schools

Due to declining literacy achievement scores of students at the middle and high school levels, the focus in instruction has shifted to providing interventions for adolescents struggling with basic reading concepts through more critical reading skills required in higher-level thinking tasks of content area classes (Brozo, 2009). Although the idea of RTI began as a means of identifying students who qualify for special education services, the use of school-wide RTI programs has become a useful tool for providing interventions to students in general education struggling with reading (Bernhardt & Hebert, 2017; Brozo, 2009; Fuchs et al., 2012; Hall & Burns, 2018; Jimerson et al., 2016; Johnson & Smith, 2008).

Researchers have suggested the need for further investigations of Tier II interventions for struggling adolescents and called for studies of specifically designed interventions to determine which programs would be most effective (Calhoon, Sandow, & Hunter, 2010; Cirino et al., 2012; Graves et al., 2011; Joseph & Schisler, 2009; Kim et al., 2017; Vaughn, Roberts, Schnakenberg, et al., 2015). Ciullo et al. (2016) found that middle schools implementing Tier II and Tier III interventions were observed sparingly using evidence-based practices and strategic cognitive strategies (such as summarizing), suggesting the need for further research of RTI in middle

schools. The importance of evidenced-based practices for interventions was stressed (Ciullo et al., 2016).

The researcher focused on RTI has mostly concentrated on elementary-aged students, but findings concerning the implementation of RTI can be related to the effective implementation of RTI in middle schools. Shepherd and Salembier (2011) studied the questions of teacher attitudes towards the implementation of the RTI model, its effectiveness in improving student achievement, and the overall perception of the success of the implementation of the pilot programs. Not surprisingly, teacher attitudes can affect the execution of the RTI process. For the RTI model to be positive and productive, collaboration time and joint planning are needed. Another common theme was the need for continued professional development and support of the administration to successfully implement the RTI model (Shepherd & Salembier, 2011). According to Bernhardt and Hebert (2017), for a system-wide approach to RTI to be successful, a change in the teacher mindset must be made from a deficit-model to an at-risk model. This change would help teachers to think more about their teaching and strategies for instructional delivery rather than gaps in student learning. The shift would move schools more towards thinking about prevention and reteaching rather than filling in gaps (Bernhardt & Hebert, 2017).

In addition to the professional development and supportive administration, there is a need for RTI to extend beyond the primary tasks of learning to read to the more challenging reading to learn, specifically the more challenging informational texts. Content area reading involves more informational texts and challenging skills. In middle school, students must draw more conclusions and interact with more challenging expository texts (Kim et al., 2017; Ritchey, Silverman, Montanaro, Speece, & Schatschneider, 2012; Vaughn, Roberts, Schnakenberg, et al., 2015; Vaughn, Roberts, Wexler, et al., 2015). In upper elementary and middle grades, students

need to be able to comprehend, read fluently, and have word attack skills to interact with expository texts. Tier II interventions include instruction in fluency, comprehension, vocabulary, and text instruction using explanatory texts. Informational and expository texts require advanced word-level attack skills due to the increased difficulty level because of multisyllabic words, technical vocabulary, and academic vocabulary (McKeown et al., 2018). Research has shown that small group intervention is promising in the science and social studies content areas in terms of applying comprehension strategies and word-level vocabulary work (Ritchey et al., 2012; Vaughn Roberts, Schnakenberg, et al., 2015; Vaughn, Roberts, Wexler, et al., 2015).

Progress Monitoring

One of the main components of determining the success of interventions in Tier I, Tier II, or Tier III as part of RTI programs is systematic and regular monitoring of student progress (Bernhardt & Hebert, 2017; Pressley & Allington, 2015). Mellard et al. (2010) explained the necessity of having clearly defined goals that students should meet when moving among tiers of intervention before being identified as nonresponsive, with the possibility of being identified as having a specific learning disability and needing special education services. With clear and specific intervention plans, the data from progress monitoring could determine whether students are making enough progress to move back into the classroom or from a Tier III to a Tier II intervention (Bernhardt & Hebert, 2017; Mellard et al., 2010).

Many types of tests can be used for progress monitoring to determine the effects of interventions on struggling readers. The purpose of the study by Archer (2011) was to determine the average growth for middle school struggling readers in terms of Lexile levels, depending upon the starting Lexile level. Companies report Lexile levels as a range of the level of books and other texts that the reader could comprehend during independent reading. The study

revealed that children reading at a low Lexile level in the middle school attain gains at different levels depending on their Lexile level at the start of the school year. As the teacher monitors progress throughout the year, the student and teacher can adjust the individual goal as necessary. The function of the starting Lexile score then serves two purposes: (a) baseline data and (b) a means of predicting expected growth (Archer, 2011).

Along with the determination of the effectiveness of progress monitoring on struggling readers, researchers also have examined the frequency of progress monitoring. Prewett et al. (2012) noted that the majority of the literature on the structure of RTI programs reported on elementary school implementations. Nevertheless, the researchers explained that successful progress monitoring took place on a frequent and consistent basis. Bernhardt and Hebert (2017) suggested the use of progress monitoring measures that take 5–15 minutes every week. Other researchers have expressed concern about identifying tests to determine whether an intervention is impacting learning (Prewett et al., 2012). Schools can determine the feasibility of periodic progress monitoring depending on their circumstances, but research recommends conducting monitoring activities regularly (Bernhardt & Hebert, 2017; Prewett et al., 2012).

Reading Interventions in Middle Schools

With the focus on the components of reading comprehension, fluency, and vocabulary in middle schools as a whole process, researchers have taken different approaches to determine which interventions are most successful. Some studies have targeted the components separately, while others have examined the effects of a specific intervention on overall reading comprehension, fluency, and vocabulary. Studies have shown many computer-based interventions claim to improve reading by integrating the main components of reading (phonics,

phonemic awareness, comprehension, fluency, and vocabulary) in entertaining ways and providing informative reports for progress monitoring.

When looking at specific interventions and their effects, this researcher examined studies showing significant or promising results in the areas of comprehension, fluency, and vocabulary, with or without the use of computer-assisted programs. Since Classworks™ aims to foster the growth of students in overall reading, comprehension, and vocabulary (IESD, 2014), studies linking these three areas of reading were included to provide a solid foundation for studying the effects of the intervention with middle school struggling readers.

Fluency focused interventions. According to Lee and Yoon (2017), reading fluency is the capability of a person to read with speed and accuracy with few miscues and with prosody. The idea behind fluency is that if word recognition is automatic, it will be easier for the person to comprehend and make meaning (Lee & Yoon, 2017; Powell & Gadke, 2018). Research has shown that in studies of struggling readers, fluency has impacted comprehension improvement (Kim et al., 2017; Paige, 2006; Paige & Magpuri-Lavell, 2014; Powell & Gadke, 2018; Rasinski et al., 2005; Rasinski, Samuels, Hiebert, Petscher, & Feller, 2011). As students invest the time on task using Classworks™, the use impacts fluency through the listening feature incorporated. Students may listen to the mini-lessons, stories, and directions within each of the units. This audio feature could further develop fluency and assist in comprehension and vocabulary development (Rasinski et al., 2011).

In terms of fluency intervention, limited current research is available past the elementary level. Of the 34 studies included in the meta-analysis of studies of the effects of repeated reading interventions on fluency of struggling readers (Lee & Yoon, 2017), only 13 studies involved students in Grades 6–8. When considering interventions for middle school students in this area,

it is essential to note that many of the findings available use case studies rather than randomized experiments, which limits the generalizability of results (Paige, 2006). In a more extensive study, Rasinski et al. (2005) assessed the Oral Reading Fluency (ORF) of students in ninth-grade; reading fluency was examined to establish whether there was a relationship between ORF rates and comprehension using scores on the high school graduation test. Results showed a statistically significant relationship between fluency and comprehension (Rasinski et al., 2005). Although the sample in the study discussed in Rasinski et al. consisted of ninth graders, this information about the link between fluency and comprehension is significant when looking to provide interventions to improve student reading achievement in middle school struggling readers.

Repeated readings and assisted reading are two ways shown to improve reading fluency (Lee & Yoon, 2017; Paige, 2006; Powell & Gadke, 2018; Rasinski et al., 2005). Some researchers suggested repeated readings could lead to increases in fluency, comprehension, and overall reading of new material, which implies that the skills transfer (Powell & Gadke, 2018; Rasinski et al., 2005). Further, repeated readings and listening passage preview have been studied and found to show positive results for increasing oral reading fluency, with repeated readings showing the most favorable results (Powell & Gadke, 2018). Additionally, Lee and Yoon (2017) found that studies with an increased number of repeated reading trials showed a more significant increase in fluency in terms of correct words per minute on measurements.

In two separate studies, Paige (2006) and Morra and Tracey (2006) found that the use of repeated readings (a cognitive strategy) showed positive results. While Paige tested whether the use of repeated readings improved reading fluency, Morra and Tracey studied the effects of multiple interventions. The results from both studies reinforce the need for fluency intervention

for struggling readers in middle school. The research also suggested that various interventions could positively affect reading fluency (Morra & Tracey, 2006; Paige, 2006). In a more current study, Rasinski et al. (2017) found that intensive daily fluency lessons incorporating repeated readings, shared reading, paired reading, and word study showed positive impacts on reading fluency and comprehension. Researchers reported above-average growth of the third-grade students over the seven-week summer intervention period. It is important to note that the intervention was conducted in small groups of four or five students (Rasinski et al., 2017). Although researchers tested the treatment using third-grade students, similar results could be expected with middle school struggling readers. The body of research on fluency suggests that interventions could have different impacts depending on the individual student (Clemens et al., 2017; Lee & Yoon, 2017; Morra & Tracey, 2006; Paige, 2006; Paige & Magpuri-Lavell, 2014; Powell & Gadke, 2018; Rasinski et al., 2005, 2017). Although not measured separately, the connection between fluency practice and improved comprehension could be an extraneous variable in this study. For this study, the intervention provides fluency practice, but the researcher is only interested in its possible effects on comprehension.

