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THE TEXTS MATTER:
ESSENTIAL TEXT CHARACTERISTICS FOR COMPREHENSION INTERVENTION
IN THE INTERMEDIATE GRADES

By

Tia Botsford Clasen

A dissertation submitted in partial fulfillment of the requirements for the degree of
Doctorate in Education

Hamline University

St. Paul, Minnesota

2021

Dissertation Chair: Dr. Jennifer Carlson, School of Education, Hamline University

Readers:

Dr. Panayiota Kendeou, College of Education and Human Development, University of
Minnesota - Twin Cities

Dr. Kristen McMaster, College of Education and Human Development, University of Minnesota
- Twin Cities

DEDICATION

To my son, Samuel,
for your selflessness and countless sacrifices that this journey should come to fruition.

To my daughter, Alana,
For always being my inspiration to better myself.

To Mother and Jim,
Though I cannot see you, I can feel you with me, and I hope I have made you proud.

To all of my students whom I had the great fortune to teach,
Your struggles have stayed with me, your successes have launched me, and I am forever blessed
for having had the opportunity to learn from and with you.

To Dr. SueAnn Gruver,
For your mentorship, guidance, and support. Golly I wish you were here at the finish line!

To Andrea,
I know you are looking at my journey from above and saying, *you can do this, girl*.
Hell yeah, I could. I did it for both of us.

Finally, to my amazing and supportive husband, Scott,
For your love, patience and amazingly good food while I wrote, slept, and sometimes cursed.
I am forever grateful for you.

It was books that taught me that the things that tormented me most were the very things that connected me with all the people who were alive, who had ever been alive.

- James Baldwin

Literacy is a tool of liberation, both personal and cultural.

-Gloria Ladson-Billings

I do believe something very magical happens when you read a book.

- J.K. Rowling

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CHAPTER ONE: THE PROBLEM

There ain't no journey what don't change you some.
-David Mitchell

Introduction to the Research Questions

What is one trait that humans here on Earth solely possess? Humans have very sophisticated language skills. We are the only animal species on Earth that has a writing system. We create text - sometimes for our own personal purposes (such as a diary), but mostly to communicate ideas to others, which they acquire by *reading*. Therefore, “the writing system matters” (Castles, Rastle, & Nation, 2018, p. 7). Reading authors’ texts is extremely important: the amount of reading and the variety of texts in which students engage is a powerful predictor of their future success (Sparks, Patton, & Murdoch, 2014; Cunningham & Stanovich, 2003; Herbers, et al., 2012; Israel & Reutzel, 2017).

Comprehension - the ultimate goal of reading - is being able to both understand text and make new meaning from it. It provides the ability to communicate across time and space and the ability to create and share ideas in concrete and lasting form. Therefore, scaffolding and support for comprehension early on is critical to later success as a reader and as a contributing member of our human society. Strong readers are strong comprehenders; they read more often, and the amount and the variety of reading in which they engage directly contributes to their academic achievement skills and their ability to obtain a solid education (Cunningham & Stanovich, 1997; Rapp, van den Broek, McMaster, Kendeou, & Espin, 2007; Sparks, 2014). However, many students struggle in reading; and every year that goes by in their educational career where they continue to struggle, a door potentially closes. Poor reading skills can lead to less motivation to

read, which may in turn lead to less time reading and less development of comprehension skills (Cain & Oakhill, 2011; Guthrie, 2015; Troyer, Kim, Hale, Wantchekon, & Armstrong, 2019).

My interest in reading in general and comprehension in particular has been a career-long passion. Now enjoying the 25th year of my education career, my passion for the power of literacy is as strong as it was when I began my career. I continue to cringe when I hear students say “I hate to read,” as reading can literally transform lives. Teaching both elementary school and middle school, I witnessed firsthand the effects of ineffective instruction and intervention with regard to reading comprehension, and students completely disengaged in the texts themselves. Continuing to witness this as a district administrator compelled me to create this study which focuses on the following question: *What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students?* I further guided this research by further focusing on the following sub-questions:

- What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format?
- What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level?

Reading is powerful. It has provided me the ability to travel through time and through worlds; it has offered me the opportunity to see my current world through others' eyes. I focused, when finally becoming a teacher, on how I could get others to love reading as much as I did, and have been continuously learning throughout my career about literacy in general, and particularly how people learn to read.

My love of reading is one reason why I wanted to become a teacher. I earned my bachelor's degree in elementary education in 1995, and spent considerable time learning more about literacy, as I knew the importance that the skill of reading had in school and outside of school. In 2000, I earned a master's degree in curriculum and instruction and again focused on reading, conducting a short but in-depth action research case study on one of my eighth grade students who was a struggling reader and had been his entire school career. Experiencing the joy and success of reading myself, I wanted him to improve his skills in reading and to learn to love it. Ultimately, I wrote my masters thesis on the effects of ability grouping on advanced readers, as I believed the advanced readers were falling through the cracks, not being afforded the opportunity to grow as in their achievement as much as they could potentially grow. They deserved to enrich their life story as much as any other student.

I am an English teacher at heart, and deeply embrace the power of story. The story of my journey in education - as a student, a teacher, and now as an administrator - reflects my deep belief in and passion for education; however, my journey has not been a traditional one. When I was in the classroom, my students often asked me, "If you could go back and do it all over again, what would you do differently?" It was a great question, one that requires deep and continual reflection. In 1995, at 32 years of age, with a second-grade daughter, I graduated summa cum

laude with a bachelor's degree in elementary education after experiencing the pain and shame of dropping out of college and spending eleven years away from learning. Although my career started late, all of my life experiences have helped me connect to my students in ways I would not have been able to otherwise. Being a strong reader certainly provided an avenue for me to hit the restart button. I was able to change my world for the better.

My story reflects my conviction in strong reading skills as a way to change the world. Students throughout my thirteen years in the classroom heard my mantra over and over again, that knowledge is power, and much knowledge comes from reading. Friere (1970) points out that students need to read words *and* the world, and teaching students to become literate means that we must be committed to teaching them the “skills, attitudes, and commitments needed to become citizens who will work for social justice... in the world” (Banks, 2003, p. 18). As a teacher and now a district administrator, I have always believed in the power of literacy as a key factor in the success of my students' futures and, as Maxwell (2013) asked his readers to reflect on why s/he is doing a particular study, I thought it was a good exercise to help ground my work, so I asked it of myself. White (2017) calls out the fact that doctoral students “have a calling they are answering” (p. 16), and in answering Maxwell's (2013) question, I realized my calling. I want to contribute to the body of research on reading comprehension. In order to do this, educators must look carefully at the texts we are placing in front of our students. Not all texts are a one-size-fits-all; our students are not a one-size-fits-all; not all tasks and environments are exactly the same. Furthermore, our students' lived experiences are not exactly the same; children have been building their knowledge of language and learning before they ever begin formal schooling (Luo, Tamis-LeMonda, & Mendelsohn, 2020). We must carefully match texts to the

task and the student. This includes the texts of new literacies, such as text messaging and blogging, and the diverse students from all walks of life who put so much faith, everyday, in our ability as educators.

At the culmination of this journey, I want to make my mark with something that can change the trajectory for a child who is struggling with reading comprehension, because that struggle can lead to a much larger struggle in learning content in other disciplines, and learning about the world in general. I want that child's future to be brighter, filled with more promise and absent of as many obstacles as I can possibly eliminate. This sounds clichè, but it is anything but. My research will provide the foundation for the development of a reading comprehension intervention tool aimed to improve the comprehension skills of young readers. This research will add to the body of research on matching the reader to the text and the task and will provide me the opportunity to come to a deeper understanding of reading comprehension and the impact of successful reading across a school career and in life, and how we are - or are not - creating equitable experiences for students that will provide a brighter future.

Background of the Problem

The act of reading is an interaction between reader, text, and context (Anderson, Hiebert, Scott, & Wilkinson, 1985; Hartman, Morsink, & Zheng, 2010; Kintsch, 1998; Kintsch, 2005; Paris & Newman, 2009; Pearson & Cervetti, 2015). Strong acquisition of reading skills early on leads not only to stronger reading achievement later on in school, but also builds other cognitive skills, such as an increased vocabulary and content knowledge. That ongoing interaction between reader, text and context continues to build both skill and knowledge which, in turn, can lead to

even greater success - in academics and in life (Pressley & Allington, 2015; Sparks, Patton, & Murdoch, 2014). Reading is not just the ability to decode words; a person is literate if they can understand the text they are reading. In our age of information, literacy is an essential skill needed to find the most accurate information in the shortest amount of time possible in order to problem-solve and communicate to others across the globe. Literacy is vital to the success of global societies (Leu, 1997; Leu, et al., 2008). It is the foundation for the acquisition of knowledge outside of one's personal sphere of experience, for engagement within and between cultures, and for a strong global economy. In 2018 alone, according to the World Literacy Foundation (2018), the effects of illiteracy cost the global economy approximately \$1.04 trillion, and contributed to inequality in basic needs, such as hygiene, health, and safety. Underpinning these alarming statistics are the names and faces of people living in poverty, incarcerated, or exploited at least partially as a result of low literacy skills.

