

THE DIFFERENCE IN ORAL READING FLUENCY SCORES AMONG RURAL, URBAN,
AND SUBURBAN SCHOOL LOCATIONS WHEN USING ISTATION

by

Christen Nicole Lee

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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ABSTRACT

The purpose of this quantitative, casual-comparative study was to determine if there is a difference in reading fluency scores among students in grades kindergarten through second grade using the Istation reading program. The importance of the study focused on the link between student's oral reading fluency and overall reading comprehension. This study focused on approximately 3,000 kindergarten through second grade students from a total of nine elementary schools in central North Carolina. Three schools were located in a rural area of the community, three from an urban area and three from a suburban area. The data from students beginning of year Istation scores and middle of year Istation scores were analyzed using an ANCOVA statistical comparison. The results for the first hypothesis showed that there was a significant difference between the rural group and suburban group and the rural group and urban group. However, there was not a significant difference between the urban and suburban groups. The results for the second hypothesis showed there was a significant difference between the rural group and suburban group and the rural group and urban group. However, there was not a significant difference between the urban and suburban groups. For the third and final hypothesis the null hypothesis was accepted. The conclusion from the study showed there to be a significant difference between a student's school location and testing scores. Further recommendations include additional studies that could be conducted centering around comparing students' mid-year scores to their end of year scores as well as locations in other areas of the United States to determine any correlations.

Keywords: Istation, reading, reading fluency, comprehension, urban, suburban, rural

Dedication

I would like to dedicate my dissertation first and foremost, to my Lord and Savior, Jesus Christ. I would not have been able to complete this process without his guidance and strength. I am in awe of his grace and love for us!

Next, I would like to thank my husband for his support during this process. He has been so patient and caring. During the times I thought I would not be able to see the process through, he was there to reassure me every step of the way.

Last, but certainly not least, I would like to dedicate my dissertation to my students. They always inspire me to be the best “me” I can be. I am proud of the people they are and will continue to become!

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List of Abbreviations

Dynamic Indicator of Basic Early Learning Skills (DIBELS)

Washington Assessment of Student Learning (WASL)

CHAPTER ONE: INTRODUCTION

Overview

The purpose of this causal-comparative, quantitative study is to determine if there is a significant difference in the Istation oral reading fluency scores in kindergarten through second grade students across urban, suburban, and rural school settings located in the central portion of North Carolina. Chapter one will discuss the background of this study, as well as the purpose and problem statement. Lastly, the research questions, including important definitions, will be outlined for this study.

Background

The benefits of having a strong reading foundation have been known for many years. Reading skills build the groundwork for success in all other subjects/areas. In many cases, students who struggle with reading also struggle in most other academic areas. Throughout the last four decades, there have been several assumptions made pertaining to reading fluency, its importance, and methods of addressing related concerns in the classroom. Originally, fluency was labeled as a two-factor construct focusing primarily on decoding, as well as linguistic comprehension. However, this evolved into a three-factor construct of decoding, reading fluency, and reading comprehension (Kang & Shin, 2019). In addition, reading fluency was originally thought of as a process surrounding elocution. However, many saw the idea of oral reading as something pertaining to entertainment. It was not viewed as a means of measuring a student's reading ability and/or reading achievement. This changed with the help of Smith and his work with reexamining elocution as essential to the reading process (Young, 2011).

Almost all researchers involved in the study of reading and reading skills agree that fluency is one of the major components of successful reading ability. A study conducted by Little

et al. (2017) determined that there was a direct correlation between a student's reading fluency and their reading comprehension. They based part of their hypothesis on Chall's (1983) stages of reading development. She believed that children enter two main developmental phases. These phases are learning to read and reading to learn. Within each phase, there are stages. The learning to read phase involves stages zero through two, and the reading to learn phase involves stages three through five. There is a transition between stages one and three from the learning to read phase to the reading to learn phase. If students are not able to make this transition, there is a greater likelihood that there will be delays and gaps in students' reading comprehension (Little et al, 2017). In fact, it has been shown historically that students who show poor reading ability in first grade will continue to show poor reading skills through fourth grade. In addition, almost 94% of children in second grade who struggle significantly with their reading ability will continue to struggle in fifth grade as well (Speece et al., 2003).

In an article by Kuhn and Schwanenflugel (2019), they stated the importance of fluency as a large component of reading success. Fluency combines accuracy, automaticity, and oral reading prosody, which, used together, facilitate the reader's construction of meaning. It is demonstrated during oral reading through ease of word recognition, appropriate pacing, phrasing, and intonation. It is a factor in both oral and silent reading that can limit or support comprehension.

Kuhn and Schwanenflugel (2019) continued their research by stating that oral reading fluency provides a much greater outcome on students' reading ability compared to silent reading. This is especially true of older readers who have been struggling. In addition, the authors share how important reading fluency is across the curriculum. As already stated, reading comprehension is something that must be acquired in order to be successful across all academic

domains. However, not all students are fluent with all types of texts. Therefore, situational fluency must be looked at to provide adequate feedback and learning for those students. Skill sets vary depending on the type of text being read. Although the authors share that much of the research related to situational fluency is still very new, the data and information that has been completed thus far has shown great importance related to the topic (Kuhn & Schwanenflugel, 2018).

Other researchers and scholars were also able to investigate how we can help improve fluency. In 1964, Goodman issued his work on miscue analysis. Through his research, he was able to determine that certain prosodic features of reading could be an indicator of overall reading comprehension. This included the natural intonation of voices while reading. In addition, Goodman also determined that to read fluently, one must use syntax, semantics, and visual cues to adjust their voice to match the appropriate meaning of what they are reading (Young, 2011).

Throughout the following decades, more researchers began to share findings related to the importance of reading fluency. LaBerge and Samuels (1974) presented research discussing a connection between information processing and reading fluency. They called this the Automaticity Theory. This theory determined that rapid word calling frees the brain to be able to focus on other reading processes (Young, 2011).

Based on the work done to emphasize the importance of reading fluency, other researchers were able to share ways to help enhance fluency. Samuels' (1997) work centered on the idea of repeated rereadings, which is reading the text multiple times. He believed that after a student read a text four times, they were able to increase their speed and accuracy. Additional reading strategies, such as read alouds, were also highlighted during this time, due to students' increased language acquisition (Ouellette et al, 1999).

As progress was being made, many researchers, such as Allington and Dowhower (2017), felt as though one key element pertaining to fluency was being overlooked, namely prosody. Prosody is defined as the appropriate use of phrasing and expression (Rasinski et al., 2020). As the need for skills related to prosody emerged, so did strategies to help educators tackle it. Zutell and Rasinski (1991) created the multidimensional fluency scale (MFS). This gave teachers specific characteristics that they can observe.

Since this time, there have been more programs, such as DIBELS and Curriculum Based Measures, as well as other materials to help monitor and improve reading fluency. Many fear that too much emphasis on fluency can lead to abstract word calling with no solid comprehension. Although this is a valid argument, the research surrounding the importance of reading fluency cannot be denied. It is still one of the most vital elements of the reading process. Newer and more creative measures continue to help address fluency. Ultimately these best practices will benefit students struggling with fluency, not only with the word recognition itself, but as a reader overall.

Problem Statement

Research shows that there is a direct correlation between a student's reading fluency and comprehension. Licerdale et al. (2022) describe how oral reading fluency is a milestone. In addition, oral reading fluency is a major indicator of success with reading comprehension. When students can read without having to think about the specific words on the page, they are better able to focus on the content of the story. Studies have also determined that the human brain has a limited capacity for conducting difficult tasks. Lastly, the effort needed to complete these tasks is diminished through the process of applying what they are reading and trying to comprehend (Uysal et al., 2018). As a result, this allows for greater comprehension. Harty et al. (2019)

discovered that positive mean gains were found in the fluency scores of students who received specific fluency interventions. Istation is an adaptive program that allows students to increase their reading ability based on their specific level of need and instruction (Istation, 2009). Oral reading fluency is one of the areas that is assessed and taught through the program. The problem is that the literature has not fully addressed the distinction in oral reading fluency scores between rural, suburban, and urban settings in the Southern United States within the same study.

Purpose Statement

The purpose of this quantitative, casual-comparative study is to determine if there is a significant difference among scores in students throughout kindergarten, first, and second grade within urban, suburban, and rural settings. The dependent variable for the study will be students' oral reading scores from Istation. Oral reading scores are defined as the score obtained from listening to a student read out loud. The score is calculated through accuracy, rate, and word recognition (Goldstein, 2011). The independent variable will be the location of the schools (rural, urban, and suburban settings). Rural school districts are defined as a geographic area that is located outside towns and cities. Urban school districts are defined as a human settlement with a high population density and infrastructure of built environment. Suburban school districts are defined as a mixed-use or residential area, existing either as part of a city or urban area, or as a separate residential community within commuting distance of a city. Three schools from each location will be used for the study (three schools located within the rural setting of the district, three from the urban setting of the district, and three from the suburban setting of the district). Within the school settings, kindergarten through second grade class data will be discussed and analyzed. These schools are located in the central portion of North Carolina. The use of different

school locations will help determine and establish if the program is being applied with equity across all locations and demographic areas.

Significance of the Study

The significance of this study will be to determine the value of Istation reading program on students' oral reading fluency scores in kindergarten through second grade based on their school setting. These are formative and foundational years for students as it pertains to reading. In a study conducted by Neugebauer et al. (2016), teachers who incorporated targeted reading instruction based on student need in urban classroom settings yielded higher results than those that did not. In another study conducted by Lerkkanen et al. (2016), teacher directed instruction resulted in a more negative outcome on students' overall reading ability than student-centered instruction. The overall goal of this would be that students become more fluent readers and increase their reading comprehension abilities. As a result, *students will see progress in reading and in other subject areas as well.* Research gathered by Nils (2019) stated that improved teaching of literacy across disciplines enhances not only language learning, but also content learning. The greater impact will go beyond just the subject of reading itself. It will help students become successful in their educational journey due to these skills being necessary. The goal of this study is determine the relationship between adaptive reading programs and student reading scores, which could influence the decisions of teachers and administrators. The use of these programs allows educators more time to work in small groups as well as individually with students. Furthermore, the data received from the program can help to differentiate and drive instruction for students. Lastly, this study will add to the ongoing literature surrounding the automaticity theory.

Research Questions

The following research questions were posed for this study:

RQ1: Is there a significant difference between the fluency scores of students in kindergarten across urban, suburban, and rural settings, when using the Istation reading program while controlling for prior achievement?

RQ2: Is there a significant difference among the fluency scores of students in first grade across urban, suburban, and rural settings, when using the Istation reading program while controlling for prior achievement?

RQ3: Is there a significant difference among the fluency scores of students in second grade across urban, suburban, and rural settings, when using the Istation reading program and when controlling for prior achievement?

Definitions

1. *Comprehension*- Comprehension is the process of simultaneously constructing and extracting meaning through interaction and engagement with print (Snow & Matthews, 2016).
2. *Fluency*- Reading fluency is made up of at least three key elements: accurate reading of connected text at a conversational rate with appropriate prosody or expression (Hudson, 2020).
3. *Istation*- Imagination Station Reading offers a suite of research-based assessment and instructional tools for targeted instruction and intervention assessment, including intervention instructional tools for targeted instruction and intervention (McMahon, 2017).
4. *Oral reading score*- Oral reading fluency is the score obtained from listening to a student read out loud. The score is calculated through accuracy, rate, and word recognition (Goldstein, 2011).

5. *Reading*- Reading is the complex cognitive process of decoding symbols to derive meaning. It is a form of language processing
6. *Rural*- A rural area is a geographic area that is located outside towns and cities
7. *Suburban*- A suburban is a mixed-use or residential area, existing either as part of a city or urban area or as a separate residential community within commuting distance of a city
8. *Urban*- An urban area is a human settlement with a high population density and infrastructure of built environment

CHAPTER TWO: LITERATURE REVIEW

Overview

The purpose of this literature review is to present the essential components of oral reading fluency and its importance for the overall success of students in the classroom setting. The chapter will begin by discussing the theoretical framework involving oral reading fluency. This study is grounded in the automaticity theory (Ladinger & Samuels, 1964), which describes the process by which students gain understanding as it relates to oral reading fluency. The study is also centered around the information processing model theory. A comprehensive review of literature appropriate for oral reading fluency was examined. In addition, strategies for fluency instruction in the classroom, as well as adaptive computerized reading programs, were analyzed for the purposes of the study.