Comprehension focused interventions. When investigating strategies used in interventions aimed at improving comprehension in adolescents, studies evaluating specific programs have yielded promising results. Cantrell, Almasi, Carter, Rintamaa, and Madden (2010) studied the implementation of the Learning Strategies Curriculum (LSC) to determine its effectiveness with adolescents. LSC combined specific strategies aimed at helping struggling readers achieve success in reading comprehension. Teachers taught students word identification, visual imagery, self-questioning, paraphrasing, and sentence writing strategies to improve understanding of written materials (Cantrell et al., 2010). Other research has suggested that the

use of different methods of instructional delivery and strategies could impact comprehension (Fien et al., 2018; Fisher & Frey, 2014; Jitendra, Hoppes, &Xin, 2000).

Comprehension interventions vary in delivery and design. Small-group, specialized reading interventions have been studied to determine the effects on comprehension. While Cantrell et al. (2010) suggested that change could come from focusing on profound understanding rather than literal knowledge, Fisher and Frey (2014) found that students made significant gains using the close reading strategy for intervention. Further, the importance of repeated readings and small group peer discussion and collaboration were critical elements in gains in comprehension (Fisher & Frey, 2014). On the other hand, Fien et al. (2018) showed that while explicit and direct instruction within the regular classroom setting had a positive impact on adolescents learning to read, reading interventions showed no significant improvement in the reading measures. Jitendra et al. (2000) reported some improvement in comprehension in a small group intervention using a main idea comprehension strategy taught using explicit direct instruction, modeling, and guided practice. Results showed the importance of explicit instruction and self-monitoring techniques as strategies showing growth after the intervention (Jitendra et al., 2000).

Overall reading interventions. Multifaceted interventions have been studied to determine the effects on overall reading. This body of research includes interventions targeting fluency, comprehension, vocabulary, word recognition, spelling, or decoding. Vaughn et al. (2010) studied the overall effects of Tier II reading intervention. The research included two intervention programs and yielded no significant results. Researchers cited fidelity concerns as a possible issue (Vaughn et al., 2010). However, in 2012, Vaughn and Fletcher chose to study whether those same students would respond to Tier III interventions in small groups of five

students. The goal was to determine if group size was a factor in the lack of response to intervention in the prior study. Results did not yield any significant improvements in overall reading scores based on group size, but instead, significant gains appeared in decoding, fluency, and comprehension for students receiving Tier I intervention (Vaughn & Fletcher, 2012). In other words, as long as the standard intervention was in place, students made gains overall.

When examining the overall reading ability of adolescents, research often includes the motivation of students to use cognitive strategies to attack complex text or unfamiliar text. Students at the middle school age are developing identities and are trying to establish their persona. This self-concept often poses challenges to motivating students to take advantage of intervention opportunities and the use of strategies when reading (Conley, 2008). Therefore, teachers ought to involve students in the text or activity in a way that does not compromise their individualities as members of their peer group, so that students will not be seen as different, causing embarrassment.

In a longitudinal study, researchers studied the effects of attention on word reading and reading comprehension. Researchers explained that as students age, there is a shift away from learning to read at a decoding level towards reading to learn based on fluency and listening. Overall, behavioral attention was implicated as another factor in designing effective interventions for struggling readers as they move to higher grades (Miller et al., 2014).

Scammacca et al. (2015) conducted a meta-analysis of studies published over 30 years. This study was to update their previous analysis including studies from 1980–2004 (Scammacca et al., 2007). The researchers included studies specifically targeting reading interventions for students in Grades 4–12 from 1980–2011. They found that multi-component interventions showed promise in helping students to improve reading skills. However, the authors suggested

the need for further research to understand the length and types of interventions that produce desired results (Scammacca et al., 2015). Hall and Burns (2018) reported that interventions of moderate length were as effective as long or short duration interventions, seemingly answering the call for further study of the period of intervention by Scammacca et al. (2015). The authors called for new research on targeted small-group interventions to determine whether the intervention is more effective if it targets specific weaknesses of the student (Hall & Burns, 2018).

The Classworks™ system claims to target particular areas through the Individual Learning Path (ILP) based on the screener, which, in this case, is MAP Growth (IESD, 2014). In this study, students participated in a pull-out class during a supplementary support reading period for approximately 40 minutes per day. Within the course, students worked in individualized learning activities based on the Classworks™ prescribed learning plan twice per week during this period. Each student worked on their individualized plans for remediation based on the MAP Growth Reading scores and data imported into the computerized program. Students in the class did not know the levels of other students in the class. This protection of privacy should have assisted with conquering those motivational challenges that adolescents may pose when faced with the chance that peers may learn that the individual is struggling (Conley, 2008).

Vocabulary-focused interventions. In addition to studies of comprehension and fluency interventions, some researchers have focused on the importance of vocabulary to improvements in overall reading achievement. Nitzkin, Katzir, and Shulkind (2014) studied the effects of intensive vocabulary instruction across the curriculum on overall reading comprehension. The researchers determined that there were three types of vocabulary words in the middle school setting. Tier 1 words were high-frequency words that most students knew upon sight in texts.

Tier 2 words were academic vocabulary seen often in manuscripts and were crucial to understanding and comprehending the content of documents in middle grades. Tier 3 words are "domain-specific" and need to be taught as they appear in the context of the subject area (Nitzkin et al., 2014). McKeown et al. (2018) also studied the effects of another intervention focused on academic vocabulary. Researchers confirmed that vocabulary intervention, including words in context and morphology using roots, showed a positive impact on comprehension (McKeown et al., 2018; Nitzkin et al., 2014). Nisbet and Tindall (2015) discussed a practical framework for teachers using direct and explicit teaching of vocabulary, especially for English language learners. Explicit teaching involves defining the word and allowing students to use the word in context multiple times throughout the year and teaching the morphology and syntax of the word. They recommended using the see/hear/say method when introducing new words to students (Nisbet & Tindall, 2015). The use of vocabulary instruction and lessons included in the Classworks™ program specifically target vocabulary in contexts of informational and narrative text, morphology, and understanding new words with the opportunity for students to listen to the word pronounced. Classworks™ assigns units as part of its ILP based on imported MAP Growth data (Curriculum Advantage, 2009).

Computer-assisted reading intervention. In 2020, it is common for students and teachers to have computers in the classroom and at home. Technology is such an integral part of every day, especially for the students who grew up in the age of technology and with immediate access to the internet at any time. Educators and education systems have seen a push for the integration of technology in the classrooms and as part of the instruction to prepare students for careers and jobs in current and future society (Yarbro, McKnight, Elliott, Kurz, & Wardlow, 2016).

The use of computer-assisted reading intervention programs has become more prevalent in middle schools. Although the inclusion of these types of programs has become more prevalent in middle schools, teachers have expressed concerns about the lack of continuous professional development and technical support (Bippert & Harmon, 2017). Yarbro et al. (2016) indicated that teachers' use of technology has been shown to help extend learning through collaboration, inquiry and research, and project-based learning. Incorporating technology encourages a more student-centered classroom, which presents more opportunities for students to learn and to engage in higher-order thinking activities. Research has shown positive results with computer-assisted interventions for middle and high-school struggling readers (Bippert & Harmon, 2017; Hollingsworth, 2014). However, Bippert and Harmon (2017) cautioned that the majority of the research on computer-assisted intervention programs focused on elementary grades.

Slavin, Lake, Chambers, Cheung, and Davis (2009) conducted a meta-analysis that included studies of interventions using mixed-method, computer-assisted, reading curricula, and various instructional methods. Within this synthesis, researchers studied instructional technology interventions, including a study using Classworks™. The results of the analysis showed that using the computer-based intervention alone had minimal impact on reading improvement. The researchers discussed the limitations of the review in terms of having a limited number of large scale studies on effective interventions for middle and high-school struggling readers. Further, Slavin, Lake, Davis, and Madden (2011) included 97 studies in a synthesis of evidence for reading intervention, including computer-based programs. They found that technology-based programs had little impact on reading improvement, which supports the previous research by Slavin et al. (2009). They also reported that the most favorable results were

shown when the focus was on improving classroom instruction and one-on-one interventions with struggling students (Slavin et al., 2011).

In contrast, after examining 20 studies that met criteria for inclusion in the meta-analysis, Cheung and Slavin (2013) found that computer-based interventions for struggling readers could have positive effects. Researchers suggested that integrated programs showed larger effect sizes, especially when administered in small groups. However, it is essential to note that once again, the research is elementary-focused. To test the use of a computer-assisted program in a small group, Madden and Slavin (2017) conducted two studies using a computer-assisted program as an intervention for elementary struggling readers. The results of both studies showed a large effect size for groups using the computer-assisted program as a small group intervention with a tutor. Authors suggested that the use of technology allowed the tutor to work with small groups, therefore reaching more students (Madden & Slavin, 2017). In another study, Messer and Nash (2018) examined the effects of a computer-based intervention on struggling readers. The researchers found that the elementary-aged students involved in the small-group intervention showed significant gains in phonological awareness and decoding. The results of the studies by Madden and Slavin and Messer and Nash confirmed the suggestion of Cheung and Slavin that computer-based reading interventions could have positive effects on reading. Interestingly, the researchers noted that the length of intervention time (longer versus shorter) did not change results significantly (Messer & Nash, 2018).

Since previous research (Bippert & Harmon, 2017; Hollingsworth, 2014) showed some positive results of computer-based intervention for middle and high-school struggling readers, the experimentation with this age group has grown more prevalent. For example, Fogarty et al. (2017) conducted an experimental study to determine the effects of a computer-based

intervention on middle school struggling readers. By including multiple components of comprehension strategies, vocabulary, and oral reading fluency, the program allowed researchers to examine the effects of the treatment on various elements of reading, which aligns with studies of non-technology-based reading interventions (Clemens et al., 2017; Fisher & Frey, 2014; Kim et al., 2017; Scammacca et al., 2015; Scammacca & Stillman, 2018). Results demonstrated that students receiving the intervention made significant gains on standardized measures of comprehension, vocabulary, and silent reading if they were in the below-average and well-below average range before intervention (Fogarty et al., 2017). These results suggest the need for targeted and individual interventions to show significant gains, as supported by prior research (Clemens et al., 2017; Fisher & Frey, 2014; Kim et al., 2017; Scammacca et al., 2015). To further investigate the effects of the technology-based intervention from Fogarty et al. (2017), Clemens et al. (2019) analyzed the data further to investigate the moderator effects on the gains of students based on the pretest. Results from the further analysis showed that the students with low pretest scores on the oral reading fluency measure demonstrated the most gains in reading comprehension. Results also showed that those students with low word-identification scores and vocabulary scores on the pretest did not exhibit as much growth (Clemens et al., 2019). Thus, the specific tie between fluency and reading comprehension confirmed for middle school struggling readers may be crucial for interventions, as suggested in prior research (Fisher & Frey, 2014; Kim et al., 2017; Lee & Yoon, 2017; Morra & Tracey, 2006; Paige, 2006; Powell & Gadke, 2018; Rasinski et al., 2011).