Although reading comprehension is vital to a student's reading skills and a predictor of future success, in the United States, a large number of students struggle in reading, as is evidenced by the 2019 National Assessment of Education (NAEP) reading assessment. That report showed that 65% of fourth graders in the United States scored below proficiency, which is down from 2017 and statistically insignificant from results a decade ago (National Center for Education Statistics, 2019). Further, a substantial gap continues to exist for fourth grade students based on race and income inequality, with only the gap between White and Hispanic fourth graders decreasing, albeit an insignificant amount (National Center for Education Statistics, 2019). The NAEP assessment, first administered in 1969 in science, writing, and citizenship, was created to provide data on outputs in education - in other words, student learning - rather than

inputs, such as per-pupil expenditures and attendance. It was changed significantly in 1986 to measure learning in reading, mathematics and science (National Center for Educational Sciences, 2019). The reading assessment is designed to measure students' reading comprehension skills on both literary (narrative) and informational texts.

As the goal of reading is to both understand and create new meaning, these statistics are alarming, yet not new: Cunningham and Stanovich, in 2003, emphasized that the achievement gap for nearly two-thirds of the nation's fourth graders will continue to widen as a result of their weak comprehension skills. These struggles can lead to a lifetime of struggle. According to the National Center for Education Statistics, in 2019, one in five adults in the United States have low literacy skills, which translates into approximately 43 million adults. Additionally, advancements in technology have altered the digital landscape and continue to demand increased effective reading skills for different texts. This study examined the essential text characteristics that can be used to explicitly teach comprehension strategies to a diverse population of third and fourth grade students reading below grade level and what essential text structures are needed for comprehension strategy instruction in a *digital* format, thereby providing comparisons between an offline (traditional, static printed text) format and an online (digital text) format. Additionally, this study examined what additional considerations are needed when selecting appropriate texts for a racially, ethnically and socioeconomically diverse population of students within a classroom in need of reading comprehension intervention.

Statement of the Problem

Reading achievement in the United States in general, and in Minnesota specifically, has remained stagnant over the last decade, with only one-third of fourth graders meeting grade-level proficiency on assessments designed specifically to analyze reading trends and growth (National Center for Education Statistics, 2019). This low level of proficiency has tremendous effects not only on the individual reader, but collectively on global society. Further, classrooms across the United States continue to become more diverse with regard to race, ethnicity, language, and socio-economic status.

Technology, as well, continues to advance rapidly, with the Internet and other technologies continually increasing in literacy worlds (Leu, Kinzer, Coiro, Castek, & Henry, 2013). With this rapidly changing technology come increased demands being made on reading skills - skills that must be taught to be successful in the digital world of the Internet and Information and Communication Technologies (ICTs). While studies continue to confirm the impact of intervention on reading achievement, the *what* that is placed in front of students - the texts themselves, and their essential characteristics with specific regard to comprehension intervention - need deeper research in order to understand the role they play in the interventions. How a person comprehends static text is not isomorphic with how they comprehend digital text; thus we cannot utilize our same understanding of offline reading comprehension (static or printed texts) with online reading comprehension (Dalton & Proctor, 2008; Leu, et al., 2011; Coiro, 2020). Therefore, the *format* of those texts placed in front of students for reading comprehension

intervention, especially with regard to an interactive, digital format versus a traditionally static print format, is extremely important to research.

Research Questions

Due to the struggles that many students continue to face with regard to reading comprehension, a better understanding of successful reading comprehension intervention is needed. The purpose of this research is to identify essential text characteristics for texts that will eventually be included in an online, automated reading strategy tutor. This tool will provide instruction and practice designed to improve deep comprehension for a diverse population of struggling third and fourth grade students, a set of grade levels that are a critical, yet under-supported time of reading development. This research will guide the development of an age-appropriate text library for informational text that is appropriate and interesting for students in grades three and four. To that end, this mixed-methods study explores reading comprehension and the role that texts and new literacies play in answering the central research question:

What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students?

This research is further guided by the following two sub-questions:

- What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format?

- What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level?

Context and Significance of the Research

The term *diectic* refers to a word, phrase or expression for which the meaning is dependent upon the context in which it is used. While not a new linguistic term, it takes on new force as digital tools and new technologies help to cement literacy as deictic in nature. “. . . the definition of literacy has expanded from traditional notions of reading and writing to include the ability to learn, comprehend, and interact with technology in a meaningful way” (Selfe cited in Coiro, 2003, p. 458).

Toward that end, my research serves as a foundational component of a larger research study to develop an online reading strategy tutor that will help improve the reading comprehension of students in third and fourth grade. This is a critical period of reading development, as students are being presented with texts from which they have to learn, but have content with which they are unfamiliar, which could lead to comprehension plateaus (Castles, Rastle, & Nation, 2018; Goldman, Snow, & Vaughn, 2016; Guthrie, et al., 2004; Sweet & Snow, 2003). This online tool will support the strategies of comprehension monitoring, paraphrasing, inferencing, question asking, explanation, and summarization. This tool is aimed to improve the reading comprehension ability of students by providing individualized comprehension instruction in a digital format during times of independent practice, as the findings from the National Reading Panel (2000) show that the benefits of comprehension strategy instruction

begin to be shown after limited instructional time and, as Willingham (2006) explains, once the strategy, or “trick” as he calls them (p. 39) is introduced and explained, students begin to use them and discover they can be used in other situations (Castles, Rastle, & Nation, 2018; Willingham, 2006). The online tutoring tool, once created, will allow students to practice what they have learned, receiving both formative and summative feedback that is generated automatically and immediately, which itself is part of the digital reading experience.

The tool will provide solid benefits for teachers as well. It will be easy to use and adaptable to their curriculum - teachers will be able to load specific texts for individual students and monitor their performance, providing more support as needed in a blended-learning format. In addition, teachers will continue to hone their educational technology skills and knowledge.

Finally, the tool will advance the field of education’s understanding of how students learn to comprehend, especially in a multimodal, digital format. The tool will leverage student engagement in somewhat of a game-based format, which is an emerging field of understanding for education (Squire, 2008; Gee, 2003; Steinkuehler, 2008), and will further inform teacher practice, as it will provide the opportunity for teachers to choose texts that are reflective of the individual student. This will increase student motivation as well.

Digital tools, including the vast wealth of texts easily available on the Internet, provide the reader with a multitude of information to process in those meaningful ways - sometimes simultaneously. For example, Strømsø, Bråten, and Samuelstuen (2003) showed that university students who were more successful at course-end used reading strategies that helped them make more connections across texts. The students’ skills were a culmination of a dozen or more years of literacy instruction, practice, and assessment. In everyday life, as well, people of all ages seek

information digitally to answer questions and make sense of information. One can neither ignore the changing face of literacy nor can we ignore those who struggle with their literacy skills. For those students who struggle in reading, intervention on comprehension must be inclusive of the materials with which a diverse body of students will interact on a daily basis, and must continue to reflect how those texts, and those students, will continue to change over time. The texts matter.

Using the deictic terms *today* and *tomorrow*, increasing a student's literacy skills today leads to increased success tomorrow. But each *today* leads to a different *tomorrow*. As educators, we know that what we do today influences how a student learns - and what success that student will enjoy - tomorrow.

Key Terms

The following terms will provide clarity for the context presented throughout this study. They are listed in alphabetical order.

Comprehension. *Comprehension* is defined as “the process of simultaneously extracting and constructing meaning through interaction and involvement with written language” (Rand Study Group, 2002, p. 11). Toward this end, a reader must decode, identify the words, and use prior knowledge and experience to make meaning. Comprehension is constructive in nature.

New literacies. The term *new literacies* for the purpose of this study is defined as both texts on the Internet and texts used as part of Information and Communication Technologies (ICTs), and the skill needed to comprehend such texts (Leu, et al., 2011). While “new” is a relative term, and “new literacies” was coined in or around 2008, texts today are not only multimodal, they are deictic; therefore, the contexts continually change.

Literacy. The term *literacy* for the purpose of this study is defined as the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society. Further, literacy is plural, being practiced in particular contexts for particular purposes and using specific languages (United Nations Educational, Scientific, and Cultural Organization, 2018).

Offline text. The term *offline text* refers to informational text that is printed and not in a digital format. Such texts include trade books, magazines, newspapers, and textbooks (Coiro, 2011a).

Skill. The term *skill* has been used differently throughout time and across different disciplines, including psychology and education, which has led to a lot of confusion both in research and practice (Almasi & Fullerton, 2012; Afflerbach, Pearson, & Paris, 2008). Reading skills are fluid and automatic, and are defined as “automatic actions that result in decoding and comprehension with speed, efficiency, and fluency and usually occur without awareness of the components or control involved” (Afflerbach, Pearson, & Paris, 2008, p. 368).

Strategy. The term *strategy*, like the term *skill*, has been inconsistently used in schools, which can lead to confusion for students, teachers, and families (Afflerbach, Pearson, & Paris, 2008). A strategy is defined as “a deliberate, goal-directed attempt to control and modify the reader’s efforts to decode text, understand words, and construct meanings of texts” (Afflerbach, Pearson, & Paris, 2008, p. 368). We use strategies deliberately when we want to achieve a

particular goal, and in this case, the goal is comprehension of a text. A strategy differs from a skill in that it is deliberate, rather than automatic.

The terms listed above are used universally throughout Chapters Two through Five, and it is important to build clarity of these terms in the research. Other terms used in this study will be defined in context as they arise in the discussion of the methodology employed, the analyses of the data, limitations and recommendations for further study. The following section provides a brief overview of the methodology utilized for this study.

