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The Impact of the Science of Reading Training on the NWEA Map Test Scores of Elementary African American Students in a Central Arkansas School District

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THE IMPACT OF THE SCIENCE OF READING TRAINING ON THE NWEA MAP TEST SCORES OF ELEMENTARY AFRICAN AMERICAN STUDENTS IN A CENTRAL ARKANSAS SCHOOL DISTRICT

By

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Dedication

Now faith is the substance hoped for, the evidence of things not seen. Hebrew 11:1

First giving honor to God who is the head of my life! I would not have been able to complete this study without the strong will and determination embedded in me from my Heavenly Father! My God is truly amazing! I would like to dedicate this dissertation to my mother. She was the first of 13 siblings to attend college. If "get an education" was a person, her picture would be listed next to it those powerful words. She modeled grit, determination, and perseverance, not only for her siblings but also for her three children. I am so proud of you!

Let us not become weary in doing good, for at the proper time we will reap a harvest if we do no give up. Galatians 6:9

I would also like to dedicate this work to my siblings, Grover and Sharmane; my nephew, Joseph; my nieces, Joy, Jessica, and Leilani. I hope that you can take away something positive and meaningful from knowing my journey. Our mother set the tone! She instilled in us that we could become or do anything that we want, as long as we are willing to believe in God and put forth the work to make it happen.

"For I know the plans I have for you," declares the Lord, "plans to prosper you and not harm you, plans to give you hope and a future." Jeremiah 29:11

Lastly, I would like to dedicate this to my family and close friends who have supported and encouraged me along the way! God knew whom I needed, and I need every one of you! I give a special "shout out" to my cousins! God is so Good!

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Abstract

THE IMPACT OF THE SCIENCE OF READING TRAINING ON THE NWEA MAP TEST SCORES OF ELEMENTARY AFRICAN AMERICAN STUDENTS IN A CENTRAL ARKANSAS SCHOOL DISTRICT

Katina Latrice Simpson-Ray

The state of Arkansas adopted ACT 1063 in 2017, which was designed to improve reading achievement for all students. Included in the law was the requirement that "curriculum programs that are supported by the science of reading and based on the instruction that is explicit, systematic, cumulative, and diagnostic be implemented (Division of Elementary and Secondary Education, 2020). All K12 teachers and administrators, as well as higher education institutions, were required to participate in the Science of Reading Training. While many states have also adopted these practices, scientifically based reading research has yet to fully transform instructional practice (Castles et al., 2018), thereby leaving a science-to-practice gap. This gap has proven challenging to close for African American students (Seidenberg, 2017). In this quantitative, causal-comparative research study the researcher examined if the Science of Reading Training was effective in improving the reading achievement scores of African American students on the NWEA MAP Test in grades 1, 2, and 3 in Tier I, Tier II, and Tier III schools in a Central Arkansas School District. A sample of 2, 086 first, second, and third-grade students enrolled in an urban Arkansas public school district during the 2020-2021 school year was included in the study. The data were analyzed using descriptive statistics, analysis of variance (ANOVA), and independent samples *t*-test. The findings from the study indicated the Science of Reading Training did not make a statistically significant difference on the NWEA MAP Test for the African American

students in this sample. The information obtained in this study can be instructive for educators in the beginning stages of implementation of the science of reading.

Keywords: NWEA MAP Test; Science of Reading

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I: Introduction

Reading achievement of elementary students has long been a concern of educators and policymakers across the country. According to a 2021 publication of *Reading Horizons*, 'reading wars' over phonics vs. whole language instruction was debated for more than 100 years, primarily due to the complexity of the English language (Husband, 2012). However, by the 1950s, phonics began to increase in popularity due to the number of students who had difficulty with the 'look/say' approach to reading used in the Dick and Jane reading series (Husband, 2012).

The war has shifted on numerous occasions between phonics and whole language. The whole language approach, which does little to no instruction in the teaching of the letter/sound relationship and the lack of progress in reading among students who are taught this method, has oftentimes led to a hybrid approach (Husband, 2012). This approach employs an embedded strategy of teaching phonics while the literature provides a context for reading and letter combinations (Husband, 2012).

Because the war continued, in 1999 Congress convened a National Reading Panel charged with the responsibility to evaluate existing research and evidence to find the best ways of teaching children to read. The panel concluded that a combination of strategies be utilized to create successful readers with the ability to navigate and master reading concepts from phonemic awareness to comprehension (Husband, 2012). The research also noted the importance of an effective professional development program designed to enhance the knowledge of teachers' pre-service training with a worthwhile program of professional development that augments the teacher's expertise in the components of reading instruction while maintaining a clear sense of the complex whole to which those

components belong (Husband, 2012). A comprehensive reading program incorporates the skills that are taught explicitly and sequentially in support of their purposeful application.

The issue of successfully teaching students to read continues to plague the educational community. Political leaders, policymakers, and educational professionals continue to work together to address this complex problem. According to the National Council on Teacher Quality (2021), more than a third of American children cannot read by the fourth grade, affecting students of color disproportionately. The National Institute of Health (2020) asserts that "these numbers can be reduced to less than 10% when teachers utilize the five essential components of effective reading instruction: phonemic awareness, phonics, fluency, vocabulary, and reading comprehension. This standard provides feedback on the degree to which teacher prep programs provide instruction and practice on those approaches" (The National Institute of Health, 2000, p. 1).

Like the reading levels of children nationally, the reading achievement scores of students in grades one to three across the state of Arkansas have been declining for years. The Arkansas Right to Read Act, originally enacted in 2017, and amended by the Arkansas Legislature in 2019, requires curriculum programs that are supported by the science of reading and based on instruction that is explicit, systematic, cumulative, and diagnostic, including without limitation: (1) dyslexia programs that are evidence-based and aligned to structured literacy, (2) evidence-based reading intervention programs, and (3) evidence-based reading programs that are in the science of reading (Division of Elementary and Secondary Education, 2020). This Act 1063 required that all teachers in the State of Arkansas complete training in the science of reading to improve reading

achievement on all required state assessments. Of particular concern are the scores of African American students.

This chapter addresses the background of the problem, statement of the problem, the purpose of the study, key definitions, the significance of the study, assumptions, limitations, delimitations, and the organization of the study.

Background of the Problem

Several studies have been conducted over the years that have examined the disparities in student achievement between African Americans and their counterparts with the gap in reading scores being the most prevalent (Gerstl-Pepin & Woodside-Jiron, 2005; Little, 2017). According to Husband (2012), there is an abundance of research concerning the reading gaps between African American students and students of other races. According to state standardized test results nationwide, fewer African American students at Title I elementary schools met state reading requirements between 2012 and 2016, relative to other racial/ethnic groups of students (Little, 2017). “Since the schools and districts had not researched to clarify teacher awareness and experience as it applied to teaching reading to African American students, there was a void in practice” (Banks et al., 2013, p. 8). The Arkansas Department of Education (ADE) saw a need to build stronger readers in Arkansas schools (Arkansas Department of Education, 2021). Low scores in literacy achievement and the potential for success in students inspired the Reading Initiative for Student Excellence – otherwise known as the R.I.S.E. Arkansas reading initiative (Arkansas Department of Education, 2021).

The state of Arkansas’ prescription for addressing this void through the practices and theories outlined in the state-adopted science of reading requirements.

R.I.S.E. was a training implemented to help teachers satisfy Act 1063, in the state of Arkansas in January 2017 (Division of Elementary and Secondary Education, 2021). According to the Division of Elementary and Secondary Education website (2021), R.I.S.E. has three main goals. They are as follows:

1. Sharpen the focus and strengthen instruction (based on the science of reading).
2. Create community collaboration focusing on reading.
3. Build a culture of reading in the state of Arkansas.

This movement is anchored in the science of reading and a commitment to transforming literacy education. Arkansas will write a new chapter – one that facilitates a new way of thinking, a new focus of instruction, a new future for our state, and raising achievement (Arkansas Department of Education, 2021).

The term 'science of reading' refers to the body of research that reading experts, especially cognitive scientists, have conducted on how we learn to read (Division of Elementary and Secondary Education, 2021). This body of knowledge, over 20 years in the making, has helped debunk older methods of reading instruction that were based on tradition and observation, not evidence (Vaughn et al., 2020). According to Phillips et al. (2020), drawing on this research to inform the science of reading, academic language comprehension involves for the reader (a) familiarity with a set of academic language forms commonly found in school texts, (b) experience with the sociocultural practices of understanding and using the academic language of text within a particular sociocultural community, and (c) aligning with or resisting the reader identities implied by the language of a text.

Consistent with the premise espoused by other reading researchers, Lyon and Chhabra (2004), assert that educators must comprehend scientific evidence and act on it so that readers learn to access print correctly and fluently. The process of conducting scientific research is explained so that educators can understand scientific evidence and choose the most successful instructional approaches. During the 2017 legislative session, Arkansas legislators passed Act 1063, also known as The Right to Read Act. This legislation targeted educators in the pivotal role of reading instruction to be professionally trained in knowledge and skills of the "science of reading" (Gerstl-Pepin & Woodside-Jiron, 2005, p. 12). The purpose of this legislation is to equip every Arkansas teacher with the tools to successfully teach reading. The premise is that if teachers are provided with the proper training to teach reading, better instruction will take place, which will result in students learning to read and will be able to demonstrate their reading capabilities on the ACT Aspire assessment. This demonstration of reading achievement is expected of all students with a particular focus on improving the reading achievement of African American students.

Statement of the Problem

The status of reading achievement of all students in schools in Arkansas led to the enactment of 'The Right to Read' legislation designed to improve reading achievement across the State. Of particular concern were the declining test scores of African American students and the inability of students in grades one to three to demonstrate improvement in reading achievement scores. These achievement outcomes have persisted over several years in Arkansas, specifically low reading achievement scores for African Americans.

"The need for change was undeniable. The 2015 ACT Aspire results indicated that less than half of Arkansas' students in grades 3-10 scored ready or above in reading, and only 39 percent of that year's graduating seniors met reading readiness benchmarks on the ACT. Arkansas ranked in the lower third of states in reading on the National Assessment of Educational Progress" (Gerstl-Pepin & Woodside-Jiron, 2005, p. 26). These results led the state of Arkansas to address its problem of low reading achievement by enacting the required Science of Reading Training that sets forth how reading is to be taught by classroom teachers. The outcome of this training was expected (1) to increase the number of students in grades 3-8 who meet the ACT Aspire reading readiness benchmark by 10 percent within three years; (2) increase the number of graduates meeting the ACT reading readiness benchmark by 10% within five years, and (3) rise above the bottom third in state comparisons within five years. The attempt to address the problem of low reading scores led to the requirement of every teacher to be trained in the science of reading by the 2023-2024 school year to improve the reading achievement scores of all students. The problem addressed in this study is the impact of the Science of Reading Training on the low reading achievement scores of African American students in grades 1, 2, & 3 on the NWEA MAP Test in the Central Arkansas School District. The NWEA MAP Test (Measures of Academic Progress) is an adaptive achievement and growth test (NWEA MAP Test Overview, 2021). It creates a personalized assessment experience by adapting to each student's learning level—precisely measuring progress and growth for each student (NWEA MAP Test Overview, 2021).

Purpose of the Study

The purpose of this quantitative, causal-comparative study was to determine if the training in the science of reading was effective in improving the reading achievement scores of African American students on the NWEA MAP Test in grades 1, 2, and 3 in Tier I, Tier II, and Tier III schools in a Central Arkansas School District. Specifically, the NWEA MAP Test scores in this district were examined to determine if there were statistically significant differences between those students taught by teachers who had completed the Science of Reading training program and those students taught by teachers who had not completed the Science of Reading training program. This quantitative causal-comparative study was used to examine the potential early effects of state-mandated training.

Research Questions/Hypotheses

The following research questions guided this study:

RQ1. Is there a statistically significant difference between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

***H1*.** There is no statistically significant difference between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas District.

RQ2. Is there a statistically significant difference by gender (male-female) between the 2020-2021 fall and spring NWEA MAP Test scores of African American

students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

***H2*.** There is no statistically significant difference by gender (male-female) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District.

RQ3. Is there a statistically significant difference by grade level (grade 1, 2, or 3) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

***H3*.** There is no statistically significant difference by grade level (grade 1, 2, or 3) between the 2020-2021 fall and spring NWEA MAP Test scores for African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District.

RQ4. Is there a statistically significant difference by Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central School District?

H4. There is no statistically significant difference by Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

Definition of Terms

According to Lunenburg and Irby (2008), clearly defining all terms central to the study is paramount. For this study, key terms were defined as follows:

- *Accountability* is equated with answerability, blameworthiness, liability, and the expectation of account giving. Accountability in this study considers the teachers' responsibility to understand the Science of Reading and to implement its components to improve the reading assessment scores of African American students in selected schools (Arkansas Department of Education, 2021).
- *Achievement gaps* can be described as the disparity in academic performance between student subgroups on standardized-test scores, course selection, dropout rates, and graduation rates (Ansell, 2011).
- *ANOVA*: (analysis of variance) similar to a t-test, except it compares all pairs of groups (Knapp, 2018).
- *Arkansas Department of Education (ADE)*: the ADE was developed through Act 169 of 1931 and consists of five divisions overseeing all aspects of every public school, including charter schools, in Arkansas (Encyclopedia of Arkansas History and Culture, 2015).

- *Black/African American*: identifying as a descendent of African lineage (Lasker-Scott, 2015).
- *Causal-comparative design* is a research design that seeks to find relationships between independent and dependent variables after an action or event has already occurred (Graves, 2021).
- *Comprehension*: Comprehension—the understanding of the connected text—is considered an "essential element" of reading, but it is more accurately the goal of reading and the result of mastery and integration of all the components of effective instruction (Kilpatrick, 2015).
- *Descriptive statistics*: a summary of a variable using figures and graphs that can characterize continuous or categorical variables (Knapp, 2018).
- *Fluent text reading*: Fluency is reading with accuracy, appropriate rate, and prosody (expression) (Kilpatrick, 2015).
- *Gender*: a specific culture's perception of a person's biological sex (APA, 2012).
- *Grade Level*: the level at which a student progresses starting at the age of five (Loo, 2018).
- *NWEA MAP Test* (Measures of Academic Progress): is an adaptive achievement and growth test. It creates a personalized assessment experience by adapting to each student's learning level—precisely measuring progress and growth for each student (NWEA MAP Test Overview, 2021). Each question is calibrated to the Rasch Unit (RIT) scale, which provides an equal-interval measure that "is continuous across grades" (NWEA MAP Test Overview, 2021, p. 6). NWEA Map Growth allows teachers and schools to measure growth between testing

windows and shows students projected proficiency (NWEA MAP Test Overview, 2021, p. 7).

- *No Child Left Behind Act of 2001 (NCLB)*: Federal act created under President Barack Obama that empowered the states to operate several federal education initiatives. The main goal of No Child Left Behind is to narrow achievement gaps among students by ensuring that all children have a fair, equal, and meaningful opportunity to receive a high-quality education (NCLB, 2001).
- *Phonics*: Phonics is a way of teaching that stresses the acquisition of letter-sound correspondences (phoneme-grapheme representations) and their use in reading and spelling (Kilpatrick, 2015).
- *Phonemic Awareness*: Phonemic awareness is awareness of the smallest units of sound in spoken words (phonemes) and the ability to manipulate those sounds. Phonemic awareness falls under the category of phonological awareness, which includes the understanding of broader categories of sounds, including words, syllables, onsets and rhymes. Although the NRP identified "awareness" as the goal, subsequent research specifically on orthographic mapping has yielded an understanding that phonemic proficiency is both critical to and a result of the orthographic mapping, and it continues to develop throughout the elementary grades (Kilpatrick, 2015).
- *R.I.S.E. (Reading Initiative for Student Excellence*): Arkansas encourages a culture of reading by coordinating a statewide reading campaign with community partners, parents, and teachers to establish the importance of reading in homes,

schools, and communities (Division of Elementary and Secondary Education, 2021).

- *Science of Reading* is the study of the relationship between cognitive science and educational outcomes, also referred to as the science of reading instruction (Vaughn et al., 2020).
- *t*-test indicates if there is a statistically significant difference between two groups containing continuous variables (Knapp, 2018).
- *Teacher*: classroom instructor of record responsible for designing and delivering instruction on-site at one of participating high schools (Dictionary.com)
- *Tier I schools*: At Tier I, core instruction is considered effective if at least 80% of students are meeting established benchmark goals (Dorn et al., 2016).
- *Tier II schools*: At Tier II, core instruction is considered at needing intervention (Dorn et al., 2016).
- *Tier III schools*: Tier III services are designed to address the needs of students who are experiencing significant learning problems, including dyslexia, and/or unresponsive to Tier I and Tier II efforts (Dorn et al., 2016).
- *Tukey test*: a test used to detect pairwise score differences wherein the groups have equal *ns*; typically used as an ANOVA post hoc test (Knapp, 2018).
- *Vocabulary*: Vocabulary is the understanding of words and word meanings (Kilpatrick, 2015).

Significance of the Study

As the disparities between African Americans and their counterparts continue to widen, this study provided data that examined the effectiveness of the science of reading

and its implications on the reading scores of African American students in a Central Arkansas School District. These results have implications for other schools in central Arkansas and the state of Arkansas. Additionally, the implications of this study provide data that can inform decisions regarding Act 1063, the law mandating the science of reading in all Arkansas public schools. The results of this research added to the body of knowledge on reading research and influenced reading practices that lead to increased reading achievement scores.

Assumptions

Assumptions outline variables, which the current study assumes to be true as research was conducted. The following assumptions were made for this research study:

- It is assumed that the data from the 2020-2021 fall and spring NWEA MAP Test scores retrieved from the Central Arkansas School District are accurate and detailed in scope.
- It is assumed that the data from the 2020-2021 fall and spring NWEA MAP Tests scores were retrieved from teachers in Tier I, Tier II, and Tier III schools who have been trained and those that have not been trained.
- It is assumed that the NWEA MAP Test is a valid and reliable assessment.
- It is assumed that the students that took the NWEA MAP Tests during the 2020-2021 school year did their very best while completing the assessments to ensure accuracy of the data.

Limitations

Limitations of a study are factors that the researcher has no control over in the study (Lunenburg & Irby, 2008). It is important to consider how limitations may

influence the conclusions of this study. The following limitations were considered regarding this study partly because it was the first school year after the COVID-19 Pandemic and school districts across the nation were closed the last three months of the previous school year:

- Schools closed down in the state of Arkansas on Tuesday, March 17, 2020, due to the COVID-19 Pandemic. Some students did not return immediately back to the district/schools, and those students did not test in the 2020-2021 fall and spring semesters.
- Only African American students with both fall and spring NWEA MAP Test scores were included in the sample; this may have had an impact on transient populations being represented accurately.
- The study was conducted in the very early implementation of the Science of Reading in Arkansas. It is possible that the training has not had enough time to show growth in one year.
- The researcher did not conduct classroom observations or interview students who had gone through the training and therefore, the fidelity of the training and teacher instruction were not considered.
- This study may or may not apply to other locations with different demographics and different academic characteristics.
- Generalizations of results to other states should be cautioned as the methods and data used in this study were not designed to determine cause and effect and are not assumed to be generalizable beyond this particular sample.