Classworks™. Classworks™ units provide students with meaningful activities using research-based methods and strategies that set the foundation and framework for tying Classworks™ together (Curriculum Advantage, 2009; Young, 2014). Fashioned after a

Madeline Hunter lesson, Classworks™ units include the following: mini-lessons, practice activities, review activities, and assessment (formal and informal). Curriculum Advantage (2009) consulted the standards from the National Council of Teachers of English, International Reading Association, and the National Assessment of Educational Progress when developing the scope and sequence and creating the units used in building the scope and sequence and organizing Classworks™ instruction (p. 22). Also, The National Reading Panel's Report was used for validation and aligning the instructional materials for Classworks™ (Curriculum Advantage, 2009).

The Classworks™ program is an integrated learning system that is web-based and designed for use in K–12 classrooms for individualized instruction in the areas of math, reading, and language. The partnership between Classworks™ and the NWEA allows for the importation of the MAP Growth data for each student into the Classworks™ system, and the system generates an ILP for each student. The ILP links the learning statements directly from the imported MAP Growth data to units within the Classworks™ program and assigns them to students (Curriculum Advantage, 2009; Young, 2014).

Slavin et al. (2009) included Classworks™ in a review of computer-assisted instructional programs. The two studies examined were conducted in elementary schools. One study included a small population of only 30 students but did show an increase from the pretest to the posttest. Within that study, teachers were interviewed and expressed positive feelings towards the program itself. One teacher expressed a desire for more time to use Classworks™ with students (Slavin et al., 2009). Further study of Classworks™ is necessary to determine if the integrated learning system can produce desired improvements in reading for struggling readers.

Summary

After completing this literature review, it is clear that there is a need for further research. To better serve struggling adolescent readers, research is necessary to provide a foundation for use in the classrooms. Much of the available research reported on studies of elementary-level students. The research needs to be expanded to include more direct studies of these age groups to promote the academic achievement of struggling readers at the middle and high school levels.

With many middle schools following the lead of their elementary counterparts, implementation of RTI programs is becoming common. With the three-tiered system of intervention, students are monitored for progress if they are struggling after classroom interventions (Tier I), small group interventions (Tier II), or one-on-one interventions (Tier III). Because there is a lack of studies focused on the evaluation of the effectiveness of many of the commercially-designed, computer-based programs, teachers, schools, and school districts face decisions based on the research touted by the companies that design the platforms, much of which is action research or company-sponsored research lacking generalizability on a large scale.

After reviewing the research concerning effective interventions, one can determine that interventions for middle school struggling readers vary depending on the needs of the individual student. Some students may thrive with some short-term interventions within the classroom (Tier I), while others may need a regular small group pull-out approach for more structured and systematic intervention (Tier II). Finally, some students may need more intensive one-on-one interventions delivered in a small setting, or they may qualify as having a specific learning disability or other reading disability, requiring more specialized services and accommodations (Tier III). The research suggests that it is essential for teachers to become adept at a variety of

instructional techniques and delivery methods to reach as many of the struggling readers in the classroom as possible.

From the research concerning reading intervention strategies, it is clear that the research on effective strategies for adolescents is incomplete. Because so much valuable time was spent concentrating on preventing the reading problems in adolescence by developing and testing effective interventions for younger children, there is an insufficient base of research to assist educators in battling the growing difficulties in reading for struggling adolescent students. As literacy remains on the forefront of education reform, the goal of having a literate citizenship capable of making informed decisions and preparing for the careers of the future remains on the mind of all educators and government officials.

After reviewing the research concerning effective instructional strategies, one can determine that effective instructional strategies for struggling readers are as individualized as the number of interventions available. Research shows the need for teachers to become adept at a variety of instructional techniques and delivery methods to reach as many of the struggling readers in the classroom as possible. Instructional interventions that incorporate a variety of strategies and a combination of approaches to target areas of vocabulary, comprehension, and other building blocks of reading in young children have resulted in growth and shown the most promise (Hay, Elias, Fielding-Barnsley, Homel, & Freiberg, 2007). Research studying the effectiveness of Classworks^{TM} as a computer-assisted ILS may assist teachers in choosing the correct interventions for students at the middle school level.

Chapter Three discusses the methodology for the proposed study. The specifics of the design of the study are expounded, including details about the overall design and control for threats to validity. Also, the research questions, hypotheses, participants, and settings are

defined. The next chapter also explores information about the MAP Growth assessment, the instrument used for this study. Finally, the researcher explains the procedures, the timeline, and data analysis.

CHAPTER THREE: METHODOLOGY

Overview

The purpose of this study was to examine the effects of using Classworks™ as a Tier II reading intervention for middle school struggling readers. This chapter begins by describing the research design and then presents the research questions and null hypotheses. Following that is a discussion of the study variables, participants, setting, and instrumentation. The chapter concludes by describing the procedures used by the researcher and the methods used to analyze the data.

Design

The study conducted was a causal-comparative study using nonequivalent groups. The researcher selected the groups for the study based on student scores on the 2017 spring MAP Growth test in reading and the South Carolina College and Career Ready Assessment (SC Ready) in English Language Arts, which is the South Carolina state standardized test given in April–May 2017. Spring 2017 SC Ready English language arts and the MAP Growth Reading Test data from each of the four schools were used to select two groups to include in the study. In addition to the test scores, students in Grades 6–8 chosen for the treatment group were placed into the intervention classes at one of the two schools using the Classworks™ program during a scheduled period each day for the first semester (August 2017–January 2018). The researcher selected the comparison group from students at schools that did not have a planned intervention class using the Classworks™ program. Specific information about the participants will be discussed in the participants and setting section of this chapter. Since the study involved collecting archival data from each school, the threats to external validity, such as the Hawthorne Effect and contamination, were not a threat. This two-group design using archival data also

controlled many threats to internal validity such as history, maturation, experimental mortality, testing, and instrumentation (Gall, Gall, & Borg, 2006; Warner, 2013).

Research Questions

For this study, the candidate investigated the following questions:

RQ1: Does the Classworks™ Tier II intervention program improve overall reading skills for middle school struggling readers as measured by the MAP Growth Reading Test?

RQ2: Is there a difference in MAP Growth Reading Test RIT scores in overall reading between students in the Classworks™ Tier II intervention treatment group and students in the comparison group?

RQ3: Is there a difference in MAP Growth Reading Test RIT scores for the areas of literary text: meaning and content; informational text: meaning and content; and vocabulary between students in the Classworks™ Tier II intervention treatment group and students in the comparison group?

Null Hypotheses

For this study, the following null hypotheses were tested:

$H_0$1: There will be no statistically significant difference in overall reading RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II intervention and those who did not.

$H_0$2: There will be no statistically significant difference in literary text: meaning and context RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II intervention and those who did not.

$H_0$3: There will be no statistically significant difference in informational text: meaning and context RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II intervention and those who did not.

$H_0$4: There will be no statistically significant difference in vocabulary RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II intervention and those who did not.

Participants and Setting

For this study, the total sample (N = 120) consisted of struggling readers as identified by scoring Does Not Meet or Approaches Expectations on the SC Ready Assessment composite score for English language arts (ELA). According to the South Carolina Department of Education (2017), the score ranges for the respective grade levels (6–8) for the performance level of Does Not Meet Expectations were: sixth (100–454); seventh (100–511); and eighth (100–537). For the performance level of Approaches Expectations, the respective score ranges were sixth (455–575), seventh (512–614), and eighth (538–642). The ELA composite score was a combined score from a writing session and a reading session on the state standardized assessment, SC Ready (South Carolina Department of Education, 2017). Additionally, struggling readers were identified by scoring in the 30th percentile or below on the previous spring's reading MAP Growth test, according to the national normative data by NWEA. Warner (2013) explained that the sample size required per cell for a small effect size with a statistical power of .70 at the .05 α level and with four outcome variables is 92–120 when there are three cells or groups. Therefore, the number of participants in each group in this study would be adequate for a small effect size with a power of .70 at the .05 α level. According to Warner (2013), "Because the size of Wilk's Λ is potentially influenced by such a complex set of factors,

it is difficult to assess the sample size requirements for adequate statistical power" (p. 750). Once the study commenced, the researcher estimated specific power and effect size.

Participants in the treatment groups (n = 60) attended two middle schools in South Carolina during the 2017–2018 school year that used the Classworks™ program as a Tier II intervention for struggling readers. Students (n = 60) who attended two other middle schools in the district but who were not selected for the Classworks™ program were randomly assigned to the comparison group. In each of the two schools, small groups of 10–15 students per grade level received the Classworks™ Tier II intervention, which constituted the treatment group. The treatment group represented a convenience sample since the individuals selected to receive the Classworks™ Tier II intervention were selected by each school before this study. For the treatment group, the researcher chose 60 students meeting the criteria described above in terms of MAP Growth percentile scores and SC Ready performance levels from the convenience sample of the two schools using the treatment program. The researcher randomly assigned students who met the same criteria described above to the control group from the available data population. The groups were equal in number for grade level between groups. The ethnicity represented in the treatment group consisted of 15 Black, 36 White, one multiracial, one Asian, and seven Hispanic students, and ethnicity represented in the comparison group consisted of 22 Black, 32 White, two multiracial, and four Hispanic students. Students included in the study had a mean age of 12.65 for the treatment group and a mean age of 12.8 for the comparison group. The treatment group contained 34 males and 26 females, and 41 males and 19 females were in the comparison group. Of the schools selected for the study, one school was located in a rural area, and three were in suburban areas.