Overview of Methodology

This research study focused on texts used in a digital comprehension intervention for third and fourth- grade students in a small, urban Midwest public school district who are reading below grade level and were identified by elementary school and district staff for additional comprehension support. The student demographics in this district are quite diverse. Approximately 40% of the elementary student body identifies as Latinx; approximately 30% of the student body identifies as White, approximately 13% of the student body identifies as Black Non-Hispanic; 10.4% identifies as two or more races, and the remainder of the student body identifies as Asian, Native American, or Hawaiian/Island Pacific. The focus on third and fourth grade students was deliberate as this is a critical time of reading comprehension development, yet comprehension has historically been undersupported (Sparks, et al., 2014). Further, the research was done during summer targeted services, which allowed for flexibility with regard to time and materials for students.

This study used both *Design-based implementation research* (DBIR) and *Mixed Methods research*. DBIR includes the active involvement of those who will ultimately be *implementing* the strategy intervention which, for the purpose of this study, are both the teachers and their students. The study used mixed-methods research as a natural continuation of DBIR. There were two iterative cycles, the number determined based on previous findings in the qualitative research focusing on teachers. The *qualitative research* employed a teacher/literacy expert focus group, facilitated by the researcher, whose members worked on identifying the core parameters for informational text development and selection. This group looked at informational texts created to match science standards, and provided feedback on their appropriate use with third and fourth grade students. The second part of the qualitative research focused on student observation with texts and a short interview with all students who participated in the research. The *quantitative research* was two-phased.

In the first phase, a focus group of teachers/literacy specialists was convened to focus on parameters for informational text development and selection. The group helped to formulate the parameters that encapsulated the *essential characteristics* of informational texts. This included, but was not limited to, such characteristics as content, themes, the interests of the students, and the developmental appropriateness of such texts with regard to third and fourth grade readers. The feedback was both qualitative and quantifiable with regard to appropriate use.

The second phase involved a quasi-experiment where the texts were evaluated for appropriateness by students in grades 3 and 4. Students were asked to read subsets of the texts developed and engaged in paraphrasing, a strategy that has shown to be an effective comprehension strategy (Hagaman & Casey, 2016; Hagaman, Casey, & Reid, 2016; Hagaman,

Casey, & Reid, 2012; Kletzien, 2009). Raters scored the level of the students' responses. The researcher observed the students as they were interacting with the texts and typing their paraphrases. After each text, students were to rate the text on interest and ease, and to rate the paraphrasing activity on interest and ease. Finally, the researcher interviewed the students to ascertain whether they could remember how to paraphrase and if they thought paraphrasing helped them become a better reader. As with any research study, there were limitations, which will be outlined in the next section.

Limitations

The spring and summer of 2020 was unlike any other in recent history. The United States found itself in the middle of the coronavirus pandemic, and public schools across the nation had to quickly shift to remote, or distance, learning. This shift in Minnesota took place in early March of 2020. The district in which this study took place began distance learning on April 5, 2020, the Monday after its spring break. The pandemic continued, and schools were unable to open for the rest of the school year. However, districts had a bit more leeway with regard to their summer targeted services structure, albeit adhering to strict social distancing and state mask policies.

The district in which this study took place revised its plans for summer targeted services programming. Many families in the district had limited access to digital technology; many families had unreliable access to the Internet access and many had no access to the Internet during the time of the full distance learning. Further, elementary students had a hard time engaging with on-screen learning even if access was not an issue. Therefore, families of

elementary students recommended for summer targeted services were given the option to send their students in person to school, or participate in summer programming remotely (distance learning). While much more equitable, this choice limited the number of students who would participate in this study; 121 of the 255 elementary students registered for summer targeted services, or 47.5%, opted for in-person learning, which is less than half of the total elementary students enrolled. From that pool of 121 students, 17 dropped; either they never attended or stopped attending and were dropped from the roster once the summer targeted services program began.

This study focused on students in grades 3 and 4. Summer targeted services enrollment for these grades was as follows:

- Grade 3: of the 33 total students registered, four dropped, and 14 of 29 remaining participated on site, for a 48.3% on-site participation
- Grade 4: of the 55 total students registered, 11 dropped, and 18 of 44 remaining participated on site, for a 40.9% on-site participation

Shulman (1999) states, “Research on educational practice is inherently consequential. It is often cross-cultural, carried on when the social class, language, ethnicity, or commitments of those conducting the research are incongruent with those whom they study” (p. 165). I, as a White, middle class, native English-speaking educator may not look like my students, or have the same home language as them, or many of the same life experiences as them. I recognize that and am committed to changing the trajectory of the narrative.

Summary

Because the act of reading is an interaction between reader, text, and context (Anderson, Hiebert, Scott, & Wilkinson, 1985; Hartman, Morsink, & Zheng, 2010; Kintsch, 1998; Kintsch, 2005; Paris & Newman, 2009; Pearson & Cervetti, 2015), it was important for me as a researcher to observe students interacting with the text. A data point (such as a score on an assessment) is one piece of evidence; a better understanding of the origin of that data point comes from the students themselves. More engaged readers are more motivated, have higher reading self-efficacy, and tend to utilize strategies to continue comprehending the text (Castles, Rastle, & Nation, 2018; Massey & Miller, 2017; Wigfield, et al., 2008; Willingham, 2017). Further, it is important to understand the interactions and experiences a diverse body of students have with texts, in order to provide the best texts possible in a reading comprehension intervention. The role of engagement and motivation is found to be a greater problem for students of color, for whom dropout rates are the highest (Fredricks, Blumenfeld, & Paris, 2004; Rumberger, 1987; Rumberger, 1995). The texts, indeed, matter.

Chapter Two further explores the literature on reading comprehension, the changing face of literacy with regard to online texts, and the engagement of diverse populations of students in the act of making and creating meaning through reading.

CHAPTER TWO: THE LITERATURE REVIEW

You don't have to burn books to destroy a culture. Just get people to stop reading them.

- Ray Bradbury

Introduction and Significance of the Topic

The ability to comprehend at high levels continues to be considered an extremely important skill, both in school and throughout one's life. It provides the opportunity for social empowerment, the creation of more equitable aspects of learning, community, work, and personal life, leading to a better life for everyone, especially those who are the least advantaged (Coiro, 2020; Leu, et al, 2015). Therefore, it is imperative that we raise the reading achievement of every student. For the purposes of this study, reading comprehension is defined using the RAND Reading Group Study (2002) definition: "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (p. 11). However, the scope of what is read has been shifting from solely on traditional paper pages (offline) to both offline and digital formats, whether online or on an e-reader or other electronic device (Goldman, Braasch, Wiley, Graesser, & Brodowinska, 2012; Hartman, Morsink & Zheng, 2010; H. J. Kaiser Family Foundation, 2010). Both formats must be included in a comprehensive, evidence-based system of early intervention designed to ensure struggling readers read and comprehend at levels commensurate with their successful grade level peers, and that *all* readers, regardless of ability, continue to grow their reading prowess.

This review of the literature explored what is known about the complex skill of reading comprehension and how that knowledge has continued to expand over the years. Specifically, it explored the interaction of student, text, context, and environment, as every reading experience uniquely involves a person, a text, and a purpose. The text itself, and its characteristics, is the main factor we as researchers and educators have control over; it is our responsibility to ensure every text placed in front of a student optimizes the interaction they have with that text to improve reading comprehension. To that end, this literature review focused on the role of informational text in successful reading comprehension with regard to building knowledge. Next, the role that culture, socioeconomic status, and language play in reading achievement in the elementary grades was examined as it intersects with successful reading comprehension and reading achievement. Further, this review explored the literature on how students interact with texts in a digital format and what that interaction means for students who struggle in reading. With a focus on intervention for struggling third and fourth grade readers, an identified critical time in the acquisition of reading skills (Feister, 2010; Goldman, Snow, & Vaughn, 2016; Sweet & Snow, 2003), this review next explored new literacies and their implication on the changing nature of reading comprehension, including new skills and strategies that are needed to read successfully in a digital world. The chapter closes with a review of literature that explored the role that motivation and engagement have with regard to reading comprehension in the elementary grades.

Research Questions

The main research question of this study focused on identifying and optimizing the text factor in the reader-text-context interaction: *What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students?* As the nature of texts continually change in a digital world, the question was further guided by the following sub-questions:

What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking in a digital format?

Because comprehension is a process that is an interaction between reader, text, and context, the research question was also guided by the following second sub-question:

What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students, and/or (b) students who read below grade level?

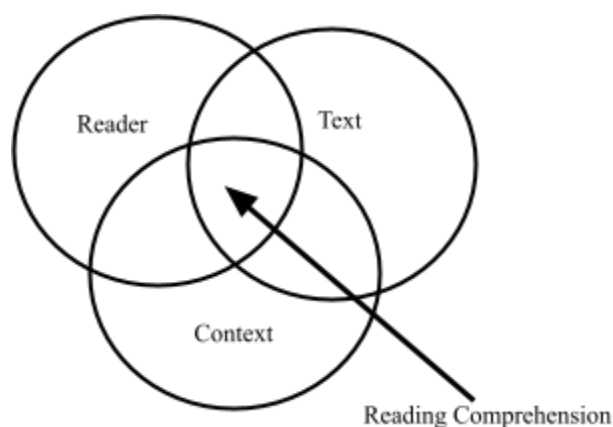
Theoretical Framework

Researchers, policy makers, and educators have spent the better part of six decades trying to improve the reading achievement of students in the United States, during both literacy-specific instructional time at the elementary level and during instruction in specific content areas at the

secondary level. There have been major shifts in thinking about reading comprehension, especially in the last 55 years, but overall there have been three major factors considered throughout all of it: the reader, the text, and context (Fox & Alexander, 2017; Pardo, 2004; Pearson & Cervetti, 2015; RAND Reading Study Group, 2002). This interaction of those three factors, and the resulting reading comprehension, is illustrated in Figure 2.1. Throughout the 55 years that were explored for the purposes of this study, different periods of time had a different major focus on one of those factors as *the* most important factor accounting for successful comprehension, and thus different theoretical models were created.