Theoretical Framework

There have been many theories that have shaped the overall view of oral reading fluency and its importance. However, the theory of automaticity has played a major role in oral reading fluency. The work of LaBerge and Samuels (1974) brought to light how deeply multifaceted oral reading fluency is with the theory of automaticity. In addition, the science of how the brain facilitates reading is found in the information processing model theory (Samuels, 1974). The theoretical framework created by these theories then helps to establish precise strategies and interventions to use in the classroom.

Information Processing Model Theory

In a more scientific approach, researchers, scientists, and theorists began investigating how language could be built in a student's brain (Aldhanhani et al., 2020). One of the models that developed was the information processing model. This theory states that oral reading fluency

is addressed through many systems that allow readers to engage in certain skills, such as letter-sound recognition. The greater amount of time spent trying to decode letters or sounds, the less brain capacity is available for comprehension. The theory is broken into three stages. These stages are sensory memory, short-term (working) memory, and long-term memory. As students see printed text and/or pictures, they retain the information. When they read, this information is stored in short-term memory for around thirty seconds. As they continue the process, this information is then moved to long-term memory. The theory states that students must be allowed time for the practice; so they are able to encode the data into their long-term memory. The theory goes a step further beyond the physical and metacognitive aspects to discuss practical applications of how the theory can, and should be, applied in the classroom setting. One of the most important attributes of the theory is that it requires the student(s) to be an active participant in their learning. Research has shown that when students are active participants in their learning, they learn at a much better and higher rate. In addition, they take a greater level of ownership and responsibility for their work.

Another component of the theory is the ability for classroom information to be made meaningful. This is considered one of the most important factors of the theory. When information is made meaningful to students, they are much more likely to retain the information longer. Meaningfulness occurs when students are able to grasp rules, generalizations, relationships between facts, and principles for how they are used. When new knowledge is connected to previous knowledge or experience, the information is presented at the student's level of understanding. The importance of organization to the theory is critical. While organization and meaningfulness are closely related, it requires active and voluntary processing to help ensure that, not only is the information learned, but it is stored in long term memory.

Information that is presented in an organized way is much more likely to be remembered than if it is not organized.

Automatic Information Processing/Theory of Automaticity

Automatic information processing, also referred to as the theory of automaticity, refers to the process by which visual information is transformed through a series of processing stages (LaBerge & Samuels, 1974; Rupley et al., 2020; Schrauben, 2010). These stages involve visual, episodic, and phonological systems until comprehension is achieved in the semantic system. Each stage involves a series of codes that are activated. This activation does not only occur inside deeper meaning, but also at the auditory and visual level. The number codes that can be simultaneously activated by outside stimuli is considered to be very large or even unlimited. This automatic processing is needed to be successful with multicomponent processes, such as reading.

As the reader begins to process the visual words through each of the stages, each stage is processed automatically. The shift from each stage must be automatic as well. Attention is at the forefront of processing information at each individual stage due to the assumption that individuals have a limited amount of attention accessible for a cognitive task. This includes the act of reading. However, there are times when one stage may begin processing before the previous stage has finished processing (Samuels, 1974)

The first of these processes is the grapheme learning. This refers to the processing of lines, curvature, intersections, and openness of what is being analyzed. The graphemic information enters and is analyzed by feature detectors and turned into letter codes. This is what allows word shape and spelling patterns to develop. In return, this lends itself to perceptual learning. Perceptual learning is the ability to recognize the letters being generated (Rupley et al., 2020). When a stimulus occurs and activates one of these codes, a signal is relayed to the brain's

attention center. This process can attract attention to that specific code as a form of additional activation. However, if attention is targeted elsewhere during the process, attention will not transfer to that visual code. The phonological memory system also works together with the visual/perceptual processes. Phonological awareness deals with the articulation and sound recognition of letters and words. Input, as it relates to the phonological memory system, consists of six main sources. These sources are units of visual memory, response memory, semantic memory, episodic memory, and auditory response and feedback. As readers move from visual to phonological awareness, there is interconnectedness by either being activated while reading. An example of this would be spelling patterns, such as “ket” or “at”. Episodic memory describes codes of temporal and physical events that are turned into visual and phonological codes. Once the visual word code connects with the phonological word code while reading, direct meaning begins to take place. This means that the reader has moved into semantic meaning, therefore recognizing and comprehending what they are reading in the text.

Related Literature

As previously discussed, reading is a complex skill that takes many different processes to occur. It is critical that students obtain these skills from the very beginning in order to become proficient readers. The importance of fluency and its influence on reading abilities has been discussed and noted. “Fluency in word decoding is a crucial requirement for the enhancement of reading. The high-demand for rapid and accurate decoding in our technology-and-knowledge-based societies gives an extra impetus to the necessity of focusing on the factors” (Breznitz, 2006 p. 14).

Research studies completed over the decades have shown the importance of oral reading fluency and its considerable correlation to students’ overall comprehension abilities (Rasinski,

2021). Research shows that students who do not develop these skills by the end of third grade dramatically increase their risk of school failure. This data can be traced back to the fundamental years when looking at high school dropouts (Snow & Matthews, 2016). The subsequent sections discuss many of the specific studies that have been completed regarding oral reading fluency, including the impact these studies have had on students.

Early grades literacy is built upon several main skill sets (Snow & Matthews, 2016). These skill sets are recognizing and writing letters, reciting the alphabet, writing their name, holding a book in the correct position (upright) and turning the pages, as well as reading environmental print. As students begin to gain familiarity with these skills, they begin to form word and sound relationships. These relationships can be formed through the use of rhyming words. This is essential in order for students to learn how to map phonemes to letter/letter sequences (called graphemes) in order to decode what they are reading. These skills are called *constrained skills* due to the fact that they are finite. This allows students in primary grades to maintain success in overall reading ability. However, as students reach upper grades, they must start focusing on unconstrained skills. Unconstrained skills refer to background knowledge and vocabulary. Most of this information is centered around words and information that students have not been exposed to or are not familiar with. Unconstrained skills help to determine long-term literacy achievement. Long-term achievement is defined as achievement after the primary grades (third grade). The nuances that characterize vocabulary and background information include language skills/vocabulary, discourse skills and grammar, as well as a general knowledge of the world. These skills showed more prevalent than a student's demographic location and parental socioeconomic status. Although these classifications help educators know areas to focus on with students, testing has shown that educators spend a vast majority of time concentrating on

constrained skills. This is mostly due to the fact that constrained skills are easier to target and improve upon. However, the 2015 National Assessment of Educational Progress (NAEP) showed that only 34% of fourth graders scored at or above the proficiency level. In addition, students who scored at the 50th percentile only achieved a scale score of 225 out of 500 (Snow & Matthews, 2016). These facts are extremely evident based on the investigation of whether reading fluency, both in text and word reading in isolation, had any correlation with a student's overall comprehension ability in kindergarten and first grade, which are foundational years in reading development. Findings suggested that text reading fluency (or oral reading fluency) is a component skill of reading comprehension, and that fluency acts as a bridge between word reading and reading comprehension (Kim et al., 2011).

Many programs have been designed and implemented over the decades to help classroom educators tackle the various reading needs of students in their classroom. While some have had success, there are certain elements that are necessary for students to become successful readers and maintain the skills throughout the upper grades. One piece to this puzzle is the significance of starting the literacy process during the children's preschool years. Children whose preschool teachers used a more complex level of vocabulary, and syntax, and who engaged in more discussions regarding texts, showed a greater level of vocabulary and more intricate grammar by the fourth grade. In order to achieve this, educators must provide a warm, rich-print environment for their students. As students' progress throughout the primary grades, many of these same characteristics are maintained. Providing students with time in text each day is necessary to grow their skill sets as a reader. Targeted instruction based on vocabulary and increasing their background knowledge/schema is also vital to help the children's reading process flourish (Snow & Matthews, 2016). However, concerns have been raised in recent years that fluency has been

overlooked as a main component for reading instruction. As a result, classroom practices and interventions regarding fluency have not occurred (Rasinski, 2021). During an annual survey conducted by leading experts in the field of reading, fluency was no longer considered a *hot topic* for reading education. In fact, these same experts determined that fluency should not be. This raised many concerns as it pertains to reading and perhaps in part explained why students' overall reading skills have declined. Much of this was because educators viewed fluency as a component of literacy in primary grades or just the ability to read quickly. While both of those aspects are true, fluency should be at the forefront of literacy instruction. Very plainly stated, fluency is the bridge that connects word recognition to overall comprehension. Focus should be placed on automaticity as well as prosody. This is accomplished through various classroom strategies and interventions.

The Importance of Fluency

Based on the work of previous theorists, educators and researchers have placed a great deal of importance on fluency. This has led the way for studies that have helped to develop strategies for readers who struggle with oral reading fluency. These studies have established a compelling and powerful relationship between the measures of reading achievement, comprehension, and oral reading fluency, as well as some general knowledge of the world. Students in second grade who demonstrate larger vocabularies typically read text more precisely (Nevo et al., 2020).

In the world of education, standardized testing is a reality among educators and students alike across the United States. In addition, testing that is considered non-standardized, such as Istation, is also extremely prevalent. These assessments are designed to show school leaders, educators, and parents how each student is performing in those specific areas. Reading is always

one of the areas evaluated by these assessments (Riedel & Samuels, 2007; Stage & Jacobson, 2001; Vander Meer et al., 2005)

Evaluations based on this information were performed to determine if students' fall, winter, and spring benchmark testing showed any correlation to their end of year high-stakes assessment scores on the Washington Assessment of Student Learning (WASL). The benchmark testing focused specifically on oral reading fluency. This information was analyzed on 173 first grade students in a mostly suburban area. It was determined that students' oral reading fluency scores, as measured by their benchmark assessments, did play a significant role on students' cut scores on the WASL. Based on these cut-scores, the positive predictive power that September oral reading fluency low scores predicted WASL failure was .41, and the negative predictive power that September oral reading fluency high scores predicted WASL success was .90 (Schilling et al., 2007).

Other studies have questioned the connection between students' oral reading fluency scores and comprehension as it pertains to school location. The oral reading fluency scores of 1,518 first grade students were critiqued in order to determine if there was a relationship between these scores and their overall comprehension. These students were in an urban setting where 85% of the students qualified for free and reduced lunch. The comparisons were made using DIBELS (Dynamic Indicator of Basic Early Literacy Skills) and the GRA+DE (Group Reading Assessment and Diagnostic Evaluation). The research found that oral reading fluency was a high predictor of student's overall comprehension scores in over 80% of the students that were examined (Riedel, 2007). Very similar results were yielded in a study from a group of third grade students in a rural school setting in South Dakota. These students' DIBELS scores were assessed based on the oral reading fluency component of the assessment. Students were assessed on their

oral reading fluency in January. In April of the same year, students were required to complete their end-of-year grade standardized test. The scores were then compared to determine the growth of their end-of-year evaluation of their oral reading fluency scores. It was determined that there was a significant correlation between a student's standardized test score and the level of their oral reading fluency (Pearce & Gayle, 2009).

The Ohio proficiency assessment is another high-stakes assessment used to determine students' proficiency in specific academic areas. The relationship between students' oral reading fluency and their performance on the assessment has been determined. Research revealed that there was a moderately high correlation between 8,800 third and fourth grade students who lived in a suburban area and their oral reading fluency scores and how they performed on the OPT. It was also determined that this information showed a strong correlation between verifying if a child should actually be considered at-risk as it pertains to their overall reading ability (Van Der Meer et al., 2005).

Students in grades first through third were examined to determine if oral reading fluency scores had any impact on their overall reading comprehension as it pertained to end-of-year high stakes testing. A total of eight urban schools and nine rural schools were chosen. In addition, these schools were identified as being high poverty. It was concluded that oral reading fluency knowledge helped to increase student's overall comprehension on their assessments across all grade levels and settings. Grade 1 oral reading fluency correlated .72 in the winter and .82 in the spring with the Grade 1. Grade 2 correlations with the five oral reading fluency assessments from winter of Grade 1 through spring of Grade 2 were .63, .72, .72, .79, and .80. Six oral reading fluency assessments from fall of Grades 2 through spring of Grade 3 correlated at .58, .63, .63, .65, .68, and .67 (Baker et al., 2008).