Delimitations

“Delimitations are self-imposed boundaries set by the researcher on the purpose and scope of the study” (Lunenburg & Irby, 2008, p. 134). The following delimitations were used in this study:

- This study was restricted to one Central Arkansas School District
- The schools that participated were delimited to elementary schools with grades one, two, and three during the 2020-2021 school year.
- The focus of this study was to determine if the Science of Reading training was having a positive effect on African American elementary students. Therefore, only African American students in grades one, two, and three were included in the study.
- Assessment data was limited to the 2020-2021 school year.

Organization of the Study

This study is organized into five chapters; each chapter has a distinct purpose. Chapter I served as the introduction of the study. The introduction includes the background of the problem, the statement of the problem, the purpose of the study, definition of terms, theoretical framework/conceptual framework, the significance of the study, assumptions, and delimitations of the study. Chapter II contains the conceptual framework for this study. It also provides a detailed review of supporting literature addressing the research of experiences and factors that affect the educational reading success of African American students in Tier I, Tier II, and Tier III within the Central Arkansas School District. Chapter III outlines the methodology of the study with detailed information about the research question/hypothesis, research methodology, research

design, population and sample selection, instrumentation, data collection, and data analysis. Chapter IV outlines the findings of the study. Chapter V presents the results, conclusions, implications for practice, and future research.

II: Literature Review

The purpose of this quantitative causal-comparative study was to determine if the training in the science of reading is effective in improving the reading achievement scores of African American students in the 2020-2021 fall and spring NWEA MAP Test scores in grades 1, 2, and 3 in schools in the Central Arkansas School District. To inform the study, several studies have been examined in the review of literature related to the conceptual framework of reading, the history of reading, the reading achievement of African American students, and the science of reading. These studies provided insight into these topics and provided the groundwork to begin the proposed study. The literature review was conducted using journal holdings within the Arkansas Tech University library resources. These journals articles were reviewed and cross-referenced leading to a search for dissertations and related studies.

Conceptual Framework

The 2020-2021 fall and spring NWEA MAP Test scores in a Central Arkansas School District were analyzed to determine the overall statistical significance of the program.

The conceptual framework that guided this study was accountability. In this case, specifically, education accountability (Cook, 2020). Accountability, in this study, considers the teachers' responsibility to understand the science of reading and to implement its components to improve the reading assessment scores of African American students in selected schools. According to Little (2017), accountability has been an educational issue for as long as people have had to pay for and govern schools. The term covers a diverse array of means by which some broad entity requires some providers of

education to give an account of their work and deem them responsible for their performance. These means include, among others:

- Performance by results schemes used by the English school system in the nineteenth century, and later variations on the theme of merit pay.
- the American pattern of a school board is held accountable through a local election, with the school board, in turn, holding a superintendent and district staff accountable.
- marketizing education through charter schools, vouchers, and the Dutch practice of using the same system for funding what Americans would call both public and private schools.
- the school inspections used in many European countries; and
- the recent rise of state testing of students in which test results are sometimes, but not always, linked to rewards or punishments for students or school staff (Little, 2017, p. 6).

In 2015, the Every Student Succeeds Act (ESSA) replaced 2001 No Child Left Behind Act (NCLB) as the nation's major K-12 education law. ESSA required states to measure, report on, and improve public school performance. Given the 14-year gap between ESSA and NCLB, how the old law measured, and improved school quality was no longer useful in improving student outcomes (Jimenez & Sargrad, 2017).

NCLB relied heavily upon a pass/fail system to measure school performance based on targets for test scores and graduation rates, but ESSA marked a significant shift away from NCLB but none more so than the requirements for how states must hold districts and schools accountable for improving student outcomes. Because of ESSA,

there is a different approach to accountability. The school accountability approach emphasized two equally important goals for these new systems:

1) ensuring that accountability systems drive toward equal education opportunities by creating a system for identifying and acting on chronic low performance by particular groups of students.

2) ensuring that accountability systems are broadly framed to drive toward a comprehensive conception of student and school success and a culture of continuous improvement rather than just shame and punishment (Jimenez & Sargrad, 2017).

ESSA's school accountability system required the collection of key student performance data to inform public reporting, the identification of low-performing schools, and school improvement efforts. This system led to the development of Arkansas' system classification of Tier I, Tier II, and Tier III schools (ESSA, 2019).

In addition to the responsibility of states to school districts, states must monitor the capacity of districts to implement evidence-based reforms in schools identified as low performing. In many ways, district-level processes could have the greatest impact on student outputs and outcomes. For example, among all in-school factors, research has shown teachers to have the greatest impact on student achievement. Additionally, inexperienced, unqualified, or out-of-field teachers disproportionately teach low-income students and students of color. Districts, not states, control hiring, placement, and professional development processes. Therefore, accountability systems should measure district-level outputs such as equitable distribution of effective teachers and mastery of instructional practice. Historically, academic proficiency rates have widely varying

performance from school to school. Consequently, school-level performance and performance among student subgroups should also be a focus of accountability.

The conceptual framework that informed this study was educational accountability. Educational accountability can be defined in numerous ways based on the underlying concepts of (a) performance reporting; (b) a technical process; (c) a political process; and (d) an institutional process (Levin, 1974). In addition, Levin stated that performance reporting is the most widely used accountability concept in education because it contains state-mandated assessments. The goal of the technical process was to correct any deficits that occurred due to the performance reporting process (Levin, 1974). The purchased service from an educational contractor is the top use of the technical process (Levin, 1974). Further, Lewin stated that the political process refers to laws, acts, and mandates issued by the government as well as tax requirements to be used for schools. The operation and structure of the school are part of the institutional process (Levin, 1974).

All four concepts of Levin's work contained assumptions about educational accountability (Cook, 2020). It was assumed that information provided through performance reporting will be useful to the education field (Levin, 1974). The performance concept also assumed that all laws, acts, and mandates were created to help schools reach their goals (Levin, 1974). It was assumed that educators based on standardized assessment results would demonstrate proficiency (Levin, 1974). For example, this assumption led California to create an accountability law known as the Stull Act, which allowed districts to terminate teachers who were not performing as expected (Levin, 1974). The political process assumed that education favors certain

groups over others (Levin, 1974). The institutional process assumed that equity was provided for all students and all groups of students (Levin, 1974). The educational accountability conceptual framework was most useful in informing the research questions for this particular study.

History of Reading Instruction in Schools

In colonial times, reading instruction was straightforward, teach children the code and then let them read (Mathews, 1966). During this time, reading material was not specifically written for children. The Bible and a few other essays were typical reading materials. The New England Primer published in the late 1680s was the early primer (Mathews, 1966). According to Mathews, there was no system for how to teach children to read or how to determine if they understood what they were reading. In the mid-19th century educators, specifically, Horace Mann advocated for instructional methods that engaged children's interest in the reading material by teaching them to read whole language, such as the *McGuffey Readers*. During this same time, Rebecca Smith Pollard developed a sequential reading program of intensive synthetic phonics, complete with a separate teacher's manual and spelling and reading books (Mathews, 1966).

The meaning-based curriculum did not dominate reading instruction until the second quarter of the 20th century (Mathews, 1966). According to Mathews, beginning in the 1930s and 1940s, reading programs became very focused on comprehension and taught children to read whole words by sight. Phonics was not to be taught except sparingly and as a tool to be used as a last resort (Mathews, 1966).

In the 1950s, Rudolf Flesch wrote a book called *Why Johnny Can't Read*, a passionate argument in favor of teaching children to read using phonics (Mathews, 1966).

He questioned the intentions of teachers, publishers, and intelligence experts spawning concerns of mothers and fathers (Mathews, 1966). His book was on the bestseller list for 30 weeks and spurred a tsunami (Mathews, 1966) that created a major debate. The reading debate now continues among educators, researchers, and parents.

History of Reading Instruction in the United States

Parker (2019) provided a lengthy history of reading in the United States from 1800 to 2009. He asserted that the early reading battle continues today. Reading instruction has been involved in this high-stakes battle between supporters of two opposing methods for teaching a child to read for more than a century (Parker, 2019). This battle is still raging and has a long history in the United States. The following provides a chronology of reading instruction from 1800 to 2009 or the present-day status of reading (Parker, 2019). This chronology is important because this study focused on the impact of the science of reading and training requirements on the NWEA MAP Test on reading achievement scores of elementary African American students.

1800 – 1900: Most children who learn to read during the 19th century were taught from either Noah Webster's *Blue-Backed Speller* or the famous *McGuffey Readers* (Parker, 2019). Both sold over 100 million copies, placing them in the same league as the Bible (Parker, 2019). McGuffey was explicit in his directions to teachers: they could use his primer with what he called the "word" method (top-down), the "phonic" method (bottom-up), or a combination of the two methods (Parker, 2019). McGuffey (1885) described these methods as follows:

> "The Word Method teaches a child to recognize words as wholes. This method pays no attention to elementary sounds and diacritical marks. After several words

> are taught as wholes, the children are told the names of the letters and learn to spell" (Parker, 2019, p. 10).
>
> "By the Phonic Method, the child is first taught the elementary sounds of letters; he is then taught to combine these elementary sounds into words. The sound is first taught, and then the character, which represents it; the spoken word is learned, and then it's written and printed form. This method pays no attention to words as wholes until the elementary sounds composing them are learned" (Parker, 2019, p. 12).

1900 – 1930: During a transitional period, The *Beacon Readers*, an improved phonics series, gradually supplanted the *McGuffey Readers* (Parker, 2019). In the *Beacon Readers*, the sound of individual letters (phonics) was taught from the start, as well as memorization of whole words (Parker, 2019).

In 1908, Edmond Huey published his book *The Psychology and Pedagogy of Reading* (1908, reprint), which quickly became the manifesto of a growing Whole Word (anti-phonics) movement (Parker, 2019). Here's an excerpt: *"Even if the child substitutes words of his own for some that are on the page, provided that those express the meaning, it is an encouraging sign that the reading has been real,"* (Parker, 2019, p. 15), which shocked the practical teacher.

In 1927, a nationally known educator, Dr. Arthur Gates, from Teachers College at Columbia University, joined the Whole Word movement. Writing in *The Journal of Educational Psychology*, he summed up his position: "That it will be the part of wisdom to curtail phonetic instruction in the first grade, it is not improbable *that it should be eliminated entirely*" (Parker, 2019, p. 15).

By 1930, phonics, meaning explicit teaching of the code was abandoned in most of the nation's classrooms (Parker, 2019).

1930 – 1965: The Whole Word became the dominant top-down method for teaching reading in the United States (Parker, 2019). Words viewed as a single unit (or picture) were drilled individually and rote-memorized based on their visual characteristics (Parker, 2019). Holding up a large flashcard with the target word printed on it, the teacher says the word: 'horse.' The children look at the word printed on the card (which includes a picture if possible) and then repeat the word each time the teacher says it. The goal was to have the children memorize the word as having a particular shape or contour, rather than decode the word based on individual letter sounds (Parker, 2019). This Whole Word method became known as *Look/Say*. The most famous basal reader of this period was the beautifully illustrated *Dick and Jane* series (Parker, 2019).

1955: The Rudolf Flesch book, *Why Johnny Can't Read*, became a runaway bestseller in the US (Parker, 2019). It was a passionate plea for the elimination of Whole Word memorization and guessing, and a return to phonics (Parker, 2019). Flesch summed up his book this way: "Memorizing or guessing the meaning of whole words is not reading; on the contrary, it is an acquired bad habit that stands in the way of a child ever learning to read properly (Parker, 2019, p. 18). "My advice is teaching your child yourself how to read" (Parker, 2019, p. 18). Unfortunately, the phonics program offered by Flesch, taking up the final third of his book, was inadequate with only two pages of instructions, followed by nothing but word lists. However, this book ignited the **Reading Wars** (Lemann, 1997), a battle over how to teach beginning reading that, to this day, is not completely resolved (Parker, 2019).

In response to the Flesch book, the education establishment and textbook publishers created the International Reading Association (later called the International Literacy Association; [Parker, 2019]). William S. Gray of the University of Chicago was the first president (Parker, 2019). Gray developed the Look/Say reading series, *Dick and Jane*, so heavily criticized by Flesch in W*hy Johnny Can't Read* (Parker, 2019).

1967: Jeanne Chall's book, *Learning to Read: The Great Debate* was published. Chall (1967) surveyed the scientific studies done on reading from 1912 through 1965. She concluded that 'code emphasis,' her term for synthetic phonics, produces better results than the Look/Say method in the teaching of beginning reading. She called for "a correction in beginning reading instructional methods" and then, speaking of phonics, asserted: "The results are better, not only in terms of the mechanical aspect of literacy alone but also in terms of the ultimate goals of reading instruction – comprehension and possibly even speed of reading" (Chall, 1967, p. 307). The long-existing fear that an initial code emphasis produces readers who do not read for meaning, or with enjoyment, is unfounded. On the contrary, the evidence indicated that better results in terms of reading for meaning were achieved with the programs that emphasized code right at the start (Chall, 1967).

1965 – 1975: The Flesch (1955) and Chall (1967) books were responsible for another transition; with mounting pressure from parents, some schools returned to phonics. Most schools, however, stuck with the Look/Say method, but they now included teaching a part of the code using 'analytic phonics.' This is a top-down form of phonics that can be employed after the child has memorized enough sight words to make it work. Once the child knows a sound for all the consonants, the guessing becomes more

accurate. The child uses the unknown word's first letter to get the mouth ready to say the word.

1973: Various researchers proposed a *Dual Route* model for turning print into speech (Parker, 2019). According to Goodman et al. (2011), "The pronunciation of a visually presented word involves assigning to a sequence of letters some kind of acoustic or articulatory coding" (Parker, 2019, p. 256). The authors asserted that there are presumably two alternative ways in which this coding can be assigned. First, the pronunciation could be computed by application of a set of graphemes–phoneme rules, or letter-sound correspondence rules (Goodman et al., 2011). This coding can be carried out independently of any consideration of the meaning or familiarity of the letter sequence (Goodman et al., 2011). Alternatively, the pronunciation may be determined by searching long-term memory for stored information about how to pronounce familiar letter sequences, obtaining the necessary information by a direct dictionary look-up, instead of rule application (Goodman et al., 2011).

1981: Rudolf Flesch (1981) published *Why Johnny <u>Still</u> Can't Read*, again condemning the Whole Word method, as well as the analytic phonics that it now includes. Looking back over the 26 years since he published his first book, he criticized analytic phonics as being "a minimum of phonics, served up in a look-and-say sauce of context clues and guesswork" (Flesch1981, p. 91).

1981: Theodor Geisel (1957) who was also known as Dr. Seuss, in an interview for *Arizona Magazine*, discussed how he was limited by his publisher to using 220 specific words from the Dolch List of sight words when he created *The Cat in the Hat*. Here was what he said about phonics and about having children memorize sight words:

"That was due to the Dewey revolt in the Twenties in which they threw out phonics and went to word recognition as if you're reading Chinese pictographs instead of blending sounds of different letters. I think killing phonics was one of the greatest causes of illiteracy in the country" (Geisel, 1957, p. 93).

1983: Jeanne Chall also updated her book, examining the scientific research done on reading from 1966 through 1981. She concluded that Synthetic Phonics, not Whole Word, led not only to better word recognition but also to better comprehension. She added that the scientific support for synthetic phonics "seems to be even stronger than it was in 1967" (Chall, 1983, p. 95). Regarding the use of analytic phonics, a practice that had become popular since her first book, Chall stated: "It would seem that many of the characteristics of direct phonics, such as teaching letter-sound directly, separating the letter sound from the words, giving practice in blending the sounds, and so forth, are more effective than the less direct procedures used in current analytic phonics programs." (Chall, 1983, p. 95).

1975 – 2000: Under growing pressure from parents, and the weight of the scientific evidence in Jeanne Chall's books, Look/Say was fully abandoned in the '70s. However, the Whole Word (top-down) method was *reaffirmed* as a new model for teaching reading appeared. It was called *Whole Language*. Kenneth Goodman and Frank Smith (1997) reported that in the 1970s, Whole Language differed from Look/Say in some fundamental ways. First, it rejected the boring, artificial, and repetitive readers of the Look/Say era, claiming to replace those readers with real children's stories. Those stories, however, were read to the children. What the children read initially were repetitive "little books" whose main function was to drill sight words. Second, phonics

understood as explicit, systematic teaching of the full code, was outright rejected. According to Goodman (1986), "matching letters with sounds is a flat-earth view of the world since it rejects modern science about reading and writing and how they develop" (Goodman, 1986, p. 28). Frank Smith (1997), who supported this movement, believed that: "Reliance on phonics or spelling-to-sound correspondence was dysfunctional in fluent reading and interfered with learning to read" (Smith, 1997, p. 57).

1983: Reading researchers David Share and Anthony Jorm (1983) in their *Self-Teaching Hypothesis*, and further elaborated by Share in 1995 who proposed that skilled, educated readers have a sight word vocabulary of 60,000 or more words and that such a feat would be impossible via rote-memorization or via guessing based on context. Jorm and Share (1983) proposed that only the *independent* decoding of unknown words could explain the ability of skilled readers. Such decoding depended on only two factors: knowledge of letter/sound (phoneme/grapheme) relationships and the ability to blend an unknown word's sounds (phonemes) into a recognizable pronunciation. Share called these twin co-requisites the *sine qua non* of reading acquisition (Jorm & Share, 1983). This conclusion placed Share and Jorm in direct opposition to the Whole Language methodology.

1986: Reading researchers Philip Gough and William Tunmer (1986) proposed their *Simple View of Reading*. Under the Simple View, reading comprehension (RC) was the product of two independent factors: decoding ability (D) and language comprehension (LC). The model stated succinctly: RC = D x LC. This also placed Gough and Tunmer in direct opposition to Whole Language methodology.

1987: Educational leaders in California, through the state's English/Language Arts Framework, instituted a statewide adoption of Whole Language as the method for teaching beginning reading in the state's grade schools. Unfortunately, many states tragically followed California's and adopted this approach.

1993: The National Assessment of Educational Progress (1993), a federal study doing a state-by-state comparison of reading proficiency, ranked California fourth-graders fifth from the bottom and in 1996, California was at the very bottom behind Mississippi.

1998: Reading researcher Linnea Ehri (1997, 1998) proposed four phases of sight word learning. Her studies revealed that it is only when beginning readers can form "complete connections" between all the letters (graphemes) seen in a word's written form and all the sounds (phonemes) heard in its spoken form, that sight word learning becomes unconscious and automatic – a process she called *orthographic mapping*. This re-emphasized the importance of knowing grapheme/phoneme correspondences and being able to blend (decode) unknown words by sounding them. Ehri's *Orthographic Mapping* too was in direct opposition to Whole Language.

1997 – 2000: The US Congress (1997) convened a National Reading Panel to examine all reputable scientific research available on how to teach children to read, and then to determine the most effective method (Parker, 2019). The Panel examined several hundred studies conducted over the last 30 years. In 2000, the Panel delivered a strong scolding of Whole Language proponents (Parker, 2019). It concluded that "systematic" phonics, not Whole Language, was the best method for teaching beginning readers and that such phonics must be taught explicitly, rather than on a "discovery" or "as-needed"

basis (Parker, 2019). It also concluded that the best time to teach phonics was in kindergarten or first grade (the traditional start of formal reading instruction) *before* a child starts to read by other means (Parker, 2019).