Figure 2.1

Reader, Text, and Context



In the 1950s and 1960s, models of reading comprehension were more text-centric; in the 1970s, the models tended to be more reader-focused. The decade of the 1980s brought with it arguments between those who wanted the emphasis to be on bottom-up processes (decoding),

and top-down processes (language comprehension), giving rise to the '*reading wars*' - phonics versus whole language instruction. The simple view of reading (SVR) provided some clarity about these two core components and their interrelation. Gough and Tunmer (1986) illustrated SVR with a mathematical equation; the SVR posits that reading (R) equals the product of decoding (D) and comprehension (C), or $R=D \times C$. The simple view of reading can be useful in understanding that in order to become a skilled reading comprehender, neither decoding nor linguistic comprehension (which differs from reading comprehension in that it encompasses listening and language comprehension) is sufficient by itself. It takes both the skill of decoding and the skill of language comprehension to become a skilled comprehender of written text.

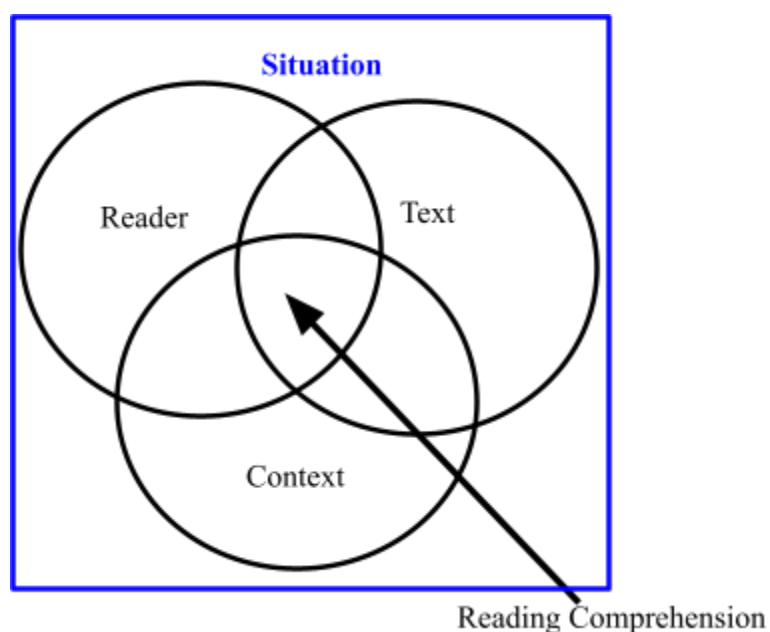
However, reading (R) is much more complex than the simple view can represent. Reading comprehension is the interplay of the cognitive processes of the reader on the text itself, including the text features, the background knowledge of the reader, and the goals and purposes for reading a particular text (Castles, Rastle, & Nation, 2018). As a result, the late 1980s and beyond brought a greater focus on context (Pearson & Cervetti, 2015).

More recently, the element of context has been expanded to include the situation, which is more of a sociocultural element and includes time, place and purpose of the act of reading, which could include the stated or implied task for reading (Fox & Alexander, 2017; Hartman, Morskin, & Zheng, 2010). This updated interaction can be seen in Figure 2.2. The characteristics of all of these elements (text, reader, context, and situation) all interact, thus affecting the process of comprehension. Important characteristics of the reader can include motivation, mood, self-efficacy with reading skills, and content knowledge. Characteristics of the text could include complexity, the content of the text, the genre of the text, even the font. Characteristics of context

could include the activity or task, such as finding evidence to support a main idea or evaluating an argument, or a nurturing reading environment. Finally, characteristics of situation as part of context could include a high-stakes testing situation, reading for pleasure, working with a partner, interrogating the text for absent narratives, engaging in game-based literacy, or making use of background knowledge to build understanding. Reading comprehension, as Castles, Rastle, and Nation (2018) illustrate, is multi-dimensional, multi-faceted, and encompasses a range of processes which are dependent upon many variables (p. 8).

Figure 2.2

Reader, Text, Context, and Situation



The theoretical framework for this study is guided by the construction-integration (C-I; Kintsch & van Dijk, 1978; Kintsch, 1983; Snow, 2002) model of comprehension that provides a more individualized understanding of reading comprehension, such as variance by age, skill,

format, and life experience (Fox & Alexander, 2017; Israel & Reutzel, 2017; Kintsch, 1998; Paris & Hamilton, 2005). The C-I model provides a more balanced view of reader and text in comparison with earlier models of reading comprehension, and also provides an extremely important focus on context, which can be thought of as “a filter through which people perceive the world” (Kintsch, 1988, p. 1). Further, as Pearson and Cervetti (2015) pointed out, this model illustrates the current dominant model of comprehension in the literature today.

The C-I model views readers as active meaning-makers who are creating “mental representations of texts” (Castles, Rastle, & Nation, 2018; Pearson & Cervetti, 2015; van den Broek, 2010). To comprehend a text does not necessarily mean that a person regurgitates verbatim what was read; the meaning is created by forming what is known as a *situation model* (Kintsch, 1998) which continues to grow as the reader continues to read, and culminates with a rich understanding of the text that goes beyond simply what was actually stated in the text (Castles, Rastle, & Nation, 2018; Pearson & Cervetti, 2015). Simply put, the reader is making their individualized meaning from the text, based on the actual words in the text but also using the reader’s own background knowledge or prior experiences, including but not limited to rules of grammar, knowledge of events, specific vocabulary, past experience, even emotions. This can explain why, even though a reader may have loathed *Cold Mountain* (1997), the novel won the Pulitzer Prize for Literature.

The construction-integration model uses both the bottom-up processes, which begin with foundational skills needed for decoding (Angosto, Sánchez, Álvarez, Cuevas, & León, 2013), and top-down processes, which involve larger chunks of text, prior knowledge, and memory, guiding comprehension. Both are an integral part of comprehension, which is highly interactive

(Kintsch, 2005). Further, this model is used to explain how a reader tackles text: If the reader is a fluent reader of the particular text, fewer strategies are needed. The reader is actively constructing meaning, using the words on the page and their prior knowledge through such critical skills as inference. However, even proficient adult readers come to words they do not know in their own reading, or read a passage that is difficult and does not make sense, but as Goodman, Goodman, and Allen (2017) point out, “proficient readers are more flexible in their use of language knowledge and reading strategies than are less proficient readers” (p. 89). At the point of struggle is when adept readers utilize strategies, such as re-reading. Kintsch (2005) states, “only when the normal flow of comprehension breaks down does strategic problem solving take over” (p. 126). Therefore, both skills and strategies are needed for successful comprehension.

Because the landscape of reading and the resulting reading comprehension skills required to traverse that landscape continue to evolve with continually changing technologies, the construction-integration model of reading comprehension allows for the rapidly changing construct of new literacies and the theories surrounding it. The construction-integration model of reading comprehension values the individual meaning-making based on the format of the text, the environment in which the text is being read, the purpose for reading the text and the reader’s prior knowledge and experiences. Therefore, the C-I model can embrace the new literacies that are part and parcel of our lives and help researchers and practitioners recognize that changes to literacy are taking place at many levels (Leu, et al., 2013) and that we must prepare our students through sound pedagogy. By understanding that comprehension is personal and individual, and understanding that new literacies allow for readers to forge their own paths through various

linked texts, the construction-integration model of reading comprehension provides the space needed for exploration of this new horizon of reader, text, context, and situation within a digital world of reading intervention.

This review of literature began with research on reading comprehension instruction in the United States, and discusses the resulting elementary student achievement in reading. Literacy, specifically the component of *reading* under the literacy umbrella, continues to evolve as the context and situation in which one reads continues to evolve (Hartman, et al., 2010; Leu, et al., 2015; Leu, et al., 2013). This review of literature, therefore, explored several important facets with regard to context and situation. First, research on reading as building content knowledge was explored, especially as it relates to the intermediate grades in elementary school, when students are increasingly exposed to expository texts and expected to comprehend them successfully as a way to learn new content. Next, a deeper understanding of the similarities and differences of online versus offline reading comprehension was warranted and further explored. Additionally, this review of the literature focused on the role that motivation to read and engagement of the reader play in successful reading comprehension, with regard to the content and the format of the texts.

Finally, this literature review explored the additional considerations of culture and when choosing texts for a diverse group of readers, especially those who struggle in reading for various reasons, and whose achievement has led to an achievement gap in reading between them and their majority group, grade-level peers. Before discussing the review of literature focusing on context and situation, however, a review of the literature on comprehension pedagogy and

reading achievement in the United States provided foundational context for why this research study took place.