The Carsey Institute found that third grade students who attended schools in a rural or urban area had significant deficits in reading skills compared to students who attended schools in a suburban school setting. These findings included the fact that rural and urban third graders had a lower average reading achievement than their suburban peers. Suburban students also made greater gains in overall reading skills from kindergarten through third grade. In addition, they also found that, due to the socioeconomic status of students in rural and urban areas, these students were at a disadvantage compared with their counterparts who attended schools in suburban areas (Graham & Teague, 2011).

Many reading assessments focus on fluency as a component of their evaluation. Dynamic Indicator of Basic Early Literacy Skills (DIBELS) helps to determine how a student is performing on the main factors of reading, such as fluency and comprehension. This program is a common choice among states for reading assessments. Research revealed that oral reading fluency was, in fact, predicative of later reading comprehension skills (Kim et al., 201; Schilling et al., 2007). The oral reading component of the DIBELS assessment requires students to read three individual passages. Each time students read a passage, their scores increased between each reading. First grade students' scores increased by 16%, second grade students' scores increased by 15% and third grade students' scores increased by 13% (Petscher et al., 2011). DIBELS has also been used to assess students to determine the growth of students' reading comprehension, if any. Additional research focused on the relationship trajectories of oral reading fluency, including vocabulary, letter-name accuracy, phonological awareness, and nonsense word recognition in first through third grade students. Over 12,000 students' data was studied. Oral reading fluency was a major indicator of growth in students' first grade scores. In addition, oral

reading fluency scores had the highest indicator of reading comprehension performance in third grade students' scores.

The information DIBELS provides has also proven to be a major indicator in how students performed on specific standardized testing throughout the year (fall, winter, and spring). Findings showed that the DIBELS assessment showed a high correlation between students' oral reading fluency scores and students who were identified of being at-risk with their overall reading ability and comprehension. In return, this allows educators to make informed decisions regarding classroom interventions for these students (Schilling et al., 2007).

The National Assessment of Educational Progress (NAEP) has long been recognized as a leading assessment across the United States to help determine students' mastery level of particular subject areas. Scholars analyzed the score of over 1,100 fourth grade students to determine the correlation, if any, between students' oral reading score and their overall comprehension score on the NAEP. Students' oral reading was measured by rate, word-reading accuracy, and prosody. These variables explained students' comprehension scores as they related to the assessment itself. This was especially true of students who were low performing on the assessment. The implication of this research points to the impact of oral reading skills on student's overall comprehension ability (Sabatini et al., 2018).

The importance of oral reading fluency on students' comprehension ability through an empirical lens has also been examined. Fuchs et al. (2001) compared the historical perspectives of oral reading fluency with empirical implications. Through this study of middle school students with an identified learning disability in the area of reading, it was determined that oral reading fluency does serve as an indicator of reading development and expertise. The incorporation of a fluency element within an assessment appears to be most accurate in determining a student's

overall reading comprehension capability. The advantages of reading fluency stretch well beyond the primary years into secondary grades. It has been concluded that the reading prosody of a high school freshman impacts their overall comprehension ability. Therefore, providing further evidence of the value of fluency, especially in the foundational years, is important (Rupley et al., 2020).

Over 100 studies have been identified, examined, and coded to determine if specific strategies related to oral reading fluency were beneficial for students. Sixteen of these studies were ultimately decided upon for their work. Samuel's (1997) strategy of repeated reading was the most effective in helping students overcome their oral reading fluency deficit. In addition, when combined with other features, such as error correction, verbal cueing, and choral reading, at least eight of the studies showed large gains in students' overall fluency and comprehension. These features are largely behavioral in nature, as described by Pavlov (Samuels, 1997)

Focus has also been placed on the oral reading fluency of at-risk students in an urban school setting (Harty et al., 2019). Students completed a survey stating three books they would be interested in reading. The books were based on students individual Lexile level. A Lexile level is a specific number given to an individual student based on their reading ability. Each grade level has designated levels within which each student should measure within. They then chose one book from the survey to use for their interventions (the study). The students received specific interventions related to reading fluency, including vocabulary, for 25 to 30 minutes each Monday, Wednesday, and Thursday for four weeks. Pre-assessment and post-assessment scores were compared after the study was complete to determine any gains made with students receiving the intervention. Researchers found significant gains in these students' post-assessment

score on the *Woodcock Reading Mastery Test- 3*. The gains ranged from an increase of 1.16 to 5.22 (Harty et al., 2019).

Reading prosody (reading with expression) is also noted to be an extremely important component of overall reading fluency success (Smith & Paige, 2019). First, second, and third grade students, located in a suburban school district, were assessed on their reading prosody. They were assessed in September and then again in May to compare their scores using a four-point Likert scale with 1 being poor development of skill and 4 being full development of skill. Students were given a multi-dimensional fluency scale in order to improve prosody over the course of the study. Results indicated an increase in students' prosody, and in return, their overall comprehension, using the multi-dimensional fluency scale (Smith & Paige, 2019).

Along with prosody, other components of oral reading fluency success have been analyzed as well. These components included phonemic awareness, decoding, and sight word efficiency (Torgesen et al., 1999). There was a 0.80 direct correlation between sight word proficiency and phonemic awareness in the scores of students' Gray Oral Reading Test (GORT) through thorough evaluation. This shows a significant parallel between a student's oral reading fluency and their achievement as a strong reader.

There are oral reading fluency skills that are important to become a fluent reader (speed, language, and decoding) (Barth et al., 2009). Students have been assessed using the GORT, which is a standardized assessment that examines student performance. Word reading fluency, as well as text reading fluency, are critical to the overall reading fluency ability. This occurs through the repetition of letter-sound recognition phonemic awareness, including identification of misspelled words when reading (Barth et al., 2008).

There are also other approaches that researchers have completed to improve reading fluency, showing its importance (Reed et al., 2019). Fourth grade students were given three reading passages, reading each passage three times. In addition, these passages focused on overlapping words, repeated words, and language. This process took place over the course of 12 weeks for approximately 20 minutes, three to four times per week. Results showed that students who had significant struggle with reading fluency benefited from this process the most. An increase of over 15 words correct per minute was noted (Reed et al., 2019).

Similar studies compared two different groups of students to determine which aspects of fluency were directly related to a student's overall reading comprehension (Alvarez-Canizo, 2015). A sample of students was chosen based on scores obtained from an evaluator and the use of expository texts that were read aloud, as well as read independently. Comprehension questions were asked after the readings, and students were then placed into two groups. Ten students were chosen who had positive results in both oral and written texts, including ten students who had poor results in oral reading fluency and comprehension. The researchers used Praat software to record the students reading aloud. This software package is designed to help speech analysis in phonetics. pausing, pitch, exclamatory, declarative, and interrogative sentences, as well as errors in words, were all parameters noted during the reading. Both groups' findings were compared using ANOVA's. Students who had a lower reading comprehension ability made more inappropriate pauses, including declination of pitch while reading. Therefore, the results showed that students with reading comprehension concerns also had issues with oral reading fluency (Alvarez-Canizo et al, 2015).

Although the speed with which a student reads is not the only component that comprises oral reading fluency, it is a major factor. There is a direct correlation between students' oral

reading fluency and speed and comprehension (Jenkins et al., 2003). One hundred thirteen fourth grade students' data from the Iowa Test of Basic Skills (IBTS) were used for the study. Students' oral reading fluency was measured in timed probes both in list form, as well as within the context of reading passages. At the conclusion of the study, it was determined that there was a direction relationship between students' speed while reading and their overall reading comprehension scores. The summation of these findings centered around the fact that when students maintain automaticity in their reading, they are better able to focus on the context and meaning of what they are reading.

The direct relationship between students' comprehension and oral reading fluency is seen even in older students as they progress through upper grades (Bigozzi et al., 2017). Standardized reading achievement tests for students in grades four through nine were a high predictor for all other literacy based subject areas. The importance of finding evidence-based tasks in order to facilitate the learning of oral reading fluency was also stressed.

Oral reading fluency has also been linked to a higher motivation for reading (Nevo et al., 2020; Mehigan, 2020). It has been determined that as much as 10% of the variance in students' reading performance is attributed to reading motivation. As students become more motivated to engage in the reading process, they are more likely to be successful. This translates to a positive self-concept as it relates to their academic performance. Research related to motivation of reading in second graders at the beginning of the year and again at the end of the year was investigated. There were three main factors that contributed to the students' motivation as it related to their reading fluency. The factors were value attached to reading, literacy out-loud (social interactions related to reading), and self-concept as a reader. The results of this research indicated each of these factors were considerably correlated with students' overall reading

comprehension by the end of the year. It was also determined that students' self-concept as a reader, including text rate, improved by the end of the school year (Nevo et al., 2020).

The importance of oral reading fluency extends beyond the general education classroom. Students who struggle with learning disabilities also benefit greatly from increased oral reading fluency (Steven et al., 2017). Research surrounding elementary students who were identified as having a learning disability is also very important. In addition, these students were at risk of reading failure. Researchers focused on repeated rereading with the students. This process was modeled with teachers and working with peers. An overall improvement in the students' oral reading fluency was noted throughout the process.

There have also been benefits to students' independent and silent reading ability through the improvement of oral reading fluency (Paige et al., 2012). Students with better fluency results tend to score better on silent reading comprehension measures. In addition, other studies corroborate the progress in fluency and parallels to improvements in comprehension when reading silently.

Technology has also become a major component of students' day-to-day lives. This is especially true as it relates to education. Research demonstrates that technology has scientific effects on the brain, much like described in the information processing theory (Lange, 2019). When using a computerized program designed to listen and record students' reading, the treatment groups assessment scores were higher than the control group. In other words, the online fluency program was successful in helping students improve their reading proficiency.

Adaptive computer-based reading programs

Adaptive computer-based reading programs have come to the forefront of classroom assessments and interventions in recent years. These programs have proven to be very beneficial

for a variety of reasons. These programs provide visual aids, such as photographs and images. These visual aids can be modified to meet the need of the student(s) using the program. In addition, these programs provide specialized instruction and support that enables personalized learning. This allows students to learn at a higher level and maintain engagement throughout the process. Furthermore, most computer-based reading programs have an assessment component. This allows easy gathering of data of student performance. As a result, teachers are better able to see how a student is performing and design targeted instruction to meet student needs. Istation is a prevalent adaptive computer-based program that focused on students' reading ability and used targeted measures to increase students reading skills (Luo et al., 2017).

Computer-assisted programs have been used to help students increase their overall reading fluency across all geographic areas. This has helped to determine the value, if any, that has occurred through the use of these programs. Five second grade students in an urban charter school who were at risk for reading This research showed that the computer-assisted program increased students' overall oral reading fluency by at least 80% (Lange, 2019).

Research has been conducted to determine the impact that Istation had on students' overall comprehension based on the targeted instruction administered through the program on students Standardized Test for the Assessment of Reading assessment (STAR) (Luo et al., 2017). Data was collected on 98 third grade students from an urban elementary school. In between the monthly STAR assessments, students logged in to the Istation program and completed at least an hour's worth of lessons weekly. The STAR scores from the months of September through January were then analyzed to determine growth, if any. The mean scores of students STAR assessments increased each month except for October. This showed a considerable correlation between the use of Istation and its positive impact on students' assessment scores.

Educators are also finding Istation to be useful in their classrooms (May et al., 2018). Kindergarten through third grade teachers across Idaho who were piloting Istation were given a survey to complete regarding Istation. The survey asked them to rate the effectiveness of Istation, the administration of the assessments, and the output of the assessment. There were 81.2% of the teachers who rated the administration of Istation as either highly or moderately confident, and 89.5% of the teachers rated Istation moderately or highly effective. Lastly, regarding program output (what data is given and how the data can be analyzed), over 50% of teachers rated Istation positively.