Instrumentation

MAP Growth testing is designed as a formative assessment to guide instruction, assess growth, and evaluate programs and interventions (NWEA, 2013a). In the selected district, students take MAP Growth tests three times per year. The MAP Growth test is a nationally normed, computer-adaptive test created by the Northwest Evaluation Association (See Appendix for Instrument Sample). Designed to assist in providing immediate feedback to students and teachers, the MAP Growth test allows teachers to identify student progress on state standards and to target areas of weakness for intervention (January & Ardoin, 2015). Because schools administer the assessment three times per year, teachers and administrators do not have to wait until the end of the school year test or for summer results to determine the growth of the individual students. The MAP Growth test has been used in numerous studies to assess growth (Edwards, Mauch, & Winkelman, 2011; Militello, Schweid, & Sireci, 2010; Pomplun, 2009; Young, 2014).

The reading MAP Growth test gives an overall reading score, and sub scores for the following: literary text: meaning and context; literary text: language, craft, structure; informational text: meaning and context; informational text: language, craft, structure; and vocabulary (NWEA, 2016). The vocabulary section tests the students' understanding of print concepts, word recognition, context clues, reference (such as word parts), and word relationships. The literature section tests students understanding of key ideas, details, craft, and structure of literary text. The informational text section assesses students' understanding of those same concepts, but with nonfiction texts (NWEA, 2013b). NWEA reported reliability test-retest from fall to spring as follows: Grade 6 (.91), Grade 7 (.90), and Grade 8 (.89), respectively (NWEA, 2004). NWEA (2004) reported the concurrent validity using Pearson's coefficient as

follows: Grade 6 (.77), Grade 7 (.78), and Grade 8 (.81). Each reading test has 40 questions with 10 questions per section (overall reading, literature, informational text, and vocabulary), and are untimed. Tests are administered and scored digitally. Within 24 hours, teachers, administrators, and district officials can access a complete breakdown of each student's score by sub-section, receiving a separate RIT score and range for each sub-section. The RIT score is an equal-interval scale score. The lowest score range is 140, which is equivalent to below K, and the highest score range is 300, which is above 12th grade. The score can then be converted to a grade level equivalent using the data from the national norming study (NWEA, 2013a). According to the 2015 normative data, the mean RITs for the beginning of the year for overall reading is as follows: Grade 6 (211), Grade 7 (214.4), and Grade 8 (217.2). For the end of the year, the mean RIT increases to the following: Grade 6 (215.8), Grade 7 (218.2), and Grade 8 (220.1; NWEA, 2015).

Procedures and Timeline

In order to gain permission to conduct this study, the researcher presented the proposed research to the Liberty University Institutional Review Board (IRB). The researcher contacted the target district and received permission to conduct the study and to review the MAP Growth, SC Ready, Demographics, and Classworks™ data of the students within the community in the middle schools from 2017–2018. The district required a copy of the proposal and a signed agreement from the chair to protect the integrity of the data of the students. Part of the district's granting permission to conduct research was an agreement to share the findings and results with the district after the study. Because the data was archival and controlled at the district level, the researcher sent a courtesy email to school principals to explain the research and the use of the

data from the students in the intervention classes and the struggling students not enrolled in intervention classes in 2017–2018.

Once the IRB granted approval, the researcher accessed archival MAP Growth and SC Ready data from the district for each middle school. The candidate requested access to demographic data to use for reporting and analysis. The candidate reported MAP Growth data using fictional ID numbers of students. The researcher used false student names and identification numbers during the study to protect the privacy of the students. Also, the candidate sorted the MAP Growth data by those students selected for the Classworks™ Tier II intervention and those students not selected for intervention at each school. Using the data, the researcher assigned students randomly to the comparison group from each school.

After dividing the data into a Classworks™ Tier II intervention group and a comparison group, the candidate entered all of the data by groups into the SPSS software. Group 1 was the Classworks™ intervention group, and Group 2 was the comparison group. Within each group, the data was sorted by school to distinguish further any patterns that may arise during data analysis. The candidate entered the data using a fictional ID number for each participant. Demographic information for each participant was entered into SPSS (gender, age, race, grade level, and whether the student has an Individualized Education Plan [IEP]). Then, the candidate entered the MAP Growth scores for each participant. The MAP Growth scores were reported in separate SPSS data cells as follows: Overall Reading RIT score; literary text: meaning and content RIT score; informational text: meaning and content RIT score; and vocabulary RIT score. By using the NWEA 2017–2018 Fall to Winter MAP Growth Data provided by the district, the researcher used the RIT scores for each student for each dependent variable. The RIT scores for each separate sub-section of MAP Growth were used in the analysis to determine

whether the Classworks™ Tier II intervention affects overall reading or only particular subskills. Once the researcher entered data into SPSS Version 26, it was saved as two separate data sets and then as one overall data set.

Subsequent data analysis occurred, and the researcher attempted to reject the null hypotheses at $p < .01$. The data were analyzed to report the mean age for each group (1 and 2). The researcher indicated how many males and females, the number of students of each race, the number of students at each grade level, and the number of students with an IEP for each group. After reporting the demographics, the candidate conducted data screening. A multivariate analysis of variance (MANOVA) was used to test the hypotheses. Assumption tests detailed in the next section were run as well. If a significant result was found during the MANOVA, the researcher conducted post hoc testing (Green & Salkind, 2011; Warner, 2013). The researcher analyzed the data to determine if it supported the rejection of any or all of the nulls.

Data Analysis

A one-way MANOVA was used to test each of the hypotheses. This analysis was chosen because there was one independent variable (Classworks™ Tier II intervention) and four dependent variables: overall reading, literary text, informational text, and vocabulary (Warner, 2013). Since there are four dependent variables, Bonferroni was calculated as $\alpha = .05/4 = .01$ (Warner, 2013), therefore increasing the confidence level to 99% (Green & Salkind, 2011; Warner, 2013). For the MANOVA, the assumptions of normality, homogeneity of variance-covariance, and random selection with the independent scores on variables independent of other participant scores were tested as required (Warner, 2013).

Data screening was conducted by checking for normality and examining descriptive statistics for extreme scores and outliers using a box-and-whisker plot. Students with incomplete

scores were excluded. The assumption of normality was tested visually using histograms and statistically using the Kolmogorov-Smirnov test of normality for the treatment group (n = 60) and the non-treatment group (n = 60) in overall reading, literary text, informational text, and vocabulary (Warner, 2013). A test of the assumption of variance-covariance matrices was conducted using Box's M statistic.

Finally, although there was no random selection, scores for any participant were independent of all other participants, meaning that a MANOVA could be conducted (Green & Salkind, 2011). This independence was ensured by the fact that the MAP growth test scores for each variable for all participants were independent of the scores for all other participants. A multivariate effect size was calculated and reported using Wilk's Λ. Using Bonferroni, significance levels for statistical tests were set at $\alpha = .01$. Subsequent ANOVAs were conducted to determine whether there was a statistically significant difference between groups on each dependent variable. If the ANOVA produced significant differences between groups for any of the dependent variables, post hoc analyses were conducted using pairwise comparisons to determine which means are different, which also indicated which effect was the strongest (Green & Salkind, 2011; Warner, 2013).

Summary

The design, participants, setting, procedures, timeline, and instrumentation were described in detail in this chapter. This causal-comparative study of archival data of students in four middle schools within one school district was collected and analyzed using a MANOVA with subsequent ANOVA to test the hypotheses, with post hoc analysis if significance was found. Also, descriptive statistical analysis was conducted. In the next chapter, results from the descriptive statistics, assumption tests, and other statistical analyses will be reported.

CHAPTER FOUR: FINDINGS

Overview

In this chapter, the candidate shares the findings from the statistical analysis of the archival data. The chapter begins with a restatement of the research questions and the null hypotheses. The descriptive statistics are reported for both the treatment and comparison groups. Data screening using box-and-whisker plots are included to determine if any extreme outliers exist within the groups for all dependent variables, which could affect the outcome of the statistical analysis. The findings from the MANOVA and subsequent ANOVA are presented, along with the results of the assumption tests.

Research Questions

For this study, the candidate investigated the following questions:

RQ1: Does the Classworks™ Tier II intervention program improve overall reading skills for middle school struggling readers as measured by the MAP Growth Reading Test?

RQ2: Is there a difference in MAP Growth Reading Test RIT scores in overall reading between students in the Classworks™ Tier II intervention treatment group and students in the comparison group?

RQ3: Is there a difference in MAP Growth Reading Test RIT scores for the areas of literary text: meaning and content; informational text: meaning and content; and vocabulary between students in the Classworks™ Tier II intervention treatment group and students in the comparison group?

Null Hypotheses

For this study, the following null hypotheses were tested:

$H_0$1: There will be no statistically significant difference in overall reading RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II intervention and those who did not.

$H_0$2: There will be no statistically significant difference in literary text: meaning and context RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II intervention and those who did not.

$H_0$3: There will be no statistically significant difference in informational text: meaning and context RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II intervention and those who did not.

$H_0$4: There will be no statistically significant difference in vocabulary RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II intervention and those who did not.

Descriptive Statistics

For this study, with a sample size (N = 120), the researcher created two groups: treatment (n = 60) and comparison (n = 60). From the available population of data available, the researcher randomly assigned 20 participants from each grade (6, 7, or 8) to the treatment group if they received the Classworks™ intervention or the comparison group if they met the criteria but did not receive the Classworks™ intervention. The sample size (N = 120) in this study was adequate to detect a medium effect (Warner, 2013). When using a MANOVA with four dependent variables, the number of participants required was 48–62 per group to observe a medium effect (Warner, 2013). The estimated statistical power of this study was .70. The alpha level of .05 determined statistical significance (Warner, 2013). The ethnicity represented in the treatment group consisted of 25% Black, 60% White, 2% multiracial, 2% Asian, and 11%

Hispanic students; ethnicity represented in the comparison group consisted of 37% Black, 53% White, 3% multiracial, and 7% Hispanic students. Students included in the study had a mean age of 12.65 for the treatment group and 12.8 for the comparison group. Thirty-four males and 26 females were in the treatment group, and 41 males and 19 females were in the comparison group. In the treatment group, two participants had an IEP, and one student had a Section 504 plan; whereas, in the comparison group, 20 participants had an IEP.

Further descriptive statistics were analyzed using the SPSS Version 26 software. An analysis of the measures of central tendency (mean, median, mode, and standard deviation) was conducted for each dependent variable (see Table 1).