Reading Comprehension Pedagogy and Achievement in the United States

Historically, reading comprehension had been framed as an interaction between reader and text (Anderson, Hiebert, Scott, & Wilkinson, 1985; Hartman, Morsink, & Zheng, 2010; Pearson & Cervetti, 2015), and also the interaction between the reader, the text that has been written, and what is happening at that moment in time (Almasi & Fullerton, 2012; Butcher & Kintsch, 2003; Pardo, 2004; Pearson & Cervetti, 2015; Snow, 2002). Hence, reading comprehension is an extremely complex process, which can be mostly *indirectly* observed (Johnston, 1984; Pearson & Cervetti, 2017). Continued creation of new technologies, however, have forwarded the progress of understanding of reading comprehension through such new technologies as eye movement photography, which are beginning to advance the opportunities for real-time observation of the human mind (Castles, Rastle, & Nation, 2018; Israel & Reutzel, 2017; Shotter & Raynor, 2015). And, outside of those new technologies and infancy of new understandings of how the mind works, there have historically been many definitions of comprehension in the United States, and many periods of time in which the definition has had little consensus (Paris & Hamilton, 2009). These varying definitions and periods lacking consensus have affected the body of research on reading comprehension, leading to wide-reaching implications, both for reading comprehension instruction and assessment, and the creation of federal literacy policies in the United States (Kapinus & Long, 2015; Pearson, 2007; Sarroub & Pearson, 1998). Those federal policies, in turn, have had far-reaching ramifications on

research on education in general, and reading comprehension in particular which, again, affect reading comprehension instruction and assessment (Buly & Valencia, 2003; Durkin, 1978).

The review of the literature for this study constructed a synthesis of the past 55 years of reading comprehension instruction. It focused on literacy reform, beginning with the Elementary and Secondary Education Act (ESEA) of 1965, providing a contemporary focus on where we are in the United States with regard to our students' ability to comprehend visual/written texts. This 55-year period witnessed serious shifts in the way educators and researchers think about processes and implications of reading comprehension for both educational and policy purposes. These implications have had a strong impact on districts, schools, teachers and students (Pearson & Cervetti, 2015) in such areas as assessment, intervention, evaluation, and even funding.

The Elementary and Secondary Education Act created national policy which shaped how students in high poverty settings, and those whose first language was not English, were to be educated (Kapinus & Long, 2015; Spring, 2017). This policy led to a focus on assessment. The first National Assessment of Education Progress (NAEP), also known as The Nation's Report Card, which was created in 1968, analyzed trend data in order to address the needs of students who were not achieving at adequate levels in schools as they existed (Lagemann, 2000). The NAEP framework utilizes both narrative and informational texts in its assessment of reading comprehension, recognizing that while some reading behaviors are text-agnostic, other reading behaviors can vary based on the text with which the individual student interacts (National Assessment Governing Board, 2019). The NAEP data showed that, from 1971 to 1999, average reading scores of 9-year olds and 13-year olds grew only four points, from 208 to 212 and from 255 to 259, respectively; and average reading scores of 17-year olds grew three points, from 285

to 288 (National Center for Education Statistics, 2015). The NAEP framework for reading has evolved over the years. The current framework used is from 2009; although there was an opportunity for a new framework to be developed in 2019, one is just now being created. The nation continues to use the 2009 framework, although students have been accessing that assessment on an online platform since 2017 (National Assessment Governing Board, 2019).

Prior to the 1970s, the term *literacy* was not used in the formal, academic way it is today. Lankshear and Knobel (2011) stated that reading, at that time, was a vehicle to get to the more important “business of school learning” (p. 3), while the term *literacy* was relegated to informal teaching of reading to more marginalized populations of adults who were illiterate as a result of what was then termed “debilitating or dysfunctional conditions and circumstances” (p. 3). Furthermore, as with the term *comprehension*, literacy has had varying agreement on a definition and continually changes (Hillerich, 1976; Turnbull, 2002). For the purposes of this study, *literacy* is defined as “the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. Literacy involves a continuum of learning in enabling individuals to achieve their goals, to develop their knowledge and potential, and to participate fully in their community and wider society” (UNESCO, 2018). In other words, a literate person uses reading, writing, speaking, listening, and *thinking* in order to make sense of, learn, and create new meaning. Reading comprehension is a critically essential component of literacy and, as such, it is imperative that research informs strong and explicit teaching of reading comprehension.

Dolores Durkin, in 1978, published an iconic study focused on reading comprehension instruction. She undertook this study because, in her observations of elementary school

instruction, she found almost no comprehension instruction taking place. She was compelled to begin this study as a result of the National Institute of Education (NIE) completing a Request for Proposal (RFP) outlining the need for a “Center for the Study of Reading whose central concern would be comprehension” (Durkin, 1978, p. 483), outlining an assumption that comprehension instruction was, in fact, taking place. Durkin’s purpose for the study was to ascertain whether elementary classrooms were providing comprehension instruction and, if so, how much time was being allocated to that instruction, especially in the middle and upper elementary grades. Her study revealed little attention to vocabulary and analysis of text structure, and an overwhelming reliance on workbooks and assignment sheets both during the reading block and social studies instructional time. In fourth grade, in particular, Durkin found that a fourth grade teacher was “clearly an assignment giver, not an instructor” (Durkin, 1978, p. 505). Further, with regard to informational text found in social studies and science content, “teaching children to be better readers of content subject textbooks never entered into any of the observed activities” (Durkin, 1978, p. 520). Durkin recommended more “observational studies” and identification of practices that lead to students becoming better readers.

Yet, reading scores continued to stay flat, as the NAEP trend scores illustrate. Due in part to the relatively stagnant scores, Congress convened the National Reading Panel in 1997, and the Panel submitted its iconic report, *Teaching Children to Read: An Evidence-Based Assessment of the Scientific Research Literature on Reading and its Implications for Reading Instruction* to Congress in 1999 (National Reading Panel & National Institute of Child Health and Human Development, 2000). Neither the Panel itself nor the report were without their critics, but both reported positive results for five of six “strategies” studied (Yatvin, 2003). Those strategies,

while never being identified as the essential strategies in the report, subsequently became known as the Five Pillars of Reading. They are: phonemic awareness, phonics, fluency, comprehension, and vocabulary, with comprehension being identified as the “essence” of reading (p. NRP, 2000, p. 228).

Comprehension is identified as a critical and multidimensional component of learning in general, and a strong predictor of later learning success because learning, especially in a school setting, is largely derived from what students read (Cunningham & Stanovich, 2003; Herbers, et al., 2012, Israel & Reutzel, 2017; Kendeou & O’Brien, 2016; Sparks, Patton & Murdoch, 2014). However, despite the critical nature of strong reading comprehension skills, elementary readers have historically acquired active comprehension strategies more informally (NRP, 2000, p. 232). Early literacy instruction, in kindergarten and grade one especially, is mostly focused on the first two pillars: phonemic awareness and phonics (Buly & Valencia, 2003; Duke, 2000; Durkin, 1978; Paris & Hamilton, 2009). The skills that encompass these two pillars precede the ability to decode, which is a skill necessary for comprehension of written text, and many researchers have focused their studies on the necessity and importance of decoding skills (for reviews, Castles, Rastle, & Nation, 2020; Snowling & Hulme, 2005; Storch & Whitehurst, 2002).

Systematic phonics instruction, especially when implemented early (prior to first grade), can improve decoding, spelling, and comprehension (Castles, Rastle & Nation, 2020). However, while necessary, decoding is not *the* single skill needed for reading comprehension (Nation, 2005; Paris & Hamilton, 2009). Comprehension skills are essential for the creation of meaning from text, and both decoding skills and comprehension skills contribute significantly to reading comprehension performance (Kendeou, et al., 2009; Shanahan & Shanahan, 2008; Storch &

Whitehurst, 2002). Buly and Valencia outlined in their 2003 paper cautions and considerations for state policy, and emphasized that the high-stakes tests utilized by states for educational accountability purposes focus on comprehension, yet the stagnant achievement results suggest “there is little data to suggest that working with early readers primarily on decoding will lead to increased reading performance of comprehension when those readers are tested in the 4th grade” (p. 6). Williams (2015) pointed out that the instructional activities teachers take advantage of in teaching phonemic awareness and phonics involve little emphasis on comprehension, especially with and of informational and expository texts.

Yet, even in the primary grades, teachers can make use of rich texts and model think-alouds and other instructional strategies to begin building the background knowledge - in comprehension skills and strategies as well as in general information knowledge - that students will learn more fully as they matriculate through elementary school. Students become more cognitively developmentally ready in third and fourth grade to improve such higher-order skills as the use of comprehension strategies (Del Giudice, 2014; Del Giudice, 2018; Pearson & Billman, 2016). Furthermore, expository and informational texts are replete with “timeless verb constructions...generic noun constructions...[certain] text structures...and graphical elements, such as diagrams” (Duke, 2000, p. 205) - all essential text components that, when learned to navigate successfully, lead to strong reading comprehension later because, as McNamara, Ozuru, and Floyd (2011) emphasize, using knowledge to comprehend depends in part on the text genre and text features. The types of texts chosen for skill instruction are important; the youngest readers can be immersed in a wide variety of both narrative and informative texts which, when used to teach foundational reading skills, can also tap into the multidimensional processes of

reading comprehension needed to understand written information. Additionally, use of such texts will provide much needed background knowledge as students get older.