2000 – present: Many members of the education establishment did not react favorably to the National Reading Panel's final report (Parker, 2019). However, the Panel's multiple recommendations in support of systematic phonics were not ignored. Many parents and legislators promoted a return to phonics (Parker, 2019). What happened is that Whole Language vanished from educational journals and "Balanced Literacy" or "The Balanced Approach" to reading was born (Parker, 2019).

2005- 2006 Several reports emerged from Scotland, Australia, and England that offered approaches to teaching phonics (Parker, 2019). The Rose Report (2006) from England created the biggest stir because it avoided some of the previous pitfalls focusing attention instead on the *Simple View of Reading*. Those who understand the *Simple View* understand reading comprehension correctly: it was the product of both Decoding and *Language* Comprehension (Parker, 2019).

2009: Modern brain imaging methods and recent advances in neuroscience were brought into the mainstream with the publication of *Reading in the Brain: The New Science of How We Read* by Stanislas Dehaene (2009). While mapping out precisely what happens in the reading brain was still in its early stages, Dehaene's book affirmed three (3) important points:

First, neuroscience verified the Dual-Route model for converting print into sound and/or meaning (Parker, 2019). Two information processing pathways coexist and supplement each other when we read (Parker, 2019). When words are regular, rare, or

novel, students preferentially process them (Parker, 2019). Conversely, when we are confronted with frequent words, or whose pronunciation is exceptional, reading takes a direct route that first recovers the meaning of the word and then uses the lexical information to recover its pronunciation (Parker, 2019). Both routes are in constant collaboration, and each contributes to the specification of word pronunciation" (Parker, 2019, p. 16). Second, Dehaene's research makes him a proponent of using bottom-up, synthetic phonics to teach a child to read (Parker, 2019). Here is what he says: "The goal of reading instruction is clear (Parker, 2019; 2020). It must aim to lay down an efficient neuronal hierarchy so that the child can recognize letters and graphemes and easily turn them into speech sounds (Parker, 2019). All other aspects of the literate mind depend on this crucial step. There is no point in describing the delights of reading to children if they are not provided with the means to get there" (Parker, 2019, p. 16). Considerable research centers on the fact that grapheme-phoneme conversion radically transforms the child's brain (Parker, 2019). This process must be taught explicitly (Parker, 2019). It does not develop spontaneously; it must be acquired (Parker, 2019). "Reading via the direct route, which leads straight from letter strings to their meaning, only works after many years of practice using the phonological decoding route. Only the teaching of letter-to-sound conversion allows children to blossom because only this method gives them the freedom to read novel words in any domain they choose. Performance is best when children are, from the beginning, directly taught the mapping of letters onto speech sounds. Regardless of their social background, children who do not learn this suffer from reading delays" (Parker, 2019, p. 30).

Dehaene (2009) contended: “The punch line is quite simple: we know that conversion of letters into sounds is the key stage in reading acquisition. All teaching efforts should be initially focused on a single goal: the grasp of the alphabetic principle whereby each letter or grapheme represents a phoneme. Children need to understand that only the analysis of letters one by one will allow them to discover a word’s identity” (Dehaene, 2009, p. 33). Last, Dehaene was adamant about using only decodable text in the early stages: “At each step, the words and sentences introduced in class must only include graphemes and phonemes *that have already been explicitly taught*. Reading lessons provide little room for improvisation. The words given to beginning readers must be analyzed letter by letter to ensure that they do not contain spelling problems that are beyond the child’s current knowledge.” If teachers do not follow this advice, “it can make children think that reading is arbitrary and not worth studying” (Dehaene, 2009, p. 33).

Reading instruction, the best method of instruction, and how we train teachers on how to teach reading, continue to perplex educational professionals even today (Duncan, 2010). Duncan (2010) stated that in 2006–2007, a non-profit reading institute in the United States implemented a reading reform initiative in which demonstration classrooms were built in 13 of Mississippi's lowest-performing schools, a state noted for its high poverty rate and low academic achievement. This qualitative study detailed the perspectives of 12 highly trained demonstration classroom teachers (Duncan, 2010). A scripted commercial curriculum called *Read Well* as core instruction for kindergarten and first-grade students who were struggling to learn to read while also coping with the consequences of poverty was utilized (Duncan, 2010). Teachers in demonstration classrooms considered the scripted curriculum ineffective in meeting the needs of all their

students, so they had to change how they used *Read Well* (Duncan, 2010). This research showed that when deciding what constitutes the best instructional practice for teachers, educational policymakers must consider the social and cultural backgrounds of learners along with the most effective methods of teaching (Duncan, 2010).

Cognitive Science of Reading

Research shows that children who do not learn to read by the end of third grade are likely to remain poor readers for the rest of their lives, and they are likely to fall behind in other academic areas, too. People who struggle with reading are more likely to drop out of high school, end up in the criminal justice system, and live in poverty. It seems like a nation; we have come to accept a high percentage of children not reading well. More than 60% of American fourth graders are not proficient readers. According to the National Assessment of Educational Progress (NAEP; 2005), it has been that way since testing began in the 1990s (Hanford, 2018). One of the excuses that have been offered over time by educators to explain poor reading performance in American schools is poverty. Silva (2015), the Chief Academic Officer for the public schools in Bethlehem, Pennsylvania examined the reading scores of students in the district. He found that only "56% of third graders in his district had scored proficient on the state reading test. He also found that many students at the wealthier schools were not reading very well either. He surmised that this was not just poverty. In fact, by some estimates, one-third of America's struggling readers were from college-educated families. He did not know much about how children learned to read so he searched online. He discovered that few educators had looked at brain research" (Silva, 2015, p. 1).

Cognitive scientists have conducted research for over 50 years trying to understand the issues related to how we learn and how we learn to read. These investigations have focused on efforts to understand language development, reading comprehension, critical thinking, and problem-solving. From the cognitive perspective of learning to read, reading comprehension (or, simply, reading) is the ability to construct linguistic meaning from written representations of language. This ability is based upon two equally important competencies. One is language comprehension–the ability to construct meaning from spoken representations of language; the second is decoding–the ability to recognize written representations of words. According to Hoover and Gough (1990), these two main foundations of reading are complex abilities with each dependent on the other with both language comprehension and decoding mastery necessary for reading comprehension success (Hoover & Gough, 1990).

According to this view, the only route to successful reading comprehension is through success at both language comprehension and decoding (Hoover & Gough, 1990). Weaknesses in either ability will result in weak reading comprehension (https://sedl.org/reading/framework/overview.html). This simple view of reading is necessary for successful reading comprehension (Hoover & Gough, 1990). However, we must be able to determine what is required to be proficient in understanding language and what is necessary to be proficient in decoding text (Hoover & Gough, 1990). Cognitive scientists and educators continue to discuss the methods and training to help students become proficient readers (Hoover & Gough, 1990).

Educators have debated the "how-to" of teaching reading for years (Stukey et al., 2018). The debate has evolved from the whole language to phonics to a balanced

approach (Stukey et al., 2018). Although it seems that educators had settled on a balanced approach to teaching reading, Stukey et al. (2018) asserted that dissension has reared its head again and arguments are breaking out among educators on social media. At the heart of the disagreement is the dichotomy between phonics instruction (the explicit teaching of letters and sounds) and a whole language approach (a focus on discovery and making meaning (Stukey et al., 2018). While "whole language" as a term is not often used now, there are many who believe the term "balanced literacy" is simply a substitute for whole language. The authors further asserted that despite the current discussions, the science on this instructional issue is settled (Stukey et al., 2018).

The Hechinger Report authored by Brown and Zimmerman (2018) opines that cognitive science suggested that children learn phonics in different ways. The authors' opinion is that when it comes to reading, traditional phonics teaches skills one at a time to mastery, intentionally limiting variation to emphasize the rule being taught, whereas whole language introduces the learner to almost unlimited (and unstructured) variation with the belief that immersion in age-appropriate literature leads to a natural understanding of phonics (Brown & Zimmerman, 2018). But cognitive science tells us that some degree of variability is important to cement skills so that they stick and become truly automatic (Brown & Zimmerman, 2018). Apfelbaum et al. (2013) from the National Library of Medicine entitled, Statistical Learning in Reading, cited the research*: variability in irrelevant letters helps children learn phonics skills.* The authors concluded that the early reading abilities of students are derived in part from statistical learning of regularities between letters and sounds (Apfelbaum et al., 2013). Although there is substantial evidence from laboratory work to support this, how it occurs in the classroom

setting has not been extensively examined (Apfelbaum et al., 2013). There are few investigations of how statistics among letters and sounds influence how children learn to read or what principles of statistical learning may improve the learning of reading (Apfelbaum et al., 2013). The authors examined two conflicting principles that may apply to learning grapheme-phoneme-correspondence (GPC) regularities for vowels: (a) variability in irrelevant units may help children derive invariant relationships and (b) similarity between words may force children to use a deeper analysis of lexical structure (Apfelbaum et al., 2013). Two hundred twenty-four first-grade students were trained on a small set of GPC regularities for vowels, embedded in words with either high or low consonant similarity, and tested their generalization to novel tasks and words (Apfelbaum et al., 2013). Variability offered a consistent benefit over similarity for trained and unfamiliar words in both trained and new tasks (Apfelbaum et al., 2013).

Brown and Zimmerman (2018) concluded that with this in mind, educators should consider the following when planning reading instruction for their students:

1. Before beginning reading instruction, teachers should conduct a high-quality baseline assessment.
2. Identify assessment tools that determine *what* students know about phonics and *whether* they can flexibly use their knowledge.
3. Assess students who have gaps in foundational skills, such as phonics, syllabication, and automatic word recognition.
4. Vary how students learn foundational skills like phonics so they can become automatic readers.

5. Match the amount of variation in both content and tasks, and types of feedback matched to the student's needs.
6. Students who have reasonably good decoding skills but still lack automaticity may be prime candidates for an approach that emphasizes systematic variation.
7. Teachers should periodically evaluate growth and fluency and compare to baseline results.

Brown and Zimmerman (2018) suggested that principles of learning studied extensively in cognitive science, could and should inform solutions to our national reading problem. We should not be stuck in the past and have arguments about methods of teaching. Practitioners and scientists should embrace and exploit the recent, relevant findings in cognitive science to understand how students learn and which instructional approaches best fit each learner (Brown & Zimmerman, 2018).

Lyon and Chhabra (2004) also discussed that educators must comprehend scientific evidence and act on it so that readers learn to access print correctly and fluently. The authors explained that the process of conducting scientific research is explained so that educators can understand scientific evidence and choose the most successful instructional approaches (Lyon & Chhabra, 2004).

The science of reading was further discussed when Vaughn et al. (2020) addressed the dispute that occurs between reading science and adaptive teaching. The debate focused on how the science of reading emphasizes reading instruction as decontextualized and compartmentalized dimensions of literacy acquisition that are removed from culturally sustaining and applicable pedagogies and limit teachers' capacity to teach reading (Vaughn et al., 2020). The authors shared how adaptive

teaching is a key feature of successful reading teachers, and proposed that scholars from both fields, those who study reading processes and acquisition (i.e., the science of reading) and those who study effective literacy instruction collaborate to better understand the complexities of these processes, particularly in ways that look at a wide range of student and teacher populations (Vaughn et al., 2020).

Snow and Matthews (2016) contended that *y*oung children should, and do, perform flawlessly. Kids, on the other hand, as they get older, need to be able to understand words that are seldom used in spoken language and to combine new information with appropriate context information. Unconstrained skills, large areas of information gained progressively through experience, include vocabulary and context knowledge. For children's long-term literacy performance, unrestricted skills are especially important (that is, success in outcomes measured after third grade). These skills are often more highly predicted by children's social status or their parents' schooling and are more difficult to teach in the classroom than restricted abilities. Unconstrained skills are often much more difficult to learn due to their open-ended nature. According to Snow and Matthews (2016), a decrease in literacy scores as children advance from elementary to middle school indicates that in the early grades, our schools might be focusing too much on restricted abilities and too little on unconstrained ones. The authors discussed promising programs and approaches for developing both constrained and unconstrained skills, ranging from comprehensive school-improvement programs to attempts to improve curricula and teachers' professional development though they point out that comparing programs is difficult due to significant differences in scope, expense, goals, and theories of change. Another problem is, it was difficult to sustain

quality and continuity over time when implementing complex systems. Snow and Matthews (2016) proposed that rather than introducing complicated interventions as a bundle, it may be easier to adopt and test promising practices that can be mixed and balanced to enhance young children's literacy performance.

Shollenbarger et al. (2017) looked at how developing first-grade African American English (AAE) speakers differed from Mainstream American English (MAE) speakers in the completion of two traditional phonological awareness tasks (rhyming and phoneme segmentation). There were 49 first graders who met the requirements for two dialect groups: AAE and MAE. In each rhyme and segmentation task, three conditions were tested: Real Words No Model, Real Words with a Model, and Non-words With a Model. Across all experimental conditions, the AAE group had substantially more responses that rhymed CVCC words with consonant-vowel-consonant words and segmented CVCC words as consonant-vowel-consonant than the MAE group. The existence of a model in the real word condition resulted in more reduced final cluster responses for both groups in the rhyming challenge. Only the AAE group shifted through the various stimulus presentations and decreased the final cluster less frequently when given a model in the segmentation task while the MAE group was at the ceiling.

Charity et al. (2004) stated that for children whose everyday speech differed significantly from the School English they hear in academic materials and environments; it was hypothesized that greater familiarity with School English (SE) would be connected to more active early reading acquisition. The sentence imitation and reading skills of 217 urban African American students in kindergarten through second grade (ages five to eight years) were assessed.

Galloway et al. (2020) argued that psychological models of reading comprehension frequently neglect written language comprehension and development as context embedded, sociocultural processes, based on evidence from psychological models of reading comprehension, ethnographic research on language and literacy, and textual linguistics lines of research. The authors presented a series of studies that have educated the science of reading by making accessible a precise collection of high-utility academic language skills that promote informational text comprehension during middle childhood (ages 9–14) using the example of academic language comprehension by middle-grade learners. According to this research, these abilities grow progressively during adolescence and play a significant role in reading comprehension. Drawing on this research to inform the science of reading, the authors suggested that academic language comprehension involves for the reader (a) familiarity with a set of academic language forms commonly found in school texts, (b) experience with the sociocultural practices of understanding and using the academic language of text within a particular sociocultural community, and (c) aligning with or resisting the reader identities implied by the language of a text. The authors argued that new studies and pedagogical methods were needed to move beyond a solely cognitive understanding of language and reading comprehension to one that incorporates the reader's contact with a text as a sociocultural phenomenon.

The science of reading and its complexities continue to present problems for how it is operationalized in the classroom in the teaching of reading. Developing a clear understanding of the current research outcome and the willingness for all to continue to build on this reading research will help us get closer to ensuring that every child can read.

Learning Gaps by Race

Learning gaps by race have a long, sordid past. While notable gains have been made in academic achievement, racial achievement gaps remain because not all students are progressing at the same rate. Lauren (2016) posited that the academic achievement of Black and White students has barely narrowed over the last 50 years despite a half-century of intended progress in race relations and increased emphasis on closing the learning gap between students. These premises came from a part of a series of issues of Education Next articles (Spring, 2016) commemorating the 50th anniversary of "Equality of Education Opportunity," also known as the Coleman Report (1966). This was a breakthrough report on educational equity written by James Coleman, then a sociologist at Johns Hopkins University in Baltimore.

Dickinson (2016) in the John Hopkins Winter Magazine, asserted that the Coleman Report (1966) set the standard for the study of public education. Coleman et al. (1966) was influenced by a single paragraph in the Civil Rights Act of 1964. The Act required the commissioner of education to conduct a survey and report to the President and Congress concerning the “lack of availability of equal educational opportunities for individuals by reason of race, color, religion, or national origin in public educational institutions” (Dickinson, 2016, p. 22). Coleman (1966) and his team had little over a year to conduct the study. At the time there was very little known about schools, no standardized test scores of whites, and blacks to compare, and no studies analyzing the elements of successful learning (Dickinson, 2016). Congress wanted to know where we stood in terms of desegregation. Coleman (1966) surveyed 600,000 students and 60,000 teachers from 4,000 public schools (Coleman et al., 1966). He did not anticipate the

findings that family background and the combined socioeconomic status of students in the classroom were far more important in determining a child's academic achievement. This line of argument became very popular among many educators and others that believed that education did not need to be examined closely because of how well education was working (Glatter, 2016). This timeless report has been successful in a continuing debate on educational policy and how educational interventions can succeed in improving student achievement. Coleman (1966) later conducted additional studies that focused on identifying the relationship between school characteristics and academic achievement that could impact a student's achievement more than family background (Oxford University Press, 2019). While the Coleman (1966) Report helped create a discourse on achievement gaps, educators continued to grapple with how to close the learning gap in reading.

According to (Jeffery, 1978; Paul, 1965), the Elementary and Secondary Education Act (ESEA) of 1965 brought education into the forefront of the national assault on poverty and represented a landmark commitment to equal access to quality education (Jeffrey, 1978). ESEA is an extensive law representing the cornerstone of President Lyndon B. Johnson's 'War on Poverty' (McLaughlin, 1975). ESEA provided funds for primary and secondary education, emphasizing high standards and accountability with reading as a major component.

Next came the National Education Goals Panel (NEGP), an organization formed in 1990 after a meeting of President George H.W. Bush and states' governors in Charlottesville in 1989. The organization was established to report on the nation's progress toward the six education goals adopted at the meeting. Legislation in1994

formally established the National Education Goals with annual reporting responsibilities (Elmore, 1998).

In the spring of 1994, President Bill Clinton signed the Goals 2000: Educate America Act into legislation (Heise, 1994). Clinton's Goals 2000: Educate America Act, the key national educational reform initiative of the last quarter of the 20th century, set the expectation for systemic reform in K-12 education including testing of reading and mathematics skills to ensure that students met these standards.

Concomitant to Goals 2000 was the re-authorization of the Elementary and Secondary Education Act (ESEA) when President Clinton signed Improving America's Schools Act (IASA) in October 1994. This Act also modified Title I of the ESEA, provided funding for teacher training, state-level testing, and raised the standards for schools educating disadvantaged students (Riley, 1995). There were reported failures and successes during this time (Schwartz et al., 2000).

The next major tsunami in education was No Child Left Behind (NCLB), which by all accounts proved to be disastrous (Hayes, 2008). This law allowed the federal government to intervene in education as it was occurring in every classroom across the country. The legislation was intended to be a response to a real problem; chronic low literacy, and a failure on the part of the educational establishment to acknowledge or address the problem (Glatter, 2016). The No Child Left Behind legislation helped to foster the idea that educational achievement in reading and other areas was not an educational problem rather a problem of social policy, social justice, and poverty. Glatter (2016) was not alone in meting out harsh criticism for No Child Left Behind (Schwartz et al., 2000). This law was unpopular because of impossible to reach goals, but one of the

main criticisms was the unfair targeting of high-poverty schools. Farley (2017) agreed when asserting that NCLB had two major goals. The goals were to close the achievement gap between advantaged and disadvantaged students and to implement an assessment regime, with serious consequences for schools that fail to meet the standards.