Table 1

Measures of Central Tendency and Sample Size for Each Dependent Variable

	Overall RIT	Literary Text	Informational Text	Vocabulary
N	120	120	120	120
Mean	205.84	204.93	203.79	206.72
Median	207.00	206.00	204.00	207.50
Mode	210	206	201	213
Std. Deviation	9.341	10.898	11.245	11.053

Data Screening

The researcher used a box-and-whisker plot (see Figure 1) to show the distribution of each of the four dependent variables: overall reading RIT; literary text: meaning and context RIT; informational text: meaning and context RIT; and vocabulary RIT over the treatment group and the comparison group. From the box-and-whisker plot for each dependent variable by group, no significant irregularities in the data were found.

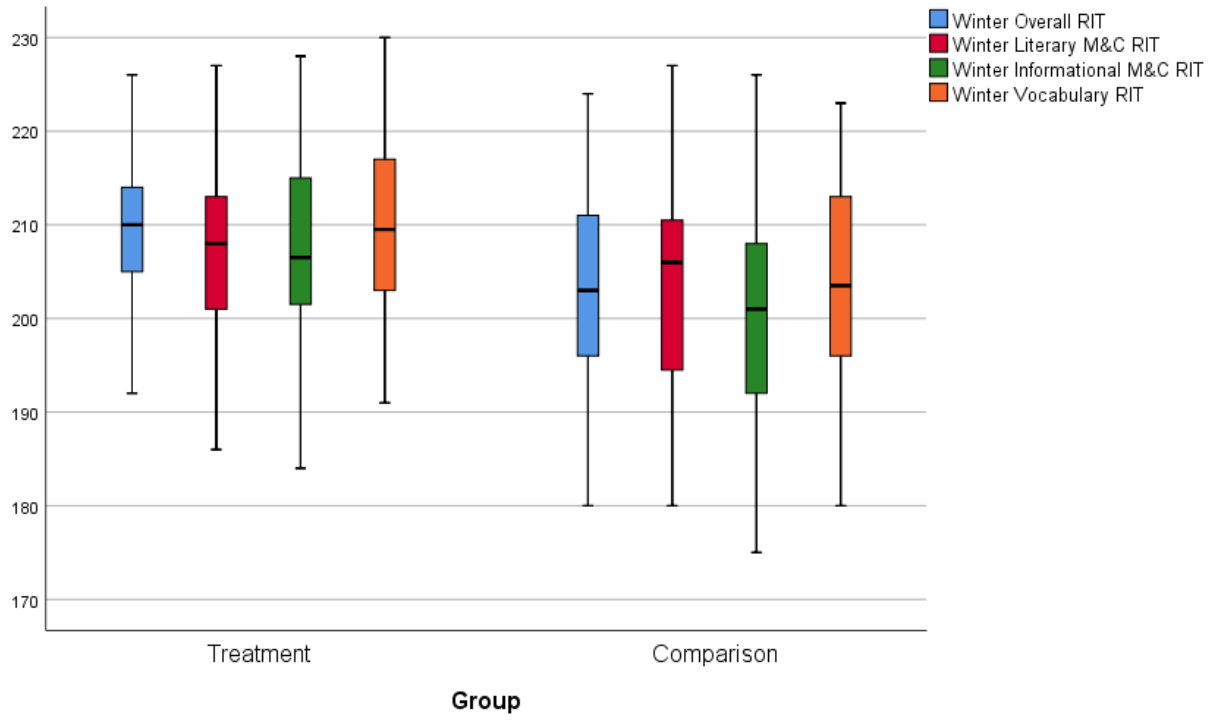

Figure 1. Distributions of the dependent variables over the two groups.

Assumption Tests

For the one-way MANOVA, necessary assumptions must be met prior to conducting the test. To begin, the assumption of normality across the dependent variables was tested and found to be normally distributed according to histograms for each dependent variable for the treatment and comparison group. The examination of the histograms showed that the data met the assumption of normality for all dependent variables (overall reading RIT; literary text: meaning and context; informational text: meaning and context; and vocabulary) for each group (see Figures 2–9).

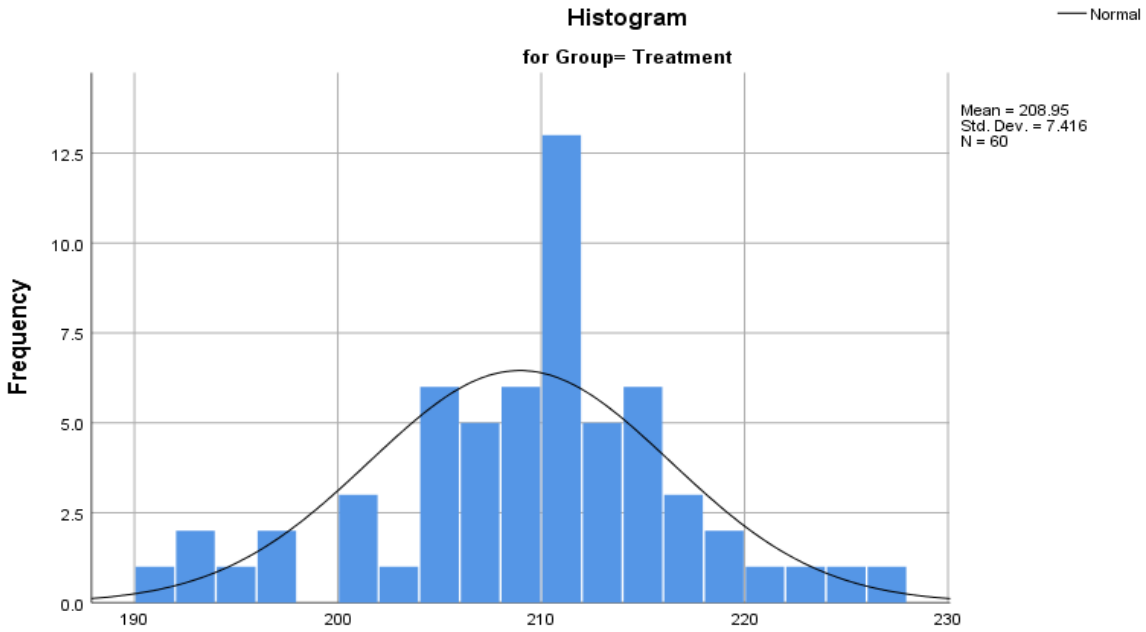

Figure 2. Winter overall RIT histogram for the treatment group.

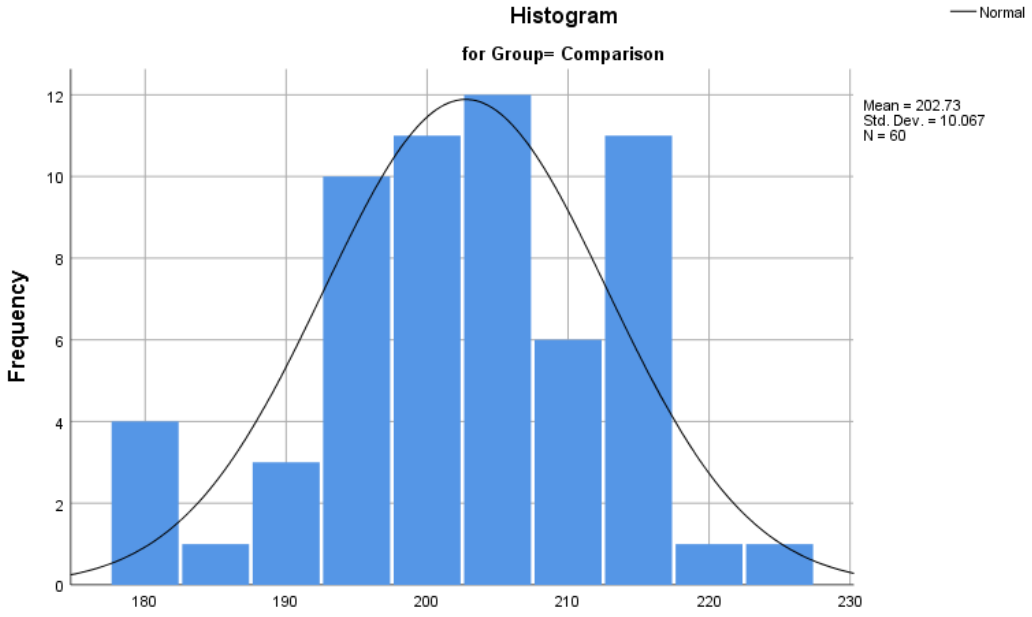

Figure 3. Winter overall RIT histogram for comparison group.

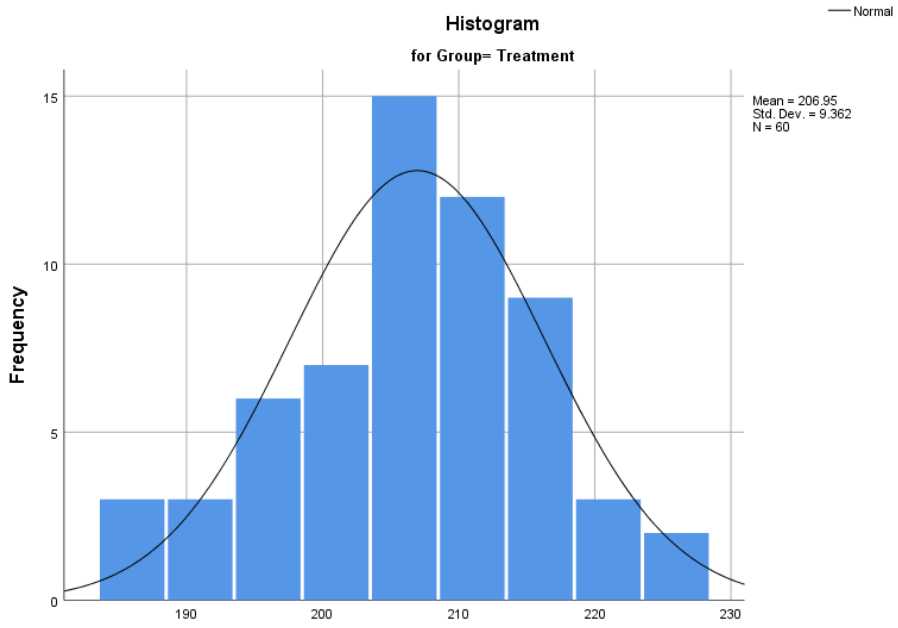

Figure 4. Winter literary text: meaning and context histogram for treatment group.

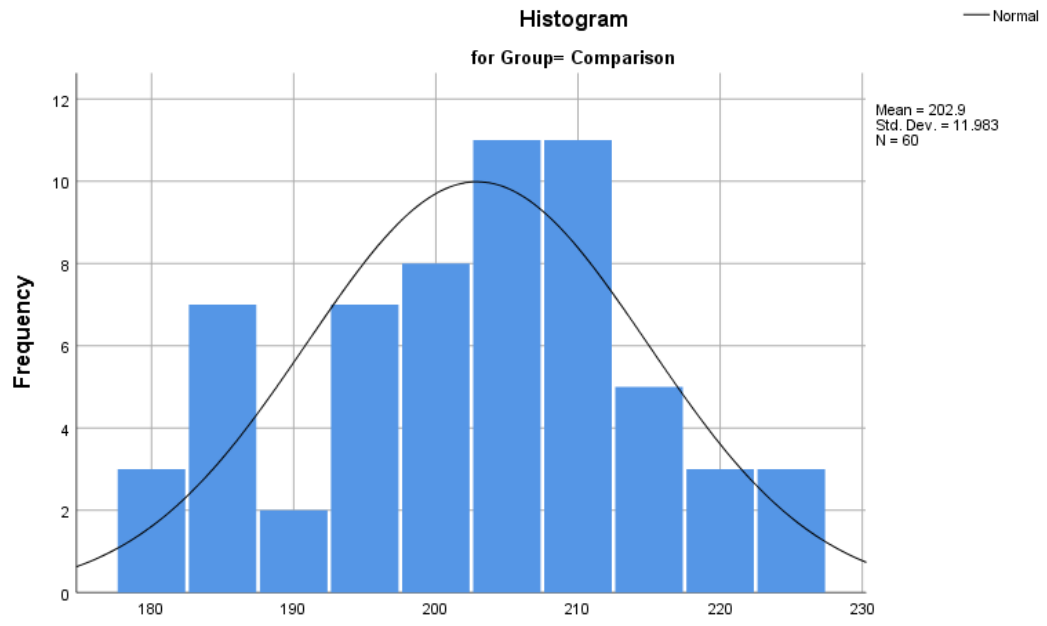

Figure 5. Winter literary text: meaning and context histogram for comparison group.

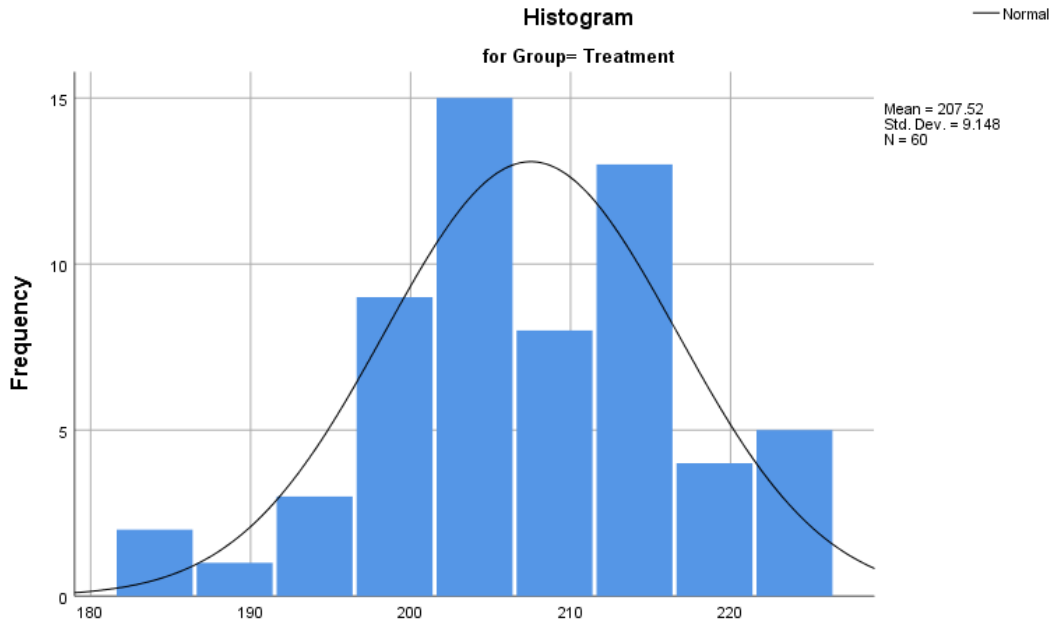

Figure 6. Winter informational text: meaning and context histogram for treatment group.

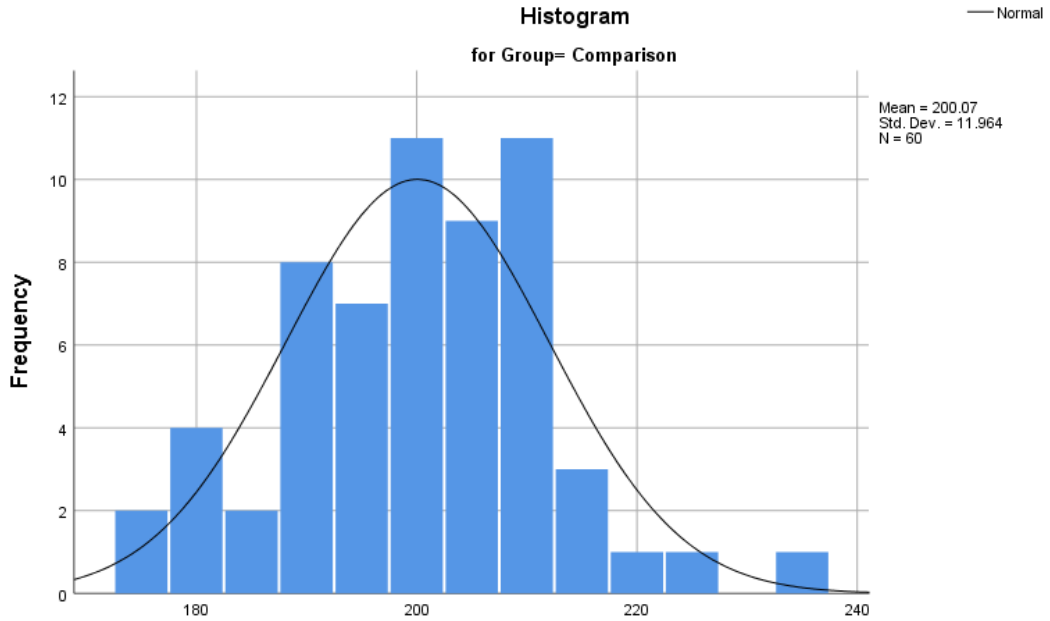

Figure 7. Winter informational text: meaning and context histogram for comparison group.

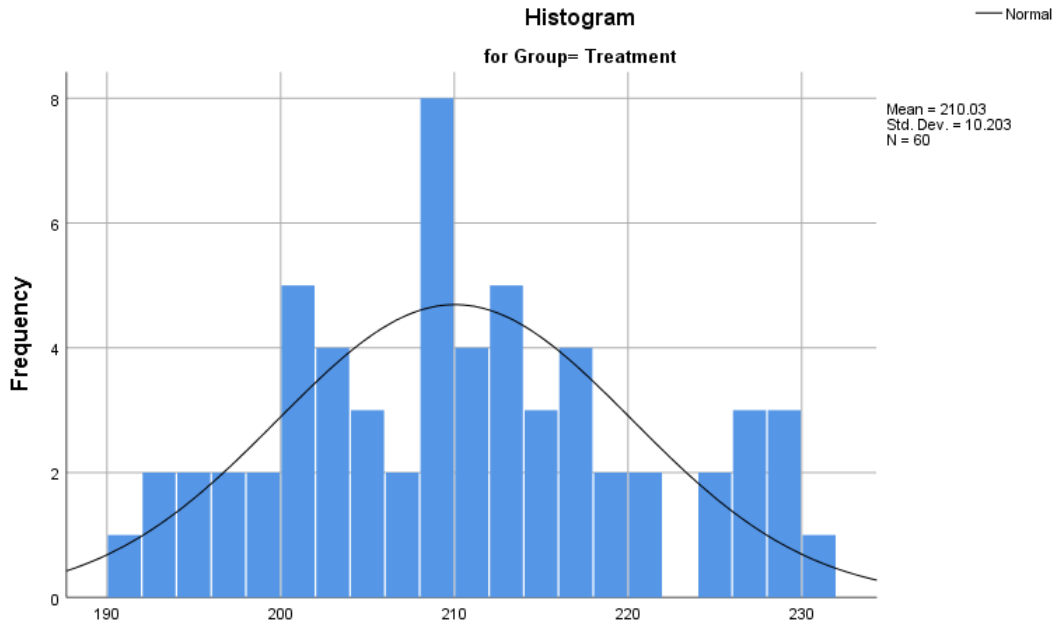

Figure 8. Winter vocabulary histogram for treatment group.

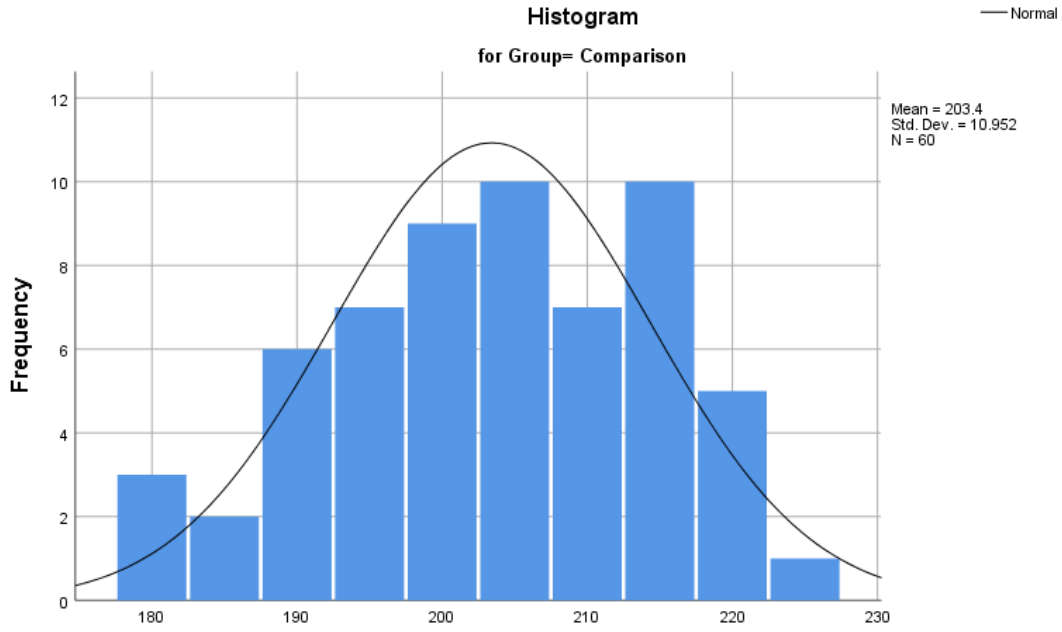

Figure 9. Winter vocabulary histogram for comparison group.

In addition to the histograms, normality was tested by conducting a Kolmogorov–Smirnov test, as recommended for sample sizes larger than 50 (Warner, 2013). The

Kolmogorov-Smirnov test results are shown in Table 2. Since $p > .05$ for all dependent variables in the treatment group and in the comparison group, the results indicated no statistical significance for any variable in either group. Consequently, the data represented a normal distribution.

Table 2

*Tests of Normality Using Kolmogorov-Smirnov***

	Group	Statistic	*df*	Sig.
Overall Reading RIT	Treatment	.106	60	.089
	Comparison	.085	60	.200*
Literary Text: Meaning and	Treatment	.084	60	.200*
Context	Comparison	.119	60	.035
Informational Text:	Treatment	.111	60	.065
Meaning and Context	Comparison	.081	60	.200*
Vocabulary	Treatment	.068	60	.200*
	Comparison	.093	60	.200*

*This is a lower bound of the true significance.

**Lilliefors Significance Correction

To test the assumption of homogeneity of variances and covariances, the researcher examined the results of Box's M Test of Equality of Covariance Matrices. The result was significant, $F(10, 66568.924) = 1.957$, $p = .034$. Thus, the researcher concluded that there are differences in the matrices.

Finally, the third assumption required for the one-way MANOVA is independence of observations. The assumption of independence was met because no participant was repeated within a group, and no participant was included in more than one group. Therefore, a

participant's scores on the MAP Growth Reading test were not related to any other participant's scores.

Results

The researcher conducted an analysis using a one-way MANOVA to determine whether the Classworks™ intervention program had effects on four dependent variables (overall reading RIT; literary text: meaning and context; informational text: meaning and context; and vocabulary). Significant differences were found between the treatment and comparison groups on the dependent variables, Wilk's $\lambda = F(4, 115) = 4.496$, $p < .01$, $\eta^2 = .135$. A subsequent analysis of variances (ANOVA) was conducted to determine where the differences lay. Using the Bonferroni method, each ANOVA was tested at the .01 level after calculating the $\alpha = .05/4$, which led to the acceptance of each hypothesis being tested using $p < .01$ to determine whether to reject each null hypothesis.

Hypotheses

The null hypotheses were tested using an ANOVA as part of the follow-up to the MANOVA (see Table 3). The first null hypothesis stated that there would be no difference in overall reading RIT scores between students who participated in the Classworks™ Tier II intervention and those who did not. The ANOVA on the overall reading RIT scores, $F(1, 118) = 14.83$, $p < .01$, $\eta^2 = .112$ was significant. This significant result caused the researcher to reject the null hypothesis, meaning that there is a statistically significant difference in the overall reading RIT scores between groups.

The second null hypothesis predicted that there would be no difference in literary text: meaning and context RIT scores between the treatment and comparison groups. The ANOVA on the RIT scores for literary text: meaning and context was not significant, $F(1, 118) = 4.26$, $p =$

.041, η2 = .035. This result caused the researcher to accept the null hypothesis because there was not a statistically significant difference of the dependent variable between students who received the Classworks™ intervention and those who did not.

Table 3

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	*df*	Mean Square	*F*	Sig.[e]	Partial eta Squared
Corrected Model	Overall RIT	1159.408[d]	1	1159.408	14.831	.000	.112
	Literary M & C	492.075[a]	1	492.075	4.256	.041	.035
	Inform. M & C	1665.075[b]	1	166.075	14.682	.000	.111
	Vocabulary	132.033[c]	1	132.033	1.784	.001	.091
Intercept	Overall RIT	5084495.008	1	5084495.008	65040.381	.000	.998
	Literary M & C	5039310.675	1	5039310.675	43588.020	.000	.997
	Inform. M & C	4983725.208	1	4983725.208	43943.213	.000	.997
	Vocabulary	5127813.633	1	5127813.633	45775.968	.000	.997
Group	Overall RIT	1159.408	1	1159.408	14.831	.000	.112
	Literary M & C	492.075	1	492.075	4.256	.041	.035
	Inform. M & C	1665.075	1	1665.075	14.682	.000	.111
	Vocabulary	1320.033	1	1320.033	11.784	.001	.091
Error	Overall RIT	9224.583	118	78.174			
	Literary M & C	13642.250	118	115.408			
	Inform. M & C	13382.717	118	113.413			
	Vocabulary	13218.333	118	112.020			
Total	Overall RIT	5094879.000	120				
	Literary M & C	5053445.000	120				
	Inform. M & C	4998773.000	120				
	Vocabulary	5142352.000	120				

[a]R Squared = .035 (Adjusted R Squared = .027)
[b]R Squared = .111 (Adjusted R Squared = .103)
[c]R Squared = .091 (Adjusted R Squared = .083)
[d]R Squared = .112 (Adjusted R Squared = .104)
[e]Computed using alpha = .01

$H_0$3 was rejected because the results of the ANOVA, $F(1, 118) = 14.682$, $p < .01$, $\eta 2 = .111$ were significant. The significant result caused the researcher to reject the null hypothesis, meaning that there was a statistically significant difference in the informational text: meaning and context RIT scores between groups.

Finally, the fourth null hypothesis asserted that there would be no difference in vocabulary RIT scores between students who participated in the Classworks™ Tier II intervention and those who did not. The ANOVA result for $H_0$4 was $F(1, 118) = 11.784$, $p < .01$, $\eta 2 = .091$, which was significant. This significant result caused the researcher to reject the null hypothesis, meaning that there was a statistically significant difference in the vocabulary RIT scores between groups.

Summary

In this chapter, the researcher reported the data screening, descriptive statistics, assumption tests, and results from the statistical analysis. A MANOVA with subsequent ANOVAs was used to reject the null hypotheses concerning the effects of the Classworks™ intervention program on the dependent variables of overall reading; informational text: meaning and context; and vocabulary. The researcher accepted the second null hypothesis concerning literary text: meaning and context after finding the effects of the intervention program to be not significant. In the next chapter, the findings will be discussed, along with implications, limitations, and suggestions for future research.

CHAPTER FIVE: CONCLUSIONS

Overview

Based on the information-processing theory, the mind receives information, processes the information through the working memory, and stores it with connections where it can be retrieved as needed (Gentile, 2018). Classworks™ assigns learning tasks based on a screener, such as MAP Growth designed by NWEA, to individual students in an ILP in an attempt to close the gaps and improve overall reading in struggling readers (IESD, 2014; NWEA, 2013b). The findings suggest that the Classworks™ intervention program had effects on the middle school struggling readers in the study in the areas of overall reading, informational text, and vocabulary, but not in the area of literary text. In this chapter, the researcher discusses the findings in light of previous research and the theoretical frameworks used as the basis for this study. The chapter concludes with a discussion of the findings, implications, limitations, and recommendations for further research.

Discussion

The purpose of the causal-comparative study was to determine whether implementing the Classworks™ Tier II small-group reading intervention generated improvements in reading for middle school struggling readers. For the study, the researcher focused on whether or not differences in MAP Growth Reading RIT scores could be seen between the intervention and comparison groups for overall reading; literary text: meaning and context; informational text: meaning and context; and vocabulary. The researcher studied archival data from students in four schools within one district in South Carolina. A sample population (N = 120) was divided into two groups: treatment (n = 60) and comparison (n = 60). Both groups included 20 students each

from Grades 6, 7, and 8. The researcher compared MAP Growth Reading RIT scores from the Winter 2018 administration.

Four null hypotheses were proposed in the study. The nulls separately stated that there would be no statistically significant difference in overall reading; literary text: meaning and context; informational text: meaning and context; or vocabulary RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II intervention and those who did not. Of the four separate null hypotheses, only one was accepted, which focused on the dependent variable of literary text: meaning and context. The nulls concerning overall reading; informational text: meaning and context; and vocabulary were rejected. The results suggested that using the Classworks™ small-group, Tier II reading intervention resulted in higher mean RIT scores for overall reading; informational text: meaning and context; and vocabulary on the MAP Growth Reading assessment in the Winter 2018 after receiving the intervention for 12 weeks.

Null Hypothesis One

Hypothesis one stated, "There will be no statistically significant difference in overall reading RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II Intervention and those who did not." Through statistical analysis using a MANOVA and subsequent ANOVA, a significant difference was found between the mean of the treatment group and the mean of the comparison group. Thus, the null hypothesis was rejected with 99% confidence.

This result contradicts the research of Vaughn et al. (2010) and Vaughn and Fletcher (2012) in regards to Tier II reading interventions in small group pullout classes. Those studies found no statistically significant results to indicate the effectiveness of small-group interventions

for middle school struggling readers. However, this study reinforced the findings from Conley (2008) concerning motivating students in a way that is nonthreatening to their identities with the use of the on-screen cheers and opportunities for students to earn badges and trophies through the system.

Null Hypothesis Two

The second null hypothesis stated that there would be no statistically significant difference in literary text: meaning and context RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II Intervention and those who did not. This null hypothesis was tested using the MANOVA and a subsequent ANOVA. Even though the overall mean for the treatment group was higher than the comparison group, no statistically significant difference was found. The researcher failed to reject this null hypothesis.

Research in the area of comprehension showed that explicit and direct instruction within the regular classroom setting yields positive results for middle school struggling readers (Fien et al., 2018). However, there is not a body of research specifically focused on middle school struggling readers in terms of the effects of intervention on literary versus informational text comprehension gains. The insignificant result may be a basis for a future study on the differences between reading improvements on literary text and informational text.

Null Hypothesis Three

The third null hypothesis stated that there would be no statistically significant difference in informational text: meaning and context RIT scores on the MAP Growth Reading Test between students who participated in the Classworks™ Tier II Intervention and those who did not. This null hypothesis was tested using a MANOVA and subsequent ANOVA. As a result of the analysis, the null hypothesis was rejected at the 99% confidence level. The findings showed

that there was a statistically significant difference between the mean score of those who received the treatment and those who did not.

In the area of informational text, much of the research has shown that by the time students are in middle school, they have shifted towards reading more informational text and shift from reading to learn to learning to read (Vaughn, Roberts, Schnakenberg, et al., 2015; Vaughn, Roberts, Wexler, et al., 2015). Research has suggested that some success has been seen in small group interventions employing strategies to focus on the main idea following a process similar to the Classworks™ unit design of direct instruction, modeling, and guided practice (Curriculum Advantage, 2009; Fien et al., 2018).

Further, the findings support research which found that interventions that target improving reading informational text are needed. Researchers explained that the content area reading required middle school students to make inferences and to understand more complex informational texts (Kim et al., 2017; Ritchey et al., 2012; Swanson et al., 2017; Vaughn, Roberts, Schnakenberg, et al., 2015; Vaughn, Roberts, Wexler, et al., 2015). The findings further support research of Swanson et al. (2017) that found intervention targeting the reading of informational text using a multifaceted intervention incorporating word study, critical reading strategies, and comprehension checks was effective in improving content area reading of middle school students. The Classworks™ intervention incorporates critical reading strategies, word study, and comprehension checks into the units on informational text (Curriculum Advantage, 2009).

Null Hypothesis Four

The final null hypothesis stated that there would be no statistically significant difference in vocabulary RIT scores on the MAP Growth Reading Test between students who participated

in the Classworks™ Tier II intervention and those who did not. This null hypothesis was tested using a MANOVA followed by a subsequent ANOVA. Results showed that there was a difference in the means between the groups in the area of vocabulary, which led the researcher to reject the null hypothesis with 99% confidence.

As middle schools search for effective ways to assist struggling readers, computer-based programs have become more common as tools for personalized learning and intervention (Bippert & Harmon, 2017). However, Bippert and Harmon (2017) have explained that most of the research focused on technology-based interventions was conducted with elementary-level subjects. The results of this study that showed a difference in RIT scores for vocabulary supported the assertions of Fogarty et al. (2017), which concluded that technology-based interventions that target multiple facets of reading (comprehension, vocabulary, fluency) to show improvements were likely to produce gains in reading.

The results of this study implicated the success of the Classworks™ intervention to help students improve in overall reading; informational text: meaning and context; and vocabulary. Research by Clemens et al. (2019), Fisher and Frey (2014), and Kim et al. (2017) asserted the importance of fluency and word-level interventions with comprehension. This idea stems from research finding that students struggling with grade-level material in upper grades previously had missed an important basic skill (Bernhardt & Hebert, 2017; Dennis, 2012; Franzak, 2006; Hall & Burns, 2018). The acceptance of the null focusing on the dependent variable of literary text: meaning and context may be related to a lack of decoding and fluency ability, which affects understanding of more complex literary text from different time periods, cultures, or traditions if there is no prior knowledge for the student to connect with (Driscoll, 2015; McMaster et al., 2015).

The findings of the study supported the information-processing theory in that during the computer-based Classworks™ intervention, the teacher became the facilitator. The intervention program assigned units based on lagging skills that were identified by each of the areas of the MAP Growth Reading Test. Each unit began with a mini-lesson, moved on through several practices, then administered an assessment, and ended with review if the student did not attain mastery on the assessment. As explained by McMaster et al. (2015), the intervention aimed to bridge a gap by helping to give students a lexical representation they could use to connect the new information to and move it into the working memory. In addition, the repeated practices with new strategies or concepts helped the reader to transfer the knowledge to long-term memory (Driscoll, 2015). The focus on the cognitive science aspect of reading using the information-processing theory related to the Classworks™ intervention by providing opportunities for students to go back to correct previous thinking to understand the new content better (Lysaker & Hopper, 2015).

In terms of the behavioral learning theory, the results also supported the theory of learning through operant conditioning (Parkay, et al., 2010; Skinner, 1958). With students being rewarded for time on task and mastery of units within the Classworks™ framework, the significantly higher mean RTI scores indicated that students learned more when conditioned with a positive response to their successes, which immediately resulted in cheers on-screen (Curriculum Advantage, 2009; Parkay et al., 2010). Overall, those students in the treatment group learned that when they mastered a unit or stayed on task, they could earn trophies and badges, which they saw when they tracked their progress in the system (Curriculum Advantage, 2009). The research related to middle school reading interventions suggested that fostering reading strengths and the conditioned responses had a positive effect on struggling readers in the

areas of comprehension, vocabulary, and fluency (Clemens et al., 2019; Fisher & Frey, 2014; Kim et al., 2017).

Implications

This study contributed to the body of research regarding the use of computer-based Tier II reading interventions for middle school struggling readers. Previous studies have investigated computer-based programs similar to the Classworks™ ILS, but there have been no studies conducted to see if the particular program produced statistically significant improvements in reading for this population. Many of the studies involved elementary-level students with different types of Tier II interventions or computer-based programs. While there have been studies conducted to determine effective interventions for improving reading in general, there have not been studies examining the effects of an intervention on the separate areas of overall reading, literary text: meaning and context; informational text: meaning and context; and vocabulary using the MAP Growth Reading Test as the instrument to measure the effects. This study suggested a way to target the middle school struggling reader population specifically with approaches to use to improve reading (overall, literary text, and informational text) and vocabulary. The goal of this study was to determine effects of Classworks™ as a Tier II intervention, whereas possible future research could use these findings to study this and other intervention programs to discover effective interventions that generate gains in reading.

Although this study yielded mixed results with statistically significant results in three of the four areas of reading, students in the treatment group scored better overall on the MAP Growth Reading Test than students who did not have the Tier II supplemental intervention for the 12 weeks between the fall and winter tests. This study's results had several implications. First, the implementation of Tier II, small-group interventions using Classworks™ produced

significantly better scores in the areas of informational text, vocabulary, and overall reading for students receiving the treatment. Since overall reading was impacted by comprehension of different types of text and vocabulary, the use of the program for intervention showed promise for middle school struggling readers.

This study resulted in rejection of three of the four null hypotheses at the $p < .01$ level, indicating that there was a difference in the mean RIT score between the treatment and comparison groups in three of the four areas of reading that were studied. In addition, the treatment group outperformed the comparison group in all areas, including the literary text: meaning and context area. This may mean that a larger sample size for both groups could produce a significant result. In order to be conclusive, an experimental or quasi-experimental study with the researcher more involved in the implementation of the Classworks™ intervention could help to ensure the treatment is used with fidelity and control for other factors.

Limitations

One of the limitations of this study was the sample used as selected from the archival data. The treatment group consisted of participants from a convenience sample. The schools had already grouped the students and already administered the treatment. A random sample (n = 60) was derived from the convenience sample, limiting the group to a specific number of participants per grade level. The inability to randomize participants was controlled by matching the groups by grade level. According to Warner (2013), a sample size of 60 per group is required for a MANOVA to have a power of .70. For the comparison group (n = 60), participants were randomly selected from the existing population if they met the criteria. The criteria required were as follows: scored Not Met on the 2017 SC Ready in ELA; overall MAP

Growth Reading RIT scores in 30th percentile or less in Spring 2017; and took the Winter 2018 MAP Growth test in Reading.

A further limitation was not having control over the independent variable and the fidelity of implementation of the program due to the design of the study. This causes difficulties in determining whether the differences in scores between those who received the intervention and those who did not were caused by the program. There were no determinations made by the researcher as to how the intervention program was supplemented by other instructional strategies or how long students actually engaged in the Classworks™ activities each day or week. The parameters of the intervention class were given to the researcher by the school principals as designed, but the teachers were not contacted to ask about fidelity.

Another threat to internal validity concerned the difference in the number of students with an IEP between the treatment and comparison group. In total, the number of participants in the treatment group with an IEP or Section 504 plan was three, and the number in the comparison group was 20. However, the archival data did not explain why the student had an IEP. In South Carolina, a student who receives speech services only would qualify for an IEP. There was no way of knowing whether participants with an IEP had a learning disability, other health impairment, speech impairment, or other disability. The data were not excluded for this reason only.

Recommendations for Future Research

The researcher recommends the following list of future studies or changes to the current study to assist in providing more generalizability of findings and to add to the body of research on reading interventions and personalized digital learning programs:

1. Use an experimental or quasi-experimental design with random samples to determine the effects of Classworks™ as a Tier II intervention for middle school struggling readers in order to gain results with more generalizability.
2. Conduct a similar study with a larger sample size using archival data from several states and schools to determine if the effects can be seen across populations.
3. Expand the research to determine whether the intervention is more effective for students in a particular grade, a particular reading level at the start, a particular gender, or a particular socioeconomic status.
4. Expand the study to include the areas of literary text: language, craft, and structure and informational text: language, craft, and structure using the MAP Growth Reading test as the instrument.
5. Conduct a study to include a teacher questionnaire to learn about the fidelity of treatment and teacher opinions about the effectiveness of the intervention.
6. Include a student motivation questionnaire or interviews to determine if the scores on MAP Growth are affected by student motivation.
7. Expand the study to compare two or more personalized digital learning programs as Tier II reading interventions.

Summary

In Chapter Five, the researcher explained the results in relation to the null hypotheses and the research questions. This chapter included a discussion of the findings, implications, and suggestions for further research. The study added to the overall research base in the areas of Tier

II reading intervention and the use of computer-based reading interventions for middle school struggling readers.

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APPENDIX

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