Beginning in fourth grade, the use of informational texts increases as students are expected to use these texts in order to learn in content areas such as science and social studies (Jeong, Gaffney, & Choi, 2010; Ness, 2011). Yet these texts may present unfamiliar information in complex structures, including language and vocabulary. Additionally, these texts often require more demanding processing skills because of their increasingly complex structure, and they require more complex strategies in order to comprehend, such as inference, summarization, analysis, and metacognition, which is the evaluation of one's understanding of what was read (McNamara, Ozuru, & Floyd, 2011; Santoro, Baker, Fien, Smith, & Chard, 2016). Furthermore, the issue may be exacerbated as students matriculate through the grade levels. Greenleaf and Valencia (2016) discovered that "the vast majority of high school students in the diverse, urban settings where [they] worked had problems with comprehension, not decoding, of the texts they might encounter in school" (p. 237). Their study illustrated that students were woefully inexperienced with the more complex text types and structures, and had inadequate prior knowledge needed to comprehend those texts. Yet students, even those as young as first grade, can learn to read *while* they read to learn, utilizing reading comprehension strategies, which are higher-order processes and skills, to aid word reading skills such as decoding, which are lower-order processes and skills (Castles, Rastle, & Nation, 2018; Landi, 2009; Perfetti & Hart, 2001). Sound explicit reading or meaning-making instruction, such as posing questions; teaching prediction, inference and paraphrasing skills; and synthesizing as students read a text, may help students build meaning and promote their word skills (McKeown, Beck, & Blake, 2009; Pearson

& Billman, 2016). Doing so at an early age will help students, who are interacting with increasingly complex text as they matriculate through the grades, be successful in their learning.

This study was conducted in a very diverse school district in suburban Minnesota; therefore, an analysis of students' reading achievement in Minnesota specifically was warranted. Minnesota historically enjoyed a higher than average achievement on the NAEP assessment in comparison to the nation. However, Minnesota has also had one of the largest achievement gaps in the nation. Therefore, for the purposes of this study, which was situated in the state of Minnesota, an analysis was warranted of recent NAEP results for the state. In looking at the 2019 achievement results of fourth graders for Minnesota specifically, 39% of students achieved proficiency or above in fourth grade reading, which is not statistically significant from the nation's average of 35%, and the scores are slightly down from 2017 (National Center for Education Statistics, 2019). Although the Minnesota Department of Education believes in "striving for excellence, equity, and opportunity" (Minnesota Department of Education, 2020), Minnesota ranked 12th in fourth grade reading achievement in 2019 which, while being a relatively consistent ranking overall for the state since 2003, is well below its ranking of fifth in 2002 (National Center for Education Statistics, 2019). Therefore, the challenges with reading comprehension that have plagued our schools nationwide are the same challenges that have plagued Minnesota for some time.

Currently, all state, national and international assessments employ online tools for assessing offline literacy skills - those skills traditionally used by students when reading print material. The digital age in which we interact, and the increased ability to access information anywhere, anytime, has strong implications for knowledge acquisition in general, and reading

comprehension skills specifically, due to myriad opportunities for interacting with new and diverse text formats and information that one may not have previously encountered. While new learning opportunities are beneficial, they also present new challenges (Coiro, 2020; Coiro, 2011a; Goldman, Snow, & Vaughn, 2016). Students must not only be able to adeptly navigate new text formats, they must also continually build their knowledge of increasingly complex information and content, which occurs with successful comprehension of any text, no matter the format.

Informational Text as a Means to Building Content Knowledge

This study focuses on comprehension as it relates to informational text through the answering of the following questions:

What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students?

The research is further guided by the following two sub-questions:

- What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format?

- What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level?

It was imperative, therefore, to review the body of literature on informational text as a means to build both content and world knowledge, to understand the importance of the role of prior knowledge, and to both understand the role vocabulary plays in successful reading comprehension.

By the time students are in third and fourth grade, they are at an extremely important stage in their reading development, as the proportion of informational text to narrative text has sharply increased from the primary grades to the intermediate grades, especially beginning in grades 3 and 4 (Gaffney & Choi, 2010; McNamara, et al., 2011; Mol & Bus, 2011), and the knowledge gained from reading informational text contributes greatly to comprehension (McNamara, et al., 2011). However, the amount of time spent in reading instruction using informational text is extremely small (Beerwinkle & Duke, 2000; Jeong, et al., 2010; Simpson, 1996; Strong, 2020; Wijekumar, Walpole, & Aguis, 2018), and the instructional activities used with informational text do not require deep comprehension, such as completing a worksheet with low level questions and activities like fill-in-the-blank or matching activities (Duke, 2000; Gaffney & Choi, 2010). In addition, the genre of informational or expository text has structures that differ widely from narrative texts, and comprehension is influenced by the text structure that is utilized to convey the information (Kendeou & Van den Broeck, 2007; McNamara, et al., 2011). This section provides the rationale behind the urgency to use informational text more

frequently and with increased rigor, both by the teacher in their instructional practices, and by the learner in the types of learning in which they are asked to engage. Prior knowledge, how it is acquired through the act of reading, and the role of vocabulary acquisition was explored as it relates to successful reading comprehension, particularly of informational text.

The Importance of Prior Knowledge in Reading Comprehension

Prior knowledge plays a pivotal role in reading comprehension and in content learning, because people learn things from what they read, and they apply that knowledge to new texts in order to comprehend them (Afflerbach, 1990; Wharton-McDonald & Erickson, 2017). Because reading is both an iterative and interactive process, the knowledge and experience a person has and continues to gain helps to build new knowledge and new sense-making (Goodman, et al., 2017; Kendeou & O'Brien, 2017; Kendeou & O'Brien, 2016; Pearson & Billman, 2016; Rupley, 1975; Willingham, 2017; Willingham, 2006). The greater the background knowledge, the more a student is able to draw on it as they read, and the more profound the effects on reading comprehension (Afflerbach, 1990; Castles, Rastle & Nation, 2018; Kendeou & O'Brien, 2016; Oakhill, Cain, & Bryant, 2003; Pearson & Billman, 2016; Wharton-McDonald & Erickson, 2017; Willingham, 2017; Willingham, 2006). The research has shown that when a person is reading and can make connections to the text from existing knowledge they have on a subject, comprehension is enhanced (Afflerbach, 1990; Castles, Rastle, & Nation, 2018; Kendeou, McMaster, & Christ, 2016; Kendeou & O'Brien, 2016; Spilich, Vesonder, Chiesi, & Voss, 1979). The more comprehension is enhanced, the more the student is learning, and this new learning contributes to a student's body of knowledge. This cycle of continuous improvement can have

far-reaching effects on the successful achievement of students. Indeed, it is essential, for as students matriculate through the grades, they must grapple with more complex, nuanced, and challenging texts that require analyzing, interrogating, and synthesizing information found in and across texts (Duhaylongsod, Snow, Selman, & Donovan, 2015; Moje, 2008; Shanahan & Shanahan, 2008; Wharton-McDonald & Erickson, 2017).

Prior knowledge is not limited to information about a subject. Lipson (1982) stated that “verbal knowledge, knowledge of text structure, knowledge about social interaction and human intentionality, and knowledge of causal relations” (p. 244) are all prior knowledge structures, along with prior world knowledge, and a reader brings these prior knowledge structures to any new reading task. In her 2000 study on informational text, Nell Duke attended not only to the contexts and intended audiences of texts, but to “specific linguistic features of text” (p. 205), including grammatical constructions, graphical elements, definitions, and specific text structures, such as comparative/contrastive and cause/effect structures. Further, she argued that a person learns how to read a particular genre, like informational text, through experience with that genre, and that this genre development can, and should, begin early on in a child’s life (pp. 206-207). Doing so provides children with the opportunity to not only learn from informational and expository texts, but to learn *about* them as well, including the structures and vocabulary contained within them. This exposure builds the knowledge base needed to navigate the increasingly complex texts that are used to teach content as students progress through the grades.

Prior knowledge also includes domain-specific vocabulary, such as the term *birdie* in golf. Research continually shows the importance of academic vocabulary to the successful navigation of informational, domain-specific, or content-specific texts in an academic setting

(Bailey & Heritage, 2008; Nagy, Townsend, Lesaux, & Schmitt, 2012). A person who is navigating a text with domain-specific vocabulary with which they are familiar spends less cognitive load determining the meaning of such words - which, as is the case with the golf term *birdie* could have multiple meanings depending upon the topic - and more of a cognitive load comprehending the text deeply, including such higher-order and cognitively complex skills as determining main idea and author's purpose, and determining the importance of details (Afflerbach, 1990). In school, many words are discipline-specific, such as *cytoplasm*, *polynomial*, or *federalism*, and understanding them within the context of reading is crucial to meaning-making and comprehension (Nagy, et. al, 2012). A student who has great interest in history may already have a strong understanding of the term *federalism* and will have an easier time comprehending a text focusing on that concept.