January of 2022 marked the 20th anniversary of the law. The No Child Left Behind Congress exercised its authority under the Congress Review Act (CRA) to overturn the accountability regulations. Every Student Succeeds Act (ESSA) issued by President Barack Obama effectively replaced NCLB (Lee, 2015). This law as with Improving America's School's Act (IASA) placed the responsibility for student performance on the states. This law builds on the progress of former laws and the tireless efforts of teachers, administrators, and policymakers. The law replaced its predecessor, the No Child Left Behind Act, and modified components but did not eliminate provisions relating to the periodic standardized tests given to students.

Reading and math proficiency tend to be the major focus of teachers and schools because according to Wagner and Espin (2015), the ability to read is necessary for all areas of student learning. Dysfluent reading creates many problems for students, including falling behind in schoolwork, inaccurately completing assignments, and causing a disdain for school-related activities. There is a growing body of literature that recognizes the importance of closing the literacy gap using phonics, fluency, and mix-method intervention strategies (Bradley & Noell, 2018; Hammerschmidt-Snidarich et al., 2019, Snyder & Golightly, 2017).

Reading is an essential subject that students must learn to succeed in school and life. According to Markgraf (2021), effective reading interventions are essential in

closing the literacy gap. Markgraf (2021) sought to determine what was known about differentiated instruction and what was considered best practice when attempting to close the literacy gap in reading using phonics, fluency, and mix-method intervention strategies in kindergarten through fifth grade. Markgraf (2021) asserted that when students fall behind in reading, educators often do not know what resources, strategies, and interventions are most effective (p. 6). He investigated whether these interventions could close the literacy gap of struggling readers in primary grade levels.

The Casey Foundation (2017) and the Office of Civil Rights (2017) purported that there are racial differences in educational access and academic achievement. Researchers continue to raise concerns regarding the differences between Black and White students' achievement. The Midwest Achievement Gap Research Alliance (MAGRA) is one such group that continually seeks answers on how to improve educational opportunities and outcomes for Black students. To assist this organization in furthering its interest MAGRA engaged the Regional Educational Laboratory Midwest (REL Midwest) in seeking answers to the following question (Same et al., 2018):

> *What interventions have been shown to be associated with improved academic of Black students according to evidence tiers I (strong evidence, II (moderate evidence) and III (promising evidence) from Every Student Succeeds Act (ESSA)?*

Of particular interest was students' academic achievement on standardized tests in English language arts (ELA) and math, high school graduation rates, and high school dropout rates. A review of 3,917 abstracts with a focus on Black students was used to obtain 53 full-text studies that met the criteria of interest and the criteria for Tiers I, II, and III. This scrutiny ultimately led to 22 studies. The results of this systematic review of

research showed that statistically significant associations between 20 interventions and the academic achievement of Black students 11 or 55% were positively associated with ELA achievement (p.ii). This study pointed out the need for continued research on explicit evidence on interventions that aim to improve Black students' educational outcomes (Same et al., 2018).

Little (2017) stated that according to state standardized test results, fewer African American students at a rural Title I elementary school met state reading requirements between 2012 and 2016, relative to other racial/ethnic groups of students. Since the school and district had not undertaken research to clarify teacher awareness and experience as it applied to teaching reading to African American students, there was a void in practice. This qualitative case study aimed to examine elementary teachers' awareness and comprehension of African American students' reading needs to resolve an issue and a difference in practice. The study's conceptual structure was based on Tomlinson et al.'s (2003) differentiated instruction theory. Ten experienced elementary teachers' interview data were analyzed using 2-cycle provisional coding and pattern coding, which revealed the themes that shaped the findings of the study: (a) teachers' understanding of factors that contribute to underachievement in the reading of some African American students, (b) professional development and preparation of teachers for teaching African American students, (c) classroom pedagogy for teaching African American students, (d) challenges that teachers encounter when teaching reading to African American students, and; (e) resources and supports that teachers perceive as necessary for teaching reading to African American students.

According to the results, elementary teachers would benefit from professional development that would help them better teach African American students to learn. The study and subsequent project could have a positive effect on local social change by raising teacher understanding of the reading needs of African American students, contributing to an eventual increase in reading proficiency.

Husband (2012) shared that there has been a lot of talk about the reading gaps between African American males and other student classes. Surprisingly, the majority of this study was focused on African American males in their preadolescent and adolescent developmental stages. Minimal research has been carried out to date about how to improve reading outcomes in African American males in early childhood and elementary school settings. This article aimed to present a multi-contextual framework for improving reading outcomes in African American boys in P-5 classrooms. Finally, these researchers examined three main sacrifices that teachers and administrators must be willing to make for these strategies to work.

Gerstl-Pepin and Woodside-Jiron (2005) studied the disconnect produced by No Child Left Behind (NCLB) between the lived culture of schools and the inflexible mandates based solely on the scientific study was discussed in this article. The researchers examined NCLB's Reading First Initiative, which was a grant program that supported unique "scientifically-based" components of reading instruction (phonemic awareness, phonics, fluency, vocabulary, and text comprehension instruction). The knowledge provided in the article is based on a qualitative case analysis of one low-income school in the Northeastern United States. The results indicated the positions of background and individual student interests in the professional role of a teacher.

Along the same line of discussion, Hunt et al. (2009) reported that it was possible, and possibly, that the challenges students must overcome to reach AYP will differ from state to state. Students from racial/ethnic groups (White, Black, Hispanic, Native American, Asian-Pacific Islander, and multiethnic), economically disadvantaged students (free and reduced lunch), students with disabilities, and students with minimal English proficiency were the current subgroups under NCLB.

Thomas (2018) shared that teachers have become more aware of how students' culture influences their perceptions of reading and the literacy materials now used in classrooms because of the early reading gap among different subgroups of students in schools. African American boys are on the outskirts of literacy growth and development due to a recorded racial and gender disparity among elementary literacy readers. As a result, teachers must introduce strategies to establish an emergent and early literacy classroom that inspires all boys of color to enjoy reading at a young age while shining a positive light on all students' backgrounds. Male students of color who are disadvantaged during the literacy learning process will be inspired by implementing a culturally sensitive approach to literacy, increasing student responsibility in the literacy selection process, and providing culturally appropriate texts that positively impact student self-perception.

Preparation and Training of Reading Teachers

Teacher preparation programs have not kept pace with what the research says about the teaching of reading. There continues to be a gap between preservice curricula and how teachers are expected to carry out reading instruction in the classroom. In 2010, researchers with the Institute of Educational Sciences surveyed more than 2,200

preservice teachers about how much their preparation programs focused on the essential components of reading instruction. Only 25% of the preservice teachers in the IES study reported that their preparation programs included a strong overall focus on reading instruction. Participants were twice as likely to report a strong focus on reading instruction in their preservice teaching experiences as in their preservice coursework.

According to Durrance (2017), research shows a gap between what we know about reading and how teachers are prepared to teach it. Reading is the foundation for learning. Accordingly, Durrance (2017) asserted that the research is clear: Students who are not reading proficiently by the end of third grade are much more likely to face poor academic outcomes. For this reason alone, we know it is incredibly important that children learn to read well early in elementary school and continue to build on those reading skills throughout the rest of school (Durrance, 2017).

The task of teaching young children to read falls to elementary school teachers, especially teachers in kindergarten through third grade. But the methods used to teach reading to vary, and so does the expertise of these teachers. Durrance (2017), not unlike many reading researchers agreed with the seminal National Reading Panel published conclusions on best practices for teaching young children to read after examining a wide body of research on scientifically based teaching strategies and the effectiveness of different approaches to reading instruction. Accordingly, researchers now know that all students need instruction in five major components of reading: phonemic awareness, phonics, fluency, vocabulary, and comprehension.

The National Reading Panel found that younger students benefit most from instruction in sound identification, matching, and the segmentation and blending of

phonemes. Networks of new vocabulary words need to be taught in context, not through memorization. In addition, compared to other approaches to teaching early reading skills, systematic phonics instruction leads to greater gains for children in kindergarten through 6th grade, as well as for children who have difficulty with reading. The Panel also noted that effective reading instruction, especially for struggling readers, must be explicit. Teachers need to model strategies and specific skills and demonstrate processes, step-by-step. Effective instruction is also systematic**:** carefully sequenced by skill difficulty and paced in a way that provides students with sufficient time for mastery before moving on to a more challenging skill. Finally, good reading instruction provides many opportunities for guided practice and teacher feedback.

The Institute of Medicine and National Research Council explained that in addition to the five essential components of reading instruction, educators must also have training that prepares them to teach more advanced literacy skills, including listening to comprehension, reading comprehension, and learning content through reading. Skilled teachers can scaffold their students' use of language by building from what they know and providing increasingly difficult prompts and questions that are appropriate for the word knowledge of each child. Doing all of this well requires practice and training.

The National Council on Teacher Quality found additional evidence that preservice training for reading instruction was not adequate in many teachers' preparation programs. The Council's most recent evaluation of more than 800 undergraduate programs for elementary teacher education determined that only 39% of programs examined instruction in all five essential components of reading. Nearly one in five programs examined one or none of the components. However, this rate is on the rise

nationwide and has increased by 10 percentage points since 2014. Some teacher education programs in SREB states are doing particularly well: six of the 13 programs recognized in the NCTQ report for their 'A+' preparation for teaching early reading skills were in the SREB region.

In Arkansas, The Right to Read Act (Act 1063) outlined the training that teachers are required to complete (https://dese.ade.arkansas.gov, 2017, p.1). By the beginning of the 2021-2022 school year: A) All teachers employed in a teaching position that requires an elementary education (K-6) license or special education (K-12) license shall demonstrate proficiency in knowledge and practices of scientific reading instruction; and B) All other teachers shall demonstrate awareness in knowledge and practices of scientific reading instruction. Arkansas also enacted Act 940, which requires districts to inform parents in writing of their child's reading level a minimum of twice per year. Act 83 outlined that the school-level improvement plans shall include a literacy curriculum and professional development that aligns with the district's needs and the science of reading. This multifaceted approach to addressing reading in Arkansas aims to address the instructional gap on many levels, teacher knowledge and demonstration of that knowledge, parental involvement and data-driven decision making for intervention, and curriculum materials. The focus on reading progression has shifted from determining a student's reading level to determining what skills are needed to read with fluency and comprehension. The figure below sets out specific expectations of the laws:

Figure 1.

Specific Expectations of the Laws of The Right to Read Act (Act 1063)

By the beginning of the 2021-2022 school year: All teachers employed in a teaching position that requires an elementary education (K-6) license or special education (K-12) license shall demonstrate proficiency in knowledge and practices of scientific reading instruction. All other teachers shall demonstrate awareness in knowledge and practices of the scientific reading instruction.	Act 1063 of 2017
Classroom Teachers in Grades K-6 and Literacy Specialist	
By the beginning of the 2021-2022 school year: All teachers **employed** in a teaching position that requires an elementary education license for grades K-6 including K-12 literacy specialists shall demonstrate proficiency in knowledge and practices of scientific reading instruction. It will be the district's responsibility to ensure that teachers employed and teaching in grades K-6 have met the proficiency criteria. o This includes any classroom elementary educator in grades (K-6) self-contained or departmentalized (Math, Science, ELA, or Social Studies) and K-12 literacy specialist or coaches. o Those employed under a licensure exception or waiver will have one year to demonstrate proficiency. o Those who are licensed and returning to the classroom in one of the above-mentioned positions will have one year to demonstrate proficiency. **An educator license that expires December 31, 2021, and thereafter will not be renewed if the educator has not met the awareness requirement for the Science of Reading.** Applicants are responsible to provide documentation of awareness of best practices in the scientific instruction of reading unless previously documented. Educators described above who have not met proficiency requirements for employment by the 21-22 school year, will have one year to complete the requirement. The educator and district will be responsible to provide documentation to show that the educator is working towards the credential during the one-year period.	Act 1063 of 2017
Special Education	
By the beginning of the 2021-2022 school year: All K-12 special education teachers **employed** in a teaching position shall demonstrate proficiency in knowledge and practices of scientific reading instruction. It will be the district's responsibility to ensure that special education teachers employed, and teaching have met the proficiency criteria. o This includes resource and self-contained special education teachers in grades K-12 all subjects	Act 1063 of 2017

o Those employed under a licensure exception will have one year to demonstrate proficiency. o Those who are licensed and returning to the classroom in one of the above-mentioned positions will have one year to demonstrate proficiency. **An educator license that expires December 31, 2021, and thereafter will not be renewed if the educator has not met the Awareness requirement for the Science of Reading.** Applicants are responsible to provide documentation of awareness of best practices in the scientific instruction of reading unless previously documented. Educators described above who have not met proficiency requirements for employment by the 21-22 school year, will have one year to complete the requirement. The educator and district will be responsible to provide documentation to show that the educator is working towards the credential during the one-year period.	
All Other Classroom Teachers	
By the beginning of the 2021-2022 school year: All other teachers **employed** in a teaching position shall demonstrate awareness in knowledge and practices of scientific reading instruction. It will be the district's responsibility to ensure that teachers employed have met the awareness criteria. o This includes 7-12 general education teachers, school and district administrators o K-6 specialty educators (music, PE, art, library media, etc.) o Those employed under a licensure exception or waiver will have one year to show awareness. o Those who are licensed and returning to the classroom in one of the above-mentioned positions will have one year to show awareness. **An educator license that expires December 31, 2021, and thereafter will not be renewed if the educator has not met the Awareness requirement for the Science of Reading.** Applicants are responsible to provide documentation of awareness of best practices in the scientific instruction of reading unless previously documented.	Act 1063 of 2017
K-6 or special education teachers (K-12) who started their education preparation program in the **fall of 2017** and thereafter must pass the approved stand-alone reading assessment. (Foundations of Reading for Arkansas) • Depending on the preparation program there may be a gap between curriculum alignment and the assessment requirements for current graduates o Candidates who complete a program of study approved as aligned to 2019 competencies, and o Pass the Foundations of Reading for Arkansas are considered proficient o Graduates prior to May 2021 will need to complete a proficiency pathway Phase I as a condition of employment unless they complete a program considered an early adopter. All graduates in **May 2021** and thereafter will meet the proficiency requirement.	Act 540 of 2019 Act 416 of 2017

K-6 or special education teachers (K-12) who apply for reciprocity after September 1, 2017, must take and pass the stand-alone reading test. The test requirement is waived with a valid out-of-state teaching license and 3 years documented teaching experience. By 2021-2022 school year these teachers shall demonstrate proficiency upon employment within one year by completing a proficiency pathway Phase I. No later than May 2023 an applicant seeking Elementary (K-6) or Special Education licensure by reciprocity or by adding an endorsement, must demonstrate proficiency in the knowledge and skills to teach reading consistent with the best practices of scientific reading instruction. The Division of Elementary and Secondary Education may issue a Provisional License for up to three years to an applicant who has not completed the required professional development to demonstrate proficiency or awareness in scientific reading instruction.	Act 416 of 2017 Act 1063 of 2017

Note. Retrieved from the Arkansas R.I.S.E. website

The science of reading is not a philosophy nor is it a one-size-fits-all, rather it is an abundance of research in the U.S. and around the world consisting of basic clinical and brain research. It is settled, science that is continuously expanded and refined, and it is not just about phonics. The research does converge around how students learn to read and on how to prepare teachers to teach a student to read.

Banks et al. (2013) wanted to see how a reading course and tutoring affected elementary school students enrolled in an after-school program in a low-income neighborhood. The researchers concluded that multicultural field-based tutoring experiences linked to a subject area course will help teachers develop their pedagogical skills and effectiveness when teaching low-income African American students.

Cartwright (2002) studied the ability to perceive multiple aspects of stimuli at the same time during elementary school and can be assessed using multiple classification tasks. While previous research has found a correlation between domain-general multiple classification capacity (e.g., classifying objects by shape and color at the same time) and reading, a precise link between the two has yet to be discovered.

Charity et al. (2004) stated that for children whose everyday speech differed significantly from School English (SE) they hear in academic materials and environments; it was hypothesized that greater familiarity with School English (SE) would be connected to more active early reading acquisition. The sentence imitation and reading skills of 217 urban African American students in kindergarten through second grade (ages 5 to 8 years) were assessed in this study.

Pease-Alvarez and Katherine (2008) shared that students read a range of texts, including their Literature Research Circle (LSC) books, individually chosen novels of varying lengths and complexity, poetry, and nonfiction picture books about science and social sciences topics. To resolve the perceived crisis in our public education system, federal, state, and local governments are asserting greater influence over how children are expected to learn and how teachers are expected to teach in our country's public schools.

Pianta et al. (2008) studied a variation in observed classroom supports (quality of emotional and educational experiences, and amount of exposure to literacy and math activities) to predict trajectories of reading and math achievement from 54 months to fifth grade in this nonexperimental, longitudinal field research. Development mixture modeling revealed two latent groups of readers: fast readers whose skills evolved quickly and then plateaued, and a traditional category whose reading skills grew more slowly. For math achievement, only one latent class was discovered. There was a slight positive link between the reported emotional consistency of teacher-child interactions and development when it came to reading. The observed emotional experiences and exposure to math activities had small positive relationships with math achievement development. There was a major interaction between the quality and quantity of reading instruction,

with less of a negative relationship between the amounts of literacy exposure and reading growth at higher levels of emotional quality.

Shollenbarger et al. (2017) shared a study that when the stimulus objects were consonant-vowel-consonant-consonant (CVCC) words and non-words, this study looked at how usually developing first grade African American English (AAE) speakers differed from mainstream American English (MAE) speakers in the completion of two traditional phonological awareness tasks (rhyming and phoneme segmentation), (Shollenbarger et al., 2017). There were 49 first graders who met the requirements for two dialect groups: AAE and MAE (Shollenbarger et al., 2017). In each rhyme and segmentation task, three conditions were tested: Real Words No Model, Real Words With a Model, and Non-words With a Model (Shollenbarger et al., 2017). Across all experimental conditions, the AAE group had substantially more responses that rhymed CVCC words with consonant-vowel-consonant words and segmented CVCC words as consonant-vowel-consonant than the MAE group (Shollenbarger et al., 2017). The existence of a model in the real word condition resulted in more reduced final cluster responses for both groups in the rhyming challenge (Shollenbarger et al., 2017). Only the AAE group shifted through the various stimulus presentations and decreased the final cluster less frequently when given a model in the segmentation task while the MAE group was at the ceiling (Shollenbarger et al., 2017).