The effect of Istation versus teacher directed instruction only shows favored use of Istation as a means of classroom instruction (Putnam, 2017). Seventy-two kindergarten students from 12 different classrooms across two suburban school districts were analyzed on this basis. Students were divided into two groups. One group focused on Istation as a primary means of classroom strategy and intervention. The second group focused on teacher directed instruction. Students in the first group showed much higher overall literacy skills than the second group (17.7% difference). In addition, it was noted that the two largest areas of variance were student's hearing and recording of sounds, as well as letter/sound knowledge. These two areas play a significant role in students' oral reading fluency and their reading comprehension.

An additional study focused on determining if pre-kindergarten and kindergarten students who used Istation made higher gains in their early literacy skills compared to those students who did not use Istation (Patarapichayatham & Roden, 2014). Pre-kindergarten students who used the Istation reading program made greater gains in vocabulary development compared to students who did not use Istation. Kindergarten students who used Istation made higher gains in letter knowledge, as well as vocabulary, compared to their peers who did not use Istation. Research

also compared student gains based on the amount of time spent using Istation to determine if students who spent a longer amount of time using Istation showed greater gains in reading skills. Students who spent more time using the Istation program showed greater gains in their reading abilities.

Students who are considered at risk as it relates to reading abilities are often targeted for additional classroom interventions. Computer programs, such as Istation, are often used to help these students improve their reading skills (Sutter et al., 2019). Does the use of Istation show any improvement for at-risk third grade students reading scores? At-risk designation was determined by the school district. In this case, it was defined as any student scoring below the 20th percentile. Students' scores from their beginning of the year Istation assessment were then compared and analyzed against their mid-year assessment and end of year assessment to ascertain if any growth had occurred. Students' scores significantly improved over the course of the school year. Students who increased over the 20th percentile increased their overall score by at least 18 points by using the Istation reading program consistently.

High-stakes testing has been a part of students' and teachers' lives for many years. Educators always look for ways to help students reach their full potential on these assessments. Istation has been determined to be an indicator of student success on end-of-grade testing (Campbell et al., 2018). Istation scores were predicative of third-grade students' scores on the Florida Standards Assessment (FSA) based on cut scores from the FSA as compared to range of scores on the Istation assessment. In return, the data provided from Istation can help educators guide classroom instruction in order to help students achieve success on high-stakes testing.

Similar results were yielded when trying to determine the predictability of student outcomes on the STARR based on Istation data (Patarapichayatham et al., 2014). Data from

fourth through eighth grade students across the state of Texas were studied. This totaled approximately 20,493 students. The researchers determined that the Istation assessment scores can be used as a predictor of how students will perform on the STARR assessment. This data was broken down to show cut scores based on each grade level. The cut scores can be used by administrators, educators, and parents, to establish how students will perform on their assessment. These results were established by conducting a linear regression and processing that with the confidence interval, as well as the prediction interval. As a result, this showed variances between the data.

In addition to all the studies that have been completed regarding Istation and its influence on reading results both in the classroom and in standardized testing, Istation has been nominated for awards based on their reading program. In 2019 Istation was nominated for the Software and Information Industry Association education technology CODiE award. This award is the only peer-reviewed program that highlights business' and education's superlative products. The program was nominated in two areas. The first area was best English Language Learner (ELL), English as a second language (ESL), or world language acquisition solution for their Spanish literacy program, Istation Español. This means that Istation was recognized as one of the best instructional solutions for English-language learners. Istation Español was also noted as being culturally appropriate and motivational for students. The program was also nominated for best game-based curriculum solution category. This category recognizes the best curriculum solution that incorporates gaming as a fundamental component of its curriculum and assessment practices (Bryan, 2019).

Fluency Strategies for the Classroom

There are numerous strategies that can be used to help improve a students' reading fluency. Depending on the specific level and need of the student, some strategies will be more beneficial than others. However, implementing these strategies will help to increase students' fluency. In return, their overall level of comprehension will improve as well.

Data collected on the relationship between oral reading fluency and comprehension among fourth grade students provides excellent insight supporting these facts (Neddenriep et al., 2011). Students were recognized as being at risk of not meeting their yearly reading goals. After interventions were completed with these students (a combination of error analysis and computerized program called AIMSweb), four out of the five students showed an increase in their oral reading fluency score, which then translated to an increase in their overall comprehension score. Of the four students who increased their score, each had at least a double digit increase in their total scores.

Double Time Word Lists

Double time word lists are lists of single words that are sorted by level of difficulty. These words can be sight words or Dolch words. The words are written in column form. Students begin by reading the lists as a group, reading the list twice. This allows students who had difficulty decoding the word the opportunity to listen to the word the first time it is read, and then practice it with peers the second time it is being read. The words are then discussed on an individual basis for students to learn the meaning of the words before reading within the text. This process happens daily for 10 minutes. Students are encouraged to set a goal for themselves of reading the lists quicker as time progresses to show mastery of the words (Acosta-Tello, 2019).

Flash Cards

Flash cards are a very traditional way to expose students to words in the hopes of becoming accustomed to reading them with automaticity. Teachers and students can keep track of how many words students recognize. Specific goals could be set for students in order to increase their word recognition accuracy. Once students master a particular list, they are able to move on to a more difficult list. After students show success with flash cards, they can move to working with word banks (Acosta-Tello, 2019).

Sight words are often a focus for this intervention, as basic sight words make up a large percentage of texts for younger students. In addition, it serves as a foundation for reading as students progress. The importance of flash cards was seen during a study in which students Development Reading Assessment (DRA) scores were used to determine their beginning level, and their final level after the intervention was completed. Three students from a suburban setting were used for the study. Each student increased their sight word knowledge over the course of the study. Student one increased 20 words, student two increased 13 words, and student three increased 14 words based on their DRA scores (Gerardi, 2018).

Word Banks

Once students show fluency with their flash card lists, the words are then moved to word banks. Word banks are designed to show students the number of words they have mastered and to begin incorporating them in their writing. The word banks should be easily accessible for students (either on their desk or in a folder that they can refer to readily). In addition, these words should be reviewed on a frequent basis to ensure that students are maintaining mastery of these words (Acosta-Tello, 2019).

Words in a Box

Words in a box is based on the premise that students have already learned to read a specific list of words on sight. Students work in small groups to write these words on individual slips of paper. These slips are then put into a box. Students then take turns picking a slip from the box. Once the word is selected, the student is encouraged to try to decode the word in their head (in other words, not sounding it out). If students are able to correctly identify the word, they are then able to choose another word. This process continues with all students in the group (Acosta-Tello, 2019).

Choral Reading

Choral reading is another small group activity that students can participate in to help improve fluency. During choral reading practice, students read a set of words in unison. These words can be within the context of a poem, song, nursery rhyme, among others. This process allows students to build a foundation to practice fluency and have the words identified by matching words they are speaking to what is written on the chart (Acosta-Tello, 2019). After the choral reading is completed, the teacher provides corrective feedback using modeling. This includes correct prosody, rate, and pronunciation.

Choral reading was used with 112 sixth grade students to determine if the strategy had any positive effects on students overall reading ability, specifically oral reading fluency. The *Test of Word Reading Efficacy* was administered at the beginning of the study and then again at the end of the study to compare students' scores. A control group and treatment group were used in order to maintain fidelity. Findings showed that on the measure of oral reading fluency, students in the treatment group made significant gains suggesting that they had improved in their ability to fluently read connected text aloud (Paige, 2011).

Repeated Rereading

The repeated reading strategy has become one of the most prevalent strategies in the world of oral reading fluency. Repeated rereading is the process of a student rereading the same text until oral reading becomes fluent. Chomsky (1957) is credited with some of the early works as it relates to reading rereading. However, Samuels (1997) is also acknowledged with refining many aspects of the theory as well. Through her research, Chomsky (1957) found that repeated rereading helped increase students overall reading success by allowing them the opportunity to decode the text. In addition, students were able to memorize the text they were reading through the repeated rereading process. This allows students to develop a measure of success as it relates to decoding. Samuels' research also focused on the importance of decoding to the overall success of improving oral reading fluency (Wolf, 2018).

Much research has been done to show improvements with students' oral reading fluency when focusing on the repeated rereading strategy (Lo et al., 2011; Swain et al., 2017). One set of data collected focused on three first-grade students. Emphasis was placed on specific grade level words to begin. The students then transitioned to reading with the teacher. Lastly, they read the text(s) independently at least four to five times. Each student was able to increase their overall fluency reading by at least four to five words per reading.

Another example of the benefits that repeated rereading has on students' oral reading fluency and, in return, their comprehension, was determined through working with a fifth-grade male who was identified as having academic learning needs related to reading. Researchers employed rereading as a source of intervention to determine if there would be an increase in students oral reading fluency, as well as comprehension. At the beginning of the seven-week study, the student's baseline score was 84 words correct per minute. At the end of the

intervention, the student's words correct per minute increased to 104 words correct per minute (Hudson, 2020).

Reader's Theater

Studies have shown the significance in putting information to music, plays and other interactive means. Reader's theater has been shown to be an excellent tool when trying to help students with their oral reading fluency (Mraz et al., 2013; Young et al., 2016). Students participated in a reader's theater poem reading for three sessions while working with the teacher, practicing. Then, during the fourth session, they performed their poem for the class. The first session was dedicated to students choosing their poem. The second session the students focused on word recognition. During the third and final session before performing the poem, they focused on expression. The students' post-test scores showed significant improvement in students' oral reading fluency.

In addition, a group of struggling third grade readers were identified and then reader's theater was used as the intervention. Students' scores were used from district assessments, both pre-assessment and post-assessment. The baseline scores for several of these students was only nine words correct per minute. During the intervention, the researchers followed a specific pattern, which included shared reading, echo reading, paired-partner reading, choral-expressive reading, and then the performance. After this cycle was repeated over the course of several weeks, data was evaluated to determine any gains made through the use of reader's theater. Each student that participated in the study made gains in word recognition, word accuracy, as well as prosody. In fact, the district goal for words correct per minute for the entire year was 17 words per minute. All students achieved at least 21 words correct per minute or higher. In addition, the

class comprehension average was 49%. After the intervention this increased to 89% (Sutter et al, 2019).

Close Sentence Reading

Close sentence reading is a strategy that works parallel with repeated rereading. The overarching purpose of close sentence reading is to teach students how to analyze a text through the process of repeated rereading. As students are rereading the text, they are focusing on a different purpose each time. Some of these purposes include decoding the text, building fluency, and asking and answering questions related to key vocabulary to build comprehension. These texts are placed where students can easily view them and are referred to them often, but only in short (5-10 minute) periods. This process allows teachers to give direct instruction on whatever the focus may be for that specific reading. For example, if the purpose is decoding, then the teacher may focus on phonemes or phonemic awareness skills (Minnery & Smith, 2018).

Over a dozen elementary and secondary teachers used close sentence reading to determine the effectiveness in the classroom setting. These grade levels spanned from kindergarten through sixth grade. Although some aspects were adapted for each specific grade level (based on that particular grade level's ability level), the premise was the same throughout. Teachers decided upon a specific text to use with their students. As needed, the text was scaffolded through initial discussions and teacher led reading as needed. These texts were short yet complex since this was a teacher led intervention. The students incorporated repeated reads of the text and then text-dependent questions were used to determine understanding of what was read. Anecdotal notes and observations over the course of ten observations were gathered. It was determined that students showed gains in their overall reading ability using close reading (Fisher & Frey, 2012).

Teacher Scaffolding

A critical factor in improving oral reading fluency is the time the teacher is able to spend with the student listening to them read and, in return, determining the best course of action for them. Teacher scaffolding is a practice that allows teachers and students the opportunity to work together in order to build the skills necessary to become an autonomous reader. These skills focused on students' word accuracy rate and their reading prosody (Enyew et al, 2015). Students who do not develop these oral reading fluency skills within their first years of language development are six times more likely to encounter difficulties with reading when they begin school (Clay, 1990).

Teacher scaffolding is critical for students, no matter their learning ability or location as seen with grade four students in Ethiopia. Students' data was analyzed from pre and post-assessment information. Information was gathered from oral reading fluency tests, classroom observation data, and interviews. Both quantitative and qualitative data gathered by the researchers showed an increase in students' oral reading fluency based on teacher scaffolding being utilized in the classroom. ($t=10.755$, $P<0.05$ between pre-assessment and post-assessment using t-test percentages) (Enyew et al., 2015).