It is not just the amount of prior knowledge a person has that is important; it is also the quality of the prior knowledge that determines successful reading comprehension (Goodman, et al., 2017; Kendeou & O'Brien, 2016). When reading a text, a person is continually using previous knowledge to confirm or disconfirm information being presented in the text, whether presented explicitly or implicitly. If presented implicitly, the reader must rely on inferential processes to confirm or refute the information presented. Thus, a reader can create inaccurate meaning from the text and will ultimately rely on inaccurate prior knowledge in future contextual situations (Kendeou & O'Brien, 2016; Lipson, 1982). Accurate prior knowledge, however, can be built early on in a child's education. As Pearson and Billman (2016) emphasize, readers as young as first grade are naturally curious about the world around them. Young students need opportunities to engage in learning experiences that support learning new concepts and, as

importantly, support learning the words that represent those new concepts (content vocabulary), and opportunities that help them learn *and practice* reading comprehension strategies such as predicting, visualizing and asking questions (p. 24). Engaging in such activities by integrating both disciplinary content and literacy provides an opportunity for young learners to learn to read *and* read to learn, constructing meaning *during* reading to build what will become accurate prior knowledge. Further, for some young readers, informational text is more engaging and interesting than narrative text (Duke, 2000) and provides those students the opportunity to see and build themselves as readers.

Yet research continues to show that, while the Common Core State Standards (2010), with which the Minnesota State Standards in English Language Arts (2010) are closely correlated, call for an increase in the use of informational text, there is still a dearth of informational text being used for reading instruction in the lower elementary grades. Literacy instruction in those grades continues to focus on phonemic awareness, phonics, and decoding, and texts used to teach those skills do not include rich concepts that provide an opportunity for students to make new meaning (Duke, 2000; Goldman, et al, 2016; Jeong, et al., Pearson & Billman, 2016). Students, as they matriculate from the primary grades to the intermediate grades and beyond, are asked to read and comprehend texts that are much more complex - in content, structure, and vocabulary - yet they have not encountered these complex concepts, structures, and specific vocabulary before, so they have not acquired the knowledge and skills needed to navigate effectively and efficiently through these texts. Students can be further stymied in their progress to grow as strong readers if they are not provided with the opportunities to learn new content, text structures and syntax, and context correctly, creating new and accurate knowledge

for the next learning experience. It is easier for students to grasp main ideas by learning new information correctly at the outset, rather than to have to correct inaccurate information (Afflerbach, 1990; Kendeou & O'Brien, 2016; Lipson, 1982).

The Acquisition of Knowledge Through Reading

Reading can open up brand new worlds, and make the reader thirst for more. Reading can answer questions and generate new questions. In other words, reading is a way to fuel curiosity and learn new things. The premise upon which informational text is written is to *inform*, and students' abilities to read and comprehend texts directly affect their capacity to learn new content and build new knowledge - which, in turn, affects their future possibilities (Wanzek, et al., 2018). Students in third and fourth grade are expected to determine main ideas from informational texts, to integrate ideas across two texts on the same subject, to draw inferences by using key information from a text, and to explain how an author uses reason and evidence to support their points (Minnesota Department of Education, 2010). These standards require deeper comprehension of informational, expository and technical texts students encounter in school, which in turn, require that a certain set of skills and strategies be taught in elementary school, such as prediction and inference, to determine the meaning of texts - both explicit and implicit, (Goodman, et al., 2017; Graesser, 2015; Kendeou, McMaster, & Christ, 2016; Wanzek, et al., 2018). Because reading achievement scores have remained relatively stagnant over the last three decades, reading researchers continue to argue for a shift from a focus on the teaching of more generic comprehension strategies to a focus on instruction which makes use of disciplinary

strategies (Goldman, Snow & Vaughn, 2016; Goldman & Snow, 2015), in order for students to better traverse the often unique features of texts in different disciplines.

As stated previously, beginning in third grade, students are expected to determine the main idea of an informational text and provide supporting evidence. While this is an extremely important skill, determining the main idea is a complex and often difficult task; when the main idea is not stated explicitly within the text, the reader must construct the main idea through comprehension of the supporting evidence found within the text (Afflerbach, 1990; Coiro, 2011, van Dijk & Kintsch, 1983), and through inferences made in the text (Kendeou, McMaster, & Christ, 2016; Wancek, et al., 2018). Chall's stages of reading development (1983) outlines reading as a process which changes as readers gain skill and proficiency. She outlined six stages from pre-reading to mature reading. An extremely critical transition time is found between Stage 2 and Stage 3 (Chall & Jacobs, 2003; Chall, et al., 1990), when students are increasingly using reading as a tool for learning. As Chall and Jacobs (2003) state, "If children are unable to make the transition from Stage 2 to 3, their academic success is usually severely challenged" (para. 3). Duncan and colleagues (2007) emphasized that academic achievement gains are cumulative, meaning that learning is a process that involves improvement of already existing skills and mastery of new ones. Students transitioning from Chall's Stage 2 to Stage 3 are encountering texts that are more complex and varied, including words and concepts that are new and unfamiliar to the everyday lived experiences of most students and where, if they are successful, they will continue to build their foundational knowledge.

Foundational concepts and knowledge makes students better readers of both narrative and informational texts, and across content areas, because reading is a process of constructing

meaning and continuing to build knowledge (Cervetti & Hiebert, 2015; Pearson & Cervetti, 2015). While these texts provide challenge for all readers, students from low-income families and multilingual learners, in particular, face an increased challenge, as basic oral language skills and myriad word meanings are critical for understanding increasingly complex and difficult texts (Duncan, et al., 2007; Herbers, et al., 2012; Townsend, Barber, & Carter, 2020), and therefore critical for building new knowledge. Yet students from low-income families and multilingual learners from low-income families in particular face challenges in procuring access to the types of resources needed to build language and literacy skills, including building a strong academic vocabulary, in order to succeed in school.

The Role of Vocabulary Acquisition on Comprehension of Informational Texts

When one comprehends a text, they learn new things. Students leaving third grade and moving to fourth grade are encountering more complex texts from which they are to learn new information. Unfortunately, the now infamous term “fourth grade slump” (Chall & Jacobs, 2003; McNamara, et al., 2011; Sweet & Snow, 2003; Wharton-McDonald & Erickson, 2017) refers to myriads of students who are not achieving at grade level. However, Chall and Jacobs (2003) found that the students’ decline was not in overall comprehension, but had its roots in a decline in word recognition and word understanding (Wharton-McDonald & Erickson, 2017). As Beck, Perfetti, and McKeown (1982) aptly state, “words are just labels for concepts” (p. 508), and for decades, researchers have found that knowledge of word meanings - the concept behind the label - is strongly related to successful comprehension (Anderson & Freebody, 1981; McKenna & Dougherty Stahl, 2015; Rupley & Nichols, 2005; Stahl & Fairbanks, 1986). The more words that

students know, the more they are able to comprehend a multitude of texts at increasingly complex levels. The act of reading is a complicated process, requiring countless connections being both made in the brain and activated as one traverses a sentence, a paragraph, an article, or a tome. Words are verbal and visual representations of concepts, and as a reader travels through a text, they simultaneously comprehend and create new meaning, thus creating new knowledge and new concepts in the mind. Readers do so by building a mental dictionary, which “uses more precise definitions” (Willingham, 2017, p. 79), and they continually build new knowledge.

For the purposes of this study, *vocabulary* is defined “as the number of printed words that are both decoded and understood” (White, Graves, & Slater, 1990, p. 281). In other words, a student’s working vocabulary consists of the number of words the student can read *and* understand. Knowledge of word meanings is strongly correlated with comprehension (Carroll, 1993; Oakhill, Cain, & Bryant, 2003; Rupley & Nichols, 2005). Building a strong vocabulary, however, means more than knowing a lot of words. Rapid lexical access during the act of reading and within a certain situation is critical to understanding a particular text, as many words have multiple meanings which are not universally appropriate in every situation (Ash & Baumann, 2017; Beck, Perfetti, & McKeown, 1982; Mezynski, 1983). *Lexical access* and *quality* is how accurately and how quickly a person can retrieve a stored mental representation of a word (Castles, Rastle, & Nation, 2018; Perfetti, 2007; Perfetti & Hart, 2002); such lexical access and quality includes both spelling (i.e. the difference between *face*, *farce*, and *fare*), and multiple meaning of the same word (i.e. the difference between the meaning of eating *jam* and sitting in a traffic *jam*). The greater understanding of words and word meaning, the more cognitive resources are freed up for comprehension and meaning-making (Beck, Perfetti, & McKeown, 1982;

Castles, Rastle, & Nation, 2018; Perfetti, 2007). Vocabulary instruction, therefore, must include instructional strategies that increase the accuracy of word meanings, fluency with regard to lexical access (how quickly a student can retrieve the correct meaning of the word), and a strong understanding by the teacher of the effects that such accuracy and fluency have on comprehension (McKeown, Beck, Omanson, & Perfetti, 1984).

However, as Michael Graves (2015) pointed out, research indicates that not much robust vocabulary instruction is taking place in classrooms - the kind of vocabulary instruction that engages students in challenging and deep meaning-making word work (p. 124). Indeed, Rupley and Nichols (2005) summarized the historical teaching of vocabulary through an exercise done with college students earning their teaching degree, whereas they asked the students to describe their recollections of vocabulary instruction: “. . . receiving an arbitrary list of words on Monday, looking up the definitions of the words in the dictionary on Monday and Tuesday, doing some type of skill work . . . on Wednesday and Thursday, and taking a test on Friday” (p. 240). Indeed, there is a vast difference between *memorizing* a list of words for a test (the definitional knowledge) and *learning* vocabulary at a contextual knowledge level, which has a stronger connection to text and therefore a stronger ability to aid comprehension (Cunningham & Stanovich, 1997; Rupley & Nichols, 2005; Watts, 1995).

The absence of robust vocabulary instruction and strong word work, such as learning prefixes, affixes, roots and suffixes, is quite unfortunate, as the size of students' vocabularies varies among different linguistic and socioeconomic groups. Systemic barriers, such as poverty and income segregation, which will be discussed further in the next section, contribute to the fact that students from lower socioeconomic groups have less access to literacy resources and

opportunities (Luo, Tamis-Lemonda, & Mendelsohn, 2019; Neuman & Celano, 2001; Neuman & Moland, 2016), and therefore have different language skills when they reach school age (Hoff, 2013) and smaller vocabularies than their more advantaged peers. English Learner (EL) students typically have smaller English vocabularies than their English-speaking peers and have different language development trajectories despite linguistic strengths, and those gaps widen with age, affecting student achievement (Graves, 2015; Hart & Risley, 1995; Hoff, 2013; White, Graves, & Slater, 1990).

The Effects of Race, Class, and Language on Reading Comprehension and Reading Achievement

Schools are often seen as the hearts of a community. The community which is served by the district in which this study took place is a small, first ring urban/suburban district, and because of its proximity to a large urban area, the school district is very diverse in terms of race, class, and home language. While the success of a community can be attributed to data such as business growth, household income and other economic indicators, the future success of a community is based largely in part on the education success of its members which, in turn, is based largely on how well they can read (Angiulli, Siegel, & Maggi, 2004). Disparities in achievement based upon race, socioeconomic status and language, unfortunately, have been a stubborn issue in schools in the United States, and in the district in which this study took place. Therefore, a review of the literature with regard to the effects of native language, socioeconomic status, and race was warranted.

This study aimed to contribute to the body of research on reading comprehension by answering the following questions:

What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students?

This research was further guided by the following two sub-questions:

- What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format?
- What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level?

Children from all walks of life, no matter the race, income status, language, or culture, gain their funds of knowledge through language - in the home, with friends and families, in the community, and through other relationships (Conley, 2017; Moje, et al., 2004; Orellana, Reynolds, & Martínez, 2010). They experience life in their neighborhoods, learn skills from elders; they learn the idioms of their language, and they learn the norms of traversing their part of the world. However, issues of race, class, language, and dialect keep underserved populations in the United States from enjoying the same reading achievement in schools as their White, middle-class peers (Almasi, Palmer, & Hart, 2010; National Center for Education Statistics, 2019; Troyer, et al., 2019). The literacy achievement gap begins at kindergarten entry and

persists throughout a child's school career (Hoff, 2013; Neuman & Celano, 2001; Neuman & Moland, 2019) because of multiple societal factors faced in early childhood. There continues the need to examine the effects of institutional systems and circumstances that marginalize these underserved populations and keep them from achieving at rates similar to their peers of the majority population. Additionally, there continues the need for research on the effects of placing students at the center of the curricula for students from different ethnic, cultural, linguistic and socioeconomic backgrounds, and creating new opportunities for learning based on lived experiences that challenge the continuing view of education found within mainstream value orientations of a largely White teacher community (Heath, 1999), and that embrace the social community in which children also learn.

Learning is personal as well as social, as Goodman, et al. (2017) so succinctly pointed out. A teacher can support or hinder a child's learning, as there is "no simple one-to-one correspondence between what teachers teach and what students learn" (p. 91), and studies have shown that expectations, especially of White teachers, can be lower for English learners and other underserved populations of students, such as students of color, as teachers' expectations are framed by their own class- and experience-based beliefs (Jiménez, et al., 2015; Marx, 2000; Redding, 2019). Indeed, instruction often is not inclusive of or responsive to students' lived experiences and the assets that come with the varying cultures, languages, genders, and races that are and can be enjoyed in classrooms of diverse students (Almasi, et. al, 2010; Emdin, 2016; Moje, 2000). Diversity also continues to play a role in the relationship between text and reader (Pearson & Cervetti, 2017). There can be quite a disconnect between a student's lived experiences outside of school and the experiences they have within the school walls. Students

from varying backgrounds and cultures read, write, and speak for different purposes outside of school, and are quite successful, while in school they are still judged as lacking skill (Hoff, 2013; Shuman, 1986).

Yet, ironically, there is, at least partially, a remedy for this that has been in existence for nearly 30 years, and has been articulated theoretically (for a review of the literature, see Fairbanks, Cooper, Webb, & Masterson, 2017). Students will connect more deeply to and learn more from texts in classrooms where teachers employ instruction that is culturally relevant and responsive, including “bringing the relevance of the text to the child’s own experience to help him or her make sense of the world” (Fairbanks, et al., 2017, p. 460; Kourea, Gibson, & Werunga, 2017). Epistemology, or our conception of knowledge and how it is created, has extremely deep undertones. As Neumann, Pallas, and Peterson (1999) explain, epistemologies are “created through personal and social interactions attuned to the nature of thought (in Lagemann & Shumann, 1999, p. 258). Much of what we know is rooted in our lived experience. It’s been said that a person does not go to school to learn what they already know. However, our lived experiences can help us learn more, but those lived experiences must be validated and honored in classrooms through belief systems and strong instructional pedagogy (Fairbanks, et al., 2017; Ladson-Billings, 2014; Ladson-Billings, 1995).

This section explored, in particular, the effects of socioeconomic status and language on reading comprehension and reading achievement, both within and outside of the classroom. Additionally, this section explored the effects on reading comprehension of the inclusion of texts that reflect the cultures and the lived experiences of young readers, and the role those texts have with regard to reading success.

The Effects of Socioeconomic Status on Reading Comprehension and Reading Achievement

Children begin learning the moment they are born. Oral language plays an important role in that early learning. Additionally, access early on in a child's development to print resources, such as stories, narrative and informational books, poetry and even board books, has a strong positive effect on a student's vocabulary and background knowledge, and, as they continue to matriculate through school, their comprehension of what they are reading, and differences in print exposure are already apparent prior to any formal education in school (Allington, et al., 2010; Evans, Kelley, Sikora, & Treiman, 2010; Mol & Bus, 2011; Neuman & Moland, 2019; Rupley & Nichols, 2005). Because reading is an iterative process, these effects are both immediate and long-term (Neuman & Moland, 2019). The more a child reads and comprehends what they are reading, the more they learn, the more vocabulary they build, and the better they can read increasingly complex texts. The more success they have in reading, the more they will continue to read; they are motivated by that success, which in turn increases reading achievement (Allington, 2014; Pribesh, Gavigan, & Dickinson, 2011; Taylor, Frye, & Maruyama, 1990; Troyer, et al., 2019). Students who read much and read often repeat this cycle and success begets success.

In the United States, however, children from lower socioeconomic backgrounds underperform compared to their middle class counterparts, a well-documented problem that has been persistent in public education for decades (Allington, et al., 2010; Hoff, 2013; Reardon & Portilla, 2016; for a review see Neuman & Celano, 2001). This inequality, however, has been historically attributed to individuals rather than to systems (Duncan, Morris, & Rodrigues, 2011;

Neuman & Celano, 2001), including the American education system and the racial and income segregation of communities and neighborhoods. Emphasis must be placed at this time on the difference between an inequity of *systems*, and the oft-quoted, oversimplified argument of the “culture of poverty” (Lewis, 1966). The latter argues an ongoing, generational view of poverty that includes dysfunction in families and communities, distorting “the concept of culture and absolv[ing] social structures—governmental and institutional—of responsibility” (Ladson-Billings, 2017, p. 82), whereas the former embraces an *environmental* view of poverty emphasizing *place*, and focusing on the impact of social structures, such as the American educational system and the systemic racial and income segregation of communities and neighborhoods. A review of the literature focusing on literacy achievement with regard to income disparity and income segregation was warranted, as lower-income neighborhoods continue to be populated disproportionately by families of color (Neuman & Moland, 2019).

Contrasts in neighborhoods are stark, and the effects are deleterious for children. Higher-income neighborhoods are able to provide resources and opportunities that are easily accessible by families to help ready their students for school. Children in lower-income neighborhoods have limited access to those same types of resources - in their homes and in their communities (Allington, et al., 2010; Ladson-Billings, 2017; Mol & Bus, 2011; Neuman & Moland, 2017). These resources include health and safety resources, green space with parks and other recreational amenities, resource-rich schools that attract high performing teachers, and school library media centers that have a plethora of both print and electronic materials.

Although access to print resources, which speaks to the environment in which a person lives, continues to prove beneficial, the body of research is now just blossoming on the

socioeconomic makeup of communities and the effects therein that the lack of resources and quality schools in low-income communities has on literacy achievement (Lareau & Goyette, 2014; Neuman & Celano, 2001; Neuman & Moland, 2019; Owens, Reardon & Jencks, 2016; Rideout & Katz, 2016). For the purposes of this study, the term *income segregation* is used to describe the system of “residential sorting” (Bischoff & Reardon, 2014) that leads to inequities in access for children. Generally speaking, in low-income neighborhoods, libraries are scarce. Families inconsistently have home libraries of books. Schools in lower income neighborhoods have smaller media centers and classroom libraries than those found in middle class neighborhoods, and they are quite smaller than those in upper-class neighborhoods (Allington, 2014; