AN IMPACT ANALYSIS OF COMPUTER ASSISTED INSTRUCTION ON THE READING SKILLS OF STUDENTS WITH DISABILITIES

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This quantitative, quasi-experimental research study was designed to determine the impact of a computer assisted reading instruction program on the fluency rates and comprehension skills of third and fourth grade students with reading disabilities at an Ohio suburban-metropolitan elementary school. Pretests established the participants' baseline reading skills. The participants' reading progress was monitored, during twenty-week baseline and intervention periods, with weekly measures of fluency and comprehension. Posttests measured the intervention program's impact on the participants' fluency rates and comprehension skills. Results were evaluated through visual analyses of experimental data graphs and by conducting time series matched pair t confidence interval tests to determine the reading intervention program's impact on the participants' reading skills, as measured by AIMSweb reading fluency probes, STAR reading comprehension tests, and Woodcock Johnson IV tests of reading achievement. The study provided two potential benefits for participants, improved reading fluency rates and comprehension skills, and increased value-added measures of student performance on Ohio's Common Core State Standards tests; and a third unintended benefit, improved school district's and teachers' value-added evaluation scores on the Ohio State Report Card.
DEDICATION

This dissertation is dedicated to my loving wife, Grace, without whom I would not have endured, and my children Penelope and Simon, who remind me that all I do impacts the lives of others. I appreciate your patience and willingness to sacrifice so that I was able to re-discover the quest that I began so many years ago. You mean the world to me. I would also like to thank my parents for showing me that education is striving to life's set prize. I hope I have made each of you proud.
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EPIGRAPH

Given the pleasures and benefits that it brings, it is not surprising that the typical imagery of literacy is of opening doors or windows, of light and space, of boundlessness. Literacy is inseparable from opportunity, and opportunity is inseparable from freedom. The freedom promised by literacy is both freedom from – from ignorance, oppression, poverty – and freedom to – to do new things, to make choices, to learn. (Matsuura, 2001, para. 2)
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CHAPTER I

Introduction

Every student must be able to read at grade level in order to master the Common Core State Standards (CCSS). There are third and fourth grade students with identified reading disabilities at Lincoln Elementary School, Rockfield Ohio (pseudonyms were used to assure the anonymity of the included elementary school, city, and school district). These students do not read at grade level and as a result have difficulty mastering their grade level's CCSS. Therefore, Lincoln Elementary School requires a program that will efficiently teach its third and fourth grade students with identified reading disabilities to read at grade level in less than one school year so that they are better able to master their grade level's CCSS.

"MindPlay Virtual Reading Coach (MVRC) is an effective online reading program that improves reading skills quickly and efficiently. It enables students with diverse skills and instructional needs to read accurately and fluently" ("MindPlay Virtual Reading Coach," n.d.). The makers of MVRC (2016) claim that by using the program for twenty hours, reading skills will improve by one grade level.

For this study, I identified each Lincoln Elementary School student with a disability in reading, and invited the identified students to participate in the MVRC program. I measured the participants' reading fluency rates and reading comprehension skill levels frequently during the first and second quarters of the 2016-17 school year. During the third quarter, I implemented the MVRC intervention program and measured its impact on the participant's reading fluency rate and reading comprehension skills. As
a follow-up to the twenty-week intervention program, I again measured the participants' reading fluency rates and reading comprehension skill levels. The individual student's quantitative data was compared using a paired t-test to determine the impact of MVRC on each participant's fluency and comprehension scores.

**Background of Study**

Since Ohio's State Board of Education adopted the CCSS in June 2010, a greater emphasis has been placed on third and fourth graders' ability to read and comprehend complex grade level texts. According to the Common Core State Standards Initiative, the "standards define the knowledge and skills students should gain throughout their K-12 education in order to graduate high school prepared to succeed in entry-level careers, introductory academic college courses, and workforce training programs" ("About the Standards," n.d., para. 5). "Development of the new standards was guided with one goal in mind: to prepare students for college and careers. So rather than designing the standards from kindergarten up, they were designed from high school down" (Conley, 2014, p. 3). This rigorous design requires that third and fourth grade students master the CCSS by reading grade level texts.

Not all students are able to read at their grade level in the third and fourth grades. Having below grade level reading skills negatively impacts a student's ability to master the CCSS (Haager, 2013). The rigor of the CCSS allows little time for remedial reading instruction in general education classes. As a result, Lincoln Elementary School students with identified reading disabilities are required to attend remedial reading classes in addition to their general education classes to learn the reading skills necessary to master the CCSS. The addition of remedial reading instruction to the CCSS curriculum resulted
in a more academically rigorous curriculum for elementary students with identified reading disabilities.

The required remedial reading classes that Lincoln Elementary students with identified reading disabilities take are in lieu of electives like art and music. The additional reading instruction and forfeiture of electives frustrated and stigmatized the students with identified reading disabilities. These negative impacts, on students with identified reading disabilities, led to resentment of remedial reading instruction.

In order to limit these negative impacts, it was essential for Lincoln Elementary School to identify a method of providing remedial reading instruction that adequately and efficiently improved the fluency and comprehension skills of students with reading disabilities. Providing remedial reading instruction in an efficient manner increases the likelihood that students with identified reading disabilities will read at their grade level sooner; will participate in remedial reading classes, rather than electives, for less time; and will master their required grade level CCSS. The desired result of an efficient reading instruction program will decrease the duration of remedial reading instruction and potentially limit its negative impact on students with identified reading disabilities. The intent of my study was to determine if the implementation of MVRC would addresses these issues.

MVRC conducted a pre-assessment that identified weaknesses in each student’s reading skills. Then, MVRC designed an individualized reading program that specifically addressed the identified weaknesses. When a teacher independently conducts skills assessments, designs individualized instructional programs, and provides reading instruction to groups of students with varying reading deficits, the resulting educational
progress can be diminished by these time-consuming tasks (Moody, Vaughn, Hughes, & Fisher, 2000). Swanson and Vaughn (2010) indicated that this type of individualized group instructional model did "not increase standard scores on measures of comprehension or word reading" (p. 481) because valuable instructional time is spent on pre-teaching activities. MVRC claimed to be a more efficient method of remedial reading instruction for students with identified reading disabilities.

Statement of the Problem

The problem was third and fourth grade students with identified reading disabilities were expected to master the CCSS, which relied heavily on the reading skills they did not possess. As students were promoted through elementary school, the CCSS built upon academic skills that were presumably acquired in previous grade levels. As a result, students with identified reading disabilities who had not mastered previous grade level skills became more academically deficient annually. To prevent an insurmountable academic and skill deficit in middle and high school, elementary schools must find a way to teach every student to read at grade level so they are able to master all levels of the CCSS.

Chambers, Mather, and Stoll (2015), and Schneider, Chambers, Mather, Bauschatz, Bauer, and Doan (2016) indicated that MVRC achieves this desired result by teaching students to improve their reading skills with reading lessons designed to address their individual needs. I attempted to duplicate these results with my study's participants. Through pretests, time series tests, and posttests, I determined how MVRC influenced my study-participants' reading fluency and reading comprehension scores in two academic
quarters. By interpreting these results, I learned how well MVRC taught my students the skills they needed to become proficient, grade-level readers.

The intended result of my study was to improve struggling readers' fluency and comprehension scores in a limited period of time. MVRC was used at the end of each school day, during structured instructional time, under my guidance. Participants completed one half hour of MVRC Computer Assisted Instruction (CAI) four days each week and participated in one-half hour of teacher-provided supplemental instruction one day each week during the ten week, third and fourth quarters. The participants were exposed to the MVRC program for a minimum of 20 hours during both the third and fourth quarters of the 2016-17 school year.

**Research Questions**

The data I gathered during this study was used to answer the following research questions. I discussed these research questions in further detail in Chapter III. My study was guided by the following questions:

1.) Did MVRC have a significant effect on the participants' reading fluency rates as measured by the AIMSweb fluency probes?

2.) Did MVRC have a significant effect on the participants' reading comprehension skills as measured the STAR reading comprehension tests?

3.) Did MVRC have a significant effect on the participants' Woodcock Johnson IV (WJ IV) Broad Reading standard scores; WJ IV Reading standard scores; WJ IV Letter Word Identification standard scores; WJ IV Reading Fluency standard scores; and the WJ IV Passage Comprehension standard scores?
Significance of My Study

My study had three discernable benefits. First and most importantly, its purpose was to improve the participants' reading fluency rates and reading comprehension skills. The participants had the opportunity to receive forty or more hours of direct reading instruction in a small group setting. This instruction was specifically designed to address the reading skills that each participant lacked. The anticipated result was an improved ability to read and master their grade level CCSS. By improving their reading ability, my study's participants would increase their potential for mastering future CCSS in later grades. My desire was that my study's participants would view their potential as an opportunity to become more successful in school because they learned to appreciate the direct outcomes of their hard work and perseverance.

The second benefit was to the school district and its teachers who are evaluated through value-added measures that are determined by annual student performance on Ohio's mandated, CCSS tests. When students with identified reading disabilities can read at grade level, they are better able to effectively read and correctly respond to CCSS test questions; and better able to achieve higher test scores that demonstrate adequate yearly progress as determined by the Ohio Department of Education. When students achieve higher test scores, their school district and teachers benefit from an improved value-added evaluation scores on their Ohio State Report Cards.

The third benefit was my study's addition to the teacher leadership literature that is currently available. My study builds upon York-Barr and Duke's (2004) Teacher Leadership for Student Learning: Conceptual Framework and Fairman and Mackenzie's (2012) Spheres of Teacher Leadership Action for Learning model. Wenner and

**Overview of My Research Methodology**

My quantitative study was quasi-experimental because it emphasized the measurement of students' reading skills with various standardized tests prior to, and during exposure to, the MVRC program. Through my study, I sought a relationship between the implemented treatment variable and participants' pretests, time series tests, and posttest results. My study was quasi-experimental because it followed the general pretest and posttest procedures of experimental research, but did not include random assignments. Additionally, my study did not use a control group and was therefore unable to control independent factors such as assigned reading teachers, class lessons, parental support, and other supplemental reading instruction. Instead, my study used each participant as an independent, single subject, N=1 control to determine the impact of MVRC on each individual relative to him or herself.

I used paired t-tests to determine if the MVRC intervention or treatment made a difference in the participants' reading fluency rates and reading comprehension skills.
This analysis was performed using the scores of relevant pretests, time series tests, and posttests. I examined the impact of MVRC by comparing each participant's posttest scores to their own pretest scores. The resulting data guided my design of future reading intervention programs for students with identified learning disabilities in reading; described in Chapter V.

The hypothesis that led me to this study was that participation in MVRC for two, ten week, academic quarters would improve the treatment group's reading fluency and comprehension skills to the point where they were able to read at grade level. The manipulated variable was participation in the MVRC program for the required minimum number of hours, as defined by the program developer, to improve reading skills. I analyzed the collected data from this study to determine the impact of the manipulated variable on the participants' reading fluency rates and reading comprehension skills.

My data collection method utilized each participant's reading fluency and reading comprehension test scores to define their skills prior to and after exposure to the MVRC program. My collected data and research analysis guided Lincoln Elementary's faculty in our future implementation decisions for reading improvement and monitoring plans and special education interventions. I chose this method of data collection and analysis because it was practical and applicable to the Individual Education Plan (IEP) progress monitoring duties I had as an Intervention Specialist at Lincoln Elementary School.

The following were included in my Intervention Specialist role: (a) evaluate the academic strengths and weaknesses of students with reading disabilities, (b) design and implement specialized instruction that addressed each student's identified academic weaknesses, (c) monitor the students' reading improvement progress, (d) and re-evaluate
students to determine the impact of specialized reading instruction. My methodology was appropriate for my study primarily because it followed the process of evaluation, design, and re-evaluation required of IEPs. My methodology allowed me to determine the impact of MVRC on the reading skills of my students. Additionally, my methodology enabled me to make informed recommendations for the specialized instruction programs of future students.

I was involved very closely in each administrative and analytical aspect of my study. As the primary provider of the MVRC intervention program, I guided my students through the CAI process and acted as the program's human tutorial component. My role included the administration of pretests, time series tests, and posttests according to the protocols of their respective assessment tools. In addition to the collected information from my study, I analyzed the data results from the participants' pretests, time series tests, and posttests. Because my relationship to the study's participants could have resulted in a subjective interpretation, I remained aware of my subjectivity to limit its potential impact on the resulting data. As a result, I objectively analyzed the participants' data from the MVRC implementation.

**Delimitations**

Delimitations are the parameters I set to define my research study. I included descriptions of my study's elements and reasons why I did not include other related pieces. The elements I have included in this section are participants, instruments, sample size and Human Subject Review Board (HSRB) consent decrees.

Participants included ethnically diverse; male and female; third and fourth grade Lincoln Elementary School students ranging in age from nine to ten years old. The
participants were formally identified as having a learning disability under the Individuals with Disabilities Education Act, 20 U.S.C. § 1400 (IDEA). The participants had previously implemented IEPs that were designed to address their identified reading disabilities; that expressed their need for specialized instruction in reading; and that provided special education accommodations to assure access to their grade level curriculum. Only third and fourth graders with identified reading disabilities at Lincoln Elementary gave consent to participate in my study. Therefore, I did not include students from other grade levels or schools.

For the purpose of this study, I measured the participants' reading skill levels by utilization of these five tools: the WJ IV test of achievement subtests of (a) Letter Word Identification, (b) Sentence Reading Fluency, (c) Passage Comprehension, (d) the Pearson Academic Improvement Measurement System based on the web (AIMSweb) reading fluency measure, and (e) the Renaissance Learning Standardized Test for the Assessment of Reading (STAR) reading comprehension measure. The combination of the three WJ IV achievement subtests provided two additional cluster test scores: (f) the WJ IV Broad Reading standard score, and (g) the WJ IV Reading standard score.

Prior to my implementation of the MVRC intervention, the identified participants registered below grade level benchmarks and age level standard scores on these seven reading skills measures (see WJ IV subtests a-g). I chose not to include other instruments because the Rockfield School District utilized the WJ IV standard scores to identify students with disabilities, and the AIMSweb and STAR assessments to monitor student progress toward IEP reading goals.
Due to the limited number of third and fourth grade students with disabilities at Lincoln Elementary, who provided HSRB consent decrees, my study's sample size was small; it initially included ten participants. Therefore, I provided a detailed description of each participant that included their grade level, age, gender, disability category, two most predominant Multiple Intelligence (MI) domains, self-reported experience with reading, self-report attentiveness in school, and reading skill level scores. I included these descriptions to increase the potential generalization of my study's results.

No evidence existed that supported a correlation between MI and learning styles. Therefore, I have not included learning styles in my Description of Participants section. I made this decision because the creator of MI theory, Howard Gardner (2013), said there was not a correlation between MI and learning styles. To further emphasize his thoughts on the correlation, Gardner strongly stated that applying learning style labels to his MI theory was "unhelpful, at best, and ill-conceived at worst" (para. 9). Additionally, the research I cited in my literature review showed that the application of learning style theory, to classroom instruction, did not yield supportive statistical evidence for improved student learning (Strauss, 2013).

Before I began my study, my research design and informed consent letters were approved by Ashland University's Human Subjects Review Board (HSRB) (see Appendix A for approval letter). In keeping with the requirements of human subject research, I mailed the informed consent letters that explained the method and purpose of my study to my ten prospective participant's parent(s) or guardian(s) and to Lincoln Elementary School's principal. Before participation in this study began, an informed consent decree granting permission to participate in the study was provided by all ten
participants' parent(s) or guardian(s) (see Appendix B for decree). The principal also granted me permission to conduct my study at Lincoln Elementary (see Appendix C for principal's letter). I did not include any students in my study for whom I had not received informed consent. In keeping with the requirements of the HSRB, the participants, city, elementary school, and school district included in this study are referred to by pseudonyms.

**Limitations**

Limitations are a study's potential weaknesses or problems that are out of a researcher's control, but cannot be dismissed (Creswell, 2002). They weaken the validity of a study's results (Pyrczak, 2016). Unfortunately, as Lunenburg and Irby (2008) explained, all studies have limitations that may affect their design and, or results. Creswell described the usefulness of detailing a study's limitations, or the factors a researcher cannot control, by emphasizing their importance for future replication of a study's generalizations and findings. I detailed the limitations of my study below.

One limitation of my study was my participants' full willingness to engage in the MVRC program and related lessons. Motivating my participants to engage in an additional two and one-half hours of reading-type work each week was a challenge. Buy-in from participants was critical to my intervention's success. I used strategies (praise, positive feedback, and the ability to choose desired workstations in the classroom) and rewards (treats, progress certificates, and computer free-time) to motivate my participants' enthusiasm for the intervention program. Through the observational progress monitoring tool, that was a part of MVRC, I determined that these motivational strategies and rewards successfully encouraged my students to engage in the program. I
did not include a quantification of student engagement in my study because I was unable to measure the degree of each students' engagement during the five, one-half hour lessons per week, for my 40-week study.

A second limitation was each participant's attentiveness while they were engaged in the MVRC lessons. Although prompting, praise, and rewards were used to encourage student attentiveness, I had no means of measuring the true attentiveness of each participant. For example, I could not know if a participant simply appeared to be focused and actively engaged in the MVRC lessons or if the participant was making efforts to appear that way, by simply logging into the program and randomly selecting answers to the lessons' questions.

By definition, the results of a single subject research study can only be applied with statistical reliability to its participants (Fraenkel & Wallen, 2006). Therefore, my study was limited by its potential to be generalized and applied to a larger population. I have provided detailed descriptions of my participants with the hope that this would benefit both teachers and the students they encounter with characteristics similar to my study's participants.

**Definition of Key Terms**

The following terms have been defined to clarify their use in my study.

*A-B-A design.* "A single-subject experimental design in which measurements are repeatedly made until stability is presumably established (baseline), after which treatment is introduced, an appropriate number of measurements are made and a second, post-intervention baseline is added" (Fraenkel & Wallen, 2006, p. G-1).
**Computer Assisted Instruction.** Since the 1960s, Computer Assisted Instruction in reading referred to the process of teaching students by using a computer to present individualized instruction based on their aptitude and ability. The intent of Computer Assisted Instruction is to help students learn new materials through interacting with the computer at their own speed (Atkinson & Hansen, 1966; Yu, Williams, Lin, & Yu, 2010).

**Computer-Based Reading Intervention.** "Reading intervention curriculum delivered via computer software" (Soboleski, 2011, p. 11).

**Common Core State Standards.** The Common Core State Standards are not a curriculum, but are learning goals for what students should know and be able to do at each grade level. The Common Core State Standards are learning goals for English language arts, literacy and mathematics adopted by state boards of education for grades K-12 ("Common Core State Standards Initiative," n.d.).

**Rasch Model.** The Rasch model is a psychometric model for analyzing categorical data as a function of the trade-off between the respondent's abilities, attitudes or personality traits and the difficulty of the assessment item(s) (Rasch, 1980). For example, a respondent's answers to questions on a reading assessment may be used to estimate a student's reading ability.

**Reading fluency.** Is one's ability to "read text with speed, accuracy, and proper expression. Fluency depends upon well-developed word recognition skills, but such skills do not inevitably lead to fluency. It is generally acknowledged that fluency is a critical component of skilled reading" (National Reading Panel, 2000, p. 3-2).

**Reading comprehension.** The National Reading Panel (2000) described reading comprehension as the process of constructing meaning from recognized words. Durkin
(1993) described reading comprehension as the essence of reading, stating it is the "intentional thinking during which meaning is constructed through interactions between text and reader" (p. 10).

Specific Learning Disability. According to the Individuals with Disabilities Education Improvement Act, this is defined as:

A disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell or to do mathematical calculations. The term includes such conditions as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia and developmental aphasia. The term does not include children who have learning problems that are primarily the result of visual, hearing or motor abilities, of cognitive disability, of emotional disturbance or of environmental, cultural or economic disadvantage. ("Parent's Guide to the Individuals with Disabilities Education Improvement Act (IDEA) of 2004", 2012, p. 63)

Time-series test. "An experimental design involving one group that is repeatedly pretested, exposed to an experimental treatment, and repeatedly posttested" (Fraenkel & Wallen, 2006, p. G-9).

Summary

Chapter I began with an explanation of the state of reading instruction at Lincoln Elementary School in Rockfield, Ohio, and the need for a reading intervention program like MVRC. The introduction presented this problem, which led to my study. Then, I introduced the background of my study and discussed the impact of the CCSS on students
with reading disabilities. Next, I presented my primary research questions which framed the study, followed by a statement of the study's significance on the participants, their school district, and their teachers. After that, I provided an overview of the study's methodology, presented a description of my participant delimitations, and acknowledged the limitations that I recognized while conducting my study. Chapter I concluded with a list of defined terms that clarified included terminology for readers who are unfamiliar with this type of research subject matter.

The second chapter is a review of the research and literature pertinent to my topic. Chapter III outlined the methodology used in my study. Chapter IV detailed the results of my study. Chapter V discussed my study's findings, my interpretation of those findings, and their implications for future research. Chapter V concluded with my recommendations for the further study of teacher leadership, of computer assisted instruction, and of MVRC.
CHAPTER II

Introduction

Gutenberg's movable type printing press, "the great innovation in early information technology," was first "established in Mainz, Germany, between 1446 and 1450" (Dittmar, 2011, p. 1133). The device revolutionized how information was shared, and how cities were grown, in the 15th century (Dittmar, 2011). Since that time, reading printed words became the standard method of sharing referable information with wide audiences. As a result, the ability to read is "the cornerstone of education and the foundation of life-long learning" (Hiebert, Pearson, Taylor, Richardson, & Paris, 1998, p. 1).

High and Klass (2014) stated, "more than 1 in 3 American children start kindergarten without the language skills they need to learn to read" (pgs. 404-405). Hart and Risley (2003) found that "vocabulary use at age 3 was equally predictive of measures of language skill at age 9-10" and "strongly associated with reading comprehension scores on the Comprehensive Test of Basic Skills" (p. 115). The associated cause and ultimate result of these statistics were defined by The 2003 National Adult Assessment of Literacy which estimated 90 million adults in the United States demonstrate below basic or only basic literacy skills (Kutner, Greenburg, Jin, & Paulsen, 2006). That was thirty-one percent of the United States total population in 2003, when the assessment was published. Simply put, parents with basic literacy skills raise children who have less experience with words before entering school. Their children's lack of experience is predictive of our country's future literacy rates. To address this issue, legislation was
enacted to hold public schools accountable for narrowing these reading skill gaps before the focus of elementary education transitions from learning-to-read, to reading-to-learn, which typically occurs in the third grade (Duke, Bennett-Armistead, & Roberts, 2003).

My understanding of Teacher Leadership Theory, Special Education, Reading Instruction, and Computer Assisted Instruction led me to design an Action Research Study that used Single Subject Research Analysis to evaluate a computer based literacy program. My hope was to identify a computer based literacy program that would address the generational cycle of basic literacy skills. To better understand what led me to this choice, I included a review of literature that I organized into these categories: Teacher Leadership Theory, the theoretical and conceptual frameworks of my dissertation; Action Research Design; Ohio's Third Grade Reading Guarantee; Special Education; Multiple Intelligences Theory; the National Reading Panel (NRP); Reading Instruction; Computer Assisted Instruction (CAI); MindPlay Virtual Reading Coach (MVRC); and Single Subject Research Design (SSRD).

**Teacher Leadership Theory**

Following the standards-based reforms of the late 20th century which resulted in the CCSS, a renewed focus had returned to teacher leadership theory (Smylie, 2008). School districts began to view teacher leadership as a cost-effective means of professional development, organizational improvement, and classroom instruction (Smylie, 2008). Since the turn of the 20th century, teacher leadership evolved from the mere delegation of administrative tasks, to the development of valued organizational and instructional improvement roles for teachers (Smylie, 2008). As a result, "non-
supervisory, school-based, instructional leadership roles" were "gaining substantial currency in schools and school districts across the country" (Smylie, 2008, p. x).

Standards-based reforms created a new focused type of professional performance pressure that required teachers to successfully teach students to master performance based measures like the CCSS (Mangin & Stoelinga, 2008). This pressure originated from many different types of stakeholders: "parents, principals, local communities, policy makers, and the media," but focused exclusively on teacher performance as measured by their students' CCSS test scores (Mangin & Stoelinga, 2008, p.1). Teachers' success was qualitatively measured by their ability to identify and address each student's instructional needs; to master the most recent best instructional practices; to assess what students know and need to learn; to reflect upon their teaching practices; and to adequately modify their practices to improve their students' ability to master all grade-level standards in a given school year (Mangin & Stoelinga, 2008). Again, the teachers' ability to successfully do all of these things was measured by their students' performance on standards based tests.

Regardless of effort or ability, a teacher in Ohio could potentially be rated Accomplished, Skilled, Developing, or Ineffective based on their students' standardized test scores (Teacher Performance, n.d.). Therefore, "it seems unlikely that teachers will be able to consistently meet the ever-increasing expectations for improved instructional performance" (Mangin & Stoelinga, 2008, p. 1). The contention of teacher leadership theory was that a teacher's instructional capacity could be improved through the implementation of nonsupervisory, school-based, instructional leadership roles (Mangin & Stoelinga, 2008). Teacher leadership theory did this by empowering the teacher, who has a special knowledge of their immediate classroom and subject matter, to function as a
trusted leader beyond the traditional bureaucratic norms of McGregor's Theory X, top-down management style (Mangin & Stoelinga, 2008; McGregor, 1960).

Teacher leadership brought a "level of special knowledge about teaching to the school setting" that was "outside the line of school authority" (Mangin & Stoelinga, 2008, p. 1). Teacher leadership also provided "teachers with the skills and knowledge necessary for continued instructional improvement and, ultimately, enhanced student learning" by developing trust between teachers and the various stakeholders listed above (Mangin & Stoelinga, 2008, p. 1). The combination of a teacher's special knowledge and this foundation of trust fostered a bottom-up organizational structure, commonly referred to as McGregor's Theory Y (McGregor, 1960). Bottom-up, Theory Y, teacher leadership inherently rewarded the ingenuity of imaginative problem solving and fostered a school where teachers embraced the challenges and responsibilities of their job (McGregor, 1960).

A great deal of emphasis had been given to teacher instructional leadership contributions (Crowther, Ferguson, & Hann, 2009; Lieberman & Miller, 2004; Moller & Katzenmeyer, 1996; Ohio Department of Education, 2017). The fact that teachers create learning opportunities, assess performance, adapt teaching techniques, and influence instruction "implies that teachers may be the logical leaders" of "instructional improvement efforts despite a lack of positional leadership authority" (Mangin & Stoelinga, 2008, p. 2). Considering Ohio's standards based educational policies and stakeholder pressures to increase students' academic achievement, it was advisable that more school and district level administrators empowered teacher to lead. I had come to this conclusion because my review of the literature convinced me that "teacher leadership
Two significant literature reviews of teacher leadership were conducted since its wide acceptance in 1980. The first, *What Do We Know About Teacher Leadership? Findings From Two Decades of Scholarship*, examined the "pivotal role of teachers in efforts to advance education" (York-Barr & Duke, 2004, p. 256). It examined all that was known of teacher leadership from 1980 through 2004. The second, *The Theoretical and Empirical Basis of Teacher Leadership: A Review of the Literature*, "examined teacher leadership research completed since York-Barr and Duke published the seminal review on teacher leadership in 2004" (Wenner & Campbell, 2017, p. 134).

The York-Barr and Duke (2004) literature review was "the foundation for research and thoughts concerning teacher leadership" for 24 years (Wenner & Campbell, 2017, p. 135). In their literature review, York-Barr and Duke stated that "the central tenet of teacher leadership aligns with notions of individual empowerment and localization of management" (p. 255). In addition, they (2004) also stated that, "the concept of teacher leadership suggests that teachers rightly and importantly hold a central position in the ways schools operate and in the core functions of teaching and learning" (p. 255). The authors (2004) also identified the goal of teacher leadership as the improvement of every student's academic achievement.

York-Barr and Duke (2004) identified and reviewed 140 sources relevant to teacher leadership. Those sources were used to answer seven questions: (a) "Why focus on teacher leadership?" (b) "How is teacher leadership defined?" (c) "What do teacher leaders do?" (d) "Who are teacher leaders?" (e) "What conditions influence teacher
leadership?" (f) "How are teacher leaders prepared to lead?" and (g) "What are the effects of teacher leadership?" (2004, p. 257). York-Barr and Duke concluded their seminal literature review by answering these questions through their *Teacher Leadership for Student Learning: Conceptual Framework* which summarized their key theoretical principles of teacher leadership. The conceptual framework was based on their literature review findings and their resulting "theory of action for teacher leadership" (2004, p. 289).

Wenner and Campbell (2017) explained the reasons why their more recent literature review was a necessary addition to York-Barr and Duke's research. They concluded that teacher leadership was a developing part of modern school reform, and explained that its popularity among educational policymakers resulted in standards based educational reforms. These reforms resulted in legislation that required evidence of teacher leadership in Ohio's teachers' professional evaluations, but did not require Ohio's school districts to provide related professional development. Wenner and Campbell found these legislated requirements increased the number of university programs that offered teacher leadership certificates or endorsements. Their rationale concluded with a description of teacher leadership roles, as possible solutions to the increase of teacher attrition rates, which may be due to the stagnant career trajectories of educators (2017).

Wenner and Campbell (2017) identified 704 literature sources related to teacher leadership. Through a process of criteria, based on exclusion and abstract analysis, the authors narrowed their literature review to 54 pieces of literature. These sources were used to answer seven questions: (a) "How is teacher leadership defined in the research and what are the constructs or elements of teacher leadership within these
conceptualizations?" (b) "To what extent and in what ways is teacher leadership being investigated within the different disciplinary contexts?" (c) "What theories are used to frame research surrounding teacher leadership?" (d) "How are teacher leaders prepared and what strategies or programs appear to be most fruitful for developing teacher leaders?" (e) "What are the effects of teacher leadership?" (f) "What factors facilitate or inhibit teacher leadership?" and (g) "To what extent and in what ways does the research surrounding teacher leadership investigate issues of equity and diversity?" (2017, p. 137).

Question (c), which asks what theories frame teacher leadership research, was the most relevant to my study. Wenner and Campbell (2017) asked this question because York-Barr and Duke "found the literature on teacher leadership to be largely atheoretical" (p. 147), and because York-Barr and Duke developed their "theory of action for teacher leadership that included the foundation on which teacher leadership may happen" (p. 147). I considered this reason for question (c) to be important to my study because it highlighted the importance of York-Barr and Duke's (2017) *Teacher Leadership for Student Learning: Conceptual Framework*.

Through their literature review of 704 teacher leadership sources, Wenner and Campbell identified only one piece of literature, Fairman and Mackenzie (2012), that used York-Barr and Duke's theory of action for teacher leadership to frame their research. Fairman and Mackenzie's research is a "qualitative case studies of seven Maine, USA schools" in which "the authors found that teachers initiated their own professional learning efforts with the central goal of improving the conditions and outcomes of student learning" (2012, p. 229). Using York-Barr and Duke's *Teacher Leadership for Student Learning: Conceptual Framework*, Fairman and Mackenzie
(2012) developed the *Spheres of Teacher Leadership Action for Learning* model, detailed below, in my theoretical framework section. The fact that Fairman and Mackenzie are the only researchers who used York-Barr and Duke's conceptual framework (2004) to design their research, revealed a literature gap that my study addressed. I specifically applied both York-Barr and Duke's *Teacher Leadership for Student Learning: Conceptual Framework* and Fairman and Mackenzie's (2012) *Spheres of Teacher Leadership Action for Learning* models to my action research study.

Wenner and Campbell (2017) concluded their literature review by explaining that very "few scholars have moved past [the] basic components of teacher leadership" (p.164). Continuing, they expressed the need for research, relevant to my study, that answered these questions: (a) "How is teacher leadership enacted?", (b) "To what extent can the roles of teacher leaders be connected to improved teacher practice and increased student learning?", and (c) "How might we encourage more teacher leadership among underrepresented groups?" (2017, pgs. 164-165). In addition to these questions, Wenner and Campbell express the need for more studies of teacher leadership. I have included their call for research which demonstrated the contribution my study made to teacher leadership research literature.

**Theoretical Framework of Teacher Leadership**

The *Teacher Leadership for Student Learning* model (York-Barr & Duke, 2004) includes seven components (a-g). The foundation of teacher leadership is built upon components a, b, and c, (a) identified the teacher leader's characteristics, (b) described the type of work a teacher leader does, (c) listed the conditions that support a teacher leader's work. The path a teacher leader takes to impact student learning is illustrated by
components d, e, and f, (d) identified "the means by which teachers lead" (York-Barr & Duke, 2004, p 289), (e) identified the targets of the teacher leader's influence, (f) identified the outcomes of teacher leadership. Finally, (g) was student learning.

York-Barr and Duke's (2004) first foundational component, Teacher Leaders, explained that teachers who lead have earned the respect of their fellow teachers and school administrators. These teacher leaders approach their work with a learning orientation, allowing them to gain knowledge from their professional practice. They also demonstrated or had the potential for leadership dispositions, knowledge, and skills.

York-Barr and Duke's (2004) second foundational component, Leadership Work, explained that a successful teacher leader maintained a consistent focus on teaching and learning. Their success also depended "in part, on the nature of their leadership work, which must be valued by their peers, visible within the school, and continually negotiated on the basis of feedback and evaluation of its effectiveness" (2004, p. 289). Of additional importance to a teacher leader's success, was the sharing of their leadership work with fellow teachers so that it was collectively evaluated and addressed.

York-Barr and Duke's (2004) third foundational component, Conditions, listed the actively supportive elements a teacher leader required to be successful. Those conditions included principals and colleagues who actively supported the teacher leader's efforts; provision of the time and resources necessary for the completion of their leadership work; and opportunities for professional development, where a teacher leader can learn and develop in a manner that supported their leadership work. These conditions created a supportive culture that fostered teacher leaders and ultimately student learning.
York-Barr and Duke's (2004) fourth component, which began their suggested path to student learning, included the Means of Leadership Influence. This component explained that "teacher leaders led by maintaining a focus on teaching and learning and by establishing trusting and constructive relationships" with fellow stakeholders (2004, p. 290). During this step on the path to student learning, teacher leaders established trusting and constructive relationships through formalized leadership positions and less formal collegial interactions.

The next step on the path to student learning was York-Barr and Duke's (2004) fifth component, Target of Leadership Influence. In this step, teacher leaders influenced "the development of individuals, collaborative teams and groups, and organizational capacities (e.g., structures, policies, processes, resources) to improve teaching and learning in their schools" (York-Barr & Duke, 2004, p. 290). By influencing these targets a teacher leader instituted change that improved teaching practice and student learning.

The sixth component and final step on York-Barr and Duke's (2004) path to student learning was the Intermediary Outcome of Leadership. Intermediary outcomes were the impacts of the conceptual framework or the results attributed to the teacher leader's interventions. This step recognized changes that improved teaching and learning practices such as:

- positive learning relationships between teachers and students and among students,
- establishing classroom routines and expectations that effectively direct student energy, engaging students in the learning process, and improving curricular,
instructional, and assessment practices, ultimately result in high levels of student learning and achievement. (2004, p. 290)

*Student Learning* is the ultimate goal of teacher leadership and the final component of York-Barr and Duke's (2004) conceptual framework. Improved student learning or student achievement resulted in the combination of the conceptual significance of teacher leadership with teacher empowerment through localized management. The *Teacher Leadership for Student Learning: Conceptual Framework* resulted in student learning and accomplished the goal of teacher leadership (2004).

The *Spheres of Teacher Leadership Action for Learning* "model can be situated within the York-Barr and Duke (2004) theory of action for teacher leadership" to describe what teacher leaders do (Fairman & Mackenzie, 2012, p. 231). This model (2012) includes nine spheres that describe "where and how teachers, individually or collectively, informally or formally, act and influence other teachers to improve student learning" (Fairman & Mackenzie, 2012, p. 232). As with the *Teacher Leadership for Student Learning* model, the end result of the *Spheres of Teacher Leadership Action for Learning* model is student learning.

Fairman and Mackenzie (2012) view teacher leadership as function, rather than a role, in which teachers are engaged. For this reason, the spheres of teacher leadership are described in terms of what teachers do and where they do it (Fairman & Mackenzie, 2012). Fairman and Mackenzie see the *Spheres of Teacher Leadership Action for Learning* model as a three-dimensional representation of the various leadership activities that teachers move in and out of during their careers (2012). Therefore, the model's nine spheres are arranged "in a circle to depict the nonlinear, non-continuous activity of
teacher leaders" (2012, p. 232) that orbit their goal of improved student learning. As noted, this nonlinear, three-dimensional, theoretical model represents the activities that teacher leaders engage in while illustrating a more conceptual point: there is no one way to be a teacher leader.

Fairman and Mackenzie labeled their non-sequential *Spheres of Teacher Leadership Action for Learning* with letters 'A' through 'I'. The authors describe the fluid spheres in their figure *Spheres of Teacher Leadership Action for Learning* (2012, p. 231), and their table *Descriptions of the spheres of teacher leadership action for learning* (2012, p. 232). While operating within the spheres, teacher(s) focus on the model's goal of improved student learning and fluidly move throughout Fairman and Mackenzie's nine spheres: (a) commit to gaining professional experience, knowledge and skills, (b) experiment with and reflect upon their professional beliefs and practices, (c) share their instructional views, theories and paths to learning, (d) collaboratively implement and reflect on evolving pedagogy, (e) vary the teacher-teams with whom they work to positively influence the whole organization, (f) question past practice, distribute leadership, and support change, (g) focus their collective effort and resources on new organizational goals, (h) engage community stakeholders in improvement plans, and (i) share their successes and failures with other professionals beyond their immediate organization (2012).

**Action Research Design**

"Action research represents a transformative orientation to knowledge creation in that action researchers seek to take knowledge production beyond the gate-keeping of professional knowledge makers" (Bradbury-Huang, 2010, p. 93). In other words,
practitioners create knowledge and understanding through the process of action research rather than relying upon researchers to tell them what to think and how to perform. Better still, action research is a social research tool that enables stakeholders to plan, implement, and reflect on problem-solutions intended to improve the functionality of their organization (Bradbury-Huang, 2010; Brydon-Miller, Greenwood, & Maguire, 2003; Creswell, 2002; Reason, 2001). In the simplest terms, action research is the fluid process a teacher undertakes to identify an educational problem, research and implement a potential solution, evaluate the impact of the solution, and adjust their practices accordingly.

"Action research has a complex history because it is not a single academic discipline but an approach to research that has emerged over time from a broad range of fields" (Brydon-Miller, Greenwood & Maguire, 2003, p. 11). Varying examples of action research can be found in the works of educational reformer John Dewey, social psychologist Kurt Lewin, anthropologist Sol Tax, teacher Palo Freire, and business theorist Chris Argyris. (Brydon-Miller, Greenwood & Maguire, 2003). What links action research in varying fields is "the key question of how do we go about generating knowledge that is both valid and vital to the well-being of individuals, communities, and for the promotion of larger-scale democratic social change" (Brydon-Miller, Greenwood & Maguire, 2003, p. 11). Action research is guided by the value systems of researchers and organizations that seek knowledge through constructed human interactions (Brydon-Miller, Greenwood & Maguire, 2003). Action research when paired with teacher leadership theory is undertaken to improve student learning.
In action research, it is considered that there are five major forms: Argyris' Action Science; Heron and Reason's Cooperative Inquiry; Freire's Participatory Action Research; Torbert's Developmental Action Inquiry; and Whitehead and McNiff's Living Theory Approach (Bradbury-Huang, 2010). At the core of each form is a cyclical improvement process: (a) identifying a problem, (b) developing a plan of action to address it, (c) collecting data on the plan's impact, (d) analyzing or interpreting that data, (e) reflect on the findings, and (f) repeating as necessary (Creswell, 2002). "A review of major writers in education" reveals two basic action research designs: participatory action research (PAR) and practical action research (Creswell, 2002, p. 552). PAR's purpose is the design of societal changes to improve quality of life (Stringer, 2014).

By definition PAR "involves a small-scale research project, narrowly focuses on a specific problem or issue, and is undertaken by individual teachers or teams within a school or school district" (Creswell, 2002, p. 552). Therefore, I chose to define my study as the PAR type because its definition accurately detailed my study's designed process. PAR was an ideal method of research for me, a teacher, who sought a solution to a narrowly focused problem, how to improve my students' reading skills, my professional practice, and my school (Creswell, 2002).

Mills (2014) called his model of PAR the Dialectic Action Research Spiral. Mills' spiral can be described as both a fluid and cyclical improvement process during which a researcher moves amongst four varying, but interrelated stages: (a) identify an area of focus, (b) develop an action plan, (c) collect data, and (d) analyze and interpret the data.
In Mills' (2014) spiral, a teacher identifies an area of focus or problem; defines the focus or problem through experience and a review of relevant literature; and designs an action plan to guide the research (Creswell, 2002; Mills, 2014). Each phase is followed by data collection from qualitative sources and quantitative instruments (Creswell, 2002; Mills, 2014). Once the data is collected, the researcher analyzes and interprets it. The interpretation of the data includes a contextualization of the findings based on the literature review and personal experience (Creswell, 2002; Mills, 2014). The researcher concludes the first cycle with a summarization of findings, recommendation of future actions, and identification of who will be responsible for additional actions and data collection (Creswell, 2002; Mills, 2014).

**The Third Grade Reading Guarantee**

Mastering independent reading skills at an early age has always been profoundly important for elementary school students. When elementary students do not read at grade level, as determined by norm referenced benchmarks of fluency and comprehension, by the end of third grade, they "rarely catch up later" and cannot adequately read in middle and high school (Heibert, Pearson, Taylor, Richardson, & Paris, 1998, p. 1). A legislative example of reading's importance to elementary students in Ohio is the Fourth Grade Reading Capability Act, Ohio Revised Code § 3313.608 (2018).

The Fourth Grade Reading Capability Act states when a school district identifies a third grade student who has not attained grade level reading equivalency skills, by the end of third grade, the district must either: (a) "promote the student to fourth grade if the student's principal and reading teacher agree that other evaluations of the student's skill in reading demonstrate that the student is academically prepared to be promoted to fourth
grade", (b) "promote the student to fourth grade but provide the student with intensive intervention services in fourth grade", or (c) "retain the student in third grade" (Fourth Grade Reading Capability Act, Ohio Rev. Code. § 3313.608, 2018, A.1.a-c.). ORC § 3313.608 prompted the Ohio Department of Education to initiate Ohio's Third Grade Reading Guarantee (TGRG). The TGRG requires that school districts identify kindergarten through third grade students who are reading below grade level. The next step is that the TGRG requires school districts to provide reading instruction to the students with identified reading disabilities, so that they reading at grade level before entering the fourth grade ("Third Grade Reading Guarantee," n.d.).

The TGRG requires "teachers and parents to work together to understand the student's reading deficiency and outline reading intervention and support" programs (Ohio Department of Education, 2016, p. 11). The student's reading deficiency is analyzed using performance assessments, including these common performance assessments: (a) Ohio's American Institutes for Research (AIR) Common Core Test, (b) the Academic Improvement Measurement System based on the web (AIMSweb) curriculum based measures of oral reading fluency, (c) the Renaissance Learning Standardized Test for the Assessment of Reading Measure of Reading Comprehension (STAR), and (d) the Woodcock-Johnson IV Tests of Academic Achievement (WJ IV) reading clusters and subtests. The teachers' and parents' collective understanding of the student's reading deficiencies results in an outline of reading intervention and instructional support known as a Reading Improvement and Monitoring Plan (RIMP). The RIMP identifies the student's specific reading deficiency; proposes supplemental instruction services that target the student's reading deficiency; lists
opportunities for parents or guardians to be involved in the instructional services; details a process of monitoring the implementation of instructional services; implements a reading curriculum which teaches the student "to read at grade level and provides for reliable tests and ongoing analysis of each student's reading progress"; and states "that unless the student attains the appropriate level of reading competency by the end of grade 3, the student will be retained, unless otherwise exempt" (Ohio Department of Education, 2016, p. 9).

Exemptions, can occur when an Individual Education Plan (IEP) excuses a student from the consequences of the TGRG (Ohio Department of Education, 2016). Not every student with an IEP is exempt from the retention provision of the TGRG. Each IEP team must determine if fourth grade promotion violates the student's access to a free and appropriate public education (FAPE) in the least restrictive environment (LRE). If an IEP team agrees that retention is necessary, adequate reading achievement data must be collected to establish the student's eligibility for exemption prior to the third grade English language arts test spring administration. Even if a student is exempt from the retention provision, all of the remaining provisions of the TGRG are still required of the school district for the sake of the student's reading improvement. There must be documentation of student-with-disabilities' reading evaluation and assessment data, which includes the required reading diagnostic results and previous instructional interventions, in the student's Evaluation Team Report (Ohio Department of Education, 2016, p. 15).
Special Education

"Students with disabilities who have individualized education programs (IEP) and also are not on track for reading must have reading improvement and monitoring plans that align and do not conflict with their IEPs" (Ohio Department of Education, 2016, p. 9). Reading disabilities effect from five to nearly eighteen percent of the population and comprise approximately 80% of all learning disabilities (Shaywitz and Shaywitz, 2005). Although students affected by reading disabilities inherently possess a greater potential for improvement in reading skills, they naturally suffer difficulty decoding and comprehending text and passages. In the United States, school-aged students, identified with specific learning disabilities in reading, are guaranteed the provision of FAPE in the LRE by their local public school districts (Individuals with Disabilities Education Act, 20 U.S.C. § 1400, 2004). Additionally, the Ohio's Third Grade Reading Guarantee Guidance Manual (Ohio Department of Education, 2016) specifically states, "Districts and schools should use caution that a student with an IEP does not receive less intensive reading interventions and supports than students without IEPs" (p. 15). Therefore, a student with a RIMP and an IEP must receive the services provided by the RIMP in addition to the services provided by the IEP.

Each public-school student with a disability who receives special education services must have an IEP designed to improve their academic progress. The United States Department of Education's A Guide to the Individualized Education Program (Kupper, 2000) states, "the IEP is the cornerstone of a quality education for each child with a disability" (p. 1). An IEP is a document, written and agreed to by a team that, at its most basic legal requirement, includes the student's parent or guardian, a school
administrator, a general education teacher, and an intervention specialist. The IEP details how special education and related services will be delivered and monitored for a student with disabilities. When properly created, and implemented an IEP improves both teaching and learning, which are intended to improve the results of its recipient's education (Kupper, 2000).

Each IEP details the method(s) of delivering, measuring, and reporting the results of the educational program. Included in the details are statements of the student's present levels of academic performance; annual academic goals and measurable short-term benchmarks or learning objectives; required instructional services; a description of the LRE where specialized instruction takes place; and the methods of evaluating and reporting progress toward the goal(s), benchmark(s), and objective(s).

The implementation of every IEP is the responsibility of the student's school district. As such, districts are charged with collecting quantifiable data that demonstrates each student's adequate progress toward their IEP goals and educational curriculum. If a district fails to properly demonstrate adequate progress toward measurable annual goals and objectives, it is vulnerable to potential costly legal challenges from the student's parents and, or advocates (Johnston, 2010). Therefore, research based measures or methods of collecting quantifiable data that document a student's progress toward their IEP goals is required.

When parents or advocates do not agree with a school district's recommendations about their child's education, or feel the district is not adequately meeting their child's educational needs, they have the right under the Individuals with Disabilities Education Act, 20 U.S.C. § 1400 (IDEA) to challenge the decisions made about the placement and
the services the district provides for their child. When parents disagree with the school district, they have the right to pursue a number of options: (a) reach an agreement with school officials about appropriate educational placement(s) and program(s), (b) work with an uninvolved third party mediator to resolve the dispute, (c) request a due process hearing before an impartial hearing officer who decides how the issue will be resolved, (d) or file a complaint that details the specific aspect of IDEA that the school has violated with the state education agency who will resolve the complaint (Individuals with Disabilities Education Act, 20 U.S.C. § 1400, 2004). Therefore, it is vitally important for school districts to clearly measure the progress each student with a disability makes toward their IEP goals and objectives to ensure all members of an IEP team agree that the student's educational needs are met.

Within the school district, intervention specialists are responsible for implementing the special education programming that is detailed in their students' IEPs and accurately measuring the progress each student with a disability makes toward their IEP goal(s) and objective(s). By knowing a student's present level of academic ability, an intervention specialist is able to more accurately and efficiently teach the skills identified in the specially designed instruction section of the IEP. Norm referenced assessments like the WJ IV, identify a student's specific academic abilities and narrow the intervention specialist's instructional focus to adequately meet the educational needs of the student with disabilities. The assessment of a student's present level of performance is crucial when designing an educational program that addresses the individual student's needs (Kame'enui et al., 2006). Student assessment is also critical to implementing an IEP, evaluating a student's progress toward their IEP goals and
objectives, and revising an educational program so that it continues to address the student's most current needs and abilities.

Ohio Department of Education (2012), Ohio's procedural safeguard notice, "summarizes the state's special education rules in Chapter 3301-51 of the Administrative Code, Operating Standards for Ohio Educational Agencies Serving Children with Disabilities" (p. 1). *Whose IDEA Is This?* (Ohio Department of Education, 2012) explains the obligation of the IEP team to review an Evaluation Team Report (ETR) to determine if the child qualifies as having a specific learning disability in reading. "If the group determines that [the] child is a child with a disability, the Individual Education Plan (IEP) team will develop an IEP for [the] child" (2012, p. 16).

The IEP team specifically designs an education plan to address a child's identified disability and related instructional needs as they are described in the ETR. This includes measurable annual academic goals specifically designed for a student with a specific disability in reading. Academic reading goals are designed by using "a process [that is] based on [the] child's response to certain ways of teaching shown by research to be successful with children at [the] child's age and grade level" or "may use other procedures that research has shown to be successful" (Ohio Department of Education, 2012, p. 16).

IDEA was a precursor to the National Reading Panel (NRP), which wrote the standard on successful teaching methods and procedures in reading. The NRP was requested by Congress, and established by the National Institute of Child Health and Human Development and the U.S. Department of Education, in 1997. The NRP was charged with evaluating existing research and identifying the best methods of teaching children to read.
In April 2000, the NRP published its findings in the seminal work, *Teaching Children to Read: An Evidence-Based Assessment of the Scientific Research Literature on Reading and Its Implications for Reading Instruction* (National Reading Panel, 2000). The NRP report concluded that successful reading programs include three critical components: phonemic awareness; reading fluency; and reading comprehension skills. The NRP also identified six effective reading instruction techniques: (a) phonemic awareness, (b) phonics, (c) fluency; (d) guided oral reading; (e) vocabulary; and (f) reading comprehension strategies.

Measurable annual academic goals for students with a specific reading disabilities use a combination of the NRP's three key components and the six effective instruction techniques to adequately address the individual learning needs identified in each child's ETR. Ideally, a child with a specific learning disability in reading will be identified early in elementary school. A child with an identified specific learning disability in reading is guaranteed, by legislation, a FAPE and an educational plan that will teach the required reading skills to the student.

Of additional relevance to my study is the York-Barr, Sommerness, Duke, and Ghere (2005) article titled *Special Educators in Inclusive Education Programmes [sic]: Reframing Their Work as Teacher Leadership.* This article discusses the "increasingly complex and demanding" nature of a special education teacher's work and how "many are considering leaving the field or have already done so" (2005, p. 193). The authors explain that this teacher exodus has the potential for damaging "short- and long-term effects on the lives of students with disabilities" (2005, p. 193). This article contends that the work of special educators should be viewed as teacher leadership due to the inherent
volume of administrative responsibilities in their job. The authors (2005) conclude by recommending support for special educators in their role as teacher leaders. The article is relevant to my study because it touches upon Wenner and Campbell's (2017) description of teacher leadership as a potential solution to growing teacher attrition rates previously noted in my Chapter II, Teacher Leadership Theory section.

**Multiple Intelligences Theory**

IEPs are developed to support the learning of students with disabilities in the LRE (Individuals with Disabilities Education Act, 20 U.S.C. § 1400, 2004). At Lincoln Elementary School, the LRE, for students with specific learning disabilities in reading, is the general education classroom. In the general education classroom teaching techniques, like lectures at the front of the classroom, notes on the board, oral questions about readings, and assessment through written work, are the norm (Stanford, 2003). An average student typically possesses the verbal and logical competencies to adequately perform in this learning environment. Contrarily, verbal and logical skills tend to be the weakest learning skills that students with disabilities in reading possess (2003). For this reason, IEPs specifically detail the most beneficial instructional methods that complement the learning styles and competencies that come naturally to students with disabilities.

When the seminal work *Frames of Mind* (Gardner, 1983; 1993) was published, Gardner's Theory of Multiple Intelligences (MI) challenged the commonly held understanding of the Intelligence Quotient (IQ). Prior to MI, intelligence was considered a limited human capacity, the whole of which could be measured by a single instrument that was designed to determine how much intelligence a person possessed (Gardner,
1993). Even today, IQ testing instruments "rely heavily on a blend of logical and linguistic abilities" to predict a student potential school ability (1993, p. x). When Gardner considered the variety of roles that were valued by different cultures at various points in human history, he could not accept that IQ testing measured the whole of a person's intellect. Gardner then identified a "far wider more universal set of competences" that did not "lend themselves to measurement by standard verbal methods" (1993, p. x). Gardner identified the seven competencies, or intelligences, that he says every person possesses in varying degrees.

Gardner named his initial six intelligences: (a) Linguistic intelligence, (b) Musical intelligence, (c) Logical-Mathematical intelligence, (d) Spatial intelligence, (e) Bodily-Kinesthetic intelligence, and (f) Personal intelligences (Interpersonal intelligence and Intrapersonal intelligence) (Gardner, 1983). Gardner's Intelligences, with the addition of a seventh, (g) Intrapersonal intelligence, were paraphrased by Stanford (2003):

(a) *Verbal, linguistic intelligence*: the production of language, abstract reasoning, symbolic thinking, conceptual patterning, reading, and writing.

(b) *Musical, rhythmic intelligence*: capacities such as the recognition and use of rhythmic and tonal patterns and sensitivity to sounds from the environment, the human voice, and musical instruments.

(c) *Logical, mathematical intelligence*: the capacity to recognize patterns, work with abstract symbols (e.g., numbers, geometric shapes), and discern relationships or see connections between separate and distinct pieces of information.
(d) **Visual, spatial intelligence**: visual arts, navigation, mapmaking, architecture, and games requiring the ability to visualize objects from different perspectives and angles.

(e) **Bodily, kinesthetic intelligence**: the ability to use the body to express emotion, to play a game, and to create a new product.

(f) **Interpersonal intelligence**: the ability to work co-operatively with others in a small group, as well as the ability to communicate verbally and nonverbally with other people.

(g) **Intrapersonal intelligence**: the internal aspects of the self, such as knowledge of feelings, range of emotional responses, thinking processes, self-reflection, and a sense of intuition about spiritual realities. (p. 81)

Since its conception, the list of multiple intelligences has grown to nine. Most recent MI lists include Naturalist intelligence and Existential intelligence.

Gardner (1983) contends that, by understanding a student's intelligence(s) profile and matching it with ideal instructional methods, a teacher is better able to design lessons that build upon a student's strengths, or works to bolster a student's weaknesses. Hearne and Stone (1995) use Gardner's contention as a call to action for schools saying, they "must meet the unique needs of students whose strengths and talents lie outside the narrow view of knowledge as being purely linguistic" (p. 447). Studies like *Improving Student Achievement in Language Arts Through Implementation of Multiple Intelligences Strategies* (Geimer, Getz, Pochert, & Pullam, 2000), indicate "a general trend toward an increase in achievement through the use of multiple intelligences strategies" and "a major
increase [in achievement through the use of multiple intelligences strategies] in students with IEPs" (p. 6).

The MI Theory "opens the door to a wide variety of teaching strategies" for teachers who often teach and assess students using verbal or linguistic methods because MI helps teachers understand how a student best thinks (Stanford, 2003, p. 82). The implementation of various teaching strategies during a single lesson provides an equal opportunity to students with disabilities who struggle with traditional verbal or linguistic intelligence strategies (Stanford, 2003). Balancing various teaching strategies throughout a lesson, allows non-traditional students to use their strengths for learning, thus improving their ability to master the content standards (Stanford, 2003).

As a result, students with disabilities in reading, have IEPs that often include non-traditional instructional methods, and benefit from the implementation of MI theory in the general education classroom (Geimer, Getz, Pochert & Pullam, 2000; and Stanford, 2003). Stanford (2003) explains the benefit of MI by saying "In the traditional classroom, assessment drives instructions. In the multiple intelligences classroom, assessment and instruction are partners" that "provide creative and active learning that engages all students -especially those with disabilities" (p. 84).

It is important for teachers to identify each student's MI profile. It is considerably more important for teachers to know the intelligence(s) of students with disabilities, whose strengths are not linguistic, to successfully make progress toward their IEP reading goals. Therefore, teachers need "multiple intelligence checklists or inventories [which] allow [them] to consider a child's performance in an intelligence area without having the child perform the task at the time of assessment" (Bordelon & Banbury, 2005, p. 34.)
The Misconception of Learning Styles

Washington Post reporter Valerie Strauss's blog, *Answer Sheet*, included as post written by Howard Gardner on October 16, 2013. In that post, Gardner states that although "it makes sense to find out about learners and to teach and nurture them in ways that are appropriate, that they value, and—above all—that are effective," he does not wholeheartedly endorse the relation of MI and learning styles (Strauss, 2013, para. 6). Gardner had two problems with how learning styles were lumped into his MI theory. First, Gardner explained, "the notion of 'learning styles' is itself not coherent. Those who use this term do not define the criteria for a style, nor where styles come from, how they are recognized/assessed/exploited" (2013, para. 4). Gardner goes on to explain his second issue with learning styles by saying, "When researchers have tried to identify learning styles, teach consistently with those styles, and examine outcomes, there is not persuasive evidence that the learning style analysis produces more effective outcomes than a one size fits all approach" (2013, para. 8). Gardner continues to explain that a lack of research evidence supporting learning styles is not a fatal flaw, but one that requires further study. Gardner explains learning styles as a hypothesis of how an individual approaches a range of materials. Gardner stated, "If an individual has a reflective style, he is hypothesized to be reflective about the full range of materials. We cannot assume that reflectiveness in writing necessarily signals reflectiveness in one's interaction with others" (2013, para. 10). However, if reflectiveness is truly observed across the board, educators should take that style seriously (Strauss, 2013). Gardner ends his post by instructing us to "Drop the term "styles." It will confuse others and it won't help either you or your students" (2013, para. 16).
Willingham, Hughes, and Dobolyi (2015) examined *The Scientific Status of Learning Styles Theories* and reiterated Gardner's opinion that "educators' time and energy are better spent on other theories that might aid instruction" rather than attempting to apply learning styles theory to each individual student they teach (p. 266). The authors (2015) are of this opinion because scientific support for learning styles theory is lacking. Even though no scientific evidence supporting learning styles theory exists, many educators believe in it. Willingham, Hughes, and Dobolyi explain that the "belief in learning styles theories is widespread" amongst teachers and the broader public (2015, p. 266). To demonstrate this point, the authors cited Howard-Jones' (2014) study that showed over "90% of teachers in five countries agreed that individuals learn better when they receive information tailored to their preferred learning styles" (Willingham, Hughes, & Dobolyi, 2015, p. 266). Although the learning styles theory is generally accepted by educators, it does not aid instruction (Gardner, 2013; Willingham, Hughes, & Dobolyi, 2015).

**National Reading Panel - Reading Instruction**

According to Ludlow (2010), the focus of today's educational agenda is improving the reading achievement of all students including those with disabilities; for them reading has never had a higher priority. The NRP was created in 1997, when the United States Congress requested a formal analysis of reading instruction in the United States. Congress implemented a panel of reading experts to study the cumulative research of all reading instruction techniques and their relative effectiveness.

Through its study of reading instruction, the NRP identified six key themes: (a) the role of parents and other individuals in providing early language and literacy
experience, (b) the early identification of children at risk for reading failure and appropriate timely intervention, (c) the significance of phonemic awareness, phonics, and good literature in reading instruction, (d) the necessity of scientifically-based knowledge about the various types of reading instruction and their effectiveness, (e) the importance of scientific evidence to reading research to identify reliable or valid results that can be replicated or applied to instruction, (f) and the impact of professional development on the role of teachers (National Reading Panel, 2000). The NRP also identified five reading instruction techniques: phonemic awareness, phonics, reading fluency, vocabulary development, and comprehension strategies.

Since the publication of the NRP's report in 2000, additional comprehensive studies of literacy research have been conducted. Included in these modern studies: Knowledge to Support the Teaching of Reading: Preparing Teachers for a Changing World (Snow, Griffin, & Burns, 2007) focuses on the educational cycle of teacher learning, enacting lessons, assessing knowledge, and reflecting on instruction. Snow also includes teacher improvement sections related to pedagogical practices, classroom management, organizational alternatives and clinical practice; Theoretical Models and Processes of Reading. (Alvermann, Ruddell, & Unrau, 2013), a text that presents past perspectives on literacy research and future methods of teaching reading and literacy which includes the use of computer assisted instruction; the Handbook of Research on Teaching the English Language Arts, 2nd ed. (Flood, Lapp, Squire, & Jensen, 2003), a text that presents the historical and theoretical perspectives of language arts teaching and learning; and the Handbook of Reading Research, Volume III (Kamil, Mosenthal,
Pearson, & Barr, 2000), a text that presents methods of various global literary research and findings on literary processes, practices and policies.

Each of these comprehensive texts and reports emphasize the importance of technology to the future of reading instruction and learning. Since the publications of the NRP report and the other cited reading research texts, Computer Assisted Instruction (CAI) has been specifically designed to supplement reading instruction. Computers are practical tools for supplementary reading instruction because CAI software can be programmed to present interesting and motivational learning activities, positive reinforcement, and practical feedback to students (Macaruso, Hook, & McCabe, 2006).

CAI programs serve different needs and populations. For example, Wise, Ring and Olson (2000) conducted a considerably comprehensive study contrasting the impact of two kinds of CAI programs on the reading skills of 200 elementary aged students. The first program taught phonological skills like sound-letter patterns, nonsense word sounds and spelling, and articulation of speech sounds. The second program taught accuracy reading and fluency (speed and comprehension) skills. The Wise, Ring and Olson study found that phonological-analysis training was a greater benefit to the elementary aged students than the accurate-reading-in-context training. The same study indicated word attack skills benefit younger, less experienced elementary readers. A broad implication of that study led me ask whether more experienced readers, who have learned phonological reading skills, would benefit from the relatively advanced fluency and comprehension reading skills presented in other CAI programs.
The Paradox of Reading Instruction

Literacy is still the unrivalled, but grossly under-implemented, key to learning both content and thinking skills (Schmoker, 2011). Meyer (2013) states that "only by reading extensively (about 150 hours per year) and critically analyzing primary sources, textbooks, and newspapers can children debate, argue, and write about the content they are exploring" (p. 90). Schneider et al. (2016) explained reading fluency and reading comprehension, the component skills of literacy, are foundational "to educational attainment across domains" (p. 798). These skills "bridge the gap between learning to read and reading to learn" (Duke, Bennett-Armistead, & Roberts, 2003, p. 226). Prior to applying the skill of reading to the process of learning, students must master the system of sound-symbol correspondence or phonological awareness.

A meta-analysis (Ehri et al., 2001) of the National Reading Panel (2000) report indicated that teaching phonics, specifically the relationship between written symbols and spoken sounds, will improve the literacy achievement of all students, even those with specific learning disabilities in reading. Snow, Griffin, and Burns' text Knowledge to Support the Teaching of Reading: Preparing Teachers for a Changing World (2007) explains that most American teachers are not prepared to provide their students with research-based instruction in reading. Walsh, Glaser, and Dunne-Wilcox (2006) reiterate this point by stating "only 15 percent of the education schools provide future teachers with minimal exposure to the science" of reading instruction (p. 3). Savage et al. (2013) claimed one method of promoting reading achievement was through the use of CAI to teach code-base phonemic awareness and phonics to groups of elementary students. Therefore, teachers must identify an efficient CAI method of providing
research-based reading instruction to groups of struggling readers, to prepare them for the reading-to-learn process and the increasingly complex standards of the Common Core Curriculum.

**Computer Assisted Instruction**

Gibson (2009) published a doctoral dissertation titled *The Effects of a Computer-Assisted Reading Program on the Oral Reading Fluency and Comprehension of At-Risk, Urban First Grade Students*. Gibson's dissertation examined the impact of a CAI reading program on the reading fluency rates and reading comprehension skills of eight, first-grade students identified as at-risk by their Dynamic Indicators of Basic Early Literacy Skills (DIBELS) benchmark assessments in reading. Gibson used DIBELS test results to identify his participants, AIMSweb probes to measure incremental fluency and comprehension gains, and the Woodcock Johnson Test of Achievement III, as pre- and posttest measures of the interventions impact on a participant's reading fluency rates and reading comprehension skills. Gibson's results suggested "computer assisted reading programs are a viable means to supplement classroom instruction" (2009, p. iv). Gibson's results indicated that the CAI intervention successfully increased every participant's oral reading fluency rate over their baseline score.

Keyes (2010) published a doctoral dissertation titled *The Effects of a Computer-Assisted Reading Program on the Oral Reading Fluency, Comprehension, and Generalization of At-Risk, Urban Second-Grade Students* to build upon the research previously conducted by Gibson (2009). Keyes' dissertation also examined the impact of a CAI reading program on the reading fluency rates and reading comprehension skills of six, second grade students determined to be at-risk by their DIBELS benchmark
assessments in reading. Keyes used DIBELs test results to identify her participants and AIMSweb probes as pre- and post-test measures of her participants' reading fluency rates. Keyes results indicated an increase in each participant's reading fluency rate and supported the use of CAI in elementary reading classrooms which "are filled with students of varying reading ability levels" and are "where teachers can use" CAI programs "to provide individualized reading practice" and instruction (2010, p. 160).

**MindPlay Virtual Reading Coach**

Methods & Solutions Inc., a publishing and development company, was founded in 1981 and is the parent company of MindPlay ("MindPlay Research Document: RAPS 360," n.d.). MindPlay has developed a suite of reading instruction computer programs to diagnose an individual student's reading skills and provide specifically designed lessons to address their identified weakness. The following describes the suite of program features: (a) the Universal Screener, a reading analysis prescription system, formerly named RAPS 360, (b) MindPlay Virtual Reading Coach (MVRC), an online instruction module for students with reading skills gaps, and (c) MindPlay Reading Fluency, an online fluency training program. The suite is a graduated system that quickly and efficiently analyzes students' reading weaknesses and prescribes lessons to improve those skills. The MVRC program includes lessons in phonemic awareness, phonics, vocabulary, grammar for meaning, reading comprehension, and reading fluency; the five critical components of reading identified by the NRP (2000).

MVRC is a "way of teaching shown by research to be successful with children at [their] age and grade level" and a procedure "that research has shown to be successful" (Ohio Department of Education, 2012, p. 16). In its professional teaching guide
(Mindplay®, Division of Methods & Solutions, Inc., 2008), the program's developers say, MVRC "systematically and uniquely addresses all three of [the] critical components" identified by the NRP (p. 2). This includes phonemic awareness, reading fluency, and reading comprehension skills. Because MVRC teaches the research based NRP critical components of successful reading programs, it is marketed as "an effective online reading program that improves reading skills quickly and efficiently" that "enables students with diverse skills and instructional needs to read accurately and fluently" ("MindPlay Virtual Reading Coach," n.d.).

MVRC provides phonics instruction by introducing letter, fused, or blended sounds and their corresponding alphabet symbol(s) (Mindplay®, 2008). MVRC uses visual, auditory, and kinesthetic instructional methods to teach students the association of produced sounds and letter symbols. It continues developing phonemic awareness by teaching students to understand reading as the process of giving meaning to sounds and letters. After learning the connection of sound, word, and meaning, MVRC participants begin to read sentences that teach grammar, and reading fluency with pause points and inflection (Mindplay®, 2008). As MVRC participants increase reading fluency, more complex sentences and reading comprehension techniques are introduced (Mindplay®, 2008).

A new MVRC participant begins with the Universal Screener placement test. The screener determines the participant's level of reading competency by presenting activities that assess decoding skills, encoding skills, eye tracking ability, oral reading fluency, and reading comprehension. The placement test activities determine the participant's
strengths and weaknesses in reading. MVRC uses the Universal Screener to assign appropriate lessons that specifically address the participant's reading needs.

MVRC includes 61 lessons. Participants automatically advance through the lessons based on their individual progress assessment data. MRVC assigns the necessary lessons, practice activities, and progress monitoring assessments "to ensure that [participants] focus only on the lessons they need to progress at their own pace" (Mindplay®, 2008, p. 5). Each lesson begins with an introduction. During the introduction, a video of a reading coach teaches a new reading skill. The introduction is followed by three to five repeated activities that teach and reinforce the presented reading skill. MVRC includes these five repeated activities: (a) Wording Building, sound letter association, (b) Listen and Find, visual discrimination of sound to symbol, (c) Reading, decoding real and nonsense words, (d) Writing, kinesthetic reinforcement of the letter sound association, and (e) Two Syllable Words, skill generalization to longer, plural or compound words (Mindplay®, 2008). Mindplay® (2008) recommends "younger students use the program 30 minutes a day, 4 times a week" (p. 7). Mindplay® (2008) also encourages the consistent use of MVRC to increase its effectiveness. The MindPlay website claims MVRC is exceptionally successful when used for a minimum of two hours per week; specifically, a minimum of four, one-half-hour sessions. MindPlay's commercial literature and website claim students will "improve one grade level in reading in 20 hours" ("MindPlay Guarantee", n.d., para. 1).

Based on MindPlay's claimed success, the Ohio Department of Education's literacy by the end of third grade, and the federal IDEA requirement to provide research based instruction for students with disabilities, MVRC appeared to be a viable means of
effectively and efficiently improving elementary students' basic reading skills. This understanding was further supported by literature that studied, reported on, and supported MVRC's instructional potential.

**MVRC Studies**

During the 2006-2007 school year, Chapin High School in El Paso, TX participated in a study that analyzed the impact of MVRC on ninth and tenth grade students who were reading two or more years below grade level as determined by the Gates MacGinitie Reading Test (Booth & Gonzales, 2009). Those students who read more than two years below grade level were randomly assigned to a control or test group. The test group spent 90 minutes every other day working with MVRC. The test group continued this rate of participation until the completion of the program. Booth and Gonzales reported that 75% of MRVC participants finished the program's lessons and passed their grade level state-mandated assessment in only one school year.

A specific case from their study was used to exemplify the potential of MVRC. A ninth grader began the school year reading at a sixth-grade level with a fluency rate of 125 words per minute (wpm). After one semester of work with MVRC, the student read at an eleventh-grade level with a fluency rate of 330 wpm. "In addition some students' spring 2007 state-mandated test results showed 'added value' increases between their anticipated scores (on the basis of past test scores) and the actual scores were as much as 500 points" (Booth & Gonzales, 2009, p. 34)

Schneider-Richardson (2015) published a dissertation titled *The Effects and the Use of an ICT-Based Reading Intervention on Students' Achievement in Grade Two*. Schneider-Richardson's quasi-experimental research evaluated the efficacy of
MVRC on the participants' reading fluency rates. Schneider-Richardson's study included 170 second-grade students. She used subtests of the WJ IV and the Test of Silent Word Reading Fluency (TOSWRF-2) as pre- and post-test measures. "Analysis revealed a significant main effect of the intervention on achievement scores of participants assigned to the treatment conditions, a result which was confirmed across three of the study's dependent variables" including reading fluency rates (Schneider et al., 2016).

**MVRC Studies Published by MindPlay**

MindPlay's director of educational services publishes a quarterly newsletter which includes articles that detail the successful implementation of MVRC in various school districts throughout the United States. A review of these published newsletters yielded 14 articles that described the implementation and results of MVRC in various elementary schools around the country. Three of the MindPlay published articles which relate specifically to my study are summarized in this section. The first example was a single subject study; the second measured the impact of MVRC on elementary reading fluency rates; the third measured the impact of MVRC on elementary STAR reading assessment data. The 11 additional articles published by MindPlay are summarized in Appendix D: Additional MVRC Studies Published by MindPlay.

"Students Achieve Outstanding Reading Gains Using MVRC" (2014), described the reading gains made by students who used MVRC in the Bonduel School District, Bonduel, WI. Since the implementation of IDEA in 2004, Response to Intervention (RTI) programs have provided early intervention to struggling students through multiple tiers of increasingly intensive instructional interventions (Fuchs & Fuchs, 2006). In 2013, the Bonduel School District used MVRC as a RTI tier 2 and tier 3 intervention

This article went on to describe three single-subject-case studies. The first, a fourth grader, who improved from a pre-school reading level to a third grade reading level, during a single academic year, also increased his reading fluency by 156 wpm and his MAP test score by 22 points. The second, a fifth grader who received special education services, began the school year reading at the kindergarten level and improved five grade levels in one school year, increasing his fluency by 92 wpm and his MAP test score by 25 points. The third, a sixth-grade student who also received special education services, participated in the MVRC program for two school years, increased her reading level from the first grade to the sixth grade, and increased her reading fluency by 58 wpm.

"Reading Intervention Students Succeed on MVRC and Reading Fluency" (2016), tells the story of students in Sparks, Nevada. In January, 2016, 25 students began using MVRC for 25 minutes a day, five days a week. The article explained that second through fourth grade students had the most success using MVRC because the program developed the reading skills those students lacked. The article provided specific examples of students' success which included a second-grade student with a learning disability who improved from a kindergarten reading level to a first-grade reading level after eight hours of MVRC interventions; and a fourth-grade student who improved her reading fluency rate from a kindergarten level to a second-grade level after ten hours of exposure to the MVRC program.
"Learning Disabled Elementary School Students Excel in MVRC" (2017) described the experience of ten students with a specific learning disability, who worked with MVRC for 30 minutes a day each week. In the article (2017), Melody Morris, a special education teacher at Sherwood Elementary School in Sherwood, Arkansas, explained that "from September to November of 2016, six out of ten learning disabled students made more than a 0.5 reading grade level gain based on their STAR benchmarks" (p. 1). These students with specific learning disabilities had made a half-of-year's growth in reading, during one school-year quarter, because of daily exposure to MVRC. Morris further illustrated the effectiveness of MVRC by saying, "In September, my fourth and fifth grade students began the school year averaging 1.8-3.4 reading levels based on the STAR reading benchmarks. At the end of November, they were averaging 2.1-4.8" (p. 1). Here again, Morris points out the effectiveness of the MVRC program in a short period of time. To further illustrate the effectiveness of MVRC, the article described a fourth-grade student who began the 2016-2017 school year at a 1.2 independent reading level. In January, 2017, after 35 hours of exposure to MVRC, this same student was reading at a 4.1 grade level. "His STAR reading range went from 1.9-2.9 to 3.2-5.0 even though he is in the fourth grade with a reading disability" (p. 1).

**Summary**

The written word had guided the process of education since the inception of mass communication and the invention of the printing press. Ironically, the very things that were intended to educate the masses have marginalized those who cannot read. Many of those who cannot read, lack the capacity due to disabling conditions. United States federal laws have been enacted to guarantee the provision of a FAPE and specialized
instruction to children with disabilities, whose abilities to read are not within the range of their typical peer group. The NRP identified the critical components and effective techniques of reading instruction. When implemented these components and techniques taught children with disabilities to read; ultimately showing an improvement their reading skills that were comparable to their grade level peer group. Ideally, all students should be taught to read by an adult mentor or teacher, in a one-on-one or small group educational setting. Unfortunately, this was time consuming and seen as an inefficient method of reading instruction at the elementary grade levels. Modern CAI programs, like MVRC, presented an opportunity for large groups of students with identified reading disabilities to receive individualized reading instruction from a computer. The potential result was a more efficient method of teaching reading skills to large groups of students because CAI limited the time required for students to participate in remedial reading classes. This enabled them to participate in grade level classes, and in electives, with their typical peers.

Students who possessed the ability to fluently read and comprehend at grade level were better able to master grade level educational standards. These students demonstrated the annual yearly progress expected of them by the Common Core State Standards. Research that evaluated MVRC indicated that it effectively and efficiently taught users the critical components of reading. Therefore, I evaluated MVRC’s ability improve in the reading fluency rates, reading comprehension skills, and WJ IV standard scores of students with disabilities at Lincoln Elementary School, Rockfield, OH.
CHAPTER III

Introduction

Chapter III served as my methodology description. It began with an explanation of my study's conceptual framework and its purpose, identification of a tool that improved the elementary reading skills of students with disabilities. In Chapter III, I stated my research questions and described my study's elements: (a) research design, (b) participant selection, (c) research setting, (d) researcher biases, (e) measurement and intervention instruments, and (f) collection and analysis of reading data. Chapter III provided an overview of my quasi-experimental study used to determine the effects of MVRC on participants' reading fluency rates and reading comprehension skills.

Conceptual Framework of My Study

My study applied the Teacher Leadership for Student Learning theoretical framework (York-Barr & Duke, 2004) and the Spheres of Teacher Leadership Action for Learning model (Fairman & Mackenzie, 2012) to an action research study that analyzed the impact of a computer assisted reading intervention on student learning. In my study, student learning was determined by the reading fluency rates and reading comprehension skills of elementary students with reading disabilities. Through the design and implementation of my study, I applied teacher leadership theory to an identified problem and experimental solution for the sake of student learning at Lincoln Elementary School in Rockfield, Ohio. To explain my application of theory, I used the Spheres of Teacher Leadership Action for Learning model, which was founded in the framework of Teacher
Leadership for Student Learning theory, to exemplify my study's adherence to the conceptual framework of teacher leadership theory.

**Sphere A, Individual teacher engages in learning about his or her practice.** As an Intervention Specialist (special education teacher) my role was to design and implement research-based, reading intervention programs for students with disabilities. As an intervention specialist, I was committed to improving my professional expertise, knowledge and skills. Through my literature review, I came to understand the importance of phonemic awareness instruction for teaching children the necessary skills to read fluently with comprehension (Ehri et al., 2001). Through my own professional development, I learned of a CAI program that teaches students phonemic awareness and other reading improvement skills. I elaborated on this topic in my study's literature review. My acquired knowledge led me to make a change in my classroom, where I implemented the MVRC program and studied its ability to improve upon student learning.

**Sphere B, Individual teacher experiments and reflects.** My study was a literal representation of action within Sphere B. During my study, I designed an innovative experiment in an effort to change my instructional practices for the benefit of student learning. After the experiment, I reflected upon my study's results which determined the impact of MVRC on my participants' reading skills and determined how their learning was improved.

**Sphere C, Teacher shares ideas and learning; mentors, coaches, other teachers.** As an Intervention Specialist at Lincoln Elementary, I collaborated with third and fourth grade general education English language arts teachers, reading specialists,
and Title I reading tutors to implement the IEP reading goals of our students with reading
disabilities. As school-based members of IEP teams, we shared our pedagogical
opinions, instructional ideas, and teaching practices to aid student learning within our
school. An example of this sharing was the design and implementation of the MVRC
reading intervention program. Throughout the implementation process, I shared my
knowledge and ideas with my colleagues, who provided me with appropriate feedback
about their understanding and questions. My knowledge and ideas fostered a mentoring
and coaching process where I taught my colleagues how to administer the MVRC
program. This collaborative sphere enhanced our team's instructional methods and
resulted in improved student learning.

**Sphere D, Teachers collaborate and reflect together on collective work.** Sphere D's relationship to Spheres C and E illustrate the fluidity of Fairman and Mackenzie's (2012) conceptual model of teacher leadership. Throughout my study, my colleagues and I discussed and debated the potential impact of MVRC. Our dialogue included topics about the intervention program's implementation, participant selection, progress monitoring, desired outcomes, and reflections on student learning.

**Sphere E, Teachers interact in groups and through relationships.** Before, during, and after my study, I worked with various teacher and administrator groups at Lincoln Elementary and in the Rockfield School District. Through these relationships, I influenced a change in school and district norms, pedagogical beliefs, and educational practices. The change embraced the potential of CAI in addition to our teacher-student instructional model. The addition of CAI to our traditional instructional model improved
our teaching practices and our ability to provide more frequent individualized reading instruction to students with disabilities, thus improving student learning.

**Sphere F, Teachers question; advocate; build support and organizational capacity.** My study of MVRC began with the question: Can the addition of CIA efficiently improve the reading skills of students with disabilities and their ability to master the CCSS? To test my hypothesis that CAI would result in faster student learning, I had to build administrative and teacher support of the concept, publicly advocate for the MVRC's purchase, and organize a school-wide change that allotted the necessary materials and time to implement the reading intervention program. Through this process, I helped to build Lincoln Elementary's capacity for distributed teacher leadership that resulted in improved student learning.

**Sphere G, Teachers engage in collective school-wide improvement, focus resources, and distribute leadership.** My study exemplified participation in planning and implementing a school-wide effort to improve student learning. Lincoln Elementary dedicated monetary and instructional resources to this goal. By asking, could MVRC successfully improve the reading skills of students with disabilities, we acknowledged the intervention program's potential to improve the reading skills of all remediate readers at Lincoln Elementary, and the school district's state standardized test scores.

**Sphere H, Teachers collaborate with the broader school community, parents.** My study required buy-in from multiple school community stakeholders, including my students with reading disabilities and their parents or guardians. The goal of our collaboration was to improve student learning at the individual level, the elementary school level, and ultimately the school district level. As a result, the potential
impact of this reading intervention was limitless. Theoretically, it reached far beyond individual students, Lincoln Elementary School, and the Rockfield School District because the reading intervention program could be utilized in similar efforts throughout Ohio and the United States. Through collaboration, MVRC had the potential to improve the efforts of every reading instructor who was willing to implement the program for the benefit of student learning.

**Sphere I, Teacher (or group) shares work outside of school-with professional organizations.** The culminating result of my teacher led action research was this study, which I shared online, through the Ashland University library database system. Additionally, I reported my study's results to my colleagues at Lincoln Elementary School and other professional organizations. The president of RELane Team Concepts requested the results of my research for a presentation at the 2017 *Embracing Hope, Purpose, and Joy in Our Schools* conference hosted by Battelle for Kids (R. Friedman, personal communication, October 26, 2016). Additionally, MindPlay's director of educational services requested a copy of my research data to cite as support for the instructional power of their MVRC program (L. Garcia, personal communication, July 17, 2017). Finally, I planned to author an article that details the process and results of my research study after my dissertation defense.

By explaining my study's relationship to the *Spheres of Teacher Leadership Action for Learning* conceptual model (Fairman & Mackenzie, 2012) and the theoretical framework of *Teacher Leadership for Student Learning* (York-Barr & Duke, 2004), I have intentionally described the lens through which I analyzed my study's results. My research lens applied teacher leadership theory, through the use of action research, and
the application of single subject research design, to my improved student learning efforts. The reflective component of teacher leadership theory and action research were further detailed in Chapters IV and V of my dissertation.

**Purpose of My Study**

The general purpose of this study was to identify a means of effectively and efficiently increasing the reading grade levels of elementary students with disabilities. My research study measured and analyzed the impact of exposure to MVRC on the reading fluency rates, the reading comprehension skills, and the WJ IV standard scores of elementary students with an identified Specific Learning Disability in reading (Ohio Department of Education, 2012). My study was designed to determine the impact of the MVRC reading intervention program on each participant's reading fluency rate, reading comprehension skill level, and WJ IV standard scores. To determine if MVRC improved the participants' reading skills, pretests and posttests were completed and compared to quantify the impact of MVRC during my forty-week study.

I included a description of action research in my literature review because I framed my study using Mills' *Dialectic Action Research Spiral*. I was a teacher who applied Mills' Spiral to my action research study of an identified a problem in my school and classroom. I chose to address the problem through the following steps: (a) I reviewed literature that was relevant to my research problem, (b) I designed an action plan, (c) I observed and collected the resulting data, and (d) I interpreted that data to guide my recommendations for future action at Lincoln Elementary School to improve the reading skills of students with disabilities. Based on this process, I considered Mills' version of Freire's Participatory Action Research (PAR) to be the ideal method of
applying the theoretical constructs of teacher leadership theory to the issues that I faced as a teacher who wanted to improve student learning and my educational community's instructional practices.

Frankel and Wallen (2006) would describe my study as action research based. Action research is a less formal type of research, conducted by a practitioner, who seeks a method for improving local practices (2006). Frankel and Wallen explained that "those involved in action research generally want to solve some kind of day-to-day immediate problem" (p. 567). They also stated that a commonly used term in action research is participants, which reflects the "intent to involve them directly in the research process as part of the research team" (p. 13).

My study fulfilled Frankel and Wallen's (2006) fundamentals of action research. First, my study did not seek powerful generalizations. I sought localized information that would help me to understand the impact of a reading intervention within the specific educational environment where I was employed as an intervention specialist. Second, my study's focus was on the participants from whom my data was collected and who were affected by my study's outcomes.

"Action research involves four basic stages: (1) identifying the research question(s), (2) obtaining the necessary information to answer the question(s), (3) analyzing and interpreting the information that has been gathered, and (4) developing a plan of action" in the process of conducting action research (Frankel & Wallen, 2006, p. 570). Chapter III included a description of my action research methodology including my research questions and my study's design. These were followed by a description of the setting in which my study took place; a demographic description of the participants'
school district; and a statement of my biases as a researcher. I continued Chapter III by presenting the instrumentation I used; the data collection procedures I followed; and a statement of my study's limitations. I concluded with an analysis of my collected data and a brief summary of Chapter III.

**Research Questions**

The problem that led to my study was the need for a research based intervention that would effectively and efficiently increase the fluency and comprehension of students with reading disabilities at Lincoln Elementary School. The Individuals with Disabilities Education Act, 20 U.S.C. § 1400 (2004) required all specialized instruction to be researched-based. A potential, research-based, solution to this problem was the MVRC program. Before permanently implementing this program, I determined, through my research, if MVRC improved the fluency rates and comprehension skills of my study's participants.

The hypothesis of this study was that participation in MVRC for one academic semester (20 weeks) would improve the treatment group's reading fluency and comprehension skills to the point where they were able to read at grade level. The following were the three identified main research questions:

1.) Did MVRC have a significant effect on the participants' reading fluency rates as measured by the AIMSweb fluency probes?

2.) Did MVRC have a significant effect on the participants' reading comprehension skills as measured the STAR reading comprehension tests?
3.) Did MVRC have a significant impact on the group mean, of my participants' Woodcock Johnson IV pre- and post-test standard scores, in Broad Reading, Reading, Letter Word Identification, Reading Fluency, and Passage Comprehension?

**Research Design**

As Glatthorn and Joyner (2005) explained, the quantitative research dissertation perspective is one that results in an "objective reality" or understanding of a test variable's impact on a test subject through numerical data (pp. 39-40). The perspective of my study is quantitative in design. This quantitative study is quasi-experimental because of its emphasis on measuring students' reading skills with various standardized reading tests prior to, during, and immediately following exposure to MVRC. I sought a relationship between the implemented treatment variable and participants' posttest results.

My quasi-experimental study followed the general, single subject research design, A-B-A pre- and post-test procedures while conducting time series tests of experimental research. Single Subject Research Design (SSRD) is referred to by many names: (a) Single Case Experimental Design, (b) Time Series Design, (c) Small-N Design, (d) Single System Designs, (e) Within Subject Comparison, (f) Idiographic Research, and (g) N of One trial. Regardless of its moniker, SSRD studies an individual by repeatedly measuring one or more dependent variable(s) before, during, and after the application of an independent variable. This procedure is an attempt to quantify the impact of an applied intervention on the individual's behavior. Horner et al. (2005), described SSRD's focus on the individual learner as significance to the development of evidence-based practice in special education. The authors described the "long and productive history" during "which single-subject research has provided useful information for the field of
special education" (Horner et al., 2005, p. 165). Sidman (1960) first operationalized SSRD in his book *Tactics of Scientific Research: Evaluating Experimental Data in Psychology*. Since 1960, "single-subject research has proven particularly relevant for defining educational practices at the level of the individual learner" (Horner et al., 2005, p. 165). SSRD "allows for individual differences associated with participants" because it "is an adaptive research design capable of identifying practices that work" (Plavnick & Ferreri, 2013, p. 550).

SSRD was an ideal method for studying the reading progress made by students with disabilities because it provided "a level of experimental rigor beyond that found in traditional case studies" and "may be used to establish evidence-based practices" (Horner et al., 2005, p. 166). SSRD had "been essential in the development of effective instructional practices for students with disabilities" (Plavnick & Ferreri, 2013, p. 549). Legislation, like the No Child Left Behind Act of 2001 (2002), and the Individuals with Disabilities Education Act (2004), increased the appropriateness of SSRD to my research study. These laws required school districts to provide evidence based instruction for students with disabilities (Plavnick & Ferreri, 2013). Therefore, SSRD was ideal for studying the impact of special education interventions, like the one in my study, where progress toward IEP reading goals must be measured by pretests before an intervention begins; time series tests during the intervention period; and posttests when the intervention has ended. For these reasons, I concluded that single subject research was the most appropriate method for me to study the impact of MVRC on the reading skills of students with reading disabilities at Lincoln Elementary School.
Horner et al. (2005); Kazdin (2011); Kennedy (2005); Morgan and Morgan (2009); Plavnick and Ferreri (2013); and the U.S. Department of Education (2006), have published SSRD manuals that influenced me when I designed this study. These authors agreed that SSRD followed these steps: (a) the identification of participants, (b) the collection of dependent variable baseline, pretest data, (c) the implementation of the independent variable, the intervention, (d) the incremental collection of dependent variable data points while the intervention was being implemented, and (e) the final collection of dependent variable posttest data, after the intervention period. These steps closely resembled Mills' *Dialectic Action Research Spiral*, which was beneficial to the organization of my study according to SSRD.

The methodology of SSRD closely related to the legislated evidence-based process of creating IEP goals and collecting IEP progress monitoring data (Horner et al., 2005; Morgan & Morgan, 2009; Plavnick & Ferreri, 2013). For example, in both my study, and the IEP goal-process, a present level of performance was established by using pretest measures to determine the need for and requirements of a reading intervention. This preliminary step was followed by the process of identifying and implementing a reading intervention program. Time series test measurements were used to monitor the program's impact on the individual's reading skills while the intervention program was implemented. Finally, a posttest was conducted to measure the impact of the intervention on the individual learner's reading skills. Because current special education law required specialized instruction that is based on scientific evidence, my study's methodology closely resembled the process of IEP progress monitoring.
Therefore, my study's results would impact the selection of future reading intervention programs at Lincoln Elementary School.

For the purpose of my study, I used the Horner et al. (2005) "Quality Indicators Within Single-Subject Research," to design my study so it qualified as SSRD. Horner et al. (2005) also used their "Quality Indicators Within Single-Subject Research" to determine "if a specific practice or procedure has been validated as 'evidence-based' via single subject research" (p. 165). "The Quality Indicators Within Single-Subject Research" detailed the validating single subject research study components as the "Description of Participants and Setting; Dependent Variable; Independent Variable; Baseline, Experimental Control or Internal Validity; External Validity; and Social Validity" (Horner et al., 2005, p. 174). My specific application of the seven indicators is described in Chapter IV.

My study did not include random assignments, did not control for other factors, and did not use a control group. Rather, per SSRD, it uses each individual participant's baseline test scores as the independent control, allowing for a comparison of each participant's scores prior to, during, and after the MVRC intervention. The use of random assignment, and a control group, was not ethically feasible in the educational setting where my study took place. This was due to the intervention's potential benefit to my study's participants. Other factors that could not be controlled for were the various parallel reading interventions that my subjects received in addition to my study's MVRC intervention.

"Currently, there are two widely used methods for evaluating intervention effects based on single-subject designs" (Harrington, 2013, p. 8). The first method is the "visual
analysis of the graphs presenting experimental data" (2013, p. 8). Visual analysis "is a commonly used approach in applied behavior analysis research" (2013, p. 8). Visual analysis of graphs is a quick method of analyzing time series data points with the purpose of identifying increasing, decreasing, or zeroing trends. These trends are then objectively determined to be representative of the intervention's degree of impact on the subject. Although convenient and commonly accepted by behavioral scientists, Crosbie (1993) contends that inferences, that are based on visual analysis, are less reliable than statistical analysis.

The second method, "interrupted time-series analysis (ITSA)," is "the statistical method used in research fields" to analyze SSRD (Harrington, 2013, p. 8). ITSA is "used to assess the impact of external interventions on times series data" (McDowall, 1980, p.6). Educators "use these techniques to test and measure the impacts of treatments in quasi-experimental settings where more conventional experimental techniques would be inappropriate" (McDowall, 1980, p. 6). My analysis of my research data included a visual analysis of each participant's fluency and comprehension scores. It also included an ITSA, using a matched pairs t confidence interval test, to determine if MVRC made a statistically significant impact on each participant's fluency, comprehension, and WJ IV scores.

The matched pairs t-tests were performed using relevant pretest, time series test, and posttest scores to determine if the treatment made a difference in the participants' reading fluency rates and reading comprehension skills. The score comparisons examined the impact of MVRC on the individual participants' posttest scores relative to their own pretest scores. Additional time series tests were conducted weekly during my
study. Biweekly time series tests of reading fluency and reading comprehension were alternately conducted during my 20-week baseline period when participants were not exposed to MVRC. Biweekly time series tests of reading fluency and reading comprehension continued during the 20-week intervention period when MVRC was implemented.

To examine the impact of MVRC on each participant's WJ IV reading achievement pre- and post-tests, I conducted a group mean analysis using a matched pairs t confidence interval test, that compared the group's mean pretest scores with the group's mean posttest scores. This statistical comparison was used to determine if the group made statistically significant gains as measured by their WJ IV standard scores.

My manipulated variable was participation in the MVRC program. Participants used MVRC for the minimum number of hours required to improve their reading skills as defined by the program's developer. The following was my research design methodology: (a) identify participants, (b) establish pretest reading scores for each participant using the seven measurement scores, (c) collect participants' weekly time series test scores for a baseline period prior to using MVRC, (d) collect participants' weekly time series test scores during the MVRC intervention period, (e) collect posttest scores for each participant using the seven measurement scores, (f) compare and analyze each single-subject's pretest, time series tests, and posttest scores, (g) compare and analyze the group mean of each WJ IV reading standard score.

After a student was identified as a participant in my study, I administered pretest AIMSweb fluency probes, STAR Reading comprehension assessments, and WJ IV Tests of Academic Achievement in Broad Reading, Reading, Letter Word Identification,
Sentence Reading Fluency, and Passage Comprehension. When baselines were established, each participant's reading fluency rate and passage comprehension skills were evaluated biweekly by alternating the AIMSweb fluency tests and STAR comprehension tests, during the intervention period.

During the intervention period, participants began the MVRC program. Participants continued their biweekly AIMSweb and STAR testing. At the end of the intervention period, I administered the Woodcock Johnson IV Tests of Academic Achievement as posttests. Finally, I conducted an analysis of the pretests, time series tests, and posttests to determine the impact of MVRC on the participants' reading fluency rates, reading comprehension skills, and WJ IV standard scores.

These methods were appropriate for my study because they used available data to determine each student's strengths, weaknesses, and gains on reading assessments. Because my data analysis compared my participant's pre- and post-intervention reading skills, I required valid progress monitoring tools to generate evidence based interpretations of my participant's growth measures. An analysis of this data guided my recommendations for Lincoln Elementary's future reading intervention programs.

**Participant Selection**

The participants in my study included third and fourth grade students at Lincoln Elementary School, Rockfield, Ohio. Each participant qualified for an Individual Education Plan that provided goals and specialized instruction in one or more of the essential reading acquisition areas: (a) phonemic awareness, (b) phonics, (c) vocabulary development, (d) basic reading skills, (e) oral reading skills, (f) reading fluency skills, (g) reading comprehension strategies, and, or (h) reading comprehension (Section 1208 (3),
No Child Left Behind Act of 2001, (2002). All participants read below their current grade level according to their subscribed benchmarks of reading skill levels. Additionally, no participant used MVRC prior to the study.

**Setting**

Rockfield, Ohio, is a six-square-mile suburb of Cleveland, Ohio. It is home to more than 3,000 businesses which includes Fortune 500 companies, thriving commercial shopping areas, and multiple medical centers. Rockfield attracts more than 100,000 people every day for business, health care, shopping, or entertainment purposes. Its land values are among the highest in Northeast Ohio's Cuyahoga County.

Rockfield is home for approximately 5,500 families. Fifty-one percent of Rockfield's residents hold bachelor's degrees. Thirty percent of the children enrolled in Rockfield Schools have parents who are Rockfield school district alumni, and many have grandparents who are active community members. Rockfield's school district is unified in a partnership with the city's government and chamber of commerce to ensure its financial stability. The school district has never failed an operating school tax levy and has not requested a ballot levy since 2005.

Lincoln Elementary School houses the Rockfield School District's third, fourth and fifth grade students. With an enrollment of approximately 325 students and a certificated staff of 45, Lincoln Elementary provides a comprehensive academic curriculum that meets the needs of each individual student including gifted enrichment classes, general education and special education inclusion classes, and small group special education classes. Lincoln Elementary School's daily academic program includes balanced literacy instruction through a guided reading approach, mathematics instruction
through the Everyday Math program, social studies, science, and a 60-minute Unified Arts block period. The Unified Arts curriculum includes the following classes: visual arts; general music; vocal performance; band; orchestra; physical education; technology; library-media; and classes led by the guidance counselor.

Lincoln Elementary students have access to a computer lab, mobile laptop carts, and classroom iPads or Chromebooks. After-school opportunities include student council, yearbook, chess club, Destination Imagination, intramural sports, vocal choir, American Sign Language Choir, the Fiddle Factory, and Greenhouse Club. Bussing is available for students who stay after school to participate in these programs.

Lincoln Elementary School has an active Intervention Assistance Team that is responsible for incorporating its Response to Intervention programs. Lincoln Elementary also provides specialized instruction to its gifted-talented and special needs populations, and differentiated instruction to meet the needs of its diverse learners. Students are also provided transportation to the school district's sponsored before- and after-school care programs.

Researcher Biases

As the Intervention Specialist charged with the implementation of my participants IEP reading goals, it was in my professional interest to document adequate annual growth and progress toward their reading goals. As a result of my professional role at Lincoln Elementary, I developed close professional relationships with my study's participants and their guardians. During the study, I was not my participant's English Language Arts teacher of record, whose evaluation score could have been impacted by my participants' annual progress on their state mandated reading tests. My ability to perform my
professional duties was impacted by my participants' performance on those tests, and by their annual growth as readers. Therefore, it was in my professional interest that each participant improved their reading skills during the 2016-2017 school year.

I implemented the MVRC intervention program at Lincoln Elementary; conducted the time series AIMSweb and STAR assessments during my study; and administered the pre- and post-tests of academic achievement. As the sole individual administering the various instruments of data collection, there was a potential for impacting the validity of my collected data if I had not strictly followed the prescribed testing norms. Therefore, I adhered to the protocols prescribed by my norm-referenced assessment tools in order to ensure their validity.

**Instruments**

**The Multiple Intelligences Inventory for Teachers.** I included a section on Multiple Intelligences Theory (MI) in my literature review because I used its seven intelligences as a method to describe my study's participants. SSRD protocol requires detailed descriptions of participants so that each case study can be more accurately applied to similar cases (Horner et al., 2005). I used *The Multiple Intelligences Inventory for Teachers* (Bordelon & Banbury, 2005) to assess my participants' intelligences and corresponding learning styles. I felt that identifying each participant's intelligence(s), in addition to their demographics, and reading skills data, would enhance my study's ability to be generalized.

"Howard Gardner's multiple intelligence theory is an alternative to the unitary concept of general intelligence, but lacks a practical, reliable, and valid method of assessment" (Shear & Jones, 1994, p.3). "Few empirical studies validating the theory of
multiple intelligences have been published" (Bordelon & Banbury, 2005, p. 47). Although I was able to identify other MI inventories and checklists (Leibowitz & Starnes, 1993; Plucker, Callahan, & Tomchin, 1996; and Shearer & Jones, 1994), I chose to build an MI evaluation tool based on the "Multiple Intelligences Domains and Items" to evaluate each of my participant's MI profile (Bordelon & Banbury, 2005).

I must note that in 1997, Shearer validated his instrument for measuring MI, "The Multiple Intelligence Developmental Assessment Scales" (MIDAS). MIDAS is commercially available for purchase from Multiple Intelligences Research and Consulting Inc. Due to financial restraints, I was unable to purchase and use MIDAS for my study. Additionally, the complex and long MIDAS assessment required so much time that it violated the required number of specialized instructional minutes specifically defined by each participant's IEP. I decided that completing my version of The Multiple Intelligences Inventory for Teachers outside of class time was in each participant's best interest, because it provided me with a general understanding of their MI profile. Since the MI profile is a participant descriptor in my study and not a variable, I considered this to be an acceptable measure of MI.

The version of The Multiple Intelligences Inventory for Teachers that I built (included 90 Multiple Intelligences Domains and Items statements rating. My version emulated the inventory Excerpt from The Multiple Intelligences Inventory for Teachers provided by Bordelon and Banbury (2005, pgs. 36-38). My inventory included 90 behavior statements in the left column and 90 five-point Likert Scales in the right column.
My MI evaluation tool inventoried an evaluator's assessment of a student's intelligences by using a "Likert-type rating scale," that "was developed based on guidelines established by Anderson (1982)" (Bordelon & Banbury, 2005, p. 35). The inventory required the Likert scale to rate how accurately a behavior statement described each subject. The inventory included 90 behavior statements which, when rated, scored, and inventoried, provide a ranking of the subject's multiple intelligences from most to least frequently observed by the evaluator. After I completed, scored, and interpreted each of my participants' rating scales, I used their inventories to identify each participant's two strongest intelligences and reported them in my Description of Participants section of Chapter III.

Validity and Reliability of The Multiple Intelligences Inventory for Teachers. Bordelon and Banbury (2005) were able to establish the "internal consistency reliability of the entire scale" (p. 47). The alpha for the whole of The Multiple Intelligences Inventory for Teachers was .98. However, "the factors that emerged from the analysis used...did not clearly match the seven intelligence areas proposed by Gardner. Therefore, The Multiple Intelligences Inventory for Teachers could not be validated" to specifically measure each individual intelligence (Bordelon & Banbury, 2005, p. 48).

Essentially, The Multiple Intelligences Inventory for Teachers used an efficient means of evaluating descriptive behavior statements rather than more thorough, but time consuming, MIDAS observed task performance measures. As a result, it could not reliably identify individually specific intelligences in my participants. Instead, it provided a general understanding of my students' MI profiles which I used to develop my
understanding of their MI profiles. For this reason, I believe the information that I gained from my *The Multiple Intelligences Inventory for Teachers* contributes to my Description of Participants and does not negatively impact the findings of my SSRD analysis of reading skills.

**Reading Skills Assessment tools.** For the purpose of this study the participants' reading skill levels were measured using eight tools: (a) the Pearson Academic Improvement Measurement System based on the web (AIMSweb) reading curriculum based measure of fluency (R-CBM), (b) and the Renaissance Learning Standardized Test for the Assessment of Reading measure (STAR), (c) two WJ IV standard score clusters, and (d) three WJ IV standard scores of reading achievement. Prior to the implementation of MVRC, the identified participants achieved below grade level benchmarks on each of those reading achievement measures.

The pretests and posttests measures for my study were the WJ IV Reading Cluster, Broad Reading Cluster, Letter-Word Identification subtest, Passage Comprehension subtest, and Sentence Reading Fluency subtest (Bradley-Johnson, Morgan, & Nutkins, 2004). The AIMSweb and STAR assessments served as time series tests to monitor my participant's biweekly reading performance during the baseline and intervention periods.

**Woodcock Johnson IV Tests of Achievement.** Flanagan and Alfonso (2016) described the WJ IV as a widely-used tool for assessing the academic abilities of children. Ding and Alfonso (2016) stated the WJ IV reading subtests provided "a measure of reading achievement via an individual's ability to decode words and the ability to comprehend meaning of text while reading" (p. 16). My study used the two WJ
IV test clusters and three WJ IV subtests to measure my participant's pre-and post-test reading skills.

The Reading Cluster used the results of the "Letter-Word Identification and Passage Comprehension tests to assess reading achievement in decoding and text comprehension" (Dumont, Willis, & Walrath, 2016, p. 58). The Broad Reading Cluster combined the results of the Sentence Reading Fluency test with the Letter-Word Identification test, and the Passage Comprehension test to yield, "a measure of overall reading achievement and taps into the area of reading decoding, reading comprehension and reading speed" (Ding & Alfonso, 2016, p. 16). The Reading Cluster and Broad Reading Cluster results were presented as standard scores (SS) with a mean of 100 and a deviation of 15 (see Table 3.1 WJ IV standard score description).

Table 3.1

**WJ IV standard score description**

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The Letter-Word Identification test measured a student's word identification skills, reading decoding (sight recognition) skills, and reading readiness skills (Bradley-Johnson, Morgan, & Nutkins, 2004). The initial test items required the test taker to identify individual letters; the remaining test items required increasingly difficult isolated words to be read aloud. Because these words were not read in context, it was not
necessary for the test taker to know the meaning of the presented words (Ding & Alfonso, 2016). Individuals with inefficient or nonexistent strategies for word identification performed poorly on this test.

The Sentence Reading Fluency test required test takers to read and comprehend simple sentences rapidly (Bradley-Johnson, Morgan, & Nutkins, 2004). It was a measure of a student's reading speed, automaticity, and rate of test taking. A low performance on this subtest may have been the result of limited basic reading skills, slow perceptual speed, reading comprehension difficulties, or an inability to sustain concentration.

During the Sentence Reading Fluency test, students were asked to complete up to 98 prompts during an allotted three-minute time span. During this timed test, "The examinee reads simple sentences quickly and silently, the and decides whether the statement is true or false" (Flanagan & Alfonso, 2016, p. 10). This subtest measured a student's application of basic reading skills including phonics, phonemic awareness, decoding, and reading fluency (National Reading Panel, 2000).

The Sentence Reading Fluency test required students to read five-word prompts and circle 'Y' for yes, if the prompt is true, and 'N' for no, if the prompt is false. An example of a true prompt was: "A man has two legs…..Y N" and an example of an incorrect prompt was: "Milk is pink……Y N" (McGrew, LaForte, & Schrank, 2014). The purpose of this subtest was to assess student reading speed and comprehension (Bradley-Johnson, Morgan, & Nutkins, 2004).

The Passage Comprehension test required an examinee to read "a passage and [identify] the missing word for the text" (Ding & Alfonso, 2016, p. 10). This subtest measured a student's application of more complex reading skills including vocabulary
and reading comprehension (National Reading Panel, 2000). The Passage Comprehension test required students to read and comprehend increasingly complex sentences and to use context clues to determine the sentence's missing word. This test's results were a measure of a student's reading comprehension skills, inferential reasoning skills, and vocabulary knowledge (Bradley-Johnson, Morgan, & Nutkins, 2004). A low performance on this subtest may have been the result of limited basic reading skills, slow perceptual speed, reading comprehension difficulties, or the student's inability to sustain concentration.

The Passage Comprehension test was not timed. The time a test taker was given on each of the 47 prompts was at the discretion of the examiner. The examiner's objective assessment of the test taker's ability to answer a prompt influenced the allotted time. Items should have been abandoned if the student gave the examiner an impression that he or she was unable to provide a response (McGrew, LaForte, & Schrank, 2014). The Passage Comprehension test prompts were clozed [sic] tasks; defined as sentences with certain words missing that required the reader to comprehend the prompt's contextual vocabulary and to replace the missing word (Taylor, 1953). An example of a Passage Comprehension test item was: "A bird has two ____." Acceptable answers to the clozed [sic] task defined by the testing protocol included: wings; eyes; legs; or feet. This test measured a test taker's ability to comprehend contextual information with only syntax and semantic clues (Bradley-Johnson, Morgan, & Nutkins, 2004).

**Reliability and Validity of the WJ IV Tests of Achievement.** The WJ IV was a reliable assessment that I used to provide a measure of reading achievement. The technical manual for the WJ IV (McGrew, LaForte, & Schrank, 2014) indicated that its
goal for test reliability was set at 0.80 or higher and the goal for cluster reliability was set at 0.90 or higher. Ding and Alfonso (2016) presented the median internal consistency reliability coefficient for the WJ IV Reading Cluster as 0.95 for ages two through eighty plus, and the median internal consistency reliability coefficient for the WJ IV Broad Reading Cluster was 0.97, also for ages two through eighty plus. Ding and Alfonso (2016) also presented the median internal consistency reliability coefficient for Reading Fluency as 0.96 for ages five through eighty plus and for Reading Comprehension as 0.93 for ages five through eighty plus. The Letter Word Identification subtest's internal consistency reliability was 0.80. Based on these reliability coefficients, the WJ IV clusters and subtests were reliable for the purpose of this study.

The assessment prompts presented in the WJ IV subtests and clusters were valid. Bradley-Johnson, Morgan, and Nutkins (2004) stated the WJ IV had established content validity because its test "items were developed with input from experts and the items were selected using the Rasch model to measure particular traits" (p. 269). The WJ IV manual indicated that the clusters and subtest corresponded with the major curricular areas noted by federal law (McGrew, LaForte, & Schrank, 2014). Bradley-Johnson, Morgan, and Nutkins (2004) provided evidence that the WJ IV subtests, that I used in this study, were interrelated and valid. Therefore, based this established validity of the WJ IV subtests and clusters, I accepted the resulting data as valid for the purpose of my study.

AIMSweb Reading Curriculum Based Measure. Curriculum-Based Measurement was identified as an alternative method of evaluating students' reading abilities in the 1980s (Deno, 1985; Shinn, 1989). Since then, hundreds of books, chapters, and peer reviewed journal articles have described how educators used Reading
Curriculum-Based Measures (R-CBM) to inform their teaching (Howe & Shinn, 2002). The R-CBM were created to address the three shortcomings of conventional reading tests. Traditional tests statically tested students at predictable annual intervals; they were used to make decisions like grade retention or identifying learning disabilities; and they were expensive and took a great deal of time to administer (Howe & Shinn, 2002). Howe and Shinn (2002) asserted that R-CBM addressed these well-known shortcomings by being simple to administer, quick (one minute), and "providing an accurate assessment of students' reading growth" (p. 3). The AIMSweb R-CBM of reading fluency was a progress monitoring tool that gathered individual student data, identified a student's grade level reading fluency rates, and determined if the student required additional reading fluency instruction. Educators also used the R-CBM measures as progress monitoring tools that determined the effect of reading interventions on reading skill acquisition (Silberglitt & Hintze, 2007). R-CBM assessments were administered to every student at Lincoln Elementary in the fall, winter, and spring as prescribed by the tool's creators (Pearson Education, 2012). At Lincoln Elementary, R-CBM probes were administered to students with disabilities more frequently, every one to two weeks, to document their progress toward their IEP reading goals.

Students read R-CBM probes, that were normed for their grade level, rather than their reading level, to measure their fluency rates relative to prescribed grade-level benchmarks. After a probe was administered, the individual student's score was compared with norm-referenced benchmarks to determine if the student was reading below, at, or above their grade level. Students who were reading below grade level at Lincoln Elementary were prescribed tiered reading interventions like Title I reading
services and, or reading skills lessons in an inclusion model English Language Arts (ELA) classroom.

For the purpose of this study, R-CBMs of reading fluency were used as biweekly, time series, progress monitoring tools. The purpose of these time series measures was to determine the short-term impact of MVRC on the participant's reading fluency rate during my study's duration. Every two weeks, during my study, each participant read a pre-selected, grade level passage. I used the data gained from these probes to document the biweekly progress each participant made toward their respective grade level reading fluency benchmarks (Pearson Education, 2014).

The R-CBM was administered one-on-one with the participant and researcher in a quiet classroom that was free of distractions at Lincoln Elementary. I provided the participants with paper copies of their reading probes. The participant read each probe aloud for one minute. I recorded the number of correct words each participant read in one minute.

AIMSweb R-CBM reading fluency rates were normed for tier one and tier two grade level benchmarks. The benchmarks indicated the number of words a student should have correctly read from a grade level passage. To read at the grade level tier one benchmark meant the student was reading at grade level. To read at the grade level tier two benchmark meant the student required reading intervention. To read below both benchmarks indicated the student required dramatic intervention and may have required specialized reading instruction through an IEP. Each grade level had tier one and tier two benchmarks for the fall, winter, and spring (see Table 3.2 AIMSweb R-CBM grade level benchmarks for reading fluency).
Table 3.2

AIMSweb R-CBM grade level benchmarks for reading fluency

<table>
<thead>
<tr>
<th>Grade</th>
<th>Fall Tier 1</th>
<th>Fall Tier 2</th>
<th>Winter Tier 1</th>
<th>Winter Tier 2</th>
<th>Spring Tier 1</th>
<th>Spring Tier 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>77</td>
<td>42</td>
<td>105</td>
<td>64</td>
<td>119</td>
<td>83</td>
</tr>
<tr>
<td>4</td>
<td>105</td>
<td>67</td>
<td>120</td>
<td>86</td>
<td>136</td>
<td>102</td>
</tr>
</tbody>
</table>


Reliability and Validity of the R-CBM. The R-CBM was a valid and reliable measurement of reading fluency rates. The R-CBM's validity and reliability were established by using standardized, frequent sampling of reading skill performance (Jensen, 2015). Good and Jefferson (1998) explained that the R-CBM's primary characteristics were its reliability and validity. Deno (2003) stated, "A substantial research literature has developed to demonstrate that CBM can be used effectively to gather student performance data to support a wide range of educational decisions" (p. 184).

In 2005, Hintze and Silberglitt conducted a longitudinal study of 1,766 students from first through third grades. Those students were assessed using the R-CBM in the fall, winter, and spring of each school year. The results of their R-CBM performance measures were compared with their performance on the Minnesota Comprehensive Assessment (MCA). The study's results suggested a strong association between the R-CBM and MCA performance at each grade level. The researchers indicated that this strong association was "both accurate and efficient in predicting those students who are likely to pass the reading portion of the MCA" (Hintze & Sinlberglitt, 2005, p. 372). Therefore, reading fluency rates were predictive of future standardized test scores.
Christ and Silberglitt (2007) evaluated the reliability of the R-CBM benchmark data by defining its standard error of measurement (SEM). Christ and Silberglitt (2007) used a sample of 8,200 students, grades one through five from the Midwest to establish their grade level benchmark scores. Christ and Silberglitt (2007) found that when the median of three R-CBM assessment are interpreted the "SEM will be in the range of 5-9" words per minute (p. 143). This established the reliability of reading fluency scores as measured by R-CBMs like the AIMSweb tests in my study.

Daniel (2010) summarized the finding of two studies of R-CBM reliability. The first study used a single (alternate-form) R-CBM probe, as a progress monitoring tool, at intervals of two weeks. The second study used the mean of three R-CBM probes, as fall, winter, and spring benchmark assessment tools, at intervals of four months. The two studies indicated that the reliability of the mean of three R-CBM probes is 0.90+ when given at intervals of two weeks or four months. Daniel (2010) presented a table that demonstrated the reliability of a single R-CBM probe. The reliability of a single third grade and a single fourth grade AIMSweb fluency probes is 0.85 (Daniel, 2010). These reliability scores further established my reasons for conducting biweekly single probe assessments of my participant's reading fluency rates.

**STAR Reading Assessment.** The STAR Reading Assessment (STAR) was a technology-based system that used basic skills tests to assess student reading skills, and used progress monitoring assessments to chart their learning. These tools used computer-adaptive technology to provide accurate data quickly by presenting and evaluating psychometric tests. "Psychometrics means literally 'measurement of the mind', and psychometric tests are designed to measure the intrinsic mental characteristics of a
person" (Hammond, 2006, p. 184). In this case, psychometric tests referred to online multiple choice test items that students completed while using the STAR program. When the assessment task was completed the STAR software calculated each student's reading comprehension scaled score.

The STAR software used a student's previous responses to gauge their reading ability and to select more or less challenging follow-up questions from its bank of over 5,000 assessment items. This process enabled the software to determine and report each test taker's reading skill level. The skills that STAR use to assess students are based on the 2010 Common Core Standards; the 2009 National Assessment of Educational Progress; the 2006 Principles of Adolescent Literacy Reform; and the 2004 Reading Next Report (Renaissance Learning, 2014).

Monitoring the progress that students with special needs make toward their IEP goals was an IDEA requirement since 2004. Progress monitoring was also an important factor during my study because it measured the incremental impact of the MVRC program on my students' assessed reading skills. According to Shapiro (2012) the "STAR measures offer an important and potentially valuable contribution" to progress monitoring because it can be done quickly. The STAR consisted of 34 questions and took typical student approximately 15 minutes to complete (Renaissance Learning, 2014). Shapiro (2012) also stated that "progress monitoring must be frequent" (p. 9). Renaissance Learning (2014) indicated that educators could administer the STAR progress monitoring assessment weekly without jeopardizing the validity and reliability of the tool.
The STAR Reading Assessment measured my participants' reading comprehension skills. The resulting standard scores were normed for fall, winter, and spring benchmarks at each grade level (see Table 3.3 *STAR reading benchmarks normed for grade level*). The benchmarks indicated the standard score that a student should have earned to demonstrate grade level reading comprehension skills. A standard score at the 75th percentile or above indicated that the student was reading at grade level and therefore, was expected to pass that state mandated grade level reading comprehension assessment. A student who performed between the 75th and 40th percentiles, at seasonal grade level benchmarks, was reading near the grade level expectation, but was also identified as at risk of failing the state mandated grade level reading comprehension assessment. A student who performed below the 40th percentile of the seasonal benchmarks was not reading at grade level, was at risk for failing the state mandated reading comprehension assessment, and would typically be recommended for specialized instruction in reading.

Table 3.3

*STAR reading benchmarks normed for grade level*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentile</th>
<th>Fall Scaled Score</th>
<th>Winter Scaled Score</th>
<th>Spring Scaled Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd Grade</td>
<td>75th-90th</td>
<td>461-591</td>
<td>500-613</td>
<td>547-673</td>
</tr>
<tr>
<td></td>
<td>40th-50th</td>
<td>319-357</td>
<td>357-392</td>
<td>393-436</td>
</tr>
<tr>
<td></td>
<td>10th-25th</td>
<td>177-259</td>
<td>215-294</td>
<td>255-334</td>
</tr>
<tr>
<td>4th Grade</td>
<td>75th-90th</td>
<td>568-689</td>
<td>612-774</td>
<td>659-853</td>
</tr>
<tr>
<td></td>
<td>40th-50th</td>
<td>415-458</td>
<td>449-487</td>
<td>476-520</td>
</tr>
<tr>
<td></td>
<td>10th-25th</td>
<td>265-350</td>
<td>287-375</td>
<td>318-406</td>
</tr>
</tbody>
</table>

Reliability and Validity of the STAR Reading Assessment. According to Renaissance Learning (2014), "STAR Assessments have been favorably reviewed as reliable, valid, and efficient by various independent groups, including the National Center on Intensive Intervention, the National Center on Response to Intervention, and the National Center on Student Progress Monitoring" (p. 1). Renaissance Learning claimed a total of 76 research publications have supported the STAR assessments ability to accurately assess student reading skills.

The STAR Reading Assessment's reliability "was estimated using two methods, internal consistency (generic reliability coefficients) and test-retest correlation coefficients, in a random national sample of more than 1.2 million STAR Reading Enterprise tests administered between September 2012 and June 2013" (Renaissance Learning, 2014, p. 22). The reliability coefficients expressed the overall precision of test scores from 0.00 to 1.00. Test reliability was "the proportion of test score variance that is attributable to true variation in the trait test measures" (Renaissance Learning, 2016, p. 31). It was noted in this literature that the technique used to estimate the STAR's 'generic' reliability is theoretical because traditional internal consistency reliability coefficients cannot be calculated for adaptive tests (Renaissance Learning, 2016).

The STAR test's internal consistency reliability estimates were very high (see Table 3.4 Internal consistency and retest reliability of STAR assessment). The grade three reliability was 0.94 and the grade four reliability was 0.93. Retest reliability estimates were 0.90 for all grades (K-12) combined. This degree of reliability was acceptable for the purposes of this study.
Table 3.4

**Internal consistency and retest reliability of STAR assessment**

<table>
<thead>
<tr>
<th>Grade(s)</th>
<th>Number of Students</th>
<th>Reliability Coefficient</th>
<th>Number of Students</th>
<th>Reliability Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>100,000</td>
<td>0.94</td>
<td>5,000</td>
<td>0.75</td>
</tr>
<tr>
<td>4</td>
<td>100,000</td>
<td>0.93</td>
<td>5,000</td>
<td>0.77</td>
</tr>
</tbody>
</table>


Content played an important role in the validity of the STAR assessment. Content validity was generally evaluated by analyzing the relationship between the assessed skills and the test items (Renaissance Learning, 2016). I considered the STAR test to be a valid measure of reading comprehension because its "content is aligned to curriculum standards at the state and national levels—including the Common Core State Standards" (Renaissance Learning, 2014, p. 23). Renaissance Learning (2014) presented a summary of 84 STAR validity studies that sampled 512,486 elementary students. These evaluations demonstrated strong evidence of the STAR test's predictive and external validities.

Construct validity evaluated a test by examining the measure of what it assessed. The STAR test "claims to provide an estimate of a child's reading comprehension and achievement level" (Renaissance Learning, 2016, p. 35). One method the STAR test used to establish its validity was comparing the results of its progress monitoring assessments with the Degrees of Reading Power (DRP) comprehension assessment, an alternative measure of reading skills. A raw correlation of 0.89 was observed between the STAR and the DRP. An adjusted correlation for weakening, due to measurement error, yielded a correlation of 0.96 (Renaissance
Learning, 2016). In these examples, the results of the two reading assessments were indistinguishable, thus asserting the construct validity of the STAR test.

Based on this content and construct validity information, and the data presented by The Research Foundation for STAR Assessments (Renaissance Learning, 2014, 2015, 2016), I concluded the STAR test was a valid measure of reading comprehension skills and was acceptable for the purpose of my study. I used the STAR assessment as a pretest baseline measure, time series progress monitoring measures, and a posttest measure.

**My Virtual Reading Coach.** My Virtual Reading Coach (MVRC) was a systematic tool that repeated and built upon new reading skills. MVRC used a student-specific series of interactive activities taught new skills and determined when those skills had been mastered. Students worked at their own pace while new lessons present unlearned skills for the students to practice. Virtual (pre-recorded videos) reading coaches and speech pathologists worked directly with each student to provide immediate feedback, which ensured their understanding of the presented MVRC lessons by modeling the new reading concepts. The MVRC internal assessments ensured that my students only participate in lessons they had not previously mastered. The focus on these previously unlearned reading skills resulted in more efficient reading skills acquisition through MVRC.

**Data Collection**

Prior to conducting my research study, I successfully completed the National Institutes of Health (2013) Office of Extramural Research web-based training course *Protecting Human Research Participants*. The Ashland University Human Subjects Review Board ensured my study was permissibly aligned with The National Institutes of
Health guidelines of ethics (See Appendix A). I submitted, to the principal of Lincoln Elementary, a written request for her permission to conduct my research and gather student reading data (see Appendix C). The principal granted permission to complete this study at Lincoln Elementary (see Appendix C). I also submitted an application, to the Ashland University Human Subjects Review Board (HSRB). After the Ashland University HSRB approved my request (see Appendix A), I identified potential participants for my study. I then contacted the potential participants’ guardians, by telephone and letter, and requested their permission to study their children’s reading skills (see Appendix B). After the guardians granted their consent for their children to participate in my study, I began to collect my participants' pretest scores and baseline fluency and comprehension data.

I created an Excel workbook to record the data findings of my study. Each participant’s name was replaced with a number that served as a pseudonym. Pretest data points were collected prior to my intervention period. I used the following as the pretest data points: (a) WJ IV Broad Reading composite test scores, (b) WJ IV Reading composite test score, (c) WJ IV Letter-Word Identification achievement test score, (d) WJ IV Reading Fluency achievement test score, (e) WJ IV Passage Comprehension achievement test score, (f) AIMSweb R-CBM reading rate, and (g) STAR Reading Assessment test scores.

During the ten-week intervention period, I conducted time series progress monitoring tests on an alternating bi-weekly basis. The AIMSweb grade level R-CBMs were used to monitor each participant's word per minute reading rate. The STAR Reading assessment was used to monitor each participant's reading progress.
Per the SSRD protocols described above, posttest data points were collected following the intervention period. The posttest data collection tools were the same as the pretest collection tools. Therefore, I used the following as the posttest data points: (a) WJ IV Broad Reading composite test scores, (b) WJ IV Reading composite test score, (c) WJ IV Letter-Word Identification achievement test score, (d) WJ IV Reading Fluency achievement test score, (e) WJ IV Passage Comprehension achievement test score, (f) AIMSweb R-CBM reading rate, and (g) STAR Reading Assessment test scores.

**Data Analysis**

Because "practical action research is intended to address a specific problem within a classroom," and "to be maximally successful, action research should result in an action plan that, ideally, will be implemented and further evaluated," the analysis gained from my study was of great importance to my action research plan’s results (Frankel & Wallen, 2006, p. 568). I collected the following data points for each of the ten participants.

(1) **Pretests** were collected during the baseline period. The following were the pretests: (a) WJ IV Letter Word Identification standard score, (b) WJ IV Sentence Reading Fluency standard score, (c) WJ IV Passage Comprehension standard score, (d) WJ IV Broad Reading composite standard score, (e) WJ IV Reading composite standard score, (f) AIMSweb reading fluency rate, (g) STAR reading comprehension standard scores.

(2) **Time Series Tests** were collected during the third quarter. The following are the time series tests: a) the AIMSweb reading fluency, and (b) the STAR reading comprehension standard scores.
Posttests were collected after the end of the baseline period. The following were the posttests: (a) WJ IV Letter Word Identification score, (b) WJ IV Sentence Reading Fluency score, (c) WJ IV Passage Comprehension score, (d) WJ IV Broad Reading composite score, (e) WJ IV Reading composite score, (f) AIMSweb reading fluency rate, (g) STAR reading comprehension scores.

The collected data was analyzed using Single Subject Research methodology. As Frankel and Wallen (2006) indicated, the magnitude of data change during incremental, time series tests-points must be taken into account when studying an intervention. Early time series test measures may appear to be stable, and may not indicate the strong experimental effect of significant increases in fluency rates and comprehension skills, when more dramatic improvements are expected. I took this type of result into account by considering the possibility of an effective intervention variable that lacked the strength to bring about immediate change. Therefore, I looked for subtle and steady growth of reading rates and comprehension skills over the duration of my forty-week study. If relatively quick or slow increases occurred only in particular individuals, I considered the occurrence of a non-controlled variable while the intervention was being implemented. Because Mindplay guaranteed ("Mindplay Guarantee", n.d.) an increase of one grade level in reading skills after 20 hours of exposure to MVRC, I looked for increases over time. The data I gained from each subject was presented and analyzed in Chapter IV.

Summary

Chapter III was organized to provide an overview of my quasi-experimental study used to determine the effects of MVRC on participants' reading fluency rates and reading
comprehension skills. This chapter began with a description of the conceptual framework of my study, an explanation of my study's purpose, my research design, and my research questions. The design and questions were followed by descriptions of my study's setting and participants. Then, I explained my biases as a researcher, and then described the instruments I used in my study, which included the instruments' reliability and validity. I concluded Chapter III with a description of how I collected and analyzed the reading data during my study. Chapter IV includes the results of my hypothesis testing.
CHAPTER IV

Introduction

Horner et al. (2005) described the Quality Indicators Within Single-Subject Research in their article The Use of Single-Subject Research to Identify Evidence-Based Practice in Special Education. Additional researchers (Hott, Limberg, Ohrt, & Schmit, 2015; Manolov, 2017;) supported the use of these indicators of quality Single Subject Research. I have used the quality indicators to guide the description of my study's setting and participants.

Description of Setting

The quality indicators (2005) required a description of a study's critical features and physical setting "with sufficient precision to allow replication" (Horner et al., 2005, p. 174). I previously detailed the specific features of Rockfield, Ohio, the Rockfield School District, and Lincoln Elementary School, in my Chapter III, Setting section. Below, I described additional important setting features: the classroom's physical description; technology that I used during the study; and me, the intervention specialist who instructed my study's student participants during their baseline and intervention periods.

The specific setting in which my study took place was a 600 square foot (20'x30') elementary school classroom. Inward opening windows were located along the northern 30-foot wall. One doorway, that accessed a main corridor, was located on the southern 30-foot wall, opposite the windows. The eastern, southern and western walls were lined with bulletin and dry erase boards. Fifteen student-desks were arranged in three, five-
desk, rows in the room's center; one teacher-desk was located near the windows, kitty-corner from the door. Two rectangular tables, with four chairs each, were located independently on the 20-foot eastern and western walls.

**Description of Technology**

A digital projection unit was suspended from the classroom's ceiling. It was used to demonstrate the processes of logging into, and navigating, the MVRC program. It was also used to display digital copies of my participants' progress certificates during the class's progress celebrations.

The classroom also housed 12 Chromebooks, laptop-type technological hardware that were used to access the MVRC online program. Each Chromebook included a built-in trackpad, used to move its display cursors. During my study, many participants found it difficult to navigate the MVRC program using the Chromebooks' trackpads. In cases of difficulty, I provided the student with an external mouse that was plugged into a Chromebook's USB port to control its display cursor.

MVRC in an interactive program that used a human image and voice to demonstrate the pronunciation of phonemic sounds. Each participant was able to control the volume their individual Chromebook. Students who preferred louder volumes were required to use headphones to limit the potential for distracting their classmates. Headphones were available to all participants who chose to use them.

Participant Nine was identified as Deaf or Hard of Hearing (DHH). As such, her IEP required the provision of an FM radio system that broadcasts amplified sound directly to the hearing aids she wore. To use the MVRC program, Participant Nine plugged an FM transmitter into her Chromebook, like a different participant would plug
headphones into a Chromebook, to broadcast the program's articulation components directly to her hearing aids.

Finally, the MVRC program was administered each day by me, a certified Intervention Specialist and English teacher. I was supported each day by an educational assistant. The provision of two adults to this group of nine students was ideal. Our pairing allowed us to adequately address technology problems, internet-connectivity issues, student behavior requirements and one-to-one instructional support, during the intervention period.

**Description of Participants**

The *Quality Indicators Within Single-Subject Research* (Horner et al., 2005) also required a description of a SSRS's participants with "sufficient detail" that will "allow others to select individuals with similar characteristics (e.g., age, gender, disability, diagnosis)" for future studies or applications of my results (p. 174). In this section, I shared the grade, age, race, primary disability category, two strongest Multiple Intelligences, baseline test scores, self-reported learning preferences, and self-reported experience(s) with reading of each of my nine participants.

Buskist and Davis (2008) explained "most researchers who use single-subject designs employ no more than 10 to 12 subjects" (p. 84). Researchers limit the number of single-subjects because they "believe that functional relations can be gleaned using only one subject" (Buskist & Davis, 2008, p. 84). I began my study with ten participants. During the study, a participant moved away from Rockfield, Ohio, and transferred to a different school district. As a result, this nine-year-old, third grade, African American female with a specific learning disability in reading completed less than half of my ten-
week reading intervention program. Therefore, I was unable to collect her posttest data. Her description and results were not included in my reporting.

**Participant One.** Participant One was a fourth-grade male. At the time of my study, he was nine years old. His parent identified him as White on his school registration form. Participant One's identified primary disability category was Specific Learning Disabled in reading fluency, reading comprehension, written expression, and math calculation. His IEP noted additional deficits in the areas of fine motor processing, visual motor processing, and speech sound production. Visual, Spatial Intelligence and Intrapersonal Intelligence were Participant One's strongest domains according to my Multiple Intelligences Inventory for Teachers (MIIT).

Prior to using MVRC, Participant One's very low range reading ability was assessed from the following pretest measures: (a) WJ IV Broad Reading Standard Score (SS) was 67, in the very low range, (b) WJ IV Reading SS was 69, in the very low range, (c) WJ IV Letter Word Identification SS was 65, in the very low range, (d) WJ IV Sentence Reading Fluency SS was 15, in the very low range, and (e) WJ IV Passage Comprehension SS was 15, in the very low range.

Participant One's ability to apply his very low range reading abilities were measured as below grade level using ten STAR comprehension probes and ten AIMSweb reading fluency probes as additional pretests. His baseline mean for the ten pretest comprehension assessments was a SS of 250.2, in the in the STAR benchmark's winter-January 10th-20th percentile. His baseline median for the ten pretest comprehension assessments was a SS of 217.5, in the winter-January 10th -20th percentile. His baseline mean for the ten pretest fluency probes was 66 words per minute (WPM), two points
higher than the winter, tier-two, grade level benchmark. His baseline median for the ten pretest fluency probes was 61.5 WPM, below the winter, tier-two, grade level benchmark.

Participant One self-reported that the way he learns best was by working one-on-one with a teacher. He describes his attentiveness in school by explaining his difficulty focusing on "all the things in the classroom at the same time." He described issues with seeing thing that were presented or projected on a Smartboard and with being able to accurately take notes.

Participant One described his experience with reading as difficult. He explained that he could not read like his classmates and preferred being read to because it helped him to better understand he lessons. He also acknowledged his need for specialized in reading, but preferred it to be private so other students would not view him as "dumb."

In late November, 2016, Participant One began a daily prescription medication that is designed to affects the brain chemistry associated with impulse control and hyperactivity. He continued to take the prescription daily, for the remainder of the school year. The drug's impact on Participant One's behavior and ability to focus on academic tasks was noticeable after one week. I suspect this medical treatment contributed significantly to the dramatic reading fluency and reading comprehension gains that Participant One made while using the MVRC intervention program.

**Participant Two.** Participant Two was a third-grade male. At the time of my study, he was nine years old. His parent identified him as African American on his school registration form. Participant Two's identified primary disability category was Other Heath Impairment- Minor, due to a medical diagnosis of Attention Deficit-
Hyperactivity Disorder. His IEP noted additional deficits with social emotional functioning or behavior, fine motor skill development, delays with written expression in the areas of fine motor processing, visual motor processing, and speech sound production. Visual, Spatial Intelligence and Logical-Mathematical were Participant Two's strongest domains according to my MIIT.

Prior to using MVRC, Participant Two's very low to average range reading ability was assessed from the following pretest measures: (a) WJ IV Broad Reading SS was 91, in the average range, (b) WJ IV Reading SS was 85, in the low average range, (c) WJ IV Letter Word Identification SS was 92, in the average range, (d) WJ IV Sentence Reading Fluency SS was 55, in the very low range, and (e) WJ IV Passage Comprehension SS was 78, in the low range.

Participant Two's ability to apply his very low to average range reading abilities were measured as below grade level using ten STAR comprehension probes and ten AIMSweb reading fluency probes as additional pretests. His baseline mean for the ten pretest comprehension assessments was a SS of 285.7, in the winter-January 20th-25th percentile. His baseline median for ten pretest comprehension assessments was a SS of 287.5, in the winter-January 20th-25th percentile. His baseline mean for ten pretest fluency probes was 60.2 words per minute (WPM), below the winter, tier-two, grade level benchmark. His baseline median for ten pretest fluency probes was 60 WPM, below the winter, tier-two, grade level benchmark.

Participant Two self-reported that the way he learns best was working in a small group with one or two other students and a teacher. He described his attentiveness in school as "on and off." He also recognized difficulty with holding still, rubbing his ears,
making coughing noises (self-stimulatory behaviors or repetitive body movements).

Participant Two's attentiveness was dramatically increased when he sat upon a T-shaped stool or physio-ball chair.

Participant Two described his experience with reading as fun. He explained that reading was a challenge, but when he reads at school or home he is able to spend time with adults (parents or teachers). Participant Two said he likes reading fiction stories about kid his own age who have adventures. Participant Two was exceptionally willing to participate in my study. Of all the participants, Two spent the most time outside of class and at home using MVRC. During my study, he made the most progress through the MVRC lessons.

**Participant Three.** Participant Three was a third-grade male. At the beginning of my study, he was nine years old, but turned ten years old during the study. His parent identified him as White on his school registration form. Participant Three's parents immigrated to Rockfield, Ohio from an Eastern European nation. They are not native speakers of English. Participant Three's identified primary disability category was Specific Learning Disability in reading fluency, reading comprehension, and written expression. His IEP noted additional deficits in cognition, communication, and fine motor skills. Logical-Mathematical and Visual, Spatial Intelligence were Participant Three's strongest domains according to my MIIT.

Prior to using MVRC, Participant Three's very low to low range reading ability was assessed from the following pretest measures: (a) WJ IV Broad Reading SS was 65, in the very low range, (b) WJ IV Reading SS was 72, in the low range, (c) WJ IV Letter Word Identification SS was 75, in the low range, (d) WJ IV Sentence Reading Fluency
SS was 16, in the very low range, and (e) WJ IV Passage Comprehension SS was 73, in the low range.

Participant Three's ability to apply his very low to low range reading abilities was measured as below grade level using ten STAR comprehension probes and ten AIMSweb reading fluency probes as additional pretests. His baseline mean for the ten pretest comprehension assessments was a SS of 101.5, lower than the winter-January 10th percentile. His baseline median for ten pretest comprehension assessments was a SS of 97.5, lower than the winter-January 10th percentile. His baseline mean for ten pretest fluency probes was 37.4 words per minute (WPM), below the winter, tier-two, grade level benchmark. His baseline median for ten pretest fluency probes was 39.5 WPM, below the winter, tier-two, grade level benchmark.

Participant Three self-reported that the way he learns best was working one-on-one with a teacher, an educational assistant or his mother. He described his attentiveness in school as "good when someone sits with [him]" to prompt him to instructional tasks. Participant Three typically works with an Intervention Specialist or Educational Assistant during his general education inclusion classes. Per his IEP, support personnel remain in close proximity to Participant Three during academic classes to provide prompting to task, to read all text aloud, and to scribe extended response essays.

Participant Three described his experience with reading as "good" when he works with adults, "and bad" when he has to read on his own. He explained that independent reading was very difficult and made him feel anxious because he was unable to keep up with his typical peers. When Participant Three is read to, and scribed for, he is able to adequately perform grade level academic tasks in his general education inclusion classes.
Participant Four. Participant Four was a third-grade male. At the beginning of my study, he was nine years old. His parent identified him as White on his school registration form. Participant Four's identified primary disability category was Specific Learning Disability in reading fluency, reading comprehension, and math problem solving. His IEP also noted a propensity to be impacted by natural noises and movements that he found distracting. Visual, Spatial Intelligence and Bodily-Kinesthetic Intelligence were Participant Four's strongest domains according to my MIIT.

Prior to using MVRC, Participant Four's very low reading ability was assessed from the following pretest measures: (a) WJ IV Broad Reading SS was 51, in the very low range, (b) WJ IV Reading SS was 53, in the very low range, (c) WJ IV Letter Word Identification SS was 51, in the very low range, (d) WJ IV Sentence Reading Fluency SS was 45, in the very low range, and (e) WJ IV Passage Comprehension SS was 49, in the very low range.

Participant Four's ability to apply his very low reading abilities was measured as below grade level using ten STAR comprehension probes and ten AIMSweb reading fluency probes as additional pretests. His baseline mean for the ten pretest comprehension assessments was a SS of 204.4, lower than the winter-January 10th percentile. His baseline median for ten pretest comprehension assessments was a SS of 205, lower than the winter-January 10th percentile. His baseline mean for ten pretest fluency probes was 61.1 words per minute (WPM), below the winter, tier-two, grade level benchmark. His baseline median for ten pretest fluency probes was 65 WPM, one point higher than the winter, tier-two, grade level benchmark.
Participant Four self-reported that the way he learns best when he is alone and things are quiet. He described his attentiveness in school as "alright, if the class is quiet." Participant Four was easily distracted by the slightest classroom noise, for example a cough or sneeze would pull his attention from lessons and his academic work. Participant Four would often become frustrated by his classmates' inability to be absolutely silent. When frustrated, his ability to attend to task was negatively impacted further. During cases of distraction and frustration, Participant Four was prompted to take a break to engage in large motor physical activities like walks or callisthenic exercises. To avoid the disruption of exercise breaks and frustration caused by natural classroom noises, Participant Four was provided with noise cancelling headphones to wear and a three-walled study carrel in which to work while he used the MVRC program. By using the headphones and study carrel, Participant Four was consistently able to focus on and complete his MVRC lessons.

Participant Four described his experience with reading as "good" when he is alone in a quiet place. He explained that independent reading in a classroom or other environment where noises occur naturally was very difficult. He describes the impact of noise distractions as anxiety inducing. Participant Four's ability to read improved greatly when the appropriate accommodations were provided to limit his interaction with his surrounding environment.

**Participant Five.** Participant Five was a fourth-grade male. At the time of my study, he was nine years old. His parent identified him as African American on his school registration form. Participant Five's identified primary disability category was Other Health Impairment-Minor, due to a medical diagnosis of Attention Deficit-
Hyperactivity Disorder. His IEP noted additional deficits in the areas of social-emotional functioning and sensory processing. Bodily-Kinesthetic Intelligence and Visual, Spatial Intelligence were Participant Five's strongest domains according to my MIIT.

Prior to using MVRC, Participant Five's average to low average reading ability was assessed from the following pretest measures: (a) WJ IV Broad Reading SS was 91, in the average range, (b) WJ IV Reading SS was 88, in the low average range, (c) WJ IV Letter Word Identification SS was 81, in the low average range, (d) WJ IV Sentence Reading Fluency SS was 94, in the average range, and (e) WJ IV Passage Comprehension Standard Score was 99, in the average range.

Participant Five's ability to apply his average to low average WJ IV pretest reading abilities were measured as below grade level. His baseline mean for the ten pretest comprehension assessments was a SS of 161.8, below the winter-January tenth percentile. His baseline median for the ten pretest comprehension assessments was a SS of 154.5, below the winter-January tenth percentile. His baseline mean for the ten pretest fluency probes was 68.3 WPM, four point three points higher than the winter, tier-two, grade level benchmark. His baseline median for the ten pretest fluency probes was 66.5 WPM, two point five points higher than the winter, tier-two, grade level benchmark.

Participant Five self-reported that the way he learns best is by using hands-on manipulatives like flash cards or computer games. He described his attentiveness in school as "pretty bad." He indicated he was often distracted by his thoughts, impulsivity, and desire to move around the classroom. Participant Five described his experience with reading as frustrating. He explained that his frustration came from his desire to be a good reader, but his inability to stay focused while he read. He further explained his
frustration by expressing a resentment for the required extra-help and practice in which he participated outside of his inclusion English language arts class. Participant Five said that he did not like to read on his own and preferred being read to by an adult or recorded audio texts.

**Participant Six.** Participant Six's family immigrated from the United Kingdom to Rockfield, Ohio during the summer prior to the beginning of the school year. As a new enrollee, she began the school year in the Sixth grade. Within the first week of school, it was apparent to her teachers that she had not mastered the third-grade skills required of new Sixth graders. At that time, the school district and her parents agreed that her interests would be best served if she were transferred to the third grade. At the time of her grade level transition, Participant Six was recommended for a multi-factored evaluation.

At the beginning of my study, Participant Six was a third-grade female. She was nine years old. Her parents identified her as White on her school registration form. Participant Six's identified primary disability category was Specific Learning Disability in reading fluency and reading comprehension. Her IEP also noted deficits fine motor skills, social-emotional functioning and visual motor development. Intrapersonal Intelligence and Visual, Spatial Intelligence were Participant Six's strongest domains according to my MIIT.

Prior to using MVRC, Participant Six's low to low average reading ability was assessed from the following pretest measures: (a) WJ IV Broad Reading SS was 78, in the low range, (b) WJ IV Reading SS was 81, in the low average range, (c) WJ IV Letter Word Identification SS was 83, in the low average range, (d) WJ IV Sentence Reading
Fluency SS was 72, in the low range, and (e) WJ IV Passage Comprehension SS was 84, in the low average range.

Participant Six’s ability to apply her low to low average reading abilities was measured as below grade level using ten STAR comprehension probes and ten AIMSweb reading fluency probes as additional pretests. Her baseline mean for the ten pretest comprehension assessments was a SS of 239.2, in the winter-January 10th-20th percentile. Her baseline median for ten pretest comprehension assessments was a SS of 232.5, in the winter-January 10th-20th percentile. Her baseline mean for ten pretest fluency probes was 60.4 words per minute (WPM), below the winter, tier-two, grade level benchmark. Her baseline median for ten pretest fluency probes was 65.5 WPM, one and one half points higher than the winter, tier-two, grade level benchmark.

Participant Six self-reported that the way she learns best was with a familiar adult. She found it difficult acclimate to "new people, because they made her nervous." She described his attentiveness in school as "okay, as long as the teacher did not call on her" or drew attention to her in any other way. Participant Six would often hide her face, for periods of ten or more minutes, behind her long hair when she felt nervous or sacred. When Participant Six hide behind her hair, she would not communicate or acknowledge other people. At the beginning of the school year, this physical barrier prevented Participant Six from engaging in classroom lessons two or three times per hour. Fortunately, by mid-school year, in January when the MVRC intervention program began, Participant Six was much more comfortable in the Lincoln Elementary school environment. By mid-year, she rarely exhibited her hiding-behavior and was an active participant in all of her classes.
Participant Six described her experience with reading as "good, when she was at home with her mommy." She explained that independent silent reading at school was enjoyable, but reading aloud in class was terrifying. As her social-emotional condition improved, Participant Six was observed actively reading aloud with her classmates.

**Participant Seven.** Participant Seven was a third-grade male. At the time of my study, he was nine years old. His parent identified him as Asian on his school registration form. Participant Seven's parents immigrated to Rockfield, Ohio from a Pacific island nation. They are not native speakers of English. Participant Seven's identified primary disability category was Specific Learning Disability in reading fluency. His IEP noted an average cognitive functioning coupled with a significant delay in the area of academic achievement due to reading fluency. Participant Seven reads and writes sheet music. He has mastered the violin and the guitar. Musical Intelligence and Bodily-Kinesthetic Intelligence were Participant Seven's strongest domains according to my MIIT.

Prior to using MVRC, Participant Seven's low to average range reading ability was assessed from the following pretest measures: (a) WJ IV Broad Reading SS was 85, in the low average range, (b) WJ IV Reading SS was 72, in the low range, (c) WJ IV Letter Word Identification SS was 90, in the average range, (d) WJ IV Sentence Reading Fluency SS was 72, in the low range, and (e) WJ IV Passage Comprehension SS was 88, in the low average range.

Participant Seven's ability to apply his very low to average range reading abilities were measured as below grade level using ten STAR comprehension probes and ten AIMSweb reading fluency probes as additional pretests. His baseline mean for the ten
pretest comprehension assessments was a SS of 116.1, below the winter-January 10th percentile. His baseline median for ten pretest comprehension assessments was a SS of 109.5, below the winter-January 10th percentile. His baseline mean for ten pretest fluency probes was 60.4 words per minute (WPM), below the winter, tier-two, grade level benchmark. His baseline median for ten pretest fluency probes was 65.5 WPM, one and one half points above the winter, tier-two, grade level benchmark.

Participant Seven self-reported that the way he learns best was working alone and on a computer. He described his attentiveness in school as "good when [he is] interested in what [his] teachers are talking about." Participant Seven was generally inattentive during all of his classes. His seemingly apathetic behavior at school was often addressed by his teachers. Their frequent prompting to classroom activities bothered Participant Seven who would often cry when he felt he was being forced to do school work against his will. Participant Seven did willingly participate in the MVRC program when he was promised a food reward at the end of a productive class. As a result I promised him this type of reward each day that he participated in the program.

Participant Seven described his experience with reading forced. He explained that reading was a challenge, that he did not enjoy. He said that he never reads at home and his parents only encourage him to play his musical instruments at home. Participant Seven did not complete homework assignments during the third grade. Of all the participants, Seven spent the least amount of time outside of class and at home using MVRC. During my study, he made the least progress through the MVRC lessons.

**Participant Eight.** Participant Eight was a third-grade female. At the time of my study, she was nine years old. Her parents identified her as African American on her
school registration form. Participant Eight's identified primary disability category was Specific Learning Disability in reading fluency, reading comprehension and written expression. Her IEP noted additional deficits in the area of math problem solving due to her weakness in reading. Intrapersonal Intelligence and Visual, Spatial Intelligence were Participant Eight's strongest MI domains according to my MIIT.

Prior to using MVRC, Participant Eight's low average to average range reading ability was assessed from the following pretest measures: (a) WJ IV Broad Reading SS was 84, in the low average range, (b) WJ IV Reading SS was 85, in the low average range, (c) WJ IV Letter Word Identification SS was 85, in the low average range, (d) WJ IV Sentence Reading Fluency SS was 87, in the low average range, and (e) WJ IV Passage Comprehension SS was 93, in the average range.

Participant Eight's ability to apply her low average to average range reading abilities were measured as below grade level using ten STAR comprehension probes and ten AIMSweb reading fluency probes as additional pretests. Her baseline mean for the ten pretest comprehension assessments was a SS of 318.9, between the winter-January, 25th and 40th percentiles. Her baseline median for ten pretest comprehension assessments was a SS of 346.5, between the winter-January, 25th and 40th percentiles. Her baseline mean for ten pretest fluency probes was 100.5 words per minute (WPM), between the winter, tier-one and tier-two grade level benchmarks. Her baseline median for ten pretest fluency probes was 103.5 WPM, one and one half points below winter, tier-one grade level benchmark.

Participant Eight self-reported that the way she learns best was working one-on-one with a teacher. She described her attentiveness in school as "good because [she]
really likes school and all of her teachers so much." Although Participant Eight was extremely attentive during all of her classes, she simply could not comprehend everything her teachers would say in class. This was due to her delayed processing speed. When a teacher worked with her one-on-one, frequently assessed her understanding, and retaught elements of a lesson that she misunderstood, Participant Eight was capable of earnest learning. Participant Eight was considered to be a "pleaser" by her teachers. They described her this way because she desperately sought her teachers' approval for everything she did. For this reason, Participant Eight was an extremely hard worker who typically put more effort into her classes than she got out of them.

Participant Eight described her experience with reading as "really nice." She explained that she enjoyed reading every day because it was a part of her nightly homework. She explained that she preferred to read independently at home, because it made her feel good to do it independently. During my study, she made above average progress through the MVRC lessons and completed many lessons outside of the school day.

**Participant Nine.** Participant Nine was a fourth-grade female. At the time of my study, she was nine years old. His parent identified her as African American on her school registration form. Participant Nine's identified primary disability category was Deaf and Hard of Hearing. Her IEP noted additional deficits in the areas of reading comprehension, written expression and math problem solving due to reading. Participant Nine received additional special education services from an audiologist and a speech language pathologist. Bodily-Kinesthetic Intelligence and Visual, Spatial Intelligence were Participant Nine's strongest MI domains according to my MIIT.
Prior to using MVRC, Participant Nine's low to average range reading ability was assessed from the following pretest measures: (a) WJ IV Broad Reading SS was 85, in the low average range, (b) WJ IV Reading SS was 72, in the low range, (c) WJ IV Letter Word Identification SS was 90, in the average range, (d) WJ IV Sentence Reading Fluency SS was 72, in the low range, and (e) WJ IV Passage Comprehension SS was 88, in the low average range.

Participant Nine's ability to apply his very low to average range reading abilities were measured as below grade level using ten STAR comprehension probes and ten AIMSweb reading fluency probes as additional pretests. His baseline mean for the ten pretest comprehension assessments was a SS of 116.1, below the winter-January 10th percentile. His baseline median for ten pretest comprehension assessments was a SS of 109.5, below the winter-January 10th percentile. His baseline mean for ten pretest fluency probes was 60.4 words per minute (WPM), below the winter, tier-two, grade level benchmark. His baseline median for ten pretest fluency probes was 65.5 WPM, one and one half points above the winter, tier-two, grade level benchmark.

Participant Nine self-reported that the way she learns best was working one-on-one or in small group with a teacher who was wearing an FM transmitter that sent an amplified voice signal directly to her hearing aids. She described her attentiveness in school as "necessary." Participant Nine explained that when her mind wanders or when she simply misses one thing a teacher says she feels lost and behind her classmates.

Participant Nine described her experience with reading as positive. She explained that reading is a daily activity in her house. She takes turns reading with her mother and grandmother each evening. Participant Nine did not consistently hear the endings of
word. As a result, she would orally read roots words and exclude their suffixes in a manner that duplicated the way she heard them. For example, rather than correctly reading 'The dog is running' she would orally read 'The dog is run.' This consistent mistake negatively impacted her ability to comprehend reading passages and negatively impacted her reading fluency scores that were based on the number of word she correctly read in a minute.

**Results of Research Question One**

With research question one I asked, did MVRC have a significant effect on the participants' reading fluency rates as measured by the AIMSweb fluency probes? I determined the answer to this question by measuring each participant's fluency rate every two weeks during the school year. Their fluency rate or score was the number of words each participant correctly read from a grade level reading passage in one minute. I obtained the words per minute (WPM) scores by using reading fluency probes names the AIMSweb reading curriculum based measures (RCBM). Reliability of the AIMSweb RCBM was 0.85 for a single probe and 0.94 for the mean of 3+ probes (Daniel, 2010). The first 20 weeks of the school year provided 10 fluency scores for each participant. These first ten scores served as my baseline data. The second 20 weeks of the school year provided an additional 10 fluency scores that served as my intervention period data.

Each participant's raw data baseline and intervention period scores were presented in graphical and tabular form (Manolov, 2017). Following each participant's fluency WPM graph and WPM table, a quantification table that identifies each participant's daily WPM rate increase, the statistical significance of the daily rate increase, the 90 percent confidence lower bound (LB) and upper bound (UB) were provided. All rates of increase
are average rate of test score change per day. Significance gives the level for which the results is statistically significant using the standard levels of 90%, 95% and 99%. The levels assume a one-sided null hypothesis that the slope is greater than zero. A 90% confidence interval is given for each slope. If the intervals do not overlap, then the slopes are significantly different.

I used the visual and quantitative results to determine the impact the MVRC program had on each participant's fluency rate during the intervention period as completed to their baseline data. In general, the students' rates of increase during the 2nd semester were lower than the rate of increase for the first semester. Only Participant Three had an intervention period daily rate increase that was significantly higher than the baseline data.
Participants One (see Figure 4.1) showed significant improvement both semesters. However, the daily WPM rate of increase was greater during the first semester. The difference in the first semester and the second semester intervention period was not statistically significant at the 90 percent confidence level.
Participant Two (see Figure 4.2) showed no improvement the first semesters with a rate of increase of effectively zero. Rate of increase second semester intervention period was statistically significant and was significantly better than the first semester.
Participant three (see Figure 4.3) showed significant improvement both semesters. However, the rate of increase was greater the first semester. Difference was not statistically significant at the 90% level.
Participant Four (see Figure 4.4) showed statistically significant rates of increase both semesters. Although the estimated slope for first semester was greater, the difference was not statistically significant.
Figure 4.5. Participant five: AIMSweb fluency.

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<th>WPM</th>
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Participant Five (see Figure 4.5) showed a significant rate of increase the first semester. Participant Five showed no significant increase during second semester intervention period.
Figure 4.6. Participant six: AIMSweb fluency.

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<td>99%</td>
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Participant Six (see Figure 4.6) showed a significant rate of increase the first semester. Participant Six showed a significant rate of increase during second semester intervention period, but it was a little lower than first semester. The estimated rates of increase were not significantly different.
Participant Seven (see Figure 4.7) showed a significant rate of increase the first semester. Participant Seven showed a significant rate of increase during second semester intervention period, but it was lower than first semester. The estimated rates of increase were not significantly different.
Figure 4.8. Participant eight: AIMSweb fluency.

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Participant Eight (see Figure 4.8) showed a significant rate of increase the first semester. Participant Eight did not have a significant rate of increase during the second semester intervention period.
Participant Nine (see Figure 4.9) showed a significant rate of increase the first semester. Participant Nine did not have a significant rate of increase during the second semester intervention period.
Results of Research Question Two

With research question two I asked, did MVRC have a significant effect on the participants' reading comprehension skills as measured by the STAR comprehension test? I determined the answer to this question by measuring each participant's comprehension standard score every two weeks during the school year. Their comprehension ability or standard score was determined by using the STAR online reading assessment. Reliability of the STAR comprehension test was 0.93. The first 20 weeks of the school year provided 10 comprehension standard scores for each participant. These first ten scores served as my baseline data. The second 20 weeks of the school year provided an additional 10 comprehension standard scores that served as my intervention period data.

Each participant's raw data baseline and intervention period scores were presented in graphical and tabular form (Manolov, 2017). Following each participant's STAR comprehension graph and standard score (SS) table, a quantification table that identifies each participant's daily SS rate increase, the statistical significance of the daily rate increase, the 90 percent confidence lower bound (LB) and upper bound (UB) were provided. All rates of increase are average rate of test score change per day. Significance gives the level for which the results is statistically significant using the standard levels of 90%, 95% and 99%. The levels assume a one-sided null hypothesis that the slope is greater than zero. A 90% confidence interval is given for each slope. If the intervals do not overlap, then the slopes are significantly different.

I used the visual and quantitative results to determine the impact the MVRC program had on each participant's comprehension skills during the intervention period as completed to their baseline data. In general, the students' rates of increase during the
second semester were lower than the rate of increase for the first semester. Only Participant Three had an intervention period daily rate increase that was significantly higher than the baseline data.
Figure 4.10. Participant one: STAR comprehension.

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</tbody>
</table>

Participant One (see Figure 4.10) showed a marginal increase over the course of the year with a first test of 320 and final score of 353. The outliers that were deleted were the last two results of the first semester 97 and 567.
This Participant Two (see Figure 4.11) show significant increases both semesters but the rate of increase of similar both semesters.
Participant Three (see Figure 4.12) showed a higher rate of gain during the second semester intervention period, but the difference was not statistically significant. When the outlying data point of 146 was removed, the intervention rate increased and was then statistically significant.
Participant Four (see Figure 4.13) showed a significant rate of increase the baseline period. Participant Four showed no significant increase during intervention. Although, the final score of 427 was by far his best, but was not enough to get a statistically significant result.
Participant Five (see Figure 4.14) showed a significant rate of increase the first semester. Participant Five showed no significant increase during the second semester intervention period.
Figure 4.15. Participant six: STAR comprehension.

Participant Six (see Figure 4.15) showed a significant rate of increase the first semester. Participant Six showed a significant rate of increase during the second semester intervention period, but it was a little lower than first semester. The estimated rates of increase were not significantly different.
Figure 4.16. Participant seven: STAR comprehension.

![Participant 7: STAR Reading Comprehension Progress](image)

<table>
<thead>
<tr>
<th>Date</th>
<th>SS</th>
<th>Date</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/30/2016</td>
<td>138</td>
<td>1/26/2017</td>
<td>123</td>
</tr>
<tr>
<td>9/13/2016</td>
<td>110</td>
<td>2/9/2017</td>
<td>196</td>
</tr>
<tr>
<td>9/27/2016</td>
<td>94</td>
<td>2/23/2017</td>
<td>169</td>
</tr>
<tr>
<td>10/11/2016</td>
<td>104</td>
<td>3/9/2017</td>
<td>157</td>
</tr>
<tr>
<td>10/25/2016</td>
<td>115</td>
<td>3/23/2017</td>
<td>211</td>
</tr>
<tr>
<td>11/10/2016</td>
<td>146</td>
<td>4/6/2017</td>
<td>203</td>
</tr>
<tr>
<td>11/22/2016</td>
<td>90</td>
<td>4/20/2017</td>
<td>178</td>
</tr>
<tr>
<td>12/6/2016</td>
<td>109</td>
<td>5/2/2017</td>
<td>149</td>
</tr>
<tr>
<td>12/20/2016</td>
<td>152</td>
<td>5/16/2017</td>
<td>202</td>
</tr>
<tr>
<td>1/12/2017</td>
<td>103</td>
<td>5/30/2017</td>
<td>215</td>
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</tbody>
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<table>
<thead>
<tr>
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<th>Signif</th>
<th>90% LB</th>
<th>90% UB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
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<td>No</td>
<td>-.3104</td>
<td>.3383</td>
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<tr>
<td>Intervention</td>
<td>.3672</td>
<td>No</td>
<td>-.0479</td>
<td>.7823</td>
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</tbody>
</table>

Participant Seven (see Figure 4.16) did not have statistically significant rate of increase either semester. The rate of increase for the second semester intervention period would be significant at an 80% level if you are willing to go that low.
*Figure 4.17. Participant eight: STAR comprehension.*

<table>
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<th>Date</th>
<th>SS</th>
</tr>
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<tbody>
<tr>
<td>8/30/2016</td>
<td>215</td>
<td>1/26/2017</td>
<td>395</td>
</tr>
<tr>
<td>9/13/2016</td>
<td>225</td>
<td>2/9/2017</td>
<td>251</td>
</tr>
<tr>
<td>9/27/2016</td>
<td>239</td>
<td>2/23/2017</td>
<td>342</td>
</tr>
<tr>
<td>10/11/2016</td>
<td>242</td>
<td>3/9/2017</td>
<td>431</td>
</tr>
<tr>
<td>10/25/2016</td>
<td>332</td>
<td>3/23/2017</td>
<td>374</td>
</tr>
<tr>
<td>11/10/2016</td>
<td>372</td>
<td>4/6/2017</td>
<td>403</td>
</tr>
<tr>
<td>11/22/2016</td>
<td>368</td>
<td>4/20/2017</td>
<td>439</td>
</tr>
<tr>
<td>12/6/2016</td>
<td>361</td>
<td>5/2/2017</td>
<td>425</td>
</tr>
<tr>
<td>12/20/2016</td>
<td>385</td>
<td>5/16/2017</td>
<td>389</td>
</tr>
<tr>
<td>1/12/2017</td>
<td>450</td>
<td>5/30/2017</td>
<td>497</td>
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<table>
<thead>
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<th>90% UB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
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<td>99</td>
<td>1.437</td>
<td>2.1400</td>
</tr>
<tr>
<td>Intervention</td>
<td>1.0397</td>
<td>95</td>
<td>.2629</td>
<td>1.8166</td>
</tr>
</tbody>
</table>

Participant Eight (see Figure 4.17) showed a significant rate of increase the first semester. Participant Eight showed a significant rate of increase during the second semester intervention period, but it was lower than first semester. The estimated rates of increase were not significantly different.
**Figure 4.18.** Participant nine: STAR comprehension.

<table>
<thead>
<tr>
<th>Baseline Date</th>
<th>SS</th>
<th>Intervention Period Date</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/30/2016</td>
<td>358</td>
<td>1/26/2017</td>
<td>284</td>
</tr>
<tr>
<td>9/13/2016</td>
<td>275</td>
<td>2/9/2017</td>
<td>255</td>
</tr>
<tr>
<td>10/11/2016</td>
<td>309</td>
<td>3/9/2017</td>
<td>318</td>
</tr>
<tr>
<td>10/25/2016</td>
<td>271</td>
<td>3/23/2017</td>
<td>341</td>
</tr>
<tr>
<td>11/10/2016</td>
<td>233</td>
<td>4/6/2017</td>
<td>320</td>
</tr>
<tr>
<td>11/22/2016</td>
<td>345</td>
<td>4/20/2017</td>
<td>300</td>
</tr>
<tr>
<td>12/6/2016</td>
<td>295</td>
<td>5/2/2017</td>
<td>274</td>
</tr>
<tr>
<td>12/20/2016</td>
<td>252</td>
<td>5/16/2017</td>
<td>270</td>
</tr>
<tr>
<td>1/12/2017</td>
<td>363</td>
<td>5/30/2017</td>
<td>265</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STAR</th>
<th>Rate/day</th>
<th>Signif</th>
<th>90% LB</th>
<th>90% UB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>.1518</td>
<td>No</td>
<td>-.594</td>
<td>.8977</td>
</tr>
<tr>
<td>Intervention</td>
<td>-.128</td>
<td>No</td>
<td>-.5639</td>
<td>.3073</td>
</tr>
</tbody>
</table>

Participant Nine (see Figure 4.18) showed no significant rate of increase either semester.
Results of Research Question Three

Research Questions Three asked if MVRC had a significant effect on my participants' WJ IV pre- and post-test standard scores on five reading subtests: (a) Broad Reading, (b) Reading, (c) Letter Word Identification, (d) Sentence Reading Fluency, and (e) Passage Comprehension. I calculated the paired t confidence interval results for each WJ IV test by establishing a confidence interval (CI) for the mean difference in each test. I did this at a 90% and then a 95% CI. In every case the mean increase was statistically significant. Also of important note was the reliability of each WJ IV subtest. The Reading Cluster reliability was 0.95; the Broad Reading Cluster reliability was 0.97; the Letter Word Identification reliability was 0.80; the Sentence Reading Fluency reliability was 0.96; and the Passage Comprehension reliability was 0.93 (Ding & Alfonso, 2016).

I have interpreted the evidence that the group improved all five of their WJ IV standard scores at a statistically significant rate after exposure to MVRC during the 20-week intervention period. The data showed that my participants' WJ IV reading scores increased by more than one standard deviation on each reading test. I viewed these results as important finding as it related specially to my students with disabilities. My results led me to believe that it was distinctly possible that continued exposure to the MVRC intervention would continue to increase the WJ IV reading scores of students with disabilities to the point where the participants were able to read at their grade level. What this essentially meant was that exposure to MVRC could potentially improve a students' WJ IV reading scores to levels where the student was an average reader, who no longer required daily specialized instruction in reading, and no longer qualified as a
student with a reading disability. Since my nine participants increased their group mean WJ IV reading scores: (a) Broad Reading +18.44 SS points, (b) Reading +18.22 SS points, (c) Letter Word +19.11 SS points, (d) Sentence Reading Fluency +32.22 SS points, (e) Passage Comprehension +22.56 SS points, it is distinctly possible that exposure to MVRC provided positive reading outcomes, as measured by the WJ IV reading tests that may have effectively limited the amount of time a student with disabilities requires specialized instruction in reading.

**Explanation of the WJ IV data.** In the following sections, I presented an explanation of the paired t confidence interval analysis of each WJ IV pre- and post-test that I conducted to answer Research Question Three. For each WJ IV subtest I will present five data points: (a) the individual participants' pre- and post-tests standard scores (SS), (b) each participant's SS gains on each subtest, (c) the group's mean pre-and post-test SS, (d) the group's mean SS gain, and (e) the 95% confidence interval's lower bound, group mean, and upper bound for each test.

My purpose in presenting this list of data was to first demonstrate the number of standard score (SS) points that my participants gained, from their WJ IV pretest to their WJ IV posttest, after the MVRC intervention period. The second purpose is to provide the data I used to calculate group means for each WJ IV pre- and post-test. I was able to calculate the group mean gain data for each of my WJ IV tests at a 95% confidence interval. The lower bound of each set of pre- and post-test data represents the minimum number of SS points I can expect a participant to gain during a 20-week intervention period. Considering the degree of confidence I have in my lower bounds, I could safely predict that future students would achieve similar results after 20 weeks of MVRC.
The WJ IV Broad Reading Cluster Test Data. The 95% confidence interval for the Broad Reading cluster test (see Table 4.1) had a posttest lower bound of 9.80 SS, a posttest group mean gain of 18.44 SS, and a posttest upper bound of 27.09. Assuming that my participant-sample was random and represents a sample of all students who would be exposed to the MVRC intervention, I was able to say with 95% confidence that the WJ IV Broad Reading true mean difference for every student who may be exposed to MVRC is in the interval (9.80, 27.09). Because the lower bound, 9.80, is greater than zero, I was 95% confident, that there was a positive group mean gain on the WJ IV Broad Reading cluster test, and that the mean gain for all students would be at least 9.80 SS points after MVRC intervention period.

Table 4.1

The WJ IV Broad Reading cluster test data

<table>
<thead>
<tr>
<th>Participant</th>
<th>Broad Reading Pretest SS</th>
<th>Broad Reading Posttest SS</th>
<th>Broad Reading SS Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>67</td>
<td>100</td>
<td>+33</td>
</tr>
<tr>
<td>Two</td>
<td>91</td>
<td>99</td>
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<tr>
<td>Three</td>
<td>65</td>
<td>82</td>
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<tr>
<td>Four</td>
<td>51</td>
<td>88</td>
<td>+37</td>
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<tr>
<td>Five</td>
<td>91</td>
<td>102</td>
<td>+11</td>
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<tr>
<td>Six</td>
<td>78</td>
<td>102</td>
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<tr>
<td>Seven</td>
<td>85</td>
<td>90</td>
<td>+5</td>
</tr>
<tr>
<td>Eight</td>
<td>84</td>
<td>105</td>
<td>+21</td>
</tr>
<tr>
<td>Nine</td>
<td>115</td>
<td>125</td>
<td>+10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>95% Confidence Interval</th>
<th>Mean Gain</th>
<th>Standard Deviation</th>
<th>Lower Bound</th>
<th>Group Mean Gain</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+18.44</td>
<td>11.25</td>
<td>9.80</td>
<td>18.44</td>
<td>27.09</td>
</tr>
</tbody>
</table>
The WJ IV Reading Cluster Test Data. The 95% confidence interval for the Reading cluster test (see Table 4.2 The WJ IV Reading cluster test data) had a posttest lower bound of 11.10 SS, a posttest group mean gain of 18.22 SS, and a posttest upper bound of 25.35. Assuming that my participant-sample was random and represents a sample of all students who would be exposed to the MVRC intervention, I was able to say with 95% confidence that the WJ IV Reading true mean difference for every student who may be exposed to MVRC is in the interval (11.10, 25.35). Because the lower bound, 11.10, is greater than zero, I was 95% confident, that there was a positive group mean gain on the WJ IV Reading cluster test, and that the mean gain for all students would be at least 11.10 SS points after MVRC intervention period.

Table 4.2
The WJ IV Reading cluster test data

<table>
<thead>
<tr>
<th>Participant</th>
<th>Reading Pretest SS</th>
<th>Reading Posttest SS</th>
<th>Reading SS Gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>69</td>
<td>99</td>
<td>+30</td>
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<td>Two</td>
<td>85</td>
<td>92</td>
<td>+7</td>
</tr>
<tr>
<td>Three</td>
<td>72</td>
<td>85</td>
<td>+13</td>
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<tr>
<td>Four</td>
<td>53</td>
<td>89</td>
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<tr>
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<td>88</td>
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<tr>
<td>Six</td>
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<td>+16</td>
</tr>
<tr>
<td>Eight</td>
<td>85</td>
<td>102</td>
<td>+17</td>
</tr>
<tr>
<td>Nine</td>
<td>85</td>
<td>95</td>
<td>+10</td>
</tr>
</tbody>
</table>

95% Confidence Interval
Mean gain +18.22
Standard Deviation 9.27
Lower Bound 11.10
Group Mean Gain 18.22
Upper Bound 25.35
The WJ IV Letter Word Identification Test Data. The 95% confidence interval for the Letter Word Identification subtest (see Table 4.3 The WJ IV Letter Word Identification test data) had a posttest lower bound of 8.81 SS, a posttest group mean gain of 19.11 SS, and a posttest upper bound of 29.41. Assuming that my participant-sample was random and represents a sample of all students who would be exposed to the MVRC intervention, I was able to say with 95% confidence that the WJ IV Letter Word Identification true mean difference for every student who may be exposed to MVRC is in the interval (8.81, 29.41). Because the lower bound, 8.81, is greater than zero, I was 95% confident, that there was a positive group mean gain on the WJ IV Letter Word Identification subtest, and that the mean gain for all students would be at least 8.81 SS points after MVRC intervention period.

Table 4.3

*The WJ IV Letter Word Identification test data*

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
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<td>105</td>
<td>+40</td>
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<tr>
<td>Two</td>
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<td>Eight</td>
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<td>+19</td>
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<td>+15</td>
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<table>
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</thead>
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<td>Standard Deviation</td>
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<td>Lower Bound</td>
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<td>8.81</td>
</tr>
<tr>
<td>Group Mean Gain</td>
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<td>19.11</td>
</tr>
<tr>
<td>Upper Bound</td>
<td></td>
<td>27.42</td>
</tr>
</tbody>
</table>
The WJ IV Sentence Reading Fluency Test Data. The 95% confidence interval for the Sentence Reading Fluency subtest (see Table 4.4 The WJ IV Sentence Reading Fluency test data) had a posttest lower bound of 14.0 SS, a posttest group mean gain of 32.22 SS, and a posttest upper bound of 50.45. Assuming that my participant-sample was random and represents a sample of all students who would be exposed to the MVRC intervention, I was able to say with 95% confidence that the WJ IV Sentence Reading Fluency true mean difference for every student who may be exposed to MVRC is in the interval (14.0, 50.45). Because the lower bound, 14.0, is greater than zero, I was 95% confident, that there was a positive group mean gain on the WJ IV Sentence Reading Fluency subtest, and that the mean gain for all students would be at least 14.0 SS points after MVRC intervention period.

Table 4.4

The WJ IV Sentence Reading Fluency test data

<table>
<thead>
<tr>
<th>Participant</th>
<th>Reading Fluency Pretest SS</th>
<th>Reading fluency Posttest SS</th>
<th>Reading fluency SS gain</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>15</td>
<td>95</td>
<td>+80</td>
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<tr>
<td>Two</td>
<td>55</td>
<td>86</td>
<td>+31</td>
</tr>
<tr>
<td>Three</td>
<td>16</td>
<td>70</td>
<td>+54</td>
</tr>
<tr>
<td>Four</td>
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<td>+43</td>
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<tr>
<td>Five</td>
<td>94</td>
<td>110</td>
<td>+16</td>
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<td>Six</td>
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<tr>
<td>Nine</td>
<td>87</td>
<td>99</td>
<td>+12</td>
</tr>
</tbody>
</table>

95% Confidence Interval | Mean Gain | Standard Deviation | Lower Bound | Group Mean Gain | Upper Bound |
------------------------|-----------|--------------------|-------------|-----------------|-------------|
                      | +32.22    | 23.71              | 14.00       | 32.22           | 50.45       |
The WJ IV Passage Comprehension Test Data. The 95% confidence interval for the Passage Comprehension subtest (see Table 4.5 The WJ IV Passage Comprehension test data) had a posttest lower bound of 3.51 SS, a posttest group mean gain of 22.56 SS, and a posttest upper bound of 41.60. Assuming that my participant-sample was random and represents a sample of all students that would be exposed to the MVRC intervention, I was able to say with 95% confidence that the WJ IV Passage Comprehension true mean difference for every student who may be exposed to MVRC is in the interval (3.51, 41.60). Because the lower bound, 3.51, is greater than zero, I was 95% confident, that there was a positive group mean gain on the WJ IV Passage Comprehension subtest, and that the mean gain for all students would be at least 3.51 SS points after MVRC intervention period.

Table 4.5

The WJ IV Passage Comprehension test data

<table>
<thead>
<tr>
<th>Participant</th>
<th>Passage Comp. Pretest SS</th>
<th>Passage Comp. Posttest SS</th>
<th>Passage Comp. SS Gain</th>
</tr>
</thead>
<tbody>
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<td>One</td>
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<td>98</td>
<td>+83</td>
</tr>
<tr>
<td>Two</td>
<td>78</td>
<td>95</td>
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<tr>
<td>Three</td>
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<td>+12</td>
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<td>86</td>
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<tr>
<td>Eight</td>
<td>93</td>
<td>110</td>
<td>+12</td>
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<tr>
<td>Nine</td>
<td>102</td>
<td>125</td>
<td>+8</td>
</tr>
<tr>
<td>95% Confidence Interval</td>
<td>Mean Gain</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Standard Deviation</td>
<td>11.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lower Bound</td>
<td>9.80</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Group Mean Gain</td>
<td>18.44</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upper Bound</td>
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Summary

Chapter IV began with an introduction to my single subject research study. I followed the introduction with descriptions of the setting in which my study took place and the technology used during the study. I continued with a detailed description of my nine individual participants, categorically describing each participant's grade, gender, age, race, disability category, and strongest Multiple Intelligence Domains. After completing the descriptions according to single subject research protocol, I provided the results of my data analysis and explained how my results answered Research Questions One, Two and Three. In Chapter V, I will present a summary, interpretation, and discussion of my study’s results; a statement of my study's limitations; and recommendations for the future research.
CHAPTER V

Introduction

Chapter V began with a restatement of my study's research questions, followed by a review of the methodology that I employed to collect and analyze my data. I continued in Chapter V with a summary, an interpretation, and a discussion of my study’s results. I then presented what I considered to be the limitations of my study. I concluded Chapter V with a statement of self-reflection and my recommendations for the further study of computer assisted instruction (CAI) and of My Virtual Reading Coach (MVRC) at Lincoln Elementary School.

Re-statement of My Research Questions

The problem that led to my study was the need for a research based intervention that would effectively and efficiently increase the fluency rates and comprehension skills of students with reading disabilities at Lincoln Elementary. The program designers of MVRC stated that students would increase reading skills by one grade level after using the program for 20 hours (Mindplay, 2016). My hypothesis was that by exposing Lincoln Elementary students with reading disabilities to MVRC, they would be better able to read at grade level. The students with reading disabilities, who participated in my study, used the program during four, one-half-hour sessions each week, for 20 weeks. I developed three research questions to guide my study of the impact of MVRC on my participants' fluency rates, comprehension skills, and WJ IV standard scores.

1.) Did MVRC have a significant effect on the participants’ reading fluency rates as measured by the AIMSweb fluency probes?
2.) Did MVRC have a significant effect on the participants’ reading comprehension skills as measured by the STAR reading comprehension tests?

3.) Did MVRC have a significant effect on the participants' Woodcock Johnson IV (WJ IV) Broad Reading standard scores; WJ IV Reading standard scores; WJ IV Letter Word Identification standard scores; WJ IV Sentence Reading Fluency standard scores; and the WJ IV Passage Comprehension standard scores?

**Review of My Methodology**

To determine the impact of MVRC on my participant's reading fluency rates and reading comprehension skills, I designed an action research study that used single subject research design (SSRD) to analyze the quantitative reading progress data I collected during my study's baseline and intervention periods. During my review of teacher leadership literature, I concluded that Mills' (2014) action research spiral adequately outlined the process of my study. Through my review of special education research literature, I concluded that SSRD was the most appropriate and valid method of analyzing an intervention's impact on individual students with disabilities. Although, some researchers considered SSRD to be quasi experimental due to its lack of random assignment and its inability to control for external factors, my SSRD used the individual participants' baseline scores as control measure during my analysis. Therefore, my SSRD served as a valid and practical method of intervention analysis for me, a special education intervention specialist, to analyze my classroom instructional practices in real time.

I conducted my research at Lincoln Elementary School in Rockfield, Ohio, where I was employed. I invited students with specific reading disabilities to participate in my study. Prior to beginning my study, I received informed consent from ten, third and
fourth grade students with Individual Education Plans that were designed to address their identified reading disables. Nine of these students participated in my year-long study. The tenth student transferred to another school district during my study. I collected my students' relevant reading progress data before, during, and after I implemented the CAI reading intervention program named My Virtual Reading Coach. The data I collected for each participant included (a) 40, bi-weekly, time series, AIMSweb pre- and post-tests of reading fluency, (b) 40, bi-weekly, time series, STAR pre- and post-tests of reading comprehension, and (c) ten, WJ IV pre- and post-intervention tests of reading skills.

At the conclusion of my study, June, 2017, I assessed my participant's baseline and intervention period data. I conducted a visual analysis of their AIMSweb reading fluency progress graphs, and their STAR reading comprehension progress graphs (Harrington, 2013). Then, I completed an interrupted time series analysis of the individual participants' AIMSweb and STAR data using matched pairs t confidence interval tests to compare the baseline and intervention periods, and determine if MVRC made a statistically significant impact on the participants' respective reading fluency rates and reading comprehension standard scores (Harrington, 2013; McDowall, 1980). Finally, I completed a group analysis using a matched pairs t confidence interval test to compare my participant-group's mean WJ IV pretest and their WJ IV posttest scores. I used this statistical comparison to determine if the group made statistically significant gains as measured by their Woodcock Johnson IV (WJ IV) standard scores in (a) Broad Reading, (b) Reading, (c) Letter Word Identification, (d) Reading Fluency, and (e) Passage Comprehension.
Summary of My Results

Research Question One. The data I collected during my 20-week intervention period indicted that MVRC did not have a statistically significant effect on my nine participants’ reading fluency rates as measured by the AIMSweb fluency probes. I attempted to measure statistical significance at 99%, 95%, and 90% confidence intervals. The daily rate of improvement during the intervention period varied among my participants.

During my study's intervention period, the daily fluency score increase ranged from Participant Nine's .0311 (words per minute per day) to Participant Two's 1.1685 (words per minute per day). These daily increases were not statistically significant when compared to the daily rate of increase during each participant's pre-intervention, baseline period. Therefore, I was unable to say MVRC increased my participant's fluency rates, as measured by the AIMSweb fluency probes, at a statistically significant rate during my 20-week intervention period.

Research Question Two. The data I collected during my 20-week intervention period indicted that MVRC did not have a statistically significant effect on my nine participants’ reading comprehension skills as measured by the STAR reading comprehension tests. I attempted to measure statistical significance at 99%, 95%, and 90% confidence intervals. The daily standard score improvement during the intervention period varied among my participants.

During my study's intervention period, my participants' daily reading comprehension standard scores increase ranged from Participant Nine's .3073 (standard score points per day) to Participant Six's 2.5836 (standard score points per day). These
daily increases were not statistically significant when compared to the daily rate of
increase during each participant's pre-intervention, baseline period. Therefore, I was
unable to say MVRC increased my participant's reading comprehension skills, as
measured by the STAR reading comprehension test, at a statistically significant rate
during my 20-week intervention period.

**Research Question Three.** The group mean, of my nine participants' WJ IV
standard scores, made a statistically significant positive gain on each of the five WJ IV
test measures: (a) Broad Reading, (b) Reading, (c) Letter Word Identification, (d)
Reading Fluency, and (e) Passage Comprehension. I determined this significance by
using a matched pairs t confidence interval test to compare my group's pretest mean with
their posttest mean. I collected, my participant group's pretest mean during the pre-
intervention baseline period, and their posttest mean after to my 20-week MVRC
intervention period. The WJ IV pre- and post-test standard scores were normed for each
participant's year-and-month-age at the time of testing. Each of the five WJ IV test
measures' pre- and post-test group mean comparisons resulted in a statistically significant
mean gain.

All five pre- and post-test mean-gains in reading indicated, with 95% confidence,
that exposure to MVRC increased my participant group's mean WJ IV standard
scores. After the 20-week intervention period, each of the five pre- and post-test
comparison resulted in a mean gain of at least one standard deviation on the WJ IV score
evaluation scale. Through this analysis, I discovered statistically significant WJ IV data
related to Research Question Three that contradicted the results of Research Questions
One and Two. The highest main gains made by the group were in the WJ IV Sentence
Reading Fluency (+32.22 standard score points) and Reading Comprehension tests (+22.56 standard score points). My five WJ IV pre- and post-test matched pairs comparison yielded, with a 95% confidence interval, the following standard score (SS) mean gains: (a) Broad Reading +18.44 SS points, (b) Reading +18.22 SS points, (c) Letter Word +19.11 SS points, (d) Sentence Reading Fluency +32.22 SS points, and (e) Passage Comprehension +22.56 SS points.

My Interpretation of Results

Research Question One. The fluency results that I obtained from my AIMSweb fluency probes indicated that MVRC did not increase the rate at which my participants read. Each participants' daily rate of gain during the MVRC intervention period was too similar to their pre-intervention daily rate of gain. Based on my AIMSweb data analysis, I could confidently say that addition of MVRC to my participant's specialized reading instruction did not increase their reading fluency rates more than the reading instruction they had received during the baseline period. Essentially, each participants' reading fluency increased at approximately the same rate throughout my study's baseline and intervention periods. There was no discernable difference, as measured by AIMSweb curriculum based fluency probes.

My initial interpretation of this null result was negative. After analyzing my participant's AIMSweb fluency data and realizing their daily rate of gain was consistent throughout the school year, I understood that each student had made positive annual fluency progress regardless of the MVRC intervention. Each participant had increased the rate at which they read grade level passages during the 2016-2017 school year. I had anticipated statistically significant gains in each student's reading speed.
Later my study provided some conflicting fluency data. When I compared, the group mean of my participants' WJ IV Sentence Reading Fluency pre- and post-test scores, my results showed MVRC had made a statistically significant positive impact on my participants' WJ IV Sentence Reading Fluency standard scores. I found this conflicting fluency information interesting, but it did not change my initial "No" answer to research question one. Based on the 40 AIMSweb fluency probes I conducted with each of my nine participants, MVRC did not have a statistically significant positive impact on their reading fluency rates as measured by the AIMSweb fluency probes. Although I did consider the statistically significant WJ IV Sentence Reading Fluency standard score data, it was measured using only one pretest and one posttest. I believe the frequency by which I measured my participants' fluency using the AIMSweb tools makes those results more valid. I discussed the potential reason for this fluency score discrepancies in my Chapter V Limitations section.

**Research Question Two.** The reading comprehension results that I obtained from my study indicated that MVRC did not affect my participants’ reading comprehension standard scores, as measured by the STAR reading comprehension tests, during my 20-week intervention period. Based on my STAR data analysis, I could not confidently declare that adding the MVRC program to my participant's specialized reading instruction improved their reading comprehension skills more than the reading instruction they received during my 20-week baseline period.

My initial interpretation of this second null result was also negative. After analyzing my participant's STAR comprehension data, and realizing their daily rate of gain was consistent throughout the school year, I understood that each student had made
positive annual reading comprehension progress regardless of the MVRC intervention. Each participant had increased their comprehension standard score on the STAR reading test. I had anticipated statistically significant gains in each student's reading comprehension skills.

For the second time, my study provided some conflicting data. When I compared, the group mean of my participants' WJ IV Sentence Reading Fluency pre- and posttest scores, the results showed that MVRC had made a statistically significant positive impact on my participants' WJ IV Passage Comprehension standard scores. I also found this conflicting reading comprehension information interesting, but it did not change my initial "No" answer to research question two.

Based on the 40 STAR reading comprehension tests my nine participants completed, MVRC did not have a statistically significant positive impact on their reading comprehension standard scores, as measured by the STAR reading test. Although I did consider the statistically significant WJ IV Passage Comprehension standard score data, I knew it was measured using only one pretest and one posttest. I believe the frequency by which I measured my participants' comprehension using the STAR tools makes those results more valid. Simply, the STAR time series tests provided significantly more data points than the two WJ IV Passage Comprehension pre- and post-tests. I discussed the potential reason for this fluency score discrepancies in my Chapter V Limitations section.

**Research Question Three.** The WJ IV results that I obtained from my study, during my 20-week intervention period, indicated that MVRC positively affected my participant group's mean standard scores on the WJ IV subtests: (a) Broad Reading, (b) Reading, (c) Letter Word, (d) Sentence Reading Fluency, and (e) Passage
Comprehension. This is an important finding for IEP teams at Lincoln Elementary School because the WJ IV tests scores were used to identify specific learning disabilities in reading.

My participants AIMSweb reading fluency rates and STAR reading comprehension standard scores did not improve at a statistically significant rate. However, my participants’ five WJ IV standard scores did improve after the MVRC intervention period at a statistically significant rate. I interpreted these results to be a very important finding. After my nine students with disabilities participated in the MVRC reading intervention program for 20 weeks, their WJ IV reading scores increased by more than one standard deviation. Therefore, it is distinctly possible that continued exposure to MVRC would continue to increase the WJ IV reading scores of students with disabilities to the point where they read at the level of their same-aged peers. What this essentially means is that exposure to MVRC may improve a student’s WJ IV reading scores to levels where they no longer qualify as a student with a reading disability.

**Discussion of My Results**

**Special Education at Lincoln Elementary.** MindPlay, the manufacturer of MVRC conducted exhaustive analyses of MVRC’s impact on student reading skills. These analyses, 20 of which I presented in my second chapter literature review and Appendix D: Additional MVRC Studies Published by MindPlay, concluded that MVRC successfully improved the reading skills of remediate readers in various educational settings throughout the United States. I was unable to duplicate these results with my study's group of nine elementary students with reading disabilities. Although my single subject research study did not demonstrate the potential of MVRC for all
remedial readers, it did demonstrate the impact of MVRC on a small group of atypical students. It also did not negatively impact my participants' ability to improve their reading skills at a standard rate.

To master grade level reading skills these atypical students with disabilities required extensive and repeated exposure to reading lessons in order to master them. A common academic accommodation, that was noted in each of my participants' IEPs, was 100% extended time. The extended time accommodation provides students with disabilities the time they require to learn or to complete assessments. Extended time, when used during standardized testing and other academic endeavors, postponed academic deadlines to assure the provision of other accommodations: (a) pre- and re-teaching academic standards, (b) breaks to refocus on a task, (c) adult scribes when writing extended response answers, and (d) adult read-aloud when assessments include passages that exceed the student's reading ability.

Over the period of 40 weeks, MVRC did not improve, nor hinder, my participant's fluency rates and comprehension skills. Each participant's IEP provided the extended time accommodation, and stated it took these students with disabilities longer to master grade level academic skills, like reading. Therefore, I can logically theorize that had each of my participants been exposed to the MVRC reading intervention for a duration of time that exceeded 20 weeks, they may have realized greater gains in fluency and comprehension.

Considering my inability to replicate MVRC's established success, and my participants' extended-time IEP accommodations, I recommended that my participants continued with the MVRC intervention program beyond the conclusion of my 20-week
study. I believe this type of extended time version of the intervention increased my participants’ AIMSweb reading fluency rates and STAR reading comprehension skills with additional exposure to the MVRC intervention program. Since my participants required more time than their typical peers to master academic skills and MVRC did not negatively impact their reading assessment scores, a longer intervention period may have ultimately achieved the desired increased reading results.

The WJ IV standard scores, as detailed in my Chapter III Instruments section, were norm referenced for a test taker's age (years and months) at the time of testing, and were plotted on a bell curve (see Table 3.1). A standard score of 100 was the midline average on the bell curve. Standard scores that fell two standard deviations below the average range were indicative of a specific learning disability in reading. Therefore, WJ IV standard scores below 80 points, that fell within the below average or significantly below average standard score ranges, were representative of a specific learning disability in reading, and typically resulted in a recommendation for special education services.

Considering the importance of WJ IV standard scores to the identification of specific learning disabilities in reading at Lincoln Elementary School, it was significant that each of my nine participants increased their standard scores on all five WJ IV reading pre- and post-test after the MVRC intervention period. I measured the group mean standard score increase from the WJ IV pre- and post-tests with a 95% confidence interval. This indicated that there was a 95% probability that my nine participants, and possibly other students with reading disabilities, would increase their WJ IV standard scores during additional MVRC intervention programs. If that possibility came to
fruition, it would be distinctly possible that the MVRC program increased my participant's WJ IV scores to the point where they were in the average range or higher.

If a student with disabilities mastered their IEP reading goals by reading at a grade level fluency rate and with grade level comprehension skills, and earned average or higher WJ IV reading standard scores, their IEP team would not find them eligible for special education services in reading. Since the ultimate goal of every IEP is to provide an eligible student with specialized instruction until deficient skills are mastered, MVRC may help students with disabilities, and their IEP teams, realize this mastery goal. When a student required special education services, in addition to their reading services, all of the services were addressed during school time. If that student had mastered their grade level reading skills and no longer qualified for special education reading services, the instructional time could be re-allotted to focus on instructional areas of need. My WJ IV pre- and post-test results led me to believe that MVRC had the potential to relieve a student of the need for reading services, thus providing time for to address their other disability categories. Since MVRC had the potential to relieve a Lincoln Elementary student of their need for reading services, it also had the potential to provide the student with an opportunity to attend general education elective courses, with their non-disabled peers, instead of remediated reading classes.

The desired result of my research was the identification of a means to provide specialized instruction in reading that would enable students with disabilities to participate in the Least Restrictive Environment (LRE). Ideally, the LREs for students with disabilities are grade level general education classes, which included non-academic
electives. This ideal LRE provided a more inclusive and typical school experience than small group specialized instruction in a special education resource room.

I believed the results of my study's data, as they related to my third research question, indicated that MVRC was a CAI program that led to an ideal LRE for students with disabilities at Lincoln Elementary School. When Lincoln Elementary students with disabilities achieved standard scores of 80+ (low average or higher) in the WJ IV reading tests, they were adequately progressing toward mastery of their IEP reading goal(s). Students who demonstrate mastery of reading goals no longer required daily specialized instruction in reading. Since my nine participants increased their group mean WJ IV reading scores: (a) Broad Reading +18.44 SS points, (b) Reading +18.22 SS points, (c) Letter Word +19.11 SS points, (d) Sentence Reading Fluency +32.22 SS points, and (e) Passage Comprehension +22.56 SS points, it was distinctly possible that exposure to MVRC provided educational outcomes, as measured by the WJ IV reading tests, that would limit the amount of time a student with disabilities require specialized instruction in reading.

**Consumer Awareness.** Nunes and Cespedes (2003) described modern consumers as more sophisticated and strategic because they were increasingly better prepared to make purchase decisions that were advantageous to their specific circumstances (Nunes & Cespedes, 2003). I viewed my study's results through the lens of a teacher leader. As a teacher leader tasked with the administration of this study, I became financially interested in the program's cost to benefit ratio. As a result, I became a better informed and more experienced consumer of educational technology and CAI
programs. I also came to view my study as a reliable method of comparing the cost of MVRC to its educational benefit.

Before my study, I had hypothesized that MVRC was an ideal method of efficiently addressing the various reading deficits of students with disabilities at Lincoln Elementary School in Rockfield, Ohio. I based my hypothesis on the manufacturer’s commercial message. The commercial message included three convincing elements: (a) 16 studies, that I summarized in my literature review, which touted the positive impact of MVRC on students' reading skills; (b) the manufacturer's claim that 20 hours of exposure to MVRC would improve a student’s reading skills by one grade level; and (c) MindPlay's money back guarantee:

MindPlay® offers a money back guarantee to schools that do not experience success with the program. MindPlay® is confident that MindPlay Virtual Reading Coach™ will improve student reading comprehension scores 10-30 percentile points after a minimum of 40 hours of use. This guarantee requires that the school implement the program with fidelity*, use the program with at least 50 students, and submit standardized pre-test to post-test scores to MindPlay®.

*Fidelity – 4 days a week, 30 minutes a day. ("Mindplay Guarantee", n.d. para. 1)

The numerous reports of MVRC's success, the manufacturer's confidence in the product, and my hypothesis led me to petition the Rockfield School District to fund my purchase of ten annual MVRC licenses for the 2016-2017 school year.

The ten MVRC licenses alone cost $1,616 for the 2016-2017 school year. This purchase included two types of licenses, six student seats and four student accounts. The total did not include the cost of Chromebooks, headphones, and other technology used
during my study, which were supplied by the Rockfield School District. Student seats were one type of software license. Seats could be used by any student with a teacher created account login. Although student seats could be shared by a limitless number of student accounts, only six students could simultaneously login at one time. The six student seats cost $170 each, for a total of $1,020. Although MindPlay no longer sells student seat licenses to customers, the Rockfield School District's ability to purchase the six shared student seats was a grandfathered purchase made prior to the recent purchasing protocol change.

Student accounts were annually renewed software licenses that were assigned to one specific student at a time. A student account could only be used by one student who logs into their teacher created individual account. Student accounts could be re-assigned by a teacher as often as necessary, this administrative step took approximately five minutes each time an account was reassigned. Essentially, a student account could be shared by many students, if a teacher reassigns the account prior to each login. For this reason, student accounts were not as easily managed or shared as the student seats. The process of reassigning a student account could be a challenging logistical issue if large numbers of students were being reassigned to student accounts, and were attempting to simultaneously use a limited number of student accounts. This problem could be averted with the purchase of one student seat for each participant. However, one student per account could become expensive at $149 per student account. The four student accounts used in my study cost $149 each, for a total of $596.

As consumers of commercially produced instructional products, educators do not typically challenge the claims of educational software manufacturers, especially ones who
have advertised achievement rates that are established through scientific methods. For this reason, I was optimistic about my hypothesis that participation in MVRC for one academic semester (20 weeks) would improve the treatment group’s reading fluency and comprehension skills to the point where they were able to read at grade level. Prior to my study, I envisioned the MVRC as a program that would quickly change the lives of students with disabilities by making them grade level readers in as little as one school year. The thought that my students with disabilities would make annual progress in 20 hours, meant that these same students could improve two grade levels in 40 hours, and possibly three grade levels in 60 hours.

The data I gained from the various reading progress monitoring tools used at Lincoln Elementary School, provided me with conflicting reading fluency and reading comprehension data. My statistical analysis of AIMSweb reading data indicated MVRC did not improve my participant's fluency rates. Likewise, my statistical analysis of STAR reading data indicated MVRC did not improve my participant's reading comprehension skills. Conversely, my comparison of pre- and post-intervention data using five WJ IV standard scores yielded different information. My WJ IV data indicated that MVRC drastically improved my participant group's mean standard scores on their Broad Reading posttests, Reading posttests, Letter Word Identification posttests, and most interestingly, on their Sentence Reading Fluency posttests, and their Passage Comprehension posttests.

I believe the variation in my study's reading fluency and reading comprehension results, and my failure to duplicate the reading improvement rates described by other researchers, could be explained through a discussion of my study’s focus. That focus was a very specific, atypical group of elementary students at Lincoln Elementary School. The
participants' atypicality may have contributed to the lower levels of progress that I observed in my study relative to the results that other MVRC researchers obtained from larger more typical subject groups.

My study's results demonstrated that MVRC did not negatively impact any students' reading fluency rates or reading comprehension skills. However, it also showed that the program did not specifically improve the AIMSweb and STAR scores of my nine students with reading disabilities. Each participant in my study was identified with a reading disability, and many had multiple disabling conditions, that impacted their ability to read fluently with comprehension. The additional disabling factors represented by my participant group included behavior disorders, attention deficit disorders, deafness, and compromised vision. After seeing my study's results, I suspected that had I included a broader range of students, including those without disabilities, my results would have shown MVRC was very capable of achieving the results advertised by its manufacturer.

The manufacturer of MVRC did not suggest that handicapping conditions may limit the program's potential. Therefore, I expected impressive results from my nine participants regardless of their disabilities. I should have been more aware of the fact that the manufacturer had not completed an exclusively special education study. I now realize this type of study was not previously completed because MVRC is not a program design specifically for students with disabilities, rather it focuses on reading skills for the general population.

Because my study was an analysis of MVRC's impact on a very specific population of students with learning disabilities, I was unable to duplicate the results of previous studies. From this, I have learned that future reading interventions must be
guided by an understanding of each individual student's learning needs before identifying a computer-assisted reading instruction program that fits that individual's learning profile. This individualized tactic would be more expensive and difficult to administer. To purchase one specific computer-assisted reading instruction program for each individual student with a learning disability is impractical and too expensive for a school district. Specialized reading instruction must be designed for individual students, by teachers who understand each student's needs. Programs like MVRC are excellent supplements to education and may hasten the process of acquiring reading skills, but they cannot exclusively fulfill student needs for specialized reading instruction which can only be provided by an experienced reading teacher.

Through my study, I learned that the best method to evaluate the potential impact of commercial CAI programs is through their application in one's own educational environment. Considering the radical educational differences in states, school districts, school buildings, and even classrooms, a belief that the best results will be easily duplicated was extremely optimistic. Simply put, the most accurate evaluation of educational programing could not be complete based solely on the manufacturer's reported success. Rather, it must be evaluated in the environment it will be used, before it is purchased, and found to inadequately address the purchaser's intended purpose.

This is not to say that manufacturers present false or inaccurate results when advertising their products. On the contrary, I am certain that MindPlay, the manufacturer of MVRC, accurately reported the success of their program. It was an excellent tool to supplement the education of remedial readers. The impact of MVRC, as reported by other research studies, was detailed in my literature review, and based on large
populations of students' achievement data. Those populations included a wide variety of students’ whose abilities ranged from various disability categories to typical general education students. After my study, I realized that I had studied the impact of MVRC on a population that was different from the dramatically successful populations that other MVRC researchers studied.

MVRC did not impact my students the way it increased the reading skills of other research study participants, one grade level in 20 hours. However, at the end of my intervention period, each of my participants was less far from their grade level reading fluency and reading comprehension benchmarks than they had been at the beginning of the study's baseline period. From these results, I learned the importance of studying CAI programs before purchasing tens, if not hundreds, of expensive user licenses. Teacher leaders are responsible to all stakeholders for making well-informed financially sound decisions in order to achieve the desired results all teacher leadership, student improvement.

**Limitations of My Study**

My study functioned according to its design. Its planned duration was 40 weeks, during the 2016-2017 school year. The first 20 weeks of the school year served as the baseline period, when I collected pretest and time-series baseline data from my nine participants. The second 20 weeks served as the MVRC intervention period, during which I continued to monitor my participant's reading fluency and comprehension progress, and after which I collected posttest WJ IV data. After the study ended in June, 2016, I plotted my participant's biweekly reading scores for visual and statistical analysis. Upon reflection of my year-long study and its results, I recognized some
matters that may have limited its ability to perfectly evaluate the impact of MVRC on the reading skills of my elementary students with disabilities.

**Complexity, Duration, and Frequency.** The AIMSweb reading fluency and STAR reading comprehension progress monitoring assessments were the tools used to assess the reading aptitude of every Lincoln Elementary School student. The AIMSweb reading probes were grade-level reading passages, and their associated words read per minute benchmarks were normed for grade-level fluency rates. Although I was confident in the AIMSweb probes' ability to assess my students' fluency rates, the grade level passages that I used were often above my participants' ability to fluently read and comprehend. Additionally, The STAR reading comprehension assessment consisted of 34 questions that the manufacturer estimated would take a student 15 minutes to complete (Renaissance Learning, 2015b, 2016). I was also confident in the STAR program's ability to assess my participant's reading comprehension skills. However, the STAR assessment often took my participants 30 minutes to an hour to complete the 34 questions that the manufactured said would take approximately 15 minutes.

When I compared the complexity of the fluency passages, and the duration of the comprehension tests, with my participant's reading skills, I realized the possibility that my participants may have been negatively impacted by the rigor of my time series assessments. For this reason, I viewed the complexity and duration of my weekly time-series tests to be potential limitations to my study's ability to measure the impact of MVRC on my participant's AIMSweb fluency rates and STAR comprehension scores. I identified this limitation because my participants were not capable of grade level reading
tasks during my study. Therefore, my data collection tools and processes might be improved upon, in future iterations of my study.

In addition to the complexity and duration, I required my participants to complete one complex fluency probe, or one prolonged comprehension test, each week, for 40 weeks. Considering the frequency of my time series testing, it was possible that the weekly assessment recurrence may have frustrated my participants or otherwise negatively impacted their assessment results. If this was the case, my participants may not have been capable of doing their best, week after week, on my biweekly measurements of fluency and comprehension. For this reason, the frequency of progress monitoring may have limited the accuracy of my weekly data points.

Accurate and reliable reading data could be obtained using reading probes and benchmarks at a student's present level of performance, rather than their grade level. It can also be obtained from students in monthly increments rather than the weekly testing. I suspect that monthly reading fluency and reading comprehension assessments, that were normed for reading level rather than grade level, would improve future iterations of this study. I have come to this conclusion because the process of collecting and maintaining large quantities of reading data was a significant task to manage for one teacher with additional professional responsibilities.

The process of completing weekly grade-level assessments of reading performance was a challenge for my elementary students with disabilities. For the reasons described above, I recommend that future iterations of this study will address my identified limitations by conducting fewer reading assessments, that use performance measures based on a student's current reading skills, rather than their grade
equivalence. I also recommend that the progress monitoring assessments are faster and
less time consuming, and less frequent.

**Conflicting Data.** During the data analysis phase of my study, I obtained
conflicting results from my AIMSweb time series fluency probes and my WJ IV
Sentence Reading Fluency pre- and post-tests. My statistical analysis of my students
reading fluency progress showed that my participants' fluency rates did not change
dramatically, after exposure to MVRC, from the baseline through the intervention
periods. Although my participants' reading fluency rates increased throughout the 2016-
2017 school year, the rate of increase was not statistically significant when the
intervention was added. The results of my matched pairs t confidence interval tests of
AIMSweb baseline and intervention data told me that the addition of MVRC had not
improved my participants' reading fluency scores, any more than the typical reading
instruction they had received during the school year.

Although the AIMSweb statistical analysis of fluency rates did not demonstrate a
statistically significant positive gain, my participants' WJ IV Sentence Reading Fluency
mean pre- and post-test scores indicated the MVRC program had improved the rate at
which my participants read. The WJ IV Sentence Reading Fluency pre- and post-test
scores were obtained during the baseline period (the first 20 weeks) and at the end of the
intervention period (the second twenty weeks). During that time, the group's WJ IV
Sentence Reading Fluency mean gain was +32.22 standard score points, which indicated
a statistically significant increase in my participants' reading fluency as measured by the
WJ IV Sentence Reading Fluency subtest.
I suspected the discrepancy in scores was influenced by the type of measurement tools the AIMSweb fluency probes and the WJ IV Sentence Reading Fluency subtests were. The AIMSweb test measures performance using grade level reading probes to determine the number of words each participant read in one minute. Because the AIMSweb probes were grade level reading passages, they were always beyond my participants' reading abilities, which were well below grade level norms. Differently, the WJ IV Sentence Reading Fluency standard scores were norm referenced for age, rather than grade level. The WJ IV Sentence Reading Fluency subtest (described in my Instruments section of Chapter III) also consisted of a different processing task. In it, students read and labeled brief true or false statements. Their WJ IV Sentence Reading Fluency standard score was based on the number of these statements each student correctly labeled as true or false.

As a result of my study, I can say with 95% confidence that MVRC did not increase my students' AIMSweb fluency scores. I can also say with 95% confidence that MVRC did increase my students' WJ IV Sentence Reading Fluency standard scores. Because both of these scores are a reflection of my participants' reading fluency rates, I cannot say with certainty which score is correct or more accurate. Although I could not definitively explain the reason for these discrepant reading fluency results, I considered them to be another limitation to my study. I believed my study's conflicting reading fluency reports could have been considered a limitation because they jeopardized the validity of my findings on both the AIMSweb and WJ IV Sentence Reading Fluency assessments. Therefore, I felt these conflicting reading fluency results could have been considered a limitation to the reliability of my study.
I also obtained conflicting results from my STAR time series comprehension probes and my WJ IV Passage Comprehension pre- and post-tests, during the data analysis phase of my study. My statistical analysis of my students’ STAR reading comprehension progress showed that my participants' reading comprehension skills did not improve, after exposure to MVRC, during the baseline and intervention periods. Although my participants' reading comprehension skills increased throughout the 2016-2017 school year, the rate of increase was not statistically significant when the intervention was added. The results of my matched pairs t confidence interval tests of STAR baseline and intervention data, told me that the addition of MVRC did not improve my participants' reading comprehension scores any more than the typical reading instruction they received throughout the school year.

Although my STAR analysis of reading comprehension skills did not demonstrate a statistically significant positive gain, my participants' WJ IV Passage Comprehension mean pre- and post-test scores indicated the MVRC program had improved my participants' reading comprehension skills. The WJ IV Passage Comprehension pre- and post-test scores were obtained during the baseline period (the first 20 weeks) and at the end of the intervention period (the second twenty weeks). During that time, the group's WJ IV Passage Comprehension mean gain was +22.56 standard score points, indicating a statistically significant increase in my participants' reading comprehension as measured by the WJ IV Passage Comprehension subtest.

I suspected the discrepancy in scores was influenced by the type of measurement tools the STAR reading comprehension assessment and the WJ IV Passage Comprehension subtests were. The STAR test measures used grade level reading
passages and 34 corresponding questions to determine the participant's reading comprehension standard score. Because the STAR tests were not limited by time, my participants worked on each STAR assessment until they had completed all 34 questions. The STAR tests were also norm referenced for Common Core grade level reading comprehension skills. Differently, the WJ IV Passage Comprehension standard scores were norm referenced for age, rather than grade level. The WJ IV Passage Comprehension subtest (described in my Instruments section of Chapter III) also consisted of a different processing tasks. During the Passage Comprehension subtest, students read incomplete sentences and predicted which word or phrase was missing from each sentence. Their WJ IV Passage Comprehension standard score was based on the number of the incomplete sentence that each student completed with a correct, protocol prescribed, word or phrase.

As a result of my study, I can say with 95% confidence that MVRC did not increase my students' STAR comprehension scores. I can also say with 95% confidence that MVRC did increase my students' WJ IV Passage Comprehension standard scores. Because both of these scores are a reflection my participants' reading comprehension skills, I cannot say with certainty which score is correct or more accurate. Although I could not definitively explain the reason for these discrepant reading comprehension results, I considered them to be another limitation to my study. I believed my study's conflicting reading comprehension reports could have been considered a limitation because they jeopardized the validity of my findings on both the STAR and WJ IV Passage Comprehension assessments. Therefore, I felt these conflicting reading
comprehension results could have been considered a limitation to the reliability of my study.

Self-Reflection

Reason (2001) explained the emphasis of participatory action research, and other iterations of action research enquiry, as a process of combining action and reflection. The result of this process was new knowledge relevant to a study's focus. The knowledge gained from an action research inquiry illustrated the cyclical interaction between understanding and change (Vaccarino, Comrie, Murray, & Sligo, 2007). This systematic approach to understanding a problem, proposing a solution, and analyzing the resulting impact was incomplete without a researcher's reflection. In order to enact positive change in a social organization, an action researcher must ask them self why they had taken certain actions, and why those actions resulted the way they did (Vaccarino et al., 2007). An action researcher must trust that their study resulted in the way it was destined. Then, an action researcher must ask, how could I take ownership of my results? Selener (1997) said, “change does not come about as a result of spontaneous acts, but through reflection on and understanding of specific problems” (p. 105). Therefore, as an action researcher, I had to ask myself what reflective understanding had I come to as a result of my study.

In my opinion, the modern high stakes testing educational-environment's emphasis on proficient tests scores had reached a point where teachers often view their students' standards based performance as a reflection of their own professional ability and too often their own self-worth. This mindset made it easy for me to reflect on the statistically significant positive impact MVRC had on my participants’ five WJ IV
standard scores, because those scores provided a positive confirmation of my year-long teaching efforts. It was more difficult to reflect upon my study's inability to increase my participant's AIMSweb reading fluency and STAR reading comprehension scores. These relatively negative results, left me with a feeling of failure because I was unable to duplicate the many reports of MVRC as a successful reading skills intervention for remediate readers throughout the United States. I felt that I had failed to achieve the cultural expectation of perfection for my group of students with reading disabilities, and had therefore failed as their teacher. As a result, I worried about how I would be perceived by my professors, colleagues, supervisors, and my students' parents.

Participatory Action Research taught me that I had to embrace my negative results and reflect upon my feelings of failure. My reflection upon this troubling conclusion, helped me to realize the most important lesson from my study was empathy for my academically marginalized students with disabilities. Through my perceived failure, I learned first-hand how my students felt nearly every day of their young academic lives. We were the victims of an educational system that pressured us to perform at an academic level for which we were not prepared. This pressure to perform to standards that were well beyond our reach negated all of the positive progress we had made in a single school year. I realized that even though my reading intervention had not taught each of my students with disabilities to read at grade level, it had done no harm. In actuality, each of my study's participants had become a more successful reader then they had been before my study's intervention period.

Much like my students with disabilities, who had received consistent messages of inadequate progress toward unachievable benchmarks, I had learned my efforts, no
matter how great, were simply not enough. Upon reflection, I was reintroduced to the concept of authentic education and the importance of celebrating sustained effort, academic growth, and student progress. These valuable aspects of education had fallen out of vogue in today's standards-based educational environment, but remained the soul and humanity of what being an educator always was to truly effective teachers. Not only were these rejuvenating conclusions profoundly important to my concepts of self-worth and professional success, they were vastly more important to the children I had been charged with fostering into adolescence. Therefore, as a result of my study, I was able to remember why I had become a special education teacher. It was not because I was driven by my arbitrary standards-based benchmarks of academic performance, it was because I wanted to improve the lives of marginalized children with disabilities, who bravely faced a world of standards for which they were not inherently equipped to succeed.

**Recommendations for Future Study**

In the present era of high-stakes-testing, the standards-based educational curriculum focused on a single end result, student achievement test scores (Diamond, 2007). This focus on student test performance was a detriment to other student learning outcomes, like basic reading skills, beyond the CCSS (Diamond, 2007; Haynes, 2008). The CCSS, and related state report card formulas, are used to evaluate school districts, teachers, and every student's growth, the standards are becoming more important than the processes by which students learn the foundational skills required to master the CCSS (Zitlow & Kohn, 2001). Educators and school districts, driven by the desire to score well on high stakes tests, often purchase CAI programs to improve their student's foundational skills efficiently, before their next round of state testing. The
decision to purchase a particular CAI program was typically informed by the program's commercial and clinical success, rather than its proven success in the specific educational environment where it will be used (Hannafin & Foshay, 2008; McDonald & Hannafin, 2003). As a result of this limited, pre-purchase, information-gathering process, a CAI program's true impact on specific students cannot be determined until after the program has been purchased and implemented in their unique educational setting.

As I have learned through my study, the results that are guaranteed by a manufacture do not always come to fruition. Therefore, there is a need for evaluating CAI programs within one's own educational environment before making large and costly software purchases. I recommend that future researchers develop their own means of gathering evidence that supports their CAI purchase. These evaluation programs should use the research based assessments that are currently used in the evaluator's educational setting, to determine the impact of their CAI program. The CAI programs they choose to use with their students will work for a specific population, like students with disabilities, versus a general population, when the research results of general education population performance are significantly positive.

I have found that my study identified a good method of evaluating CAI programs in specific learning environments. It proved to be a thorough method of analyzing the impact of MVRC on the reading skills of elementary students with learning disabilities. My method yielded a quantifiable analysis of a CAI program's impact of my school's most needy learners. With it, I was able to evaluate the CAI program at a limited cost before my school district purchased hundreds of MVRC licenses. For this reason, I recommend following my method of program analysis when evaluating other CAI
intervention programs. That method should be informative and include pretests, time series tests, and posttests that measure the impact of a potential CAI purchase on the test group's academic skills.

My second recommendation is for Lincoln Elementary to continue its use of the reading fluency and reading comprehension progress monitoring procedures I established during my study. Because the design of my single subject research study adequately monitored my participants' reading progress for the duration of their annual IEPs, I have established an appropriate and thorough method of monitoring and reporting students' progress toward their IEP reading goals. By continuing to use this method to progress monitor student reading skills, I can confidently say that Lincoln Elementary will be using IDEA-required, scientific, research-based progress monitoring tools that the Rockfield School District currently owns. Since every student with a reading disability at Lincoln Elementary has a reading fluency and, or a reading comprehension goal in their IEP, the reading growth measurement processes that I used during my study are ideal methods of progress monitoring future IEP reading goals.

The third recommendation for future study is the continuation of this study. Valuable information will continue to be gleaned from my single subject research participants' reading performances. Adding additional students with disabilities, or other students who require remedial reading instruction, would broaden the data Lincoln Elementary has on the MVRC reading intervention.

The fourth recommendation that have is for Lincoln Elementary to use my method of program evaluation to study the impact of other CAI programs. Ideally, individual students, who have reading and various other secondary disabilities, will be
provided individualized CAI reading programs that will supplement their specific learning needs, their MI strengths, and their present level of academic performance. MVRC was an excellent start for teaching students with disabilities basic reading skills. However, it is distinctly possible that other CAI reading programs will more efficiently impact my study's participants' reading fluency rates and reading comprehension skills.

Because every student's IEP is considered to be a living document that is meant to be amended and modified as deemed necessary by an IEP team, the specialized instruction or supplemental CAI programs can also be changed. If members of an IEP team identify a CAI reading intervention program that is better designed to address a specific student's individual learning needs, then it must be implemented to assure the student has access to their LRE. When better suited CAI programs are identified, I recommend studying their impact on the individual student's reading skills, as I have measured the impact of MVRC on my participant's skills.

My final recommendation echoes Wenner and Campbell’s (2017) call for more studies of teacher leadership. Every day I witness talented professionals design, implement, analyze, and modify their instructional practices. The vast amount of educational experience and instructional knowledge that begins and ends within the confines of a single classroom must be staggering. If teachers were given the opportunity to share their experience and knowledge with other professionals, education would undoubtedly improve. Ironically, teachers are not called upon to lead often enough. Therefore, the need exists for examples of the art of education. Each iteration of teaching as an art, that brings the science of education to life, deserves to be studied and
shared. If unshared, we have lost the opportunity to learn from the success and failures of
our fellow teacher leaders.

All types of reading students at Wakulla Charter School accomplish outstanding results on MVRC. (2016, May). *Teacher's Playbook, 11*, 1.


At Stocker, MVRC is more than just reading instruction. (2014, September). *Coach's Playbook, 2*(4), 1-2.


Fourth grade students with disabilities improve their reading skills. (2016, March). *Teacher's Playbook, 10*, p. 2.


Ohio Department of Education. (2012). *Whose IDEA is this? A parents guide to the Individuals with Disabilities Education Improvement Act of 2004 (IDEA).* Columbus, OH. Retrieved from http://education.ohio.gov/Topics/Special-Education/Whose-IDEA-Is-This?


Pearson Education. (2012). *AIMSweb: Reading curriculum-based measurement administration and scoring guide* [Teaching manual]. Bloomington, MN.


Using MVRC with fidelity pushes student to read on grade level. (2016, October).  

Teacher's Playbook, 12, 2.


APPENDIX A

HUMAN SUBJECTS REVIEW BOARD APPROVAL LETTER
TO: David A. Reiser and Dr. Harold E. Wilson
FROM: Chris Chartier, HSRB Chair
DATE: January 30th, 2016
SUBJECT: Human Subjects Review Board Approval
PROJECT TITLE: Impact of Mind play Virtual Reading Coach on Reading Fluency and Comprehension
HSRB APPROVAL CODE: 9-23-16-4038

The Human Subjects Review Board has approved your research study. You may proceed with the study as you have outlined in your proposal. The approval is granted for one calendar year. Research participant interaction and/or data collection is to cease at this time, unless application for extension has been submitted and approval for continuance is obtained.

The primary role of the HSRB is to ensure the protection of human research participants. As a result of this mandate, we ask that you adhere to the ethical principles of autonomy, justice, and beneficence. We would also like to remind you of your responsibility to report any violation to participant protections immediately upon discovery. Likewise, we would like to remind you that any alteration to the research proposal as it was approved cannot move forward. Any amendment to the application must be submitted for approval before the project can resume.

We wish you success in your discoveries,

[Signature]

Doctor Chris Chartier
Ashland University
Chair Human Subjects Review Board
APPENDIX B

PARENT OR GUARDIAN INFORMED CONSENT DECREE
The Impact of Mindplay Virtual Reading Coach on Reading Fluency and Comprehension

Dear (Custodial Guardian):

The Department of Leadership Studies at Ashland University supports the practice of informed consent and protection for human subjects participating in research. The following information is provided for you to decide whether you will allow (your child) to participate in my present study. You are free to withdraw (your child) from the study at any time.

I will study the impact of the Mindplay Virtual Reading Coach computer assisted reading program, on your (son/daughter)'s reading fluency rate and reading comprehension skills. During my study your (son/daughter) will participate direct reading instruction lessons that I present and learn various reading skills using specially designed computer lessons designed to address your child’s specific reading weaknesses by the Mindplay Virtual Reading Coach program.

Mindplay Virtual Reading Coach is an online reading program that improves reading skills quickly and efficiently. It enables students with diverse skills and varying instructional needs to read accurately and fluently. Mindplay Virtual Reading Coach presents phonemic awareness, phonics, vocabulary, grammar, fluency and comprehension lessons individually designed for each user. Mindplay Virtual Reading Coach does this by evaluating your (son/daughter)'s reading skills, designing individualized exercises and accompanying teacher taught lessons, that address (his/her) specific reading weaknesses. The program's designers claim to assure students improve one grade level in only 20 hours.

Research indicates that reading fluency and reading comprehension are fundamental to learning the Common Core elementary curriculum. I am interested in learning how this program will improve your (son’s/daughter’s) reading fluency rate and reading comprehension skills. I believe participating in this study will help you (son/daughter) to become a better reader. It will also help Hillsboro Elementary enhance its current instructional practices.

The data that I will use for my study will include three measures of reading fluency and reading comprehension. The assessment tools I will use to measure reading fluency and reading comprehension will include the Woodcock Johnson IV tests of reading achievement; the AIRweb curriculum based measures; and the Renaissance Learning ITAR reading assessments. These assessment tools will provide a baseline measurement, weekly progress monitoring measurements, and a post-intervention measurement of each participant's reading fluency rate and reading comprehension skills.

I am requesting your permission to use your child’s data in my dissertation research. Your child’s participation is requested but is strictly voluntary. I assure you that your child’s name will not in any way be associated with the research findings. The information will be identified only through a code number. The data collected will be published in my dissertation and possibly a journal article(s).

If you would like additional information concerning this study before or after it is completed, or have any issues or concerns, please contact me, my dissertation chair, or the Ashland University Human Subjects Review Board (listed below). Thank you very much for your time. I appreciate your interest and cooperation.

Sincerely,

David Reiter
Graduate Student
(216) 831-714
DJK@newwoodward.org

Harold E. Wilson, Ph.D., Dissertation Chair
(419) 289-5339
bwilson@ashland.edu

Dr. Christopher Charlier, Chair Human Subjects Review Board
(419) 289-5342
Ashland University Human Subjects Review Board

I have read and understand the information about "The Impact of Mindplay Virtual Reading Coach on Reading Fluency and Comprehension." I give consent for my child to participate in this study. I understand that this consent is voluntary and can be withdrawn without penalty at any time.

Signature of parent or legal guardian

Date
APPENDIX C

PRINCIPAL APPROVAL LETTER
The Impact of Mindplay Virtual Reading Coach on Reading Fluency and Comprehension

Dear Principal Holthaus:

During my summative evaluation meeting last June, we discussed my plan to complete a dissertation this school year. The dissertation requires me to engage in scholarly research to improve my practice of leadership. As we discussed at the summative meeting, I plan to study the impact of the Mindplay Virtual Reading Coach computer-assisted reading program, the reading fluency rate and reading comprehension skills of students with reading disabilities.

For the study, I will use the available norm-referenced measurements of reading fluency and reading comprehension to establish a pre-intervention baseline for each student. I then plan to measure the impact of the Mindplay Virtual Reading Coach program on each participant’s reading fluency rate and reading comprehension skills. Before beginning the study, I plan to solicit the strictly voluntary participation of students and permission from their parents. I will assure each parent that their child’s name will not in any way be associated with the research findings.

The data that I will use for my study will include three measures of reading fluency and reading comprehension. The assessment tools I will use to measure reading fluency and reading comprehension will include the Woodcock Johnson IV tests of reading achievement; the Aimsweb curriculum-based measures; and the Renaissance Learning STAR reading assessments. These assessment tools will provide a baseline measurement, weekly progress monitoring measurements, and a post-intervention measurement of each participant’s reading fluency rate and reading comprehension skills.

The students’ participation will be solicited but strictly voluntary. I will assure each parent/guardian their child’s name will not in any way be associated with the research findings; the information will be identified only through a code number. I will seek the parent/guardian’s permission to include their child’s data in my dissertation and possibly a journal article.

In order to conduct this research study at Hilltop Elementary School, I am required to obtain your consent. If you support my research taking place at Hilltop, please take the time to sign and return the attached consent statement to me. If you would like additional information concerning this study or after it is completed, or have any issues or concerns, please contact me or my faculty advisor phone or email. I appreciate your assistance and support.

Sincerely,

David Reiser
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Ashland University Human Subjects Review Board
hsrb-au@ashland.edu

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I have read and understand the information about “Impact of Fluent Reading Trainer on Woodcock Johnson Reading Battery Scores.” I give consent for this study to take place at Beachwood High School. I understand that this consent is voluntary and can be withdrawn without penalty at any time.

[Signature of principal]

1/11/17

Date
APPENDIX D

ADDITIONAL MVRC STUDIES PUBLISHED BY MINDPLAY
During the 2012-2013 school year, 90 kindergarten through fifth grade students piloted the MVRC program at Stocker Elementary School, in the Kenosha Unified School District, Kenosha, WI. Stocker Elementary, used the Phonological Awareness Literacy Screening (PALS) and the STAR Reading Assessment to identify students who would benefit from the program. Wisconsin's Measure of Academic Progress test indicated that all of the second through fifth grade students who participated in the MVRC program achieved their reading goal on their spring test (At Stocker, MVRC is MORE Than Just Reading Instruction, 2014, p. 1). Additionally, the kindergarten and first grade students' PALS scores improved dramatically. Kindergarten and first grade "students who scored 6-7 points below the benchmark in the Fall are now showing 15-18 points above the benchmark in the Spring" (At Stocker, MVRC is MORE Than Just Reading Instruction, p. 1). Stocker Elementary's instructional coach indicated that apathetic students who did not apply themselves, or students who lacked self-confidence, also made great progress with MVRC.

During the 2012-2013 school year, Scott County School District Two in Scottsburg, Indiana, used MVRC in its Title I reading program. The district's population was made up of 20-25% special education students, and more than 50% received free and reduced lunches ("Indiana Implementation: A Win for Third Grade," 2014). After one year of using MVRC, the district saw an eight percent increase in the state mandated, standardized Indiana Reading Evaluation And Determination Assessment (IREAD). In the spring of 2013, "the third-grade students passed the IREAD Assessment with a 94.4% pass rate, up from 86% the prior year" (p. 1). Because of these results, the district began including Title I and MVRC support in general education classes during the 2013-2014
school year. That year 100% of the Scott County School District's third grade class achieved passing scores on the IREAD Assessment and were eligible to advance to the fourth grade (2014).

During the summer of 2013, 68 students, from Southern Arizona, who had completed eighth grade participated in a 16-day summer school program for four hours each day. According to Mindplay Research Status (2014), the students spent two hours of each day focusing on reading. "Researchers determined that 78% of the students' time was spent using MVRC as it was intended to be used" ("Mindplay Research Status", 2014, p. 2). The researchers used the Test of Silent Word Reading Fluency (TOWRF), as an independent pre- and post-test measure, to determine the impact of exposure to MVRC on the students' reading fluency. The TOSWRF pretest mean was 88. After 25 hours of exposure to MVRC, the posttest mean was 95. "Students with initial scores indicating a reading level of 5th grade 7th month increased to 7th grade 2nd month (an increase of 1.5 years). Students who started at or above 8th grade level increased to the 11th grade 2nd month" (Mindplay Research Status, 2014, p. 2).

In the article, "An Interview with Jody Bentz, Principal of Snowflake Intermediate School, AZ Former Taylor Elementary Title 1 Reading Specialist" (2015), Bentz described the MVRC pilot program she ran during the 2013-2014 school year. The pilot program included 30 third grade students who were enrolled in the Title I reading program at Taylor Elementary, Snowflake, AZ. Participants were selected using various methods including Arizona's Instrument to Measure Standards (AIMS) standardized test scores. Bentz reported that after using the MVRC program, all of the school's third grade students made adequate progress on their AIMS tests and were promoted to fourth grade.
In 2014, sixth grade "special education, dyslexia, second language, and 504 Program students" in El Paso, Texas used MVRC in their classes and outside of school for one and a half to two hours per week ("Middle School Fragile Readers Improve Their Reading Scores Using MVRC", 2015, p. 1). The teachers using the program hoped to improve their students' results on The State of Texas Assessments of Academic Readiness (STAAR) test. After one academic year, the MVRC intervention yielded positive results: (a) sixth grade students improved seven points on the STAAR test, (b) regular education students demonstrated three or four year gains, (c) dyslexic students showed two year gains, (d) a former non-reader read at a third grade level, (e) and students who did not pass the STAAR test met or exceeded expected growth (2015).

In 2015, 38 dyslexic second through fifth grade students from Beaumont, Texas, completed four 45-minute MVRC sessions each week, from September through December. In that time, 26% of the students increased their reading comprehension skills by one grade level, 11% increase their reading comprehension skills by two grade levels, 7% increased their reading comprehension skills by three or more grade levels, and one student increased five grade levels (Dyslexic Elementary School Students Succeed using MVRC, 2016). The second graders who participated in this study improved one grade level or more.

"Fourth Grade Students with Disabilities Improve Their Reading Skills" (2016) discussed the impact of MVRC on three fourth grade students with disabilities from Kissimmee, Florida. The first student with an identified learning disability was an English Language Learner. The report indicated that this student had increased her reading level from the first to the second grade after working on MVRC for hours. The
second student was diagnosed with Autism Spectrum Disorder and Attention Deficit Disorder. After using MVRC for 16 hours, the second student had increased his reading level from the first grade to the second grade, and had improved his reading fluency from Kindergarten to third grade. The third student also had an identified learning disability and was an English Language Learner. In 20 hours of MVRC intervention, he had improved from a first-grade reading level to the second-grade level.

In September 2015, 21 second grade students in St. Marks, Florida began using MVRC for 30 minutes, four times a week ("All Types of Reading Students at Wakulla Charter School Accomplish Outstanding Results on MVRC", 2016). Their teacher conducted a pretest of reading skills in September. The results of the pretest indicated that 11 students were in critical need of reading intervention, two students were approached grade level reading skills, seven students were meet grade level reading expectations, and one was exceeded grade level reading expectations. In March, 2016, after six months and approximately 48 hours of exposure to MVRC, the teacher conducted a posttest of reading skills. The resulting reading skills improved dramatically. After six months, only three students were in critical need of reading intervention, two different students approached grade level reading skills, six students met grade level reading expectations, and ten exceeded grade level reading expectations.

In January of 2016, 250 kindergarten through second grade students at Alexander Elementary School in Greenville, South Carolina, began using MVRC for a minimum of 30 minutes per day, five days a week. "Using MVRC with Fidelity Pushes Student to Read on Grade Level" explained that the MVRC intervention "began with 78% of the students as critical (two years below grade level) and 22% were approaching (one year
below grade level)" and concluded by stating "the average gain for grades K-2 was 1.75 years" (p. 2). This article specifically noted two students with disabilities, who were previously retained, began reading on grade level; a skill the author attributed to MVRC. The article continued to explain that when early elementary aged students use MVRC for a minimum of 30 minutes a day, four days a week, they make great gains in reading.

During the 2015-2016 school year, 18 third graders who participated in the MVRC program at Moran Elementary School, Osceola, IN, "contributed to [the school's] most successful passing percentage of Indiana's state mandated reading assessment" (Students Make Outstanding Reading Gains Using MVRC with Fidelity, 2016, p. 2). That year, 98% of the Moran Elementary third grade students passed Indiana's IREAD test. Moran Elementary's reading coach, Shelli Treely said, "This year we are seeing the most growth with our second-grade students based on their recent Universal Screener scores. After only one grading period, from August 25 to November 2, 2016, they had a .42 gain in reading" (p. 2). When third graders at Moran Elementary were exposed to MVRC, their reading skills made nearly one-half-year's growth during a single academic quarter.

Sixty-three third graders at Red Rock Elementary School, Gallup, New Mexico, used MVRC from August 23, 2016 through January 18, 2017 in the school's Response to Intervention (RTI) program. RTI, a tiered intervention program, was provided to at-risk students who required remedial reading instruction, but did not qualify for special education services. The students used MVRC for 30 minutes a day, four days a week. During two academic quarters these students used MVRC for approximately 18.5
hours and demonstrated an average of .57 grade level growth in reading ("Third Grade Students Learn the Power of Words and Literacy", 2017). Although a .50 grade level gain should be expected over this period of time, it is important to note the socio-economic and demographic makeup of the student body at Red Rock Elementary. One hundred percent of the students at this school qualified for free or reduced lunches, 40% of the students are Native American, and 18% are Hispanic with Spanish speaking households (2017). This is significant due to these national testing results: (a) 73% of English Language Learners (ELL) scored below basic (the lowest level possible) in reading (Fry, 2007), (b) the 2003 National Assessment of Adult Literacy 25% of Native Americans, (c) 41% of Hispanics over the age of 16 years fail to attain basic reading levels (Kutner, Greenburg, Jin, & Paulsen, 2006), and (d) Lee and Otaiba (2015) directly correlated increased poverty with a decrease in the acquisition of early literacy skills.