Snow and Matthews (2016) stated that young children should, and do, perform flawlessly. Kids, on the other hand, as they get older, need to be able to understand words that are seldomly used in spoken language and to combine new information with appropriate context information. Unconstrained skills—large areas of information gained

progressively through experience—include vocabulary and context knowledge. For children's long-term literacy performance, unrestricted skills are especially important (that is, success in outcomes measured after third grade). They are often more highly predicted by children's social status or their parents' schooling, and more difficult to teach in the classroom than restricted abilities. Unconstrained skills are often much more difficult to learn due to their open-ended nature. According to Snow and Matthews (2016), a decrease in literacy scores as children advance from elementary to middle school indicates that in the early grades, our schools might be focusing too much on restricted abilities and too little on unconstrained ones. The authors discussed promising programs and approaches for developing both constrained and unconstrained skills, ranging from comprehensive school-improvement programs to attempts to improve curricula and teachers' professional development—though they point out that comparing programs is difficult due to significant differences in scope, expense, goals, and theories of change. Another problem is the difficulty to sustain quality and continuity over time when implementing complex systems. Snow and Matthews (2016) proposed that rather than introducing complicated interventions as a bundle, it may be easier to adopt and test promising practices that can be mixed and balanced to enhance young children's literacy performance.

Sonnenschein et al. (2010) stated that using the nationally representative Early Childhood Longitudinal Research data collection, a latent growth model was used to examine the longer-term effectiveness of phonics and integrated language arts instruction, as well as the amount of such instruction, on children's reading development (kindergarten through fifth grade). Teachers' ratings were used to assess the type and

volume of instruction. Children's entry-level skills and ethnicity were found to be predictors of kindergarten reading grades. Ethnicity and the education level of the parents projected the rate of growth. Children's reading scores were predicted by the form and volume of reading instruction they got. The effects of the form of teaching, on the other hand, were time-dependent, occurring only in kindergarten and first grade. While children benefit from decoding and comprehension training, likely, the instruction was not tailored to the children who were most at risk.

Thomas (2018) shared that teachers have become more aware of how students' culture influences their perceptions of reading and the literacy materials now used in classrooms because of the early reading gap among different subgroups of students in schools. African American boys are on the outskirts of literacy growth and development due to a recorded racial and gender disparity among elementary literacy readers. As a result, teachers must introduce strategies to establish an emergent and early literacy classroom that inspires all boys of color to enjoy reading at a young age while shining a positive light on all students' backgrounds. Male students of color who are disadvantaged during the literacy learning process will be inspired by implementing a culturally sensitive approach to literacy, increasing student responsibility in the literacy selection process, and providing culturally appropriate texts that positively impact student self-perception.

Summary

Improving the reading achievement of African American students across this country continues to be of concern to many educators, policymakers, and parents. The review of literature for this quantitative, casual-comparative study began with the

conceptual framework of accountability (Cook, 2020, Jimenez et al., 2017), specifically educational accountability (Cook, 2020, Levin, 1974, Little, 2017). It examined the teachers' responsibility to understand and implement the science of reading and its components in reading instruction in the classroom to improve reading assessment scores of African American students. An explanation of the history of reading instruction in schools, (Barry, 2008, https://www.k12academics.com/reading-education-united-states/history-reading-education-us) and a detailed history of reading in the United States (Chall, 1967; Ehri, 1998; Flesch,1981; Goodman, 1986; Lemann, 1997; McGuffey, 1885; Parker, 2019; Share,1995; Smith, 1999) from the 1800s to present day was outlined to demonstrate why the "reading wars" (Barshay, 2020; Castles et al., 2018; McNeil, 2021) continue.

Following the detailed history of reading in the United States, the cognitive science of reading was thoroughly discussed pointing out the research by Hanford (2018) that stated that if a child is not reading by the end of the third grade that they are likely to be poor readers (Durrance, 2016) and the research by NAEP, which revealed that sixty percent of American fourth graders were not proficient readers. Once believed that the debate on the "how-to" of teaching was over, a discussion by several researchers (McNeil, 2021; Stuckey et al., 2018) suggested that it has reared its ugly head again. Phonics instruction (Apfelbaum et al., 2012; Brown et al., 2018), the need for scientific research by teachers (Brown et al., 2018; Lyon & Chhabra, 2004; Vaughn et al., 2020), and adaptive teaching was cited as a key feature of a successful reading teacher. The literature review discussion on learning gaps by race was addressed based on the premise that state standardized test results continue to demonstrate that fewer African Americans

students met state reading requirements as compared to other racial/ethnic groups creating a learning gap by race (Husband, 2012; Little, 2017; Thomas, 2018).

The literature review concluded with a detailed explanation of the preparation and training of reading teachers (Durrance, 2016; 2017; The National Reading Panel, 1998; The Institute of Medicine and National Research, 2020; The National Council on Teacher Quality, 2020; The Right to Read Act, 2019) and why teachers must be trained in the science of reading to effectively teach elementary-aged students to read by the end of the third grade. The early reading gap has made teachers more aware of how cultural influences impact their perception of reading. It is the hope of this new revelation coupled with the science of reading that we will begin to see improvement in reading achievement in African American students commensurate with their counterparts.

Chapter III describes the procedures that were utilized to complete the study. These include the research questions and hypotheses, research methodology, research design, setting, population and sample, instrumentation, data collection, and data analysis.

III: Methodology

This chapter examined the research question, research methodology, research design, population and sample selection, instrumentation, data collection, and data analysis.

The purpose of this quantitative, causal-comparative study was to determine if the training in the science of reading was effective in improving the reading achievement scores of African American students on the 2020-2021 fall and spring NWEA MAP Tests in grades 1, 2, and 3 in Tier I, Tier II, and Tier III schools in a Central Arkansas School District. The 2020-2021 fall and spring NWEA MAP Test scores were analyzed to determine whether there was a statistically significant difference between the scores of students taught by teachers who received the training and students taught by teachers who did not receive the training in the science of reading.

The NWEA MAP Test (Measures of Academic Progress) is an adaptive achievement and growth test (Cordray et al., 2012). It creates a personalized assessment experience by adapting to each student's learning level—precisely measuring progress and growth for each student (Cordray et al., 2012). The NWEA MAP Test is a norm-referenced measure of student growth over time (Cordray et al., 2012). MAP assessments, joined with other data points, provide detailed, actionable data about where each child is on his or her unique learning path (Cordray et al., 2012). The test is given via computer to children in grades K-12 (Cordray et al., 2012). Its structure is cross-grade, which provides a measurement of students who perform on, above, and below grade level (Cordray et al., 2012). It is multiple choice and provides questions that are depth of knowledge so that you can see if a child performs at levels 1, 2, or 3 of difficulty

(Cordray et al., 2012). The test is untimed, but students generally spend about 60 minutes per subject area. Feedback results are available in 24 hours (Cordray et al., 2012).

MAP Growth uses a scale called RIT to measure student achievement and growth. RIT (**R**asch Un**IT)** is a measurement scale developed to simplify the interpretation of test scores (NWEA Map Test Overview, 2021). It is an equal-interval scale, like feet and inches on a ruler, so scores can be added together to calculate accurate class or school averages (NWEA Map Test Overview, 2021). The RIT scale ranges **from 100–to 350**. RIT scores make it possible to follow a student's educational growth from year to year (NWEA Map Test Overview, 2021).

The hypothesis for this study was that the students taught by teachers who received the Science of Reading Training have higher scores on the 2020-2021 fall and spring NWEA MAP Test scores than students taught by teachers who did not receive the awareness training.

Research Questions/Hypotheses

The following research questions guided this study:

RQ1. Is there a statistically significant difference between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

***H1*.** There is no statistically significant difference between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who

received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas District.

RQ2. Is there a statistically significant difference by gender (male-female) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

***H2*.** There is no statistically significant difference by gender (male-female) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the science of reading training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District.

RQ3. Is there a statistically significant difference by grade level (grade 1, 2, and 3) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the science of reading training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

***H3*.** There is no statistically significant difference by grade level (grade 1, 2, or 3) between the 2020-2021 fall and spring NWEA MAP Test scores for African American students taught by teachers who received the science of reading training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District.

RQ4. Is there a statistically significant difference by Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the science of reading training in a Central School District?

***H4*.** There is no statistically significant difference by Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

Research Methodology

The purpose of this study was to determine if the science of reading awareness training mandated by the Arkansas DESE was effective in increasing the reading assessment scores of African American students in a Central Arkansas School District. Because the data used in this study is archival and the researcher would not be manipulating the independent variable (the training), a causal-comparative methodology was deemed to be the best approach for this study.

Causal-comparative research or *ex post facto* research allows the setup of a quasi-experimental design whereby two groups are established for comparison purposes (Graves, 2021). In this study, the two groups were established based on whether their teacher received the Science of Reading Training or not. In a true causal-comparative, the idea is to create two groups that are as similar as possible (matched-pairs) with the only difference between the two groups being the independent variable. In this study, the two

groups were assumed to be similar simply based on grade level and Tier level. In a sense, the students not taught by a teacher who received the Science of Reading Training were the control group, and the students taught by a teacher who received the Science of Reading Training were the treatment group (Edmonds & Kennedy, 2013).

The purpose of this quantitative, causal-comparative study was to determine if the Science of Reading Training was effective in improving the reading achievement scores of African American students on the 2020-2021 fall and spring NWEA MAP Tests in grades 1, 2, and 3 in Tier I, Tier II, and Tier III schools in a Central Arkansas School District. The quantitative, causal-comparative approach that was utilized in this study examined the 2020-2021 fall and spring NWEA MAP Test scores of African American students in grades 1, 2, and 3 in Tier I, Tier II, and Tier III schools to determine if there was growth in reading achievement from the fall to the spring tests in the 2020-2021 school year. The quantitative, casual-comparative study consisted of analyzing the 2020-2021 fall and spring NWEA Map Test scores of African American students in a Central Arkansas School District from teachers who have had the Science of Reading Training and teacher who have not had the Science of Reading Training.

Research Design

The current study involved the use of a causal-comparative design to compare the academic growth in reading of 1st, 2nd, and 3rd-grade students enrolled in Tier I, Tier II, and Tier III schools by teachers who have been trained in the science of reading and not trained in the science of reading. A casual-comparative design was the best research method to use in the current study to determine if there was a relationship between the independent and dependent variables after the testing windows had already occurred

(Salkind, 2010). The schools in the study were disaggregated by school Tier Levels (Level I, II, and III). Students were disaggregated by grade level (grades 1, 2, and 3) and gender (male and female). The dependent variables in the study were academic growth in reading RIT scores, as measured by the difference between the NWEA MAP RIT fall and spring scores. To determine a difference between the student academic growth at grades 1, 2, and 3 from Tier Levels I, II, and III elementary schools in the Central Arkansas School District that were taught by teachers who received the science of reading training. Similar students who were taught by teachers who did not receive the science of reading training composed the comparison group or the control group.

Setting

The Central Arkansas School District is one of the largest public-school districts in the state of Arkansas. It is comprised of 29 elementary schools (pre-k - 5), seven middle schools (6 - 8), five high schools (9 - 12), four early childhood centers (pre-k), a career-technical center, an accelerated learning center, and two alternative learning centers (Central Arkansas District, 2021). Approximately 3,700 people work toward the goal of educating more than 23,000 students (Central Arkansas District, 2021). Nearly half of all classroom teachers have a master's or doctoral degree, 147 have National Board Certification, and many of the educators have been honored with state and national awards, including the Milken Family Foundation National Educator Award, the U.S. Department of Education's American Star of Teaching Award, and Arkansas PTA Teacher/Administrator of the Year (Central Arkansas District, 2021).

This study utilized the NWEA MAP RIT scores in the fall and spring of African American students in Tier I, Tier II, and Tier III Schools of teachers who received

awareness training and teachers who were not trained in the science of reading in a Central Arkansas School District. Because these were archived scores, scores from all elementary schools in the district were utilized in the study.

Population and Sample Selection

The participants in this study were African American students who took the NWEA MAP Test in the fall and spring of the 2020-2021 school year in Tier I, Tier II, and Tier III schools in a Central Arkansas School District. The students came from classrooms of students whose teachers participated in the science of reading training and teachers who did not have the science of reading training. Elementary classroom teachers in the Central Arkansas School District did not have to agree to participate in this study as data came from archived data from the district. The scores of students with both a fall and spring RIT score on reading were analyzed by gender to determine if there was a gap between the African American males and females, by trained and non-trained teachers, and in Tier 1, Tier 2, and Tier 3 schools. Any student who did not have a fall and spring NWEA MAP score was not included in the analysis.

Instrumentation

NWEA MAP Test is a research-based, not-for-profit organization that supports students and educators worldwide by creating assessment solutions that precisely measure growth and proficiency—and provide insights to help tailor instruction (NWEA, 2017). NWEA MAP Growth is noted for its stable, equal-interval vertical scale and the accurate, valid, and reliable data it provides (NWEA, 2017). The assessment measures student academic growth by using the fall assessment score as a baseline. The RIT score is the scale used to measure student progress (NWEA, 2017). It is the only interim

assessment that provides school-level norms based on recent data from more than 1.5 million students and 5.5 million test events (Cordray et al., 2012).

The NWEA MAP Test (Measures of Academic Progress) is an adaptive achievement and growth test (Cordray et al., 2012). It creates a personalized assessment experience by adapting to each student's learning level—precisely measuring progress and growth for each student (Cordray et al., 2012). NWEA's Measures of Academic Progress® (MAP®) assessment serves many purposes, from informing instruction to identifying students for intervention to projecting proficiency on state accountability assessments (Cordray et al., 2012).

The NWEA MAP reading assessment RIT scores were the only assessment used for this study. All identified students in the sample completed each assessment within the assessment periods in the 2020-2021 school year. The study was conducted to examine student growth during one school year. Data were analyzed from the fall assessment and the spring assessment window. The NWEA MAP Test is a computer-adaptive assessment in which the difficulty level of each question is adjusted based on the student's response (NWEA, 2017). Student responses determine the number of questions each student is required to answer. Valid NWEA MAP RIT scores range between 100 to 350 (NWEA, 2017). Student growth scores were determined by subtracting the fall RIT score from the spring RIT score (NWEA, 2017).

Data Collection

An application was submitted to the Arkansas Tech University Institutional Review Board (IRB) and was approved on December 29, 2021 (see Appendix A). Permission from the Central Arkansas School District was sought to obtain the data for

the study. A request was made and approved by the director of the assessment and accountability on January 4, 2022 (see Appendix B). Where applicable, the name of the district and other identifying information was redacted.

The researcher collected and utilized the fall and spring NWEA MAP RIT scores from the 2020-2021 school year from schools in Tier I, Tier II, and Tier III from teachers who have completed the training and teachers who have not completed the training. This information was utilized to determine if there was a statistically significant difference in the reading test scores of African American examinees in the Central Arkansas School District.

The actual test scores were acquired from the Central Arkansas School District with non-identifiers to provide anonymity for the student subjects. Testing information was reviewed for the overall effectiveness of the process and district administrators identified the teachers from the schools who had the training and those that did not have the training. Once the data was compiled in Microsoft Excel, the data were reviewed for accuracy. The data was imported into IBM SPSS Statistics Faculty pack 25 for PC for data analysis.

Data Analysis

Quantitative methods were utilized to analyze the data in this study. The scores from the 2020-2021 fall and spring NWEA MAP Test scores from African American students in grades 1, 2, and 3 in Tier I, Tier II, and Tier III schools were analyzed to determine if the science of reading training has made a statistically significant difference. In addition, data was analyzed of African American males and females in grades 1, 2, and

3 in Tier I, Tier II, and Tier III schools. The four research questions, corresponding hypothesis, and methods are:

RQ1. Is there a statistically significant difference between the 2020-2021 fall and spring NWEA MAP Test scores for all African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading training in a Central Arkansas School District?

H1. There is no statistically significant difference between the 2020-2021 fall and spring NWEA MAP Test scores for all African American students taught by teachers who received the science of reading training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas District.

For Research Question 1, the RIT Growth scores from the NWEA MAP Test were analyzed to determine if there was a statistically significant difference between the scores of students whose teachers received the science of reading training and those that did not. At each level, the mean scores of the two groups were compared using an independent-samples *t*-test to determine if there is a statistically significant difference between the two groups at the $p<.05$ probability level.

RQ2. Is there a statistically significant difference by gender (male-female) between the 2020-2021 fall and spring NWEA MAP Test scores for African American students taught by teachers who received the science of reading training and students taught by teachers who did not receive the science of reading training in a Central Arkansas School District?

H2. There is no statistically significant difference by gender (male-female) between the 2020-2021 fall and spring NWEA MAP Test scores for African American

students taught by teachers who received the science of reading training and students taught by teachers who did not receive the science of reading training in a Central Arkansas School District.

For Research Question 2, data were analyzed to determine if there was a statistically significant difference between the two specified groups by gender (male-female) and teachers that received the Science of Reading Training and those that did not receive the Science of Reading Training.

A two-way analysis of variance (ANOVA) was performed to analyze the effect of gender and the teachers that received the Science of Reading Training and those that did not receive the Science of Reading Training. Each of these variables was compared using dependent t-tests to determine if there was a significant difference at the $p<.05$ probability level.

RQ3. Is there a statistically significant difference by grade level (grade 1, 2, or 3) between the 2020-2021 fall and spring NWEA MAP Test scores for African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in Central Arkansas School District?

H3. There is no statistically significant difference by grade level (grade 1, 2, or 3) between the 2020-2021 fall and spring NWEA MAP Test scores for African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District.

For Research Question 3, data were analyzed to determine if there was a statistically significant difference between the two specified groups by grade level (grade 1, 2, or 3) and teachers that received the Science of Reading Training and those that did not receive the Science of Reading Training.

A two-way ANOVA was performed to analyze the effect of grade level (grade 1, 2, or 3) and the teachers that received the Science of Reading Training and those that did not receive the Science of Reading Training. Each of these variables will be compared using dependent t-tests to determine if there is a significant difference at the $p<.05$ probability level.

A two-way ANOVA was conducted that examined the effect of teachers that received the Science of Reading Training and those that did not receive the science of reading on grade level fall-to-spring RIT scores.

RQ4. Is there a statistically significant difference by Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores for all African American students taught by teachers who received the Science of Reading Training and those that did not receive the Science of Reading Training in a Central School District?

H4. There is no statistically significant difference by Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores for all African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

For Research Question 4, data were analyzed to determine if there was a statistically significant difference by Tier Level (Tier I, Tier II, or Tier III) between the

2020-2021 fall and spring NWEA MAP Test scores for all African American students taught by teachers who received the science of reading training and those that did not receive the Science of Reading Training. At each level, the mean scores of the two groups were compared using a dependent *t*-test to determine if there was a statistically significant difference between the two groups at the $p<.05$ probability level.

A two-way analysis of variance (ANOVA) was conducted that examined the effect of teachers that received the Science of Reading Training and those that did not receive the science of reading on grade level fall to spring RIT scores.

Summary

This chapter provided an overview of the methodology that was utilized to conduct this quantitative, casual-comparative study. The purpose of the study, the research question/hypothesis, and research methodology was included to further explain the study. Also, this chapter examined the research design, population and sample selection, and instrumentation. Finally, the data collection and data analysis sections explained how the data was collected and analyzed. In Chapter IV, a discussion of the results of the data analysis was provided.

IV: Data Analysis and Results

The state of Arkansas has recently mandated the science of reading as the programmatic basis for teaching reading in K12 schools. This decision was research-based and implemented as a state-wide training program for teachers to learn the methods of teaching reading based on the Science of Reading Training. The training was ongoing at the time of this study. The fact that during the 2020-21 formative testing period some teachers had completed the R.I.S.E. training and others had not provided an opportunity to examine the potential effectiveness of the Science of Reading Training on student progress in reading. This study, a causal-comparative designed study provided an early view of the potential effectiveness of the science of reading for Arkansas K12 schools.

In particular, the researcher was concerned with the effectiveness of the science of reading on the reading of African American elementary students in grades 1-3. The reading gap by ethnicity is an ongoing problem for education. While it is valuable to learn how effective the science of reading is for all students, the focus of this study was the potential effectiveness of the science of reading in improving the reading ability of African American students.

Although the debate on how to teach reading has existed for many years, there continues to be a lack of agreement on how to teach reading, particularly in the early grades. Several studies outlined in the review of the literature suggested that students should be taught to read utilizing a combination of phonics and literature. This approach uses an embedded strategy of teaching phonics while the literature approach provides a context for reading and letter combinations (Husband, 2012). This academic disagreement over phonics vs. whole language or literature has existed for over 100 years

(Husband, 2012) and continues today. This war shifts continuously, oftentimes leading practitioners to choose a hybrid approach to teaching reading.

The purpose of this quantitative causal-comparative study was to determine if the training in the science of reading was effective in improving the reading achievement scores of African American students on the NWEA MAP Test in grades 1, 2, and 3 in Tier I, Tier II, and Tier III schools in a Central Arkansas School District. The NWEA MAP Test scores in this district were analyzed to determine the overall statistically significant difference of the program.

The data analyzed were collected from the archives of the Central Arkansas School District 2020-2021 NWEA MAP Test database. The scores from the 2020-2021 fall and spring NWEA MAP Test from students in grades 1, 2, and 3 of Tier I, Tier II, and Tier III schools were analyzed to determine if the Science of Reading Training made a statistically significant difference. Data were also analyzed between African American males and females in grades 1, 2, and 3 in Tier I, Tier II, and Tier III schools.

This chapter contains an overview of the procedures for quantitative data analysis from the population of African American students who took the NWEA MAP Test in the fall and spring of the 2020-2021 school year in Tier I, Tier II, and Tier III schools in a Central Arkansas School District. The students were from classrooms of students whose teachers participated in the Science of Reading Training and teachers who did not have the training. The data came from the results of the archived tests for the district. Therefore, it did not require the participation of elementary classroom teachers. In addition, the test scores were analyzed by gender to determine if there was a gap between

the African American males and females, by trained and non-trained teachers, and by Tier I, Tier II, and Tier III schools.

This chapter also includes a description of the findings, the data analysis procedures conducted within the analysis, and the demographic characteristics of the sample. The results are also reported. The first part of the study provided the descriptive statistics of the sample. The second part of the study provided the procedures of data analysis using IBM Statistical Package for the Social Sciences (SPSS) software. The final part provides the research findings that answer the research questions and the null hypotheses.

Research Questions/Hypotheses

The following research questions guided this study:

RQ1. Is there a statistically significant difference between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

***H1*.** There is no statistically significant difference between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas District.

RQ2. Is there a statistically significant difference by gender (male-female) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students

taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

***H2*.** There is no statistically significant difference by gender (male-female) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District.

RQ3. Is there a statistically significant difference by grade level (grade 1, 2, or 3) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

***H3*.** There is no statistically significant difference by grade level (grade 1, 2, or 3) between the 2020-2021 fall and spring NWEA MAP Test scores for African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District.

RQ4. Is there a statistically significant difference by Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central School District?

H4. There is no statistically significant difference by Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

Descriptive Results

The study sample consisted of 2,086 African American elementary students in grades 1, 2, and 3. All students took the NWEA MAP Test reading fall and spring assessments during the 2020-2021 school year. The students were enrolled in Tier I, Tier II, or Tier III schools. The students were taught either by a teacher that was fully trained in the science of reading or not fully trained in the science of reading.

Table 1

Frequencies by Teacher Training, Grade Level, School Tier Level, and Student Gender

		Frequency	Percentage
R.I.S.E Training	Yes	1418	68.0%
	No	668	32.0%
Grade Level	1	735	35.2%
	2	686	32.9%
	3	665	31.9%
School Tier	I	627	30.1%
	II	876	42.0%
	III	583	27.9%
School Gender	Female	1028	49.3%
	Male	1058	50.7%

Table 1 represents the frequencies of the participants in this study. Of the 2,086 teacher participants, 1418 (68%) received R.I.S.E. Training, and 668 (32%) did not receive R.I.S.E. Training. Grade levels of the student participants were first grade 735 (35.2%), second grade 686 (32.9%), and third grade 665 (31.9%). Of the schools represented there were 627 (30.1%) students in Tier I schools, 876 (42.0%) in Tier II schools, and 583 (27.9%) were represented in Tier III schools. Of the 2,086 student participants 1028 (49.3%) were female and 1058 (50.7%) were male.

Data Analysis Procedures

Quantitative methods of data analysis were used in the study. The four research questions and corresponding hypotheses are listed. The methods for statistical analysis and results of the test are also provided.

RQ1. Is there a statistically significant difference between the 2020-2021 fall and spring RIT Growth scores from the NWEA MAP Test for African American elementary students taught by teachers who had received the Science of Reading Training and students taught by teachers who had not received the Science of Reading Training in one central Arkansas school district?

H1. There is no statistically significant difference between the 2020-2021 fall and spring RIT Growth scores from the NWEA MAP Test for African American elementary students taught by teachers who had received the R.I.S.E. science of reading training and students taught by teachers who had not received the R.I.S.E. science of reading training in one central Arkansas school district.

For RQ1, the RIT Growth scores from the fall to spring NWEA MAP Test were analyzed to determine if there was a statistically significant difference between the scores

of students whose teachers received the Science of Reading Training and those students whose teachers did not receive the Science of Reading Training. The mean scores of the two groups were compared using an independent sample *t*-test to determine if there was a statistically significant difference between the two groups at the $p < .05$ probability level.

Results of this analysis showed that the difference in mean RIT Growth scores for teachers who received the Science of Reading Training ($M = 6.566$, $SD = 13.249$) and those teachers who did not receive the Science of Reading Training ($M = 5.819$, $SD = 13.160$) was not statistically significant at the $p < .05$ level of significance ($t(2084) = 1.205$, $p = .228$). Therefore, H_o1 cannot be rejected.

RQ2. Is there a statistically significant difference by student gender (female-male) between the 2020-2021 fall and spring RIT Growth scores from the NWEA MAP Test for African American elementary students taught by teachers who had received the Science of Reading Training and students taught by teachers who had not received the Science of Reading Training in one central Arkansas school district?

H2. There is no statistically significant difference by student gender (male-female) between the 2020-2021 fall and spring RIT Growth scores from the NWEA MAP Test for African American elementary students taught by teachers who had received the Science of Reading Training and students taught by teachers who had not received the Science of Reading Training in one central Arkansas school district.

For RQ2, a two-way ANOVA was performed to analyze the effect of student gender (female-male) and whether the students' teachers had received Science of Reading Training or not on the 2020-2021 fall to spring RIT Growth scores from the NWEA MAP Test for African American elementary students.

The two-way ANOVA revealed that there was not a statistically significant interaction between the effects of student gender and whether or not the students' teachers had received Science of Reading Training ($F(1, 2082) = 0.15$, $p = 0.699$). Simple main effects analysis showed that student gender did not have a statistically significant effect on 2020-2021 fall to spring RIT Growth scores from the NWEA MAP Test for African American elementary students ($p = 0.369$). Also, simple main effects analysis showed that whether or not the students' teachers had received Science of Reading Training or not did not have a statistically significant effect on 2020-2021 fall to spring RIT Growth scores from the NWEA MAP Test for African American elementary students ($p = 0.233$). Therefore, H_o2 cannot be rejected.

Table 2

Descriptive Statistics for Student Gender by Teacher R.I.S.E. Training

	Student	*M*	*SD*	*N*
Completed R.I.S.E. Training	Female	6.9661	13.39970	708
	Male	6.1676	13.09448	710
	Total	6.5663	13.24910	1418
Did Not Complete R.I.S.E Training	Female	5.9844	12.30553	320
	Male	5.6667	13.91486	348
	Total	5.8189	13.15967	668
Total	Female	6.6605	13.07087	1028
	Male	6.0028	13.36536	1058
	Total	6.3269	13.22198	2086

Table 3

Two-way ANOVA Results for Student Gender and R.I.S.E. Training Interaction on RIT Growth Scores

Source	*SS*	*df*	*MS*	*F*	*Sig.*	η^2
RISE Trained or Not	249.256	1	249.256	1.426	0.233	.001
Student Gender	141.269	1	141.269	0.808	0.369	.000
Interaction: RISE Trained and Gender	26.210	1	26.210	0.150	0.699	.000
Error	364004.497	2082	174.834			
Total	448004.000	2086				
Corrected Total	364501.026	2085				

a. R Squared = .001 (Adjusted R Squared = .000)

RQ3. Is there a statistically significant difference by grade level (grades 1, 2, or 3) between the 2020-2021 fall and spring RIT Growth scores from the NWEA MAP Test for African American elementary students taught by teachers who had received the Science of Reading Training and students taught by teachers who had not received the Science of Reading Training in one central Arkansas school district?

H3. There is no statistically significant difference by grade level (grades 1, 2, or 3) between the 2020-2021 fall and spring RIT Growth scores from the NWEA MAP Test for African American elementary students taught by teachers who had received the Science of Reading Training and students taught by teachers who had not received the Science of Reading Training in one central Arkansas school district.

For RQ3, a two-way ANOVA was performed to analyze the effect of grade level (grades 1, 2, or 3) and whether or not the students' teachers had received it. Science of Reading Training or not on the 2020-2021 fall to spring RIT Growth scores from the NWEA MAP test for African American elementary students.

The two-way ANOVA revealed that there was not a statistically significant interaction between the effects of grade level and whether or not the students' teachers had received Science of Reading Training ($F(2, 2080) = 0.023$, $p = 0.977$). Simple main effects analysis showed that grade level did have a statistically significant effect on 2020-2021 fall to spring RIT Growth scores from the NWEA MAP Test for African American elementary students ($p < 0.001$). Also, simple main effects analysis showed that whether or not the students' teachers had received Science of Reading Training or not did not have a statistically significant effect on 2020-2021 fall to spring RIT Growth scores from the NWEA MAP Test for African American elementary students ($p = 0.747$). Therefore, *H3* cannot be rejected.

Post hoc comparisons using the Tukey HSD test indicated that the difference between grade one and two is 0.53 for the mean RIT score, with a probability of 72.6 %. Results indicate there was no main effect of the mean RIT scores for second grade as compared to the mean RIT scores in grade one. However, the difference in mean RIT scores between grade three and grades one and two are -4.41 and -3.88 with (p=.01), indicating the difference is statically significant.

Table 4

Descriptive Statistics for Grade Level by Teacher R.I.S.E. Training

R.I.S.E. Completed	Grade	*M*	*SD*	*N*
Yes	1	7.811	14.241	555
	2	7.357	12.063	513
	3	3.434	12.809	350
	Total	6.566	13.249	1418
No	1	8.211	14.909	180
	2	7.445	12.619	173
	3	3.559	12.002	315
	Total	5.819	13.160	668
Total	1	7.909	14.398	735
	2	7.379	12.197	686
	3	3.493	12.424	665
	Total	6.327	13.222	2086

Table 5

Two-way ANOVA Results for Grade Level and R.I.S.E. Training Interaction on RIT Growth Scores

Source	*SS*	*df*	*MS*	*F*	*Sig.*	η^2
RISE Trained or Not	17.799	1	17.799	0.104	0.747	.000
Grade Level	7356.021	2	3678.011	21.457	<.001	.020
Interaction: RISE Trained or Not * Grade Level	8.012	2	4.006	0.023	0.977	.000

Error	356537.213	208	171.412
Total	448004.000	208	
Corrected Total	364501.026	208	

a. R Squared = .022 (Adjusted R Squared = .019)

Table 6

Tukey Post hoc Test for Main Effect of Grade Level and RIT Growth Scores

	(I) Grade	(J) Grade	Mean Difference (I-J)	Std. Error	Sig.
Tukey HSD	1	2	.530	0.695	.726
		3	4.416*	0.701	<.001
	2	1	-.530	0.695	.726
		3	3.886*	0.712	<.001
	3	1	-4.416*	0.701	<.001
		2	-3.886*	0.712	<.001

RQ4. Is there a statistically significant difference by tier level (Tier I, II, or III) between the 2020-2021 fall and spring RIT Growth scores from the NWEA MAP Test for African American elementary students taught by teachers who had received the R.I.S.E. Science of Reading Training and students taught by teachers who had not received the Science of Reading Training in one central Arkansas school district?

H4. There is no statistically significant difference by tier level (Tier I, II, or III) between the 2020-2021 fall and spring RIT Growth scores from the NWEA MAP Test

for African American elementary students taught by teachers who had received the Science of Reading Training and students taught by teachers who had not received the Science of Reading Training in a central Arkansas school district.

For RQ4, a two-way ANOVA was performed to analyze the effect of school tier level (Level I, II, III) and whether or not the students' teachers had received Science of Reading Training or not on the 2020-2021 fall to spring RIT Growth scores from the NWEA MAP test for African American elementary students.

The two-way ANOVA revealed that there was not a statistically significant interaction between the effects of tier level and whether or not the students' teachers had received Science of Reading Training ($F(2, 2080) = 2.465$, $p = 0.085$).

Simple main effects analysis showed that tier level did not have a statistically significant effect on 2020-2021 fall to spring RIT Growth scores from the NWEA MAP Test for African American elementary students ($p = 0.067$). Also, simple main effects analysis showed that whether or not the students' teachers had received Science of Reading Training or not did not have a statistically significant effect on 2020-2021 fall to spring RIT Growth scores from the NWEA MAP Test for African American elementary students ($p = 0.213$). Therefore, H_o4 cannot be rejected.

Table 7

Descriptive Statistics for School Tier by Teacher R.I.S.E. Training

R.I.S.E. Completed	School Tier	*M*	*SD*	*N*
Yes	Tier 1	6.667	13.035	484
	Tier 2	6.457	13.700	582
	Tier 3	6.608	12.812	352

	Total	6.566	13.249	1418
No	Tier 1	4.734	12.537	143
	Tier 2	4.772	13.641	294
	Tier 3	7.823	12.726	231
	Total	5.819	13.160	668
Total	Tier 1	6.227	12.939	627
	Tier 2	5.892	13.696	876
	Tier 3	7.089	12.781	583
	Total	6.327	13.222	2086

Table 8

Two-way ANOVA Results for School Tier and R.I.S.E. Training Interaction on RIT Growth Scores

Source	*SS*	*df*	*MS*	*F*	*Sig.*	η^2
R.I.S.E. Trained or Not	270.587	1	270.587	1.551	0.213	.001
School Tier	945.841	2	472.920	2.711	0.067	.003
Interaction: R.I.S.E. Trained or Not*School Tier	860.079	2	430.040	2.465	0.085	.002
Error	362817.124	2080	174.431			
Total	448004.000	2086				
Corrected Total	364501.026	2085				

a. R Squared = .005 (Adjusted R Squared = .002)

Summary

The descriptive statistics of participants included in this study began in Chapter 4. In conclusion, the null hypotheses posited in this study were retained. The results of this study indicated that no statistically significant difference exists between the 2020-2021 fall and spring NWEA MAP Test scores for all African American students taught by teachers who received the science of reading training and students taught by teachers who did not receive the science of reading training in a central Arkansas district. Additionally, no statistically significant difference was rendered by gender (male-female) or Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores. Of the variables included in this study, the effect of teachers that received the Science of Reading Training and those that did not receive the Science of Reading Training by grade level (grade 1, 2, or 3) from fall to spring was a statistically significant difference on the RIT scores on grade level ($F(2, 2080) = 21.45$, $p < .001$.

Further discussion and analysis are included in Chapter V. An introduction and summary of the study, and a summary of findings and conclusions are also included.

V: Discussion, Conclusions, and Recommendations

The Arkansas Department of Education (ADE) recognized the need to build stronger readers in Arkansas schools. This need inspired the Reading Initiative for Excellence known as R.I.S.E., the Arkansas Reading Initiative, anchored in the science of reading. The focus was on the need for systemic and explicit reading instruction in the early grades. R.I.S.E. became the vehicle by which Arkansas teachers would receive high-level professional development in the science of reading as well as a foundational approach to understanding the research to shift instructional practices (Division of Elementary and Secondary Education, 2021).

Arkansas was not alone in the implementation of the science of reading. Reading achievement of elementary students is a major concern of many educators and policymakers across the county that comes with its controversy. This concern does not seem to have disappeared or dissipated since "the war" on reading was first introduced in the 1800s. Similar to the early debate on the teaching of reading, the science of reading, which is essentially an evidence-based best practice approach of research conducted by cognitive scientists for teaching foundational literacy skills called Structured Literacy, does not come without controversy.

Horace Mann's stance in Parker (2019) against teaching the explicit sound of each letter seems to be experiencing a resurgence since the theory was first developed in 1967. Chall (1967) developed this theory by surveying the scientific studies conducted in reading from 1912 to 1965. In her book, Learning to Read: The Great Debate, she introduced "code emphasis" a term she used for synthetic phonics, which asserted that

this method produces better results than the Look/Say method of teaching beginning reading (Parker, 2019).

Stanovich (1986), confirmed Chall's (1967) assertion that the method of using systematic, direct instruction in phonics was effective because the evidence supported that at-risk students in the early grades became better readers, had fewer reading problems, and probably became more lifetime readers than those taught the meaning-emphasis method (Parker, 2019)**.** In addition, Chall (1989a, 1989b) further asserted that the history of reading instruction taught us that literature, writing, and thinking are not exclusive properties of any one approach to beginning reading. It was recommended that educators provide reading instruction that reflects what we have learned about the reading process and about what methods are most effective from scientific investigations (Parker, 2019). Chall (1989a, 1989b) also recommended that we inform teachers and administrators how to explore the evidence on the use of phonics through workshops and in-service training that substantiates its effectiveness leading to a national priority (Parker, 2019). Many of Chall's (1967, 1989a, 1989b) assertions were explored in this study. Specifically, school districts under scrutiny over test scores have embraced the professional development components of the science of reading (Parker, 2019).

Organization of the Chapter

This chapter examined the results of the findings from Chapter IV, expounded upon the results in comparison to previous research, and provided evidence-based recommendations for policy and practice, as well as suggestions for future research. This study added to the existing literature in the field and provided educational stakeholders

with data that can help make informed decisions that may influence the science of reading policy and implementation. This chapter ended with a chapter summary.

Discussion of the Results

This section provided a summary of the research that was conducted for this study. It included an overview of the research questions, hypotheses, and specific findings of the study.

The following research questions guided this study:

RQ1. Is there a statistically significant difference between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

***H1*.** There is no statistically significant difference between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a central Arkansas district.

Results of the independent sample *t-test* related to the first question revealed that there was not a statistically significant difference in the mean student reading scores for the 2020-2021 fall and spring NWEA MAP Assessment for African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas District.

Training teachers to create an environment that helps students to improve their reading skills is an important strategy to increase reading scores (De Naeghel et al.,

2016). Training teachers to find a positive trigger in each student to encourage reading in literacy achievement is vital to students making growth on literacy assessments each year (Rennie, 2011).

One of the primary goals of scientific research was to produce generalizable and replicable findings (National Research Council, 2002). To increase confidence that an instructional approach or an intervention improves reading outcomes, its implementation must be investigated in more than one study, in different school settings, and with different school populations (Terry, 2021). There is a sense of urgency for teachers to understand the science of reading and its implications in practice. The question of how to make sure students are reading is likely posed by teachers in classrooms daily. To answer this question, we must accept that the solution is multifaceted. There is no one solution but research can point us to what is predictive of reading achievement in schools (Terry, 2021). However, presenting the science of reading as a panacea can be misleading. Consequently, we must seek answers based on verifiable evidence of how the science of reading has improved reading achievement. This investigation sought to determine if teachers who have the science of reading strategies embedded in their daily instruction can improve reading achievement.

This study also investigated whether there was a difference in the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District. While this research question did not find a statistically significant difference, other systemic factors that may have affected the outcomes were not investigated such as the experience

of the teachers, what was included in the science of reading training, the fidelity of the training by each presenter and the impact of COVID-19.

The outcome of this research study was inconclusive leaving it insufficient to draw any definitive conclusions about the effectiveness of the science of reading instruction in the sample under investigation. This conclusion was supported in the literature by Solari (2020) when asserting that despite scientific advances that have informed our understanding of reading acquisition and development, a profound gap exists between empirical findings and the implementation of evidence-based practices in the assessment and instruction of reading in school settings (Solari, 2020). There is a continued debate regarding the practical implications of the science of reading and its implementation in authentic school settings. The author further argued that it is troubling how little the current and past debates have focused on processes that could ensure that the instructional experience students receive in classrooms is informed by existing science (Solari, 2020). Specifically, the author contended that the persistent gap between the science of reading and its school-based implementation exists because the field has yet to invest in the appropriate methodologies and processes to develop an effective model of translational science.

RQ2. Is there a statistically significant difference by gender (male-female) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

***H2*.** There is no statistically significant difference by gender (male-female) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District.

The total number of female and male students taught by teachers who received the R.I.S.E. training was relatively close. Females had a higher mean RIT Growth score for fall to spring (*M*=6.96, *N*=708, *SD* =13.39) than males (*M*=6.1, *N*=710, *SD*=13.09). The total number of female and male students taught by teachers who did not complete the R.I.S.E. Training somewhat varied, females also had a higher mean RIT Growth score (*M*=5.98, *N*=320, *SD* =12.30) than males (*M*=5.66, *N*=348, *SD*=5.66), but the difference was not significant.

There is a strong need to understand the gender gap in reading achievement. The evidence reported in the research that girls outperform boys on measures of reading in all age groups is consistent. In the United States, this gender gap in reading has been recognized since the 1960s (Chatterji, 2006; Robinson & Lubienski, 2011). It is evident as early as first grade, particularly among struggling readers (Chatterji, 2006; Robinson & Lubienski, 2011). Chatterji's (2006) study examined the reading achievement gaps in different ethnic, gender, and socioeconomic groups of 1st graders in the U.S. compared with specific reference groups identifying statistically significant correlates and moderators of early reading achievement. A group of 2, 296 students in 184 schools from an Early Childhood Longitudinal Study (ECLS) in a kindergarten to 1st-grade cohort was analyzed with hierarchical linear models (Chatterji, 2006). With child-level

background differences controlled, significant 1st-grade reading differentials were found in African American children (-0.51 SD units below Whites), boys (-0.31 SD units below girls), and children from high-poverty households (-0.61 to -1.0 SD units below well-to-do children) (Chatterji, 2006). In all three comparisons, the size of the reading gaps increased from kindergarten entry to 1st grade (Chatterji, 2006). Reading level at kindergarten entry was a significant child-level correlate, related to poverty status (Chatterji, 2006). At the school level, class size and elementary teacher certification rate were significant reading correlates in 1st grade. Cross-level interactions indicated reading achievement in African American children was moderated by the school students attended, with attendance rates and reading time at home explaining the variance.

The gender gap continues to be an ongoing issue, especially for reading. This issue was not just noted in the United States. Price-Mohr and Price (2017) conducted a study in England that looked at evidence of gender differences in learning to read that emerged during the development of a reading scheme for 4- and 5-year-old children in which 372 children from classes in sixteen schools participated in 12-month trials. There were three different trials: Intervention non-PD (non-phonically decodable text with mixed methods teaching); Intervention PD (phonically decodable text with mixed methods teaching); and a 'business as usual' control condition SP (synthetic phonics and decodable text) (Price-Mohr & Price, 2017). Students were randomly assigned to intervention groups and standardized measures of word reading and comprehension were used (Price-Mohr & Price, 2017). This research provided statistically significant evidence suggesting that boys learn more easily using a mix of whole-word and synthetic phonics approaches (Price-Mohr & Price, 2017). In addition, the evidence indicated that boys

learn to read more easily using the natural-style language of ‘real’ books including vocabulary that goes beyond their assumed decoding ability (Price-Mohr & Price, 2017). At post-test, boys using the non-phonically decodable text with mixed methods were 8 months ahead in reading comprehension compared to boys using a wholly synthetic phonics approach (Price-Mohr & Price, 2017).

The spread of the COVID-19 pandemic quickly necessitated digital learning, which presented challenges for all students but especially for groups disadvantaged in a virtual classroom. In March 2020, a majority of countries announced temporary school closures, preventing around 1.6 billion children and young people from physically attending school (UNICEF, 2020). As a response, most schools switched to digital learning, creating a unique situation for everyone in the education field (UN, 2020). The urgent imperative to move online following the outbreak of the virus forced digital learning upon unprepared school systems (Hodges et al., 2020), putting all students at risk but especially groups that might be particularly disadvantaged in the virtual classroom.

A study conducted by Korlat et al. (2021) investigated gender differences in the digital learning environment students faced in the spring of 2020. Biological sex and gender role self-concept were used to investigate the role of gender in different components of this stereotyped domain in a more differentiated way (Korlat et al., 2021). A total of 19,190 Austrian secondary school students (61.9% girls, M= 14.55, SD = 2.49, age-range 10–21) participated in an online study in April 2020 and answered questions regarding their competence beliefs, intrinsic value, engagement, and perceived teacher support in digital learning during the pandemic-induced school closures (Korlat et al.,

2021). To examine differences in digital learning components among adolescents, four separate analyses of covariance (ANCOVAs) were conducted with sex (male/female) and gender role self-concept (androgynous/masculine/feminine/undifferentiated) as between-subject factors and age as a covariate (Korlat et al., 2021). The mean scores for digital learning competence beliefs, intrinsic value, engagement, and perceived support in digital learning served as the dependent variables (Korlat et al., 2021).

The results showed higher perceived teacher support, intrinsic value, and learning engagement among girls than boys (Korlat et al., 2021). No significant gender differences were found in beliefs regarding digital learning (Korlat et al., 2021). Implications of the findings for theory and practice suggested that the digital experiences of students during the COVID-19 Pandemic may very well have affected the outcomes of the variables under investigation in this study.

The results of the two-way ANOVA indicated that there was no significant interaction between gender and the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training ($p = 0.69$). Simple main effects analysis showed that R.I.S.E. trained or not trained teachers did not have a statistically significant effect ($p = 0.23$). Simple main effects also showed that Student Gender ($p = 0.36$), did not have a statistically significant effect.

RQ3. Is there a statistically significant difference by grade level (grade 1, 2, or 3) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students

taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

H3. There is no statistically significant difference by grade level (grade 1, 2, or 3) between the 2020-2021 fall and spring NWEA MAP Test scores for African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District.

A two-way ANOVA was performed to analyze the effect of grade level (grades 1, 2, or 3) and teachers who received the Science of Reading Training and those who did not. There was a statistically significant difference in mean fall to spring RIT scores on grade level ($F(2, 2080) = 21.45$, $p < .001$). A two-way ANOVA revealed that there was not a statistically significant interaction between the effects of grade level and teachers that received the Science of Reading Training and those who did not receive the Science of Reading Training on fall to spring RIT scores ($F(2, 2080) = .023$, $p = .977$). Post hoc comparisons using the Tukey HSD test indicated that the difference between grades one and two is 0.53 for the mean RIT score, with a probability of 72.6 %. Results indicated that there was no main effect of the mean RIT scores for second grade as compared to the mean RIT Scores in grade one. However, the difference in mean RIT scores between grade three and grades one and two is -4.41 and -3.88 with ($p = .01$), indicating that the difference was statically significant.

Post hoc comparisons revealed that significant differences occurred between third-grade students' mean RIT scores and first and second-grade mean RIT scores. For this study, the grade level of the student participants was first grade 735 (35.2%), second

grade 686 (32.9%), and third grade 665 (31.9%). Of the third graders, 350 were assigned to teachers who received the Science of Reading Training, and 315 were assigned to those who did not. Students taught by teachers who completed the Science of Reading Training for third grade showed a mean of (M = 3.4) as compared to first grade (M = 7.8) and second grade (M = 7.3). Students taught by teachers who did not complete the Science of Reading Training showed mean differences for third grade (M = 3.5), first grade (M = 8.2), and second grade (M = 7.3). Third-grade mean differences could indicate that there was a difference in the type of support the students received. The total number of third graders had a larger number of students who were taught by teachers who did not receive the Science of Reading Training. This could be attributed to the fact that intensive reading support was not provided in the same manner to upper grades as they were in K-2. This is evidenced by current literature where students in K-2, received intensive reading instruction based on the science of reading as soon as necessary following the identification of the reading deficiency. According to the requirements for Intensive Reading Instruction (IRI) as described in (https://dese.ade.arkansas.gov, 2017):

"Any student who exhibits a substantial deficiency in reading, based upon statewide assessments conducted in grades kindergarten through two (K-2), or teacher observations, shall be given intensive reading instruction based on the science of reading as soon as practicable following the identification of the reading deficiency" (https://dese.ade.arkansas.gov, 2017, p. 1). The reading assessment for students in K-2, with NWEA MAP Growth being one of those assessments, requires teachers and school personnel to use the results from the assessments, along with other supporting data, to identify students with a reading deficiency, the intensive reading instruction continues

until the reading deficiency instruction is corrected (Division of Elementary and Secondary Education, 2022).

RQ4. Is there a statistically significant difference by Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central School District?

***H4*.** There is no statistically significant difference by Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores of African American students taught by teachers who received the Science of Reading Training and students taught by teachers who did not receive the Science of Reading Training in a Central Arkansas School District?

For Research Question 4, data were analyzed to determine if there were a statistically significant difference by Tier Level (Tier I, II, or III) between the 2020-2021 fall and spring NWEA MAP Test scores for all African American students taught by teachers who received the Science of Reading Training and those that did not receive the Science of Reading Training. At each level, the mean scores of the two groups were compared using an independent *t*-test to determine if there is a statistically significant difference between the two groups at the $p < .05$ probability level.

A two-way ANOVA was conducted that examined the effect of teachers that received the Science of Reading Training and those that did not receive the Science of Reading Training on grade level fall to spring RIT scores. There was not a statistically significant difference in mean fall to spring RIT scores between teachers that received the

Science of Reading Training and those who did not receive the Science of Reading Training, ($F(1, 2080) = 1.55$, $p = .213$. There was not a statistically significant difference in mean fall to spring RIT scores by School Tier ($F(2, 2080) = 21.45$, $p < .001$).

A two-way ANOVA revealed there was not a statistically significant interaction between the effects of School Tiers and teachers that received the Science of Reading Training and those who did not receive the Science of Reading Training on fall to spring RIT scores ($F(2, 2080) = .2.71$, $p = .067$).

A two-way ANOVA revealed there was not a statistically significant interaction between the effects of Tier Level (1, 2, or 3) and students that were taught by teachers that received the Science of Reading Training and those that did not receive the Science of Reading Training ($F(2, 2080) = 2.46$, $p = .085$).

Although there was no significant interaction between the students in Tier I, II, and III schools taught by teachers who had the Science of Reading Training and those that did not, research has indicated when a tiered system was implemented, students receive targeted and specific interventions that address their needs. The tiers are a continuum of learning that allowed students to move along as they learn with support from these interventions (Smith, 2015; Toste et al., 2014).

Along, with the Science of Reading Training, the schools in this study could likely benefit from focusing on the Tiers of the Response to Intervention (RTI) pyramid. RTI implementations addressing primary-grade reading vary on several dimensions but shared essential characteristics (Gersten et al., 2008; Kovaleski & Black, 2010). They were multi-tiered intervention systems in which students were provided with evidence-based classroom reading instruction and supplemental intervention where needed. Much

like the NWEA MAP Test, decisions related to intervention were based on student assessment data.

RTI has three tiers of support. The first tier, which is the most crucial, provides a foundation that the other two tiers are built upon. Unfortunately, when RTI implementation in schools fails to provide high-quality interventions in the first tier, it resulted in ineffective and disjointed implementations (Abbott et al., 2015). When student progress was monitored, improved performance was demonstrated (Goodman et al., 2011). Crawford (2014) indicated assessments should be carried out each term throughout the school year. When systems are built to collect data, data can be utilized to monitor and evaluate students' success.

Implications

The focus of this study was to determine if the Science of Reading Training had an impact on the reading achievement scores of African American students. The study examined the 2020-2021 NWEA MAP Test in grades 1, 2, and 3 in Tier I, Tier II, and Tier III schools in a Central Arkansas School District by analyzing student growth test data from fall to spring of trained and untrained teachers in the science of reading. The data showed that there were no significant differences in scores of African American students taught by teachers who received the Science of Reading Training and those that did not receive the training, by gender, or in Tier I, Tier II, or Tier III schools. However, when analyzing the data to determine if there was a significant difference by grade level, the results showed that there was a statistically significant difference.

Conceptual Implications

This study was guided by the conceptual framework of educational accountability (Cook, 2020), which considered the teachers' responsibility in understanding and implementing the foundational skills to teach the science of reading. The premise was that the implementation of the components of the science of reading would lead to improvement or growth in NWEA MAP Test scores from fall to spring in the 2020-2021 school year of African American students. This premise was postulated by analyzing the scores of teachers trained in the science of reading as compared to those teachers who did not have the training. Although no significance was found except by grade level, a relationship between the implementation of components of the science of reading with fidelity and its impact on improving African American students' reading still exists.

According to Wexler (2020), when it comes to reading, what works is a simultaneous mix of two things at early grade levels: phonics instruction, and starting to build the kind of knowledge students will need in high school and beyond. The National Council on Teacher Quality (2021) reported that only 53% of preservice programs contain the components of science. Yet in a report of the National Reading Council (2000), the National Institutes of Health declared unacceptable that the rate of failure of more than a third of American children could not read by fourth grade, which disproportionately harms students of color. This can be reduced to less than 1 in 10 when teachers utilize the five essential components of effective reading instruction: phonemic awareness, phonics, fluency, vocabulary, and reading comprehension.

While the researcher did not obtain the results that were expected, there may be one significant contributing factor regarding African American students reading

achievement levels, academic disengagement. Academic disengagement occurs when students do not have the psychological investment that may be needed to master skills and academic knowledge (Newman et al., 2000). This factor was highlighted because of the educational trauma for students and families as well as teachers due to COVID-19.

Disengagement was likely during the 2020-2021 school year, the first year of COVID-19 where students primarily received virtual instruction. The virtual instruction in reading was scattered at best. Some parents reported difficulty with the internet while others reported the lack of technology and therefore did not receive direct instruction from a teacher but what was approved by the state as Alternative Method of Instruction (AMI) packets. In these cases, parents became the teacher or students lacked any instruction at all. Students with learning difficulties or those who had only received minimal instruction in phonics and other components of the science of reading made questionable progress.

Implications for Practice

Student achievement was placed squarely in the hands of teachers, schools, and school districts with the NCLB (2001) legislation and now the Every Student Succeed Act (ESSA). These accountability measures were heightened when student subgroups were examined and the achievement gap was disclosed, particularly for Black students where gapping differences in reading scores were even more astonishing.

The current study sought to determine if the Science of Reading Training was effective in improving the reading achievement scores of African American students on the NWEA MAP Test in grades 1, 2, and 3 in Tier I, Tier II, and Tier III schools in a Central Arkansas School District. These findings suggested that the training may need to

be revisited to assess which components of the training may need to be revised. In addition, the results must be examined carefully considering the conditions, which may have affected the outcomes. Some of the R.I.S.E. trained teachers in the study may have been affected by the halt of professional development due to COVID-19 in March of 2020 when all programming for education became virtual including ADE training. In addition, simply receiving training in the science of reading does not automatically transfer to teaching and learning practices, therefore resulting in various degrees of success. The deployment of an implementation model and the follow-up to ensure fidelity may be directly related to the understanding of the building leadership.

The results from this study supported the research that is well-documented and has been discussed extensively in the research over the years (Castles & Nation, 2018; Duke & Cartwright, 2021; Grissom et al., 2021; Reardon et al., 2019, Solari et al., 2020, Thomas & Dychez, 2020), which purported, no matter what the reasons or where you stand in the debate, there is a dismal number of Black and Brown children reading well in school (Terry, 2021). Accordingly, Terry (2021) asserted that it "is fortuitous that at this moment in history for reading research and practice and the debates over the science of reading, Black and Brown children do not seem to have benefitted in a sustainable, replicable, and transformative way" (Terry, 2021, p. 1).

The results of this study could be instructive for professional development in the science of reading. Delivering on the promise that education starts with the mastery of the most fundamental foundational skill, the ability to read. The Simple View of Reading has been widely used as the model of reading which posited that reading is the product of two independent components: decoding or the ability to read isolated words quickly,

accurately, and silently (Gough & Tunmer, 1986) using letter-sound combination rules (p. 7) together with comprehension or linguistic comprehension, which is reading.

The Simple View of Reading has been around for some time and has been used as a method to teach reading. It is sometimes used interchangeably and sometimes appears together in the research to support the science of reading. Reading, in the "simple view" of reading, is viewed as comprehension of written text (Hoover & Gough, 1990) to explain the science of reading to classroom teachers and others involved in reading education to guide instruction (Moats et al., 2018, Rose Report, 2006). The advances beyond the simple view of reading must be explicitly delivered in professional development for teachers, so they will know and understand what needs to be taught. In the Report of the National Reading Panel (NICHD, 2000), the panel identified what needs to be taught. These five components of reading that are essential and effective when taught thoroughly and skillfully are:

- **Phonemic Awareness:** Phonemic awareness is awareness of the smallest units of sound in spoken words (phonemes) and the ability to manipulate those sounds. Phonemic awareness falls under the category of phonological awareness, which includes the understanding of broader categories of sounds, including words, syllables, onsets and rimes. Although the NRP identified "awareness" as the goal, subsequent research specifically on orthographic mapping has yielded an understanding that phonemic proficiency is both critical to and a result of the orthographic mapping, and it continues to develop throughout the elementary grades (Kilpatrick, 2015).

- **Phonics:** Phonics is a way of teaching that stresses the acquisition of letter-sound correspondences (phoneme-grapheme representations) and their use in reading and spelling (Kilpatrick, 2015).
- **Fluent text reading:** Fluency is reading with accuracy, appropriate rate, and prosody (expression) (Kilpatrick, 2015).
- **Vocabulary:** Vocabulary is the understanding of words and word meanings (Kilpatrick, 2015).
- **Comprehension:** Comprehension—the understanding of the connected text—is considered an "essential element" of reading, but it is more accurately the goal of reading and the result of mastery and integration of all the components of effective instruction (Kilpatrick, 2015).

Since the report of the NRP, none of its findings has been refuted, and the evidence has been corroborated and expanded upon (Stewart, n.d.). It is important to recognize the ambiguities that appear in the research on instructional methods to teach reading. Unfortunately, these contradictions often find their way in the classroom teachers' practices. You cannot teach what you do not know. We have a long way to go to ensure reading proficiency for all students. Our current progress cannot be left to chance and therefore preservice programs and in-service programs must design professional development to equip the teachers with the proper tools.

Recommendations for Future Research

This completion of this study and the examination of the results led to several emerging recommendations for further studies. The results did find a statistically significant difference between African American NWEA MAP Test fall and spring

scores by grade level. However, questions remain outside of the scope of this research. Studies that could be conducted to answer some of these questions are:

1. A replication study could be considered that would allow the teachers who felt proficient in the science of reading to volunteer for participation.
2. A replication study using norm-referenced achievement test scores.
3. A study could be conducted with similar questions in grades K-5. The grade configuration for primary schools could provide longitudinal student growth outcomes.
4. A study could be conducted utilizing the same research questions when comparing African American students and their non-Black counterparts.
5. A study could be conducted on a larger scale comparing students with the same demographics with other districts in Central Arkansas.
6. A qualitative study could be conducted that would allow the researcher to obtain the perspectives of teachers regarding the effectiveness of the science of reading in advancing African American students to grade-level on the NWEA MAP Test by grade 3.
7. A program evaluation study could be conducted of the R.I.S.E. training to examine the fidelity of implementation across districts in Arkansas.
8. A study conducting a hierarchical level analysis of the RIT Growth scores in a longitudinal design.
9. A study conducting a comparison of the NWEA MAP Test scores and the achievement test scores for the same students in the same school year.

Limitations of the Study

The 2020-2021 school year was far from normal in all aspects of the schooling process. The challenges faced by families and school districts were as varied as the communities themselves. The disruption for students and teachers experiencing the sudden shutdown of schools with little knowledge of a reopening caused schools and communities to respond to the onset of COVID-19 quite differently. The onset of testing was the most challenging, hitting the communities of color and low-income families the hardest. In Arkansas, students were required to take an assessment on site after receiving most of their instruction online and after being excused from the test in 1999-2020; potentially causing students and teachers to question the significance of demonstrating improved outcomes.

According to Dorn et al. (2021), states and districts can not only help students catch up on unfinished learning from the pandemic but also tackle long-standing historical inequities in education. The authors asserted that the 2020–2021 academic year ended on a high note with access to at least some in-person learning, but it was perhaps one of the most challenging for educators and students in our nation's history (Dorn et al., 2021, p. 1). The authors termed this problem "unfinished learning" to capture the reality that students were not allowed to complete all the learning they would have completed in a typical year (Dorn et al., 2021). The pandemic widened preexisting opportunity and achievement gaps, hitting historically disadvantaged students hardest (Dorn et al., 2021).

To confirm their assertions, the researchers investigated the impact of the pandemic on K–12 student learning. The outcomes were significant leaving students on

average four months behind in reading by the end of the school year (Dorn et al., 2021). To assess student learning through the pandemic, Curriculum Associates analyzed. Ready in-school assessment results of more than 1.6 million elementary school students across more than 40 states (Dorn et al, 2021). Students' performance was compared in the spring of 2021 with the performance of similar students before the pandemic (Dorn et al., 2021). The results showed that students testing in 2021 were about nine points behind in reading, compared with matched students in previous years (Dorn et al., 2021).

While all students experienced unfinished learning, some groups were disproportionately affected. Students of color and low-income students suffered the most. Students in majority-Black schools ended the school year six months behind in reading. For Black and Hispanic students, the losses are not only greater but also piled on top of historical inequities in opportunity and reading achievement.

In addition, the full implementation of the components of the science of reading and the fidelity of the associated reading practices may have limited its effectiveness. Given these restrictions, the growth outcomes investigated in the study for the 2020-2021 NWEA MAP Test were limited by:

1. The sample consisted of African American students who were taught by teachers who were trained in the science of reading and teachers who were not trained in the science of reading with varying levels of experience with the training. These limitations made it difficult to generalize the outcomes to the population of African American students in other schools in Arkansas and elsewhere.

2. The study was conducted in the early stages of the implementation of the science of reading, which may have prevented teachers from utilizing all the strategies that lead to growth in reading scores resulting in limited time to demonstrate the expected growth for African American students.
3. Fidelity of implementation of professional development is typically determined by observation of instruction. Given the COVID-19 restrictions, observations were minimal leaving to question the quality of reading instruction outlined in the components of the science of reading.
4. The R.I.S.E. Training was launched statewide in the state of Arkansas in January 2017 (Division of Elementary and Secondary Education, 2022), due to the limited amount of time the training has been in place, there was limited research on its impact on African American students.

Summary

This study determined that the reading RIT scores on the NWEA MAP Test for students by grade level were statistically significant. While the other research questions did not show a difference, the results piqued further interest by this researcher surrounding the quality of the professional development provided to teachers and the follow-up support given to teachers in the implementation phase in the classroom. Consequently, because of the overall findings of this study, a wider lens must be utilized to determine the effectiveness of the science of reading instruction as the tool by which African American children are to develop reading skills commensurate with their non-African American peers by reading on grade level through high school. This is even more

important because of the evidence in the literature and any evidence that this research refuted to date.

There were implications and future research resulting from this study. Given the status of African American students in reading and the potential impact that COVID-19 has had on America's educational system, it would be well to begin conducting those studies now.

Solari (2020) a professor of reading education at the University of Virginia's Curry School of Education and Human Development, argued that the COVID-19 Pandemic has the potential to amplify a critical and widening nationwide gap in reading. According to Solari, the good news is that a robust, evidence-based practice exists that can inform how best to teach reading and support students. Unfortunately, too much of that practice is not making its way to teachers and students (Solari, 2020).

Solari (2020) further asserted that the implementation of evidence-based practices was complex. It was almost impossible to pinpoint one reason that the science of reading was not being translated into evidence-based instructional practices in schools. And while we know a lot about how children learn to read, there has been much less research on a process that identified how to implement these evidence-based practices at scale in authentic school settings; there is a lack of research in this area (Solari, 2020).

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Appendices

Appendix A

Approval Letter from the ATU IRB

OFFICE OF RESEARCH AND SPONSORED PROGRAMS

1509 North Boulder Avenue
Administration, Room 207
Russellville, AR 72801

479-880-4327
www.atu.edu

December 20, 2021

To Whom It May Concern:

The Arkansas Tech University Institutional Review Board has deemed the application for Katina Simpson-Ray's proposed research, entitled "The Impact of the Science of Reading on the NWEA MAP Test Scores of Elementary African American Students in a Central Arkansas School District," to be exempt pursuant to federal regulation 45 CFR 46.104 (d)(2)(i)(ii).

Please note that in the event that any of the parameters of the study change, the researcher may be required to submit an amended application.

Please proceed with your research. We wish you success with this endeavor.

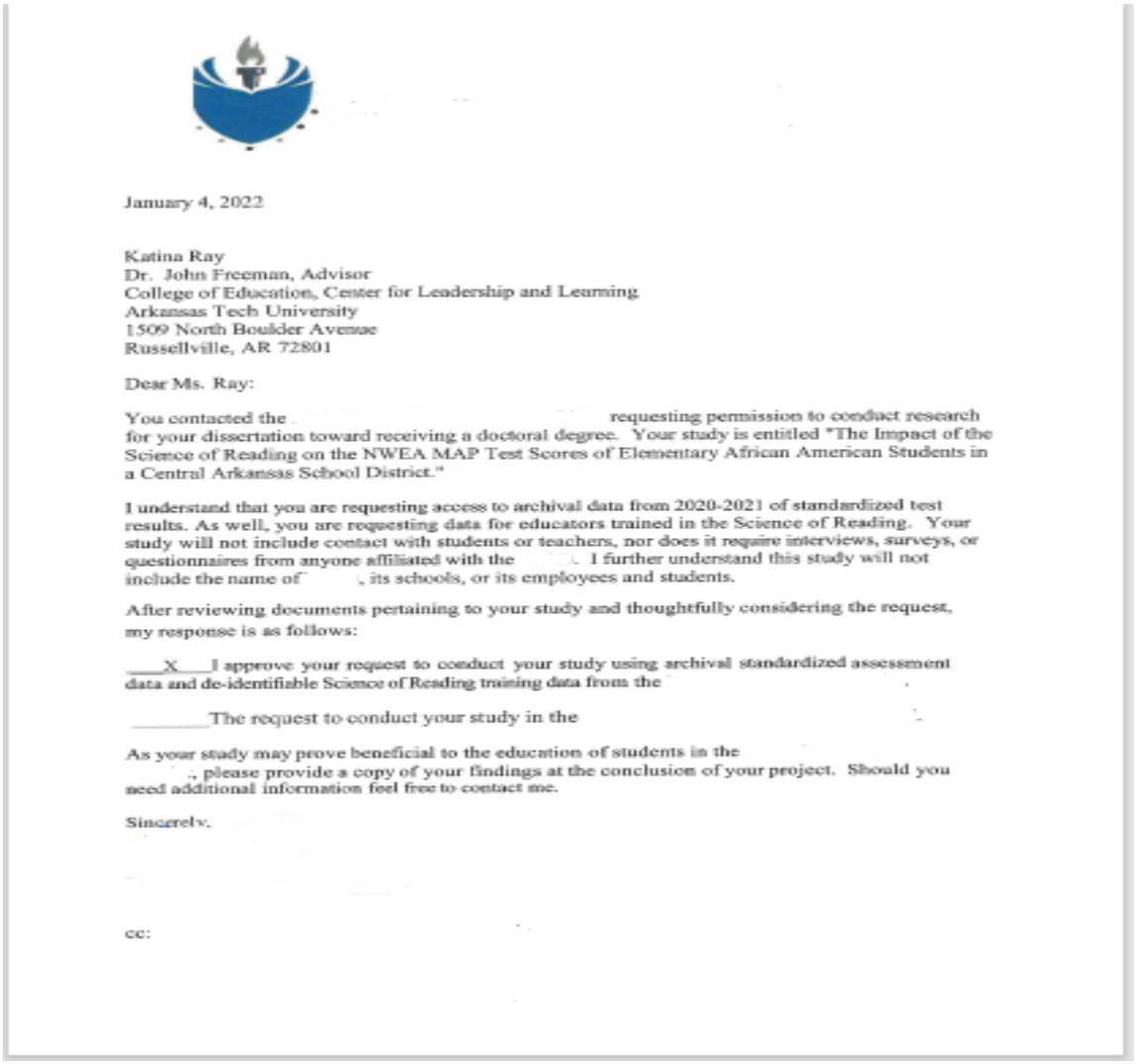
Sincerely,

Bryan D. Rank

Bryan Rank, Ph.D.
Institutional Review Board
Arkansas Tech University

Appendix B

Approval Letter from School District



January 4, 2022

Katina Ray
Dr. John Freeman, Advisor
College of Education, Center for Leadership and Learning
Arkansas Tech University
1509 North Boulder Avenue
Russellville, AR 72801

Dear Ms. Ray:

You contacted the requesting permission to conduct research for your dissertation toward receiving a doctoral degree. Your study is entitled "The Impact of the Science of Reading on the NWEA MAP Test Scores of Elementary African American Students in a Central Arkansas School District."

I understand that you are requesting access to archival data from 2020-2021 of standardized test results. As well, you are requesting data for educators trained in the Science of Reading. Your study will not include contact with students or teachers, nor does it require interviews, surveys, or questionnaires from anyone affiliated with the . I further understand this study will not include the name of , its schools, or its employees and students.

After reviewing documents pertaining to your study and thoughtfully considering the request, my response is as follows:

___X___I approve your request to conduct your study using archival standardized assessment data and de-identifiable Science of Reading training data from the .

_____The request to conduct your study in the .

As your study may prove beneficial to the education of students in the , please provide a copy of your findings at the conclusion of your project. Should you need additional information feel free to contact me.

Sincerely,

cc:

Appendix C

Approved IRB

This form is to be used only for modifications to projects that already have IRB approval.

IRB Approval Number (e.g., Bailey_120120): None provided.

Title of Project: The Impact of the Science of Reading on the NWEA Map Test Scores

Date: 12-17-21

Request for Review of Modification or Amendment to an IRB Approved Research Project

Please note: If the investigator plans to make substantial changes to his or her study, he or she should submit a new IRB application. For minor changes (e.g., a change in principal investigator, minimal changes in wording of a survey instrument, or increasing the sample size from the same sample pool), the investigator must submit this request form.

The IRB must review and approve any modification or amendment to currently approved study before implementation. Please complete this form and submit it and a copy of your initial application materials with all changes tracked on electronically to irb@atu.edu.

Principal Investigator: Katina Simpson-Ray	E-Mail: kray16@atu.edu
Additional Researchers' Names:	
Department: CLL	Phone: 501-256-2070
Project Title: The Impact of the Science of Reading on the NWEA Map Test Scores of Elementary African American Students in the Little Rock School District	

Advisor (complete if PI is a student)

Name of Advisor: Dr. John Freeman	E-Mail: jfreeman44@atu.edu
Advisor's Department: CLL	Advisor's Office Number: 964-0583 x3211

Check any modifications that apply:

- ☑ Change in project title
- ☐ Change in investigators
- ☐ Change in study design
- ☐ Change in participant cost of compensation
- ☐ Change in participant population
- ☐ Change in materials or instruments
- ☐ Change in risks and/or benefits
- ☐ Change in location of research
- ☐ Change in participant activity
- ☐ Change in recruitment method
- ☐ Change in consent and/or assent form(s)
- ☐ Change in method and/or materials for advertisement
- ☐ Change in advisor

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This form is to be used only for modifications to projects that already have IRB approval.

XX Other changes (Please describe):

The original application approved on 12-2-21 filled out Items 3a-3d and 3f to describe the descriptors that will be attached to the masked archived data requested. The Little Rock School District has requested that those items be indicated as none, since the students will not be providing the data directly.
Therefore, it is requested that the IRB review that again, and make sure that it meets IRB regulations. The District will not release the data without this change.

Please provide a brief summary of the requested modifications using this form. List and described each proposed change indicated above and provide rationale for each revision. Use additional pages as needed.

Request 1: Change title from "The Impact of the Science of Reading on the NWEA MAP Test Scores of Elementary African American Students in the Little Rock School District.

To: "The Impact of the Science of Reading on the NWEA MAP Test Scores of Elementary African American Students in a Central Arkansas School District."

Request 2: Remove the information from Item 3a-3d and 3f to reflect the fact that the data requested is archived data and will not be directly collected from the subjects.

Request 3: Provide a revised approval letter with the new title, removing the Little Rock School District from the title. This is a request from that district before they will release the data.

Please provide new or revised consent and/or assent form(s), questionnaires, surveys, recruitment materials, advertisements, etc. as attachments. Use the space below to describe the changes you have made.

John Freeman — Principle Investigator Signature — 12-17-21 — Date

Katina Simpson-Ray — Faculty Advisor Signature (if applicable) — 12-17-21 — Date

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Appendix D

NWEA and MAP Frequently asked Questions

NWEA and MAP
Frequently Asked Questions

What is NWEA?
NWEA stands for Northwest Evaluation Association. NWEA is a non-profit organization that has assessed over 4.5 million students. NWEA has a presence in 49 foreign countries, 50 states, and 3400 districts.

What is MAP?
MAP stands for Measures of Academic Progress. MAP is an online assessment that is aligned to the Common Core standards.

What is different about MAP?
These computerized tests are adaptive and offered in Reading, Language Usage, Science, and Mathematics. When taking a MAP test, the difficulty of each question is based on how well a student answers all of the previous questions. As the student answers correctly, questions become more difficult. If the student answers incorrectly, the questions become easier. In an optimal test, a student answers approximately half the items correctly and half incorrectly. The final score is an estimate of the student's achievement level.

Why MAP?
Results from MAP tests are typically available to teachers, schools, and districts with 48 hours of when the student completes the test. Whereas, results of State assessments are typically not available for a minimum of three months. MAP allows schools to assess students for growth during the school year and between school years. MAP data allows schools to differentiate and adjust instruction for individuals students, groups of students, or entire classes based on results of the assessment. The results can be used by students, parents, teachers, grade levels, subject areas, schools, and the school district for a variety of purposes.

How long does it take to complete a test?
Although the tests are not timed, it usually takes students about one hour to complete each MAP test. MAP for Primary Grades tests take from 20 to 30 minutes to complete.

How often will my child be tested?
Students will be ideally test in Fall, Winter, and Spring.

What are MAP tests used for?
MAP assessments are used to measure each student's progress or growth in school. Parents may have a chart in their home that marks their child's height at certain times, such as on his or her birthday. This is a growth chart. It shows how much he or she has grown from one year to the next. MAP assessments do the same sort of thing, except they measure each child's growth in mathematics, reading, and language usage. The scale used to measure each child's progress is called a RIT scale (Rasch unIT), which is an equal-interval scale much like feet and inches on a yardstick. It is used to chart each child's academic growth from year to year.

How will the school use the test scores?
MAP tests are important to teachers because they keep track of progress and growth in basic skills. The test scores let teachers know where a student's strengths are OR if help might be needed in any specific areas. Teachers use this information to help guide individual and group instruction in the classroom. Grade levels, subject areas, schools, and the district will use results to continue to improve teaching and learning and helping each student grow as much as they can.

Commonly Used Terms

District Average: the average RIT score for all students in the school district in the same grade who were tested at the same time as your child.

Norm Group Average: the average score of students who were in the same grade and tested in the same term as observed in the latest NWEA norming study.

Percentile Range: percentiles are used to compare one student's performance to that of the norm group. Percentile means the student score as well as, or better than, that percent of students taking the test in his/her grade.

Percentile Rank: this number indicates the percentage of students in the NWEA norm group for this grade that this student's score equaled or exceeded. The percentile rank is a normative statistic that indicates how well a student performance in comparison to the student in the norm group. A student percentile rank indicates that the student scored as well as, or better than, the percent of student in the norm group. In other words, a student with a percentile rank of 72 scored as well as, or better than, 72 percent of the students in the norm group.

RIT: tests developed by NWEA use a scale called a TIE to measure student achievement and growth. RIT stands for Rasch unIT, which is a measurement scale developed to simplify the interpretation of test scores. The RIT score relates directly to the curriculum scale in each subject area. It is an equal-interval scale, like feet and inches, so scores can be added together to calculate accurate class or school averages.

For more information about NWEA, visit www.nwea.org.

For more information about how the Twinsburg City School District will utilize NWEA's MAP results, please contact any school administrator.