Paired Reading

Allowing students the opportunity to work with peers can also be a very powerful tool for developing reading fluency. Paired reading is the process of students working together to share and read a text. The teacher begins by modeling the process. This allows students the opportunity to see what the expectations are when they work with their partner. The story chosen by the teacher is designed to teach specific features, such as plot or dialogue, to help improve vocabulary and other reading skills. Before the teacher reads, students are allowed to predict

what the story will be about, including completing a picture walk. Then the teacher reads the story out loud. After the story is finished, the teacher asks another set of guided questions.

Students are then able to follow this process with their partner (Son & Chase, 2018).

Paired reading has been a very popular and effective method of reading instruction in the classroom. Paired reading has been used to establish a connection to an increase in students' oral reading fluency and, in return, their overall comprehension (Nes, 2003). Four students were used from fourth and fifth grades in a school located in a rural school district in West Texas were analyzed. Research findings showed that each student increased their oral reading fluency rate from their initial score. Student one increased their rate by 60.8 words, student two increased their rate by 56.2 words, student three increased by 70.8 words, and student four increased by 56.6 words. In addition, all students had an overall mean score of between 90-100% for their comprehension.

Student Self-recordings

One of the greatest indicators of students' improvement in any area is motivation. Motivation allows students to learn at a higher level of engagement. One of the most influential ways a student can be motivated is to self-assess their learning. This can be done in terms of oral reading fluency through student self-recordings. During the process of self-recording, students learn to monitor their fluency using running records. Students are taught indicators to look for, such as speed, unknown or unfamiliar words, omission of a word(s), and more. Students then reread the text in order to improve upon their fluency each time they read. After each read, students set goals for themselves. After student mastery of a specific text, new and more difficult texts can be introduced to continue and strengthen students overall oral reading fluency skills, as well as comprehension (Ness, 2016).

Although self-recording is a relatively new intervention as it relates to reading, many educators are seeing the merit of incorporating it into their classroom. There is enormous benefit in using this strategy as a means of helping improve students' oral reading fluency (Edwards & Lambros, 2018). Three seventh grade students from an urban school district in Southern California were chosen to determine how much value, if any, self-recording brings to oral reading fluency. Each student in the study was identified as being a struggling reader. The baseline scores for the three students ranged from first to second grade levels regarding their oral reading fluency. Student one increased in overall fluency from a baseline average of 72 words correct per minute to 87 words correct per minute. Student two had a baseline of 55 words correct per minute. Their oral reading fluency increased to 77 words correct per minute. Lastly, student three was reading at an average baseline of 25 words correct per minute. After the intervention was complete, the student increased to 46 words correct per minute. In addition, two of the three students noted that they found value in using the intervention, and they noticed an increase in their overall reading capabilities. This data is extremely beneficial as it relates to student motivation.

Summary

Oral reading fluency plays a major role in the success of students' reading ability. Without a solid foundation as described by theorists throughout the past century, students will likely struggle to comprehend what they read. Therefore, educators must make every effort to understand the process pertaining to fluency, how to work with students who struggle with fluency, and incorporate these skills on a consistent basis. This includes being able to identify the specific components of fluency that students may struggle with, such as word recognition, prosody, intonation, and more. The process includes incorporating appropriate oral reading

fluency strategies, such as word banks, repeated rereading, and scaffolding into daily practice. Research is clear how effective this is for students who are struggling with reading. This is especially true as it relates to using adaptive computerized reading programs in the classroom. Adaptive programs, such as Istation, meet students where they are as they are working. This ensures the most accurate results possible. These programs allow educators to collect data to better guide instruction in the classroom.

CHAPTER THREE: METHODS

Overview

Reading fluency is a key foundational process that allows students to become successful readers. However, many students lack the necessary skills related to reading fluency. Becoming a more fluent reader enables students to engage with the text they are reading, as well as comprehend what they are reading. Often, when students struggle with reading fluency, they also struggle with other pillars of reading. In this study, kindergarten through second grade students' reading fluency scores from the Istation reading program will be compared across several demographic areas (urban setting, suburban setting and rural setting) in order to determine if there is a significant difference among them. This chapter focuses on the research design, participants, instrumentation, as well as data analysis of the study.

Design

A quantitative, casual-comparative research design was used in order to determine if there is a significant difference in the fluency scores of students in grades K-2 across rural, urban and suburban school settings as measured using the Istation reading program. During the study, the initial assessment taken during August/September will serve as the covariate-controlling variable. The assessment taken by students in December will serve as the instrumentation. The students' reading fluency scores from the Istation assessment served as the dependent variable. The school setting (urban, suburban or rural) served as the independent variable. The other dependent variable was the grade level of the students in the study, kindergarten, first, and second grades.

The purpose of this study was to compare the results of students' oral reading scores in grades kindergarten, first and second, across suburban, urban and rural settings in order to

determine any differences between the data. A causal-comparative study was most appropriate for the research due to the various components of the study itself. As defined by Gall et al. (2007), a causal-comparative study includes an independent and dependent variable. Independent variables in a casual-comparative study cannot be manipulated. In addition, another component of this research was the fact that the independent variable was measured in the form of categories. This research study has definitive categories in terms of grade levels and school location. A causal-comparative study was also conducted by Martino (2021) where multiple independent variables were defined in order to determine specific relationships between them and the dependent variables. The location in which the students are located (suburban, urban and/or rural) cannot be changed or adjusted. In addition, the data will determine if the dependent variable in the study does in fact play any role, and if so, how large, on the independent variables. This by definition fits the parameters of a casual-comparative research study.

Research Questions

RQ1: Is there a significant difference between the fluency scores of students in kindergarten in urban, suburban, and rural settings, as measured by the Istation reading program, while controlling for prior achievement?

RQ2: Is there a significant difference between the fluency scores of students in first grade in urban, suburban, and rural settings, as measured by the Istation reading program, while controlling for prior achievement?

RQ3: Is there a significant difference between the fluency scores of students in second grade in urban, suburban, and rural settings, as measured by the Istation reading program, while controlling for prior achievement?

Null Hypotheses

H₀₁: There is no statistically significant difference between the fluency scores of students in kindergarten in urban, suburban and rural settings as measured by the Istation reading program, while controlling for prior achievement.

H₀₂: There is no statistically significant difference between the fluency scores of students in first grade in urban, suburban and rural settings as measured by the Istation reading program, while controlling for prior achievement.

H₀₃: There is no statistically significant difference between the fluency scores of students in second grade in urban, suburban and rural settings as measured by the Istation reading program, while controlling for prior achievement.

Participants and Setting

The population of this study was kindergarten through second grade students in a school district located in North Carolina. Data from students in grades kindergarten through second grade from three schools located in a rural setting, three schools located in an urban setting, and three schools located in a suburban setting will be used for the study. A total of 3,335 students' data were used for the study. This exceeded the minimum number of 150 participants, assuming a medium effect size, at the alpha of .05. There were six kindergarten classes used from each of the nine schools that participated. There were five first grade classes used from each of the nine schools that participated. In addition, there were five second grade classes used from each of the nine schools represented in the study. A total of 125 students were used per grade level. This helped to ensure that there is an unbiased representation in the study itself. The decision for the specific schools used for the study was decided by the chief officer of accountability and equity of the school district. Discussions were maintained through telephone conversations as well as

email regarding the data needed for the study. These discussions included the specific information needed (Istation scores, school locations- urban, rural, and suburban as well as grade levels- kindergarten, first and second grades). The school district that participated in the study is comprised of roughly 40% white, 29% African American, 25% Hispanic, 4% multiracial, 3 % Asian and less than 1% American Indian or Native Hawaiian/Pacific. Permission for the study was obtained through the school district. The superintendent of the school district was advised of the study and approved.

Instrumentation

For this study, the dependent variable was reading fluency and the independent variable was the location of the schools within the district (rural, urban, and suburban). Scores were identified through the use of Istation. Istation is a program that is designed to adapt to the specific needs of students based on diagnostic assessments (McMahon, 2017). The program itself includes the diagnostic assessment used to assess students. Readers are assessed in approximately 40 minutes with an engaging computer-adaptive assessment at the beginning of each month. These assessments are multiple choice questions as well as fill-in-the-blank responses. The computer adaptive testing algorithms determine the students' score as they are working (Putnam, 2017). Therefore, if a student is not performing well on the assessment, their questions will be centered around their instructional level. The same process occurs for students who are performing above average on the assessment. Fluency scores are based on the Flesch-Kinkaid readability scale. This scale categorizes a text based on a number between 1-100. These numbers correlate with a specific range that students should average based on their grade level. For Kindergarten through second grade students this range would be 0.0- 2.9. These also correlate to an overall Lexile score range between 120L and 630L. Based on their results,

learners are seamlessly placed in interactive online instruction. Struggling students are routed through reteach lessons, and teachers are given instant reports to monitor student progress. Each Priority Report directs teachers to specific skills-based, small-group lessons for targeted reading intervention (Istation, 2020). Based on the assessment score they receive, specifically designed instruction is created for them within the Istation program. Students are expected to receive 45 minutes of tailored instruction using the program each week. This is to ensure maximum effectiveness of the program. This process repeats itself each month. Based on the assessments that the students are given, a score is automatically generated for each of the five areas of reading proficiency: phonics, phonetic awareness, vocabulary, comprehension, and fluency. The fluency scores of the students will be analyzed to see if there is a difference in the scores of students at both grade level and school location (urban, suburban and/or rural).

Istation was created by John Schnurrenberger. Istation is based around comprehensive and scientific research (McMahon, 2017) The reading component of the Istation program is centered around the National Reading panel's five major pillars of reading (McMahon, 2017). The oral reading fluency element has been designed with over three decades of research. Students are able to read directly to the program and scores are digitally recorded based on student responses. In addition, Istation is used by over four million students across the United States as well as several other countries around the world (McMahon, 2017)

Istation has been found to be a very effective tool when used appropriately in the classroom setting. In a study conducted by Putman, it was found that there was a 17.7% difference in kindergarten students overall literacy skills when using Istation versus teacher directed instruction solely (Putnam, 2016). An additional research study completed by Luo et. Al (2017) showed that over a four month period, students in the state of Texas completing the

STAR assessment showed multi-digit growth with their scores when using Istation during a three out of four month period.

Many studies have been conducted to determine the reliability and validity of Istation and its methods. Content validity was established through several means. Key testing items were initially created for the assessment. In return, these items underwent review by a panel of reading experts. These items were then used in a previous version of the assessment and revised as needed. The items' parameters were analyzed and those that were deemed to have unacceptable fit statistics in regard to the subtest were removed. Therefore, the items that remained were considered valid since they are accurate representations of what they were intended to measure (Istation, 2009). A study completed by Patarapichayatham & Roden (2014) determined that students who used the Istation reading program showed greater gains in their overall reading skills than students who did not participate in Istation. This was concluded to be true across multiple grade levels, Pre-Kindergarten through eighth grade. In an independent study by Mathes (2016), Istation was found to be reliable through the use of specific testing such as Cronbach's coefficient alpha among other common assessments. The lower limit that was set for the Cronbach Coefficient alpha was 0.90. The results for the overall reading ability range was between 0.927 and 0.970 ($N = 416$). This yielded a very high rate of reliability.

Procedures

For the initial process of completing this study, permission was obtained through the superintendent of the cooperating school district (see Appendix B). The district provided the archived data needed for the study through the department of equity and accountability. The data collected was from kindergarten through second grade students Istation fluency scores. Students completed their diagnostic assessment at the beginning of each month under teacher supervision.

The program then tailored the Istation lessons to accommodate the specific needs of each student, in return, allowing higher success rates for students' overall understanding. Students' scores from their August assessment and their December assessment were analyzed to determine growth. The data was sent through the head of the department of equity and accountability through email. The data that was given included each individual student score from each class in grades kindergarten through second grade in the cooperating schools from August and then December. No permission from parents or guardians was needed for this study because no identifiable information was used (school name, teacher name and/or student name) as archived data was used (a coding form will be used in place of specific identifiable information). The data was kept on an unused flash drive that is kept in a locked safe when not being used. This helped to ensure the confidentiality of the information/data. Permission was then obtained through Liberty University Institutional Review Board (see Appendix A). Once the IRB granted acceptance and the data was received, the researcher compared the results from each grade level, kindergarten through second grade, over the course of the designated period, September through December. Data were organized into categories based on the variables. These included grade level, school location, and test scores compared from August to December. Similarly, a study conducted by Veenendaal et al. (2014) used a time frame of one semester when conducting a study on reading fluency and the connection to reading comprehension. The data was then organized into each of the multiple categories (comparison of classroom to classroom, grade level to grade level, as well as school location to school location). Tables were created to show the results of these comparisons. Within each table, the identifying factor was listed (classroom, grade level, or school location) as well as the overall reading fluency score. School location information was provided through the cooperating school districts department of equity and

accountability. In addition, a scatterplot was created in order to show the variance between the independent variables.

Data Analysis

For the purposes of this casual-comparative study/research design, three analysis of covariance (ANCOVA) were used to analyze the collected data as well as evaluate each hypothesis of the research. The ANCOVA statistical procedure is most effective and beneficial when comparing the mean scores between two or more groups or variables. ANCOVA is appropriate when there is one independent variable with two or more categorical groups, one dependent variable measured on a continuous scale, and a covariate, also measured on a continuous scale. (Gall et al., 2007). This statistical analysis was needed for this study to show/determine the difference, if any, in the score of each group based on the designated independent variable. Students' original assessment completed in September served as the covariate controlling variable. The assessment completed in December as well as the school setting served as the dependent variable.

All data were screened for missing data points and inaccurate data. All incomplete data sets and inaccurate data were omitted. Then, the data was screened using box and whisker plots to screen for extreme outliers. Each assumption of ANCOVA was tested. Any outliers were identified using a Box and Whisker plot for each group and/or variable. This detected any extreme outliers. An assumption of normality test was also completed by using the Kolmogorov-Smirnov to determine if the assumption of normality was met. An assumption of linearity test using a scatter plot was used. An assumption of bivariate normal distribution was also conducted to determine any distribution among the variables. The assumption of homogeneity of slopes was tested in order to ascertain any commonalities among variables. Lastly, an assumption of equal

variance (Levine's Test of Equality) was tested to show any error variances. The alpha level will be set at 0.05. The effect size will be tested using partial eta squared.

CHAPTER FOUR: FINDINGS

Overview

This study will investigate the difference, if any, between the beginning of year score and mid-year score of kindergarten through second grade students Istation reading assessment among urban, suburban, and rural settings. This chapter will contain the research questions proposed, the null hypothesis as well as all data analysis pertaining to the study. In order to evaluate any differences, an ANCOVA analysis as well as assumptions testing was conducted.

Research Questions

RQ1: Is there a significant difference between the fluency scores of students in kindergarten across school settings when using the Istation reading program while controlling for prior achievement?

RQ2: Is there a significant difference among the fluency scores of students in first grade across school settings when using the Istation reading program while controlling for prior achievement?

RQ3: Is there a significant difference among the fluency scores of students in second grade across school settings when using the Istation reading program while controlling for prior achievement?

Null Hypotheses

H₀1: There is no statistically significant difference between the fluency scores of students in grades Kindergarten across school settings when using the Istation reading program controlling for prior achievement.

H₀₂: There is no statistically significant difference between the fluency scores of students in first grade across school settings when using the Istation reading program controlling for prior achievement.

H₀₃: There is no statistically significant difference between the fluency scores of students in second grade across school settings when using the Istation reading program controlling for prior achievement.

Descriptive Statistics

Descriptive statistics were determined on the dependent variable (school location) as well as the independent variable (Istation score). The specific descriptive statistics for each null hypothesis can be found in Tables 1-6

Table 1

Descriptive Statistics: Covariate: Beginning of Year Scores for Kindergarten

District Type	<i>n</i>	<i>M</i>	<i>SD</i>
Rural	345	178.67	13.962
Suburban	262	179.96	13.570
Urban	154	180.93	13.200

Table 2

Descriptive Statistics: Dependent Variable: Mid-Year Scores for Kindergarten

District Type	<i>n</i>	<i>M</i>	<i>SD</i>
Rural	345	193.210	15.608
Suburban	262	197.230	15.529
Urban	154	198.700	16.655

Table 3*Descriptive Statistics: Covariate: Beginning of Year Scores for First Grade*

District Type	<i>n</i>	<i>M</i>	<i>SD</i>
Rural	348	201.042	12.417
Suburban	309	202.901	.777
Urban	194	207.220	15.556

Table 4*Descriptive Statistics: Dependent Variable: Mid-Year Scores for First Grade*

District Type	<i>n</i>	<i>M</i>	<i>SD</i>
Rural	348	212.035	15.289
Suburban	309	216.026	17.043
Urban	194	221.709	19.174

Table 5*Descriptive Statistics: Covariate: Beginning of Year Scores for Second Grade*

District Type	<i>n</i>	<i>M</i>	<i>SD</i>
Rural	335	222.103	16.675
Suburban	310	224.136	16.538
Urban	207	225.678	17.439

Table 6*Descriptive Statistics: Dependent Variable: Mid-Year Scores for Second Grade*

District Type	<i>n</i>	<i>M</i>	<i>SD</i>
Rural	335	231.798	18.441
Suburban	301	233.265	20.175
Urban	207	236.228	21.370

Results

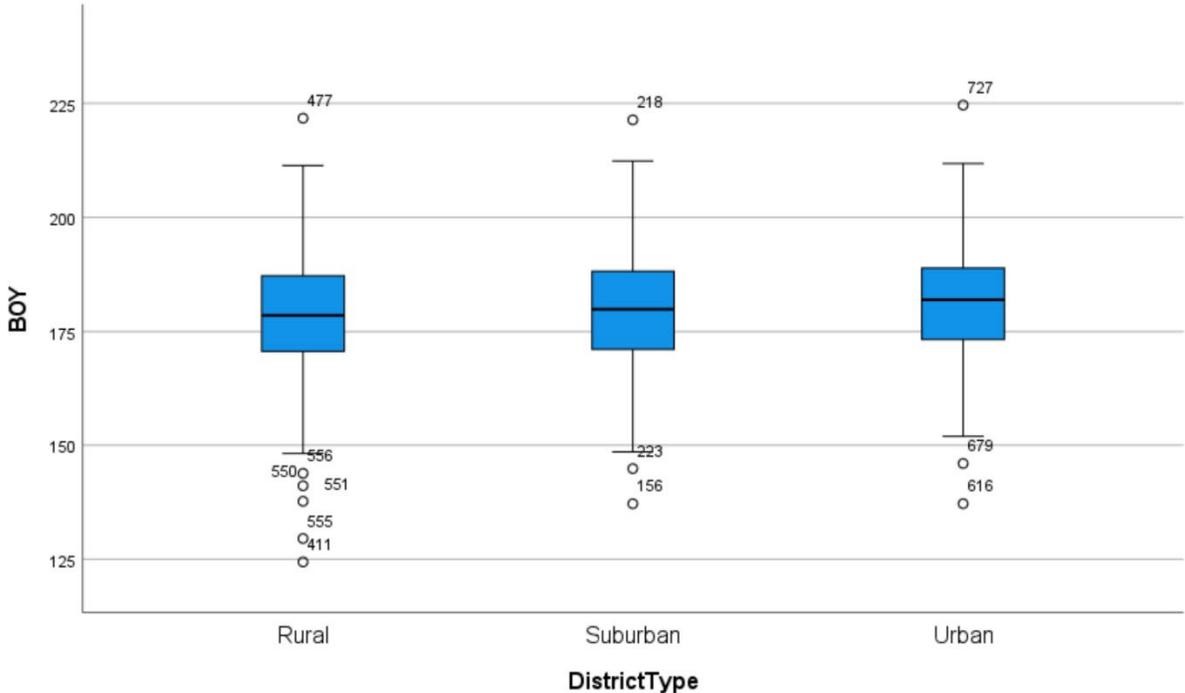
Null Hypothesis One

Data Screening

An ANCOVA was used to test the null hypothesis. During the analysis, data screening was conducted to determine if there were any inconsistencies. Some data was removed due to missing data (either beginning of year score or end of year score). In addition, box and whisker plots were created to look for any extreme outliers within the data. See Figure 1 for the box and whisker plot for Null Hypothesis One.

Figure 1

Box and Whisker Plot for Kindergarten Covariate



Assumptions

Assumptions were tested to determine if the researcher could proceed with the ANCOVA, including the assumptions of normality, assumption of linearity and bivariate normal distribution, assumptions of homogeneity of slopes, and the homogeneity of variance.

First, normality was examined using the Kolmogorov-Smirnov test of normality because the sample size was greater than 50. No violations of normality were found. See Table 7 for Tests of Normality.

Table 7

Kindergarten Kolmogorov-Smirnov Tests of Normality

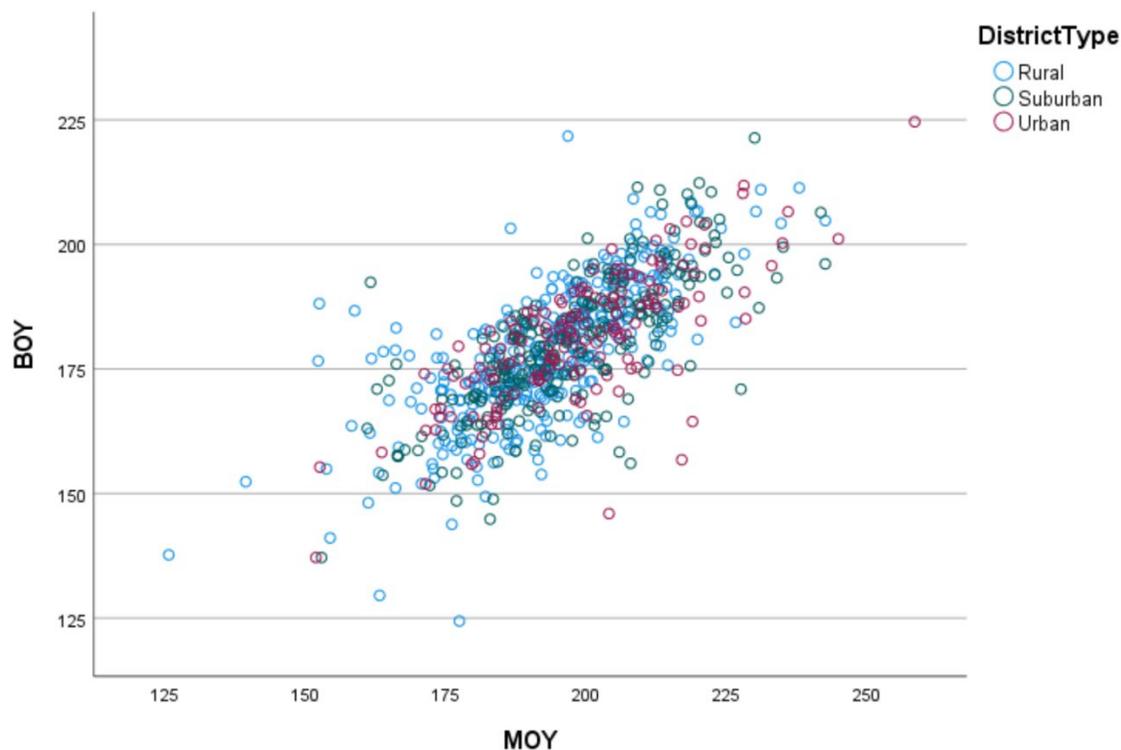
District Type	Statistic	<i>df</i>	Sig.
Rural	.047	345	.064
Suburban	.039	262	.200
Urban	.044	154	.200

The assumption of linearity and bivariate normal distribution were tested using scatter plots for each group. Linearity was met and bivariate normal distributions were tenable as the shapes of the distributions were not extreme. Figure 2 includes the scatterplot for each group.

Figure 2

Scatterplot of Rural, Suburban, and Urban Kindergarten Scores

Graph



The assumption of homogeneity of slopes was tested and no interaction was found where $p = .157$. Therefore, the assumption of homogeneity of slope was met. The assumption of homogeneity of variance was examined using the Levene's test. No violation was found where $p = 8.59$. Therefore, the assumption of homogeneity of variance was met.

Results for Null Hypothesis One

An ANCOVA was used to test the null hypothesis regarding the fluency scores of students in kindergarten between rural, suburban, and urban settings when using the Istation reading program. The null hypothesis was rejected at a 95% confidence level where $F(2, 757) = 8.284, p < .01, \eta_p^2 = .021$. The effect size was large. Because the null was rejected, post hoc

analysis was conducted using a Bonferroni post hoc test. There was a significant difference between the rural group and suburban group ($M = -2.934, p = .003$) and the rural group and urban group (mean difference of $-3.581, p = .002$). However, there was not a significant difference between the urban and suburban groups (mean difference of $.647, p = 1$). See Table 8 for multiple comparisons of groups.

Table 8

Kindergarten Multiple Comparison of Groups

District Type (I)	District Type (J)	Mean Difference (I-J)	SE	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Rural	Suburban	-2.934	.886	.003	-5.060	-.809
	Urban	-3.581	1.049	.002	-6.097	-1.065
Suburban	Rural	2.934	.886	.003	.809	5.060
	Urban	-6.47	1.097	1.000	-3.279	1.985
Urban	Rural	3.581	1.049	.002	1.065	6.097
	Suburban	.647	1.097	1.000	-1.985	3.279

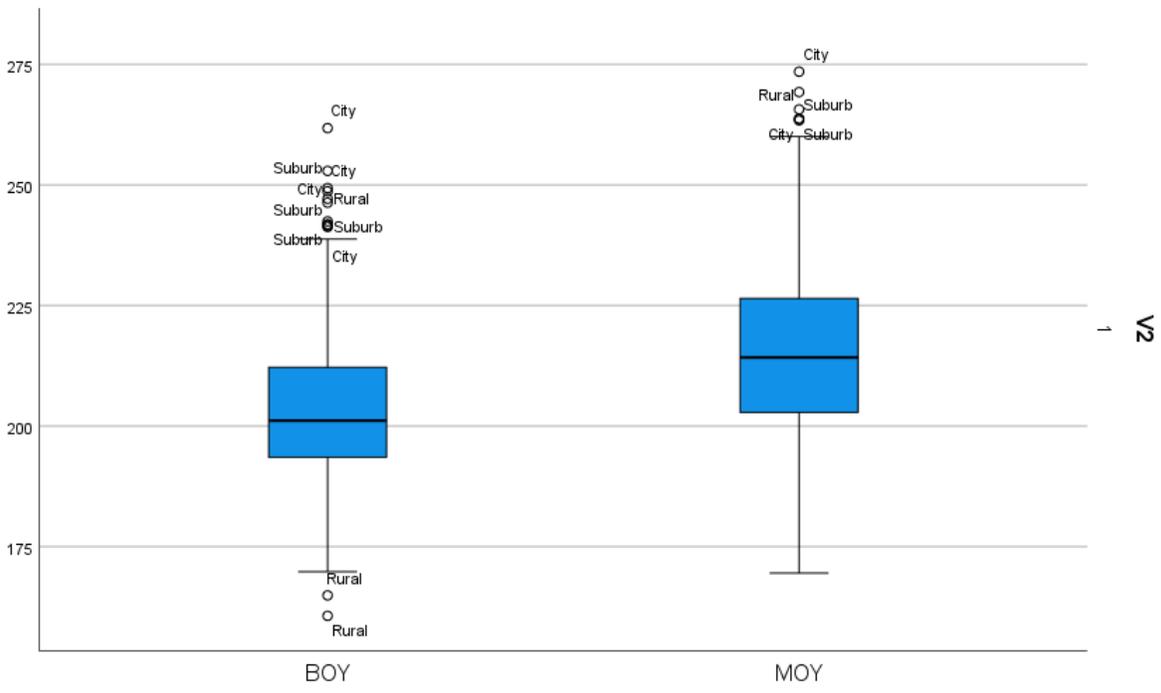
Null Hypothesis Two

Data Screening

data screening was conducted to determine if there were any inconsistencies. Some data was removed due to missing data (either beginning of year score or end of year score). In addition, box and whisker plots were created to look for any extreme outliers within the data. Although there were several outliers in the data, the researcher decided to keep the outliers. See Figure 3 for the box and whisker plot for Null Hypothesis Two.

Figure 3

Box and Whisker Plot for First-Grade BOY scores compared to MOY scores



Assumptions

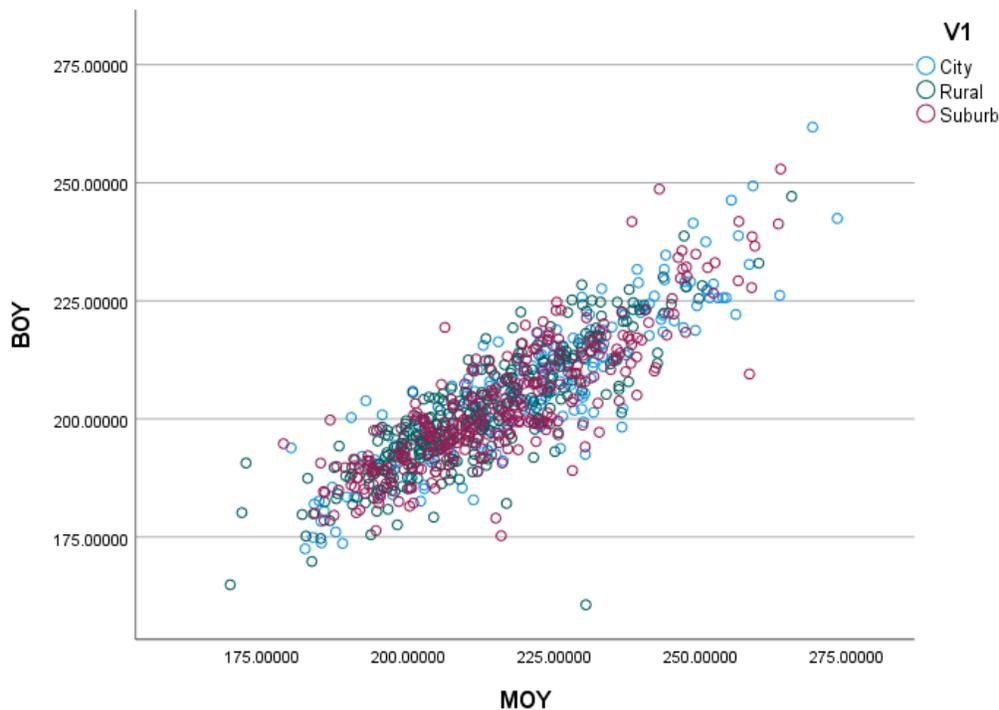
Assumptions were tested to determine if the researcher could proceed with the ANCOVA, including the assumptions of normality, assumption of linearity and bivariate normal distribution, assumptions of homogeneity of slopes, and the homogeneity of variance.

First, normality was examined using the Kolmogorov-Smirnov test of normality because the sample size was greater than 50. There was a violation of normality found in the rural group, but the researcher continued with the ANCOVA analysis. See Table 9 for Tests of Normality.

Table 9*First-Grade Kolmogorov-Smirnov Tests of Normality*

District Type	Statistic	df	Sig.
Rural	.059	348	.006
Suburban	.040	309	.200
Urban	.038	194	.200

The assumption of linearity and bivariate normal distribution were tested using a scatter plot. Linearity was met and bivariate normal distributions were tenable as the shapes of the distributions were not extreme. Figure 4 includes the scatterplot for each group.

Figure 4*Scatterplot- First Grade BOY Scores Compared to MOY Scores*

The assumption of homogeneity of slopes was tested and no interaction was found where $p = .613$. Therefore, the assumption of homogeneity of slope was met. The assumption of

homogeneity of variance was examined using the Levene's test. No violation was found where $p = .098$. The assumption of homogeneity of variance was met.

Results for Null Hypothesis Two

An ANCOVA was used to test the null hypothesis regarding the fluency scores of students in first grade between rural, suburban, and urban settings when using the Istation reading program. The null hypothesis was rejected at a 95% confidence level where $F(2, 847) = 8.804, p < .001, \eta_p^2 = .020$. The effect size was large. Because the null was rejected, post hoc analysis was conducted using a Bonferroni post hoc test. There was a significant difference between the rural group and suburban group (mean difference of $-2.013, p = .01$) and the rural group and urban group (mean difference of $-3.127, p < .001$). However, there was not a significant difference between the urban and suburban groups (mean difference of $-1.114, p = .500$). See Table 10 for multiple comparisons of groups.

Table 10

First-Grade Multiple Comparison of Groups

District Type (I)	District Type (J)	Mean Difference (I-J)	Std Error	Sig.	95% Confidence Interval for Difference	
					Lower Bound	Upper Bound
Rural	Suburban	-2.013	.683	.010	-3.652	-.373
	Urban	-3.127	.794	< .001	-5.031	-1.223
Suburban	Rural	2.013	.683	.010	.373	3.652
	Urban	-1.114	.805	.500	-3.046	.817
Urban	Rural	3.127	.794	< .001	1.223	5.031
	Suburban	1.114	.805	.500	-.817	3.046

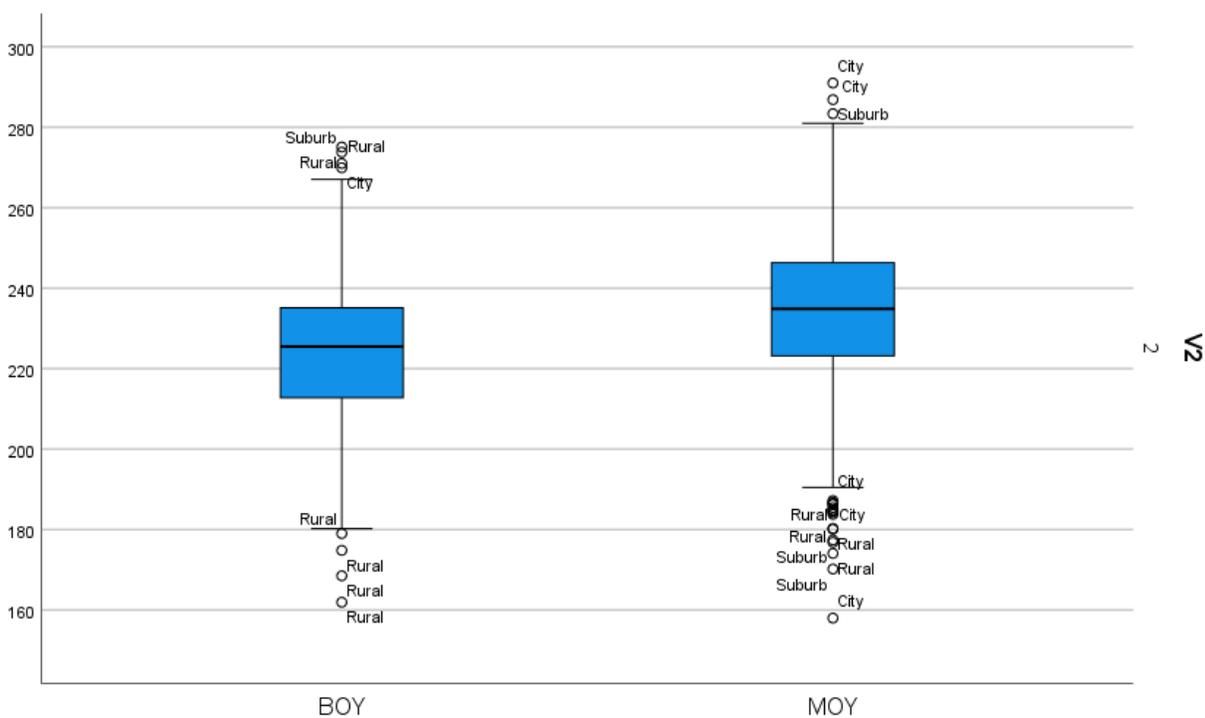
Null Hypothesis Three

Data Screening

data screening was conducted to determine if there were any inconsistencies. Some data was removed due to missing data (either beginning of year score or end of year score). In addition, box and whisker plots were created to look for any extreme outliers within the data. Although there were several outliers in the data, the researcher decided to keep the outliers. See Figure 5 for the box and whisker plot for Null Hypothesis Three.

Figure 5

Box and Whisker plot- Second grade BOY scores compared to MOY scores



Assumptions

Assumptions were tested to determine if the researcher could proceed with the ANCOVA, including the assumptions of normality, assumption of linearity and bivariate normal distribution, assumptions of homogeneity of slopes, and the homogeneity of variance.

First, normality was examined using the Kolmogorov-Smirnov test of normality because the sample size was greater than 50. There was a violation of normality found in the suburban

and rural groups, but the researcher continued with the ANCOVA analysis. See Table 11 for Tests of Normality.

Table 11

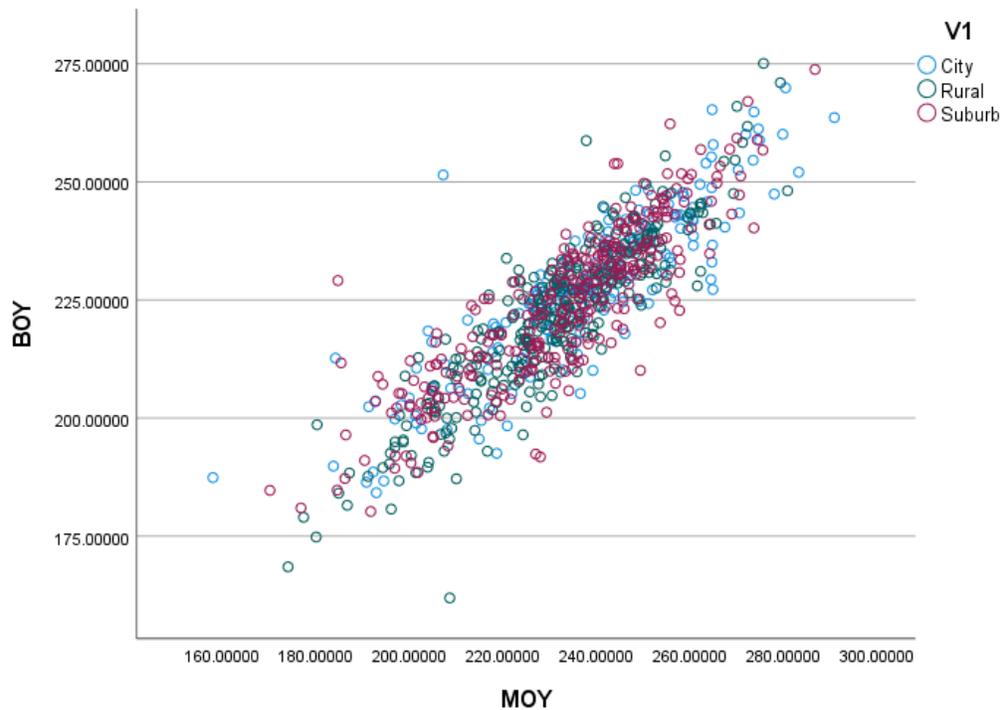
Second-Grade Kolmogorov-Smirnov Tests of Normality

District Type	Statistic	df	Sig.
Rural	.063	335	.003
Suburban	.820	310	.001
Urban	.062	207	.051

The assumption of linearity and bivariate normal distribution were tested using a scatter plot. Linearity was met and bivariate normal distributions were tenable as the shapes of the distributions were not extreme. Figure 6 includes the scatterplot for each group.

Figure 6

Scatterplot- Second grade BOY Scores compared to MOY Scores



The assumption of homogeneity of slopes was tested and no interaction was found where $p = .238$. Therefore, the assumption of homogeneity of slope was met. The assumption of homogeneity of variance was examined using the Levene's test. No violation was found where $p = .015$. The assumption of homogeneity of variance was met.

Results for Null Hypothesis Three

An ANCOVA was used to test the null hypothesis regarding the fluency scores of students in second grade between rural, suburban, and urban settings when using the Istation reading program. The null hypothesis was accepted at where $F(2, 848) = 1.451, p = .235, \eta_p^2 = .003$. Because the null was accepted, there no post hoc analysis was conducted.

CHAPTER FIVE: CONCLUSIONS

Overview

The purpose of the study was to determine how, if any, the location of specific school settings impacted Kindergarten through second grade students Istation reading score. Data was obtained from a school district in central North Carolina to compare the exact variables of the study. This chapter summarizes the findings of the research from the study. In addition, this chapter will focus on recommendations and implications for future research.

Discussion

The purpose of this study was to determine if there was a significant difference between the beginning and mid-year Istation reading fluency scores of kindergarten through second grade students across urban, suburban, and rural school settings. To begin this study, research was conducted to determine the importance of reading fluency to a student's overall reading ability success. Fluency is one of the essential components of a student's capability to attain reading achievement.

Research studies completed over the decades have shown the importance of oral reading fluency and its considerable correlation to students' overall comprehension abilities (Rasinski, 2021; Snow & Matthews, 2016). Research shows that students who do not develop these skills by the end of third grade dramatically increase their risk of school failure. This data can be traced back to the fundamental years when looking at high school dropouts (Snow & Matthews, 2016). The subsequent sections discuss many of the specific studies that have been completed regarding oral reading fluency, including the impact these studies have had on students.

There were three research questions for this study. The first is as follows: Is there a significant difference between the fluency scores of students in kindergarten across school

settings when using the Istation reading program controlling for prior achievement? The first null hypothesis (H_01) states that there is no statistically significant difference between the fluency scores of students in grades Kindergarten across school settings when using the Istation reading program controlling for prior achievement. Results indicated that the null hypothesis was rejected and there was a significant difference between the rural group and urban as well as the rural group and suburban. There was not a significant difference between the urban and suburban groups. This may indicate a need for additional resources and/or testing to indicate validity of Istation where rural schools are concerned.

Many studies have questioned the connection between students' oral reading fluency scores and comprehension as it pertains to school location. The oral reading fluency scores of 1,518 first grade students were critiqued to determine if there was a relationship between these scores and their overall comprehension. These students were in an urban setting where 85% of the students qualified for free and reduced lunch. The comparisons were made using DIBELS (Dynamic Indicator of Basic Early Literacy Skills) and the GRA+DE (Group Reading Assessment and Diagnostic Evaluation). Through the research that was found, oral reading fluency was a high predictor of student's overall comprehension scores in over 80% of the students that were examined (Riedel, 2007).

The second research question was: Is there a significant difference among the fluency scores of students in first grade across school settings when using the Istation reading program while controlling for prior achievement? The second null hypothesis (H_02) states that there is no statistically significant difference between the fluency scores of students in first grade in urban, suburban, and rural settings as measured by the Istation reading program, while controlling for prior achievement. The results indicated that the null hypothesis was rejected. There was a

significant difference between the rural group and suburban group as well as the rural group and urban group. However, there was not a significant difference between the urban and suburban groups.

Another evaluation conducted by Schilling et al. (2007) was completed to determine if students' fall, winter, and spring benchmark testing showed any correlation to their end of year high-stakes assessment scores on the Washington Assessment of Student Learning (WASL). The benchmark testing focused specifically on oral reading fluency. This information was analyzed on 173 first grade students in a mostly suburban area. It was determined that student' oral reading fluency scores, as measured by their benchmark assessments, did play a significant role on students' cut scores on the WASL. Based on these cut-scores, the positive predictive power that September oral reading fluency low scores predicted WASL failure was .41, and the negative predictive power that September oral reading fluency high scores predicted WASL success was .90 (Schilling et al., 2007).

The final research question was: Is there a significant difference between the fluency scores of students in second grade in urban, suburban and rural settings, as measured by the Istation reading program, while controlling for prior achievement?

Since null hypothesis three was centered around second grade students, there could be varying factors that played a role in these results. Second grade students have had more exposure to reading skills. Therefore, their knowledge base is going to be greater than students in kindergarten and first grade. In return, they could be able to score higher on assessments such as Istation. Another explanation could be that second grade students have had more practice with the Istation program itself. Thus, these students are able to perform better on the evaluation.

Implications

Based on the results of two out of the three null hypothesis, educators must examine the role that school setting plays in a student's overall performance. Research has shown that students who attend schools in primarily suburban areas have a greater level of achievement as opposed to their counterparts (Sirin, 2005). This happens for a variety of reasons. However, the implication stands that these students must be provided with additional opportunities to make greater gains than their peers.

Another factor to consider is the Istation program itself. The program is supposed to be designed with students from all backgrounds, locations and statuses in mind. However, this may not be the case for all students. This can hold major implications for the overall success of students partaking in the program. Students from urban backgrounds can come to the table with more negative experiences than their counterparts from more affluent backgrounds. This can cause learning experiences to be far different for those students (Gagnon and Mattingly, 2018).

Although Istation has been proven to be an effective tool to help students with their reading ability, this study has shown that there are some areas for reconsideration. Students from rural areas who are not scoring as well as their suburban and urban peers will likely need additional interventions and procedures in place to help them be successful readers.

Limitations

Although this study shows a variety of student populations, it only included three schools from each of the locations discussed: urban, suburban, and rural. Including all of the schools from each of these areas could help to solidify even more valid results. In addition, only one reading program was used for this study. This provides data based on limited factors. Further

data could be gathered from other reading programs to compare the programs to determine which may be the most beneficial, reliable, and valid.

In addition, only kindergarten through second grade students were used for this study. Although these are primarily the formative years of a student's reading foundation, other skills are also developed in the upper grades as well. Furthermore, Istation is one of many computer-adaptive programs designed to target student's reading ability. Although this study has shown Istation to be a valid and reliable resource, this study did not compare it to other computer-adaptive programs. This could pose additional questions about the reliability and internal validity of Istation compared to other computer-adaptive programs. A threat to the study's external validity can occur in a couple of different manners. We do not know each setting that the students were tested in. Therefore, we do not know if each student was given the same parameters as the others. This could include factors such as teacher observation, quiet working environment, proper directions and more. Furthermore, we do not know what outside influences could have positively or negatively impacted the outcomes of each assessment for the students. These factors could include whether or not the student had a proper night's rest, if they ate breakfast, if an event at home occurred that impacted them negatively before the assessment. Each of these circumstances could play a role in the external validity of the study being compromised.

Recommendations

1. Conduct a study to determine if there was any difference between students' mid-year scores and their end of year score.
2. Conduct an additional study comparing students' beginning of the year score to their end of year score.

3. The study could be replicated with the same parameters, but a school district within another area of the country.
4. Further studies could be conducted to determine Istation's validity and reliability compared to other computer-adaptive programs. Similar parameters such as beginning and mid-year scores could be included. However the focus would be comparing the actual programs themselves and their reliability and validity compared to one another.

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APPENDIX A



Date: 3-7-2023

IRB #: IRB-FY21-22-1102

Title: THE DIFFERENCE IN ORAL READING FLUENCY SCORES AMONG RURAL, URBAN AND SUBURBAN SCHOOL LOCATIONS WHEN USING ISTATION

Creation Date: 5-14-2022

End Date:

Status: **Approved**

Principal Investigator: Christen Lee

Review Board: Research Ethics Office

Sponsor:

Study History

Submission Type	Initial	Review Type	Exempt	Decision
				No Human Subjects Research

Key Study Contacts

Member	Role	Contact
Christen Lee	Co-Principal Investigator	
Rebecca Lunde	Co-Principal Investigator	
Christen Lee	Principal Investigator	
Christen Lee	Primary Contact	

APPENDIX B

school data

347 of many

Christen Lee

[Redacted] to me Wed, Mar 3, 2021, 1:27 PM

Christen,

Attached is the data that was shared with you. Remember to follow all of the guidelines set forth in directions we provided to you and [found on this page](#).

[Redacted]

From: Christen Lee [Redacted]
Sent: Tuesday, March 2, 2021 10:05 AM
To: [Redacted]
Subject: Quick question...

This email originated outside of the [Redacted] organization. Do not click links or open attachments unless you have verified the sender. Remember to send all suspicious emails to [Redacted]

[Redacted]

Good morning! I hope you are doing well! I wanted to send you a quick message and ask a favor. Can you resend the data that I requested? Since I moved my email was disabled and I thought I downloaded it but I had not. Thank you so much for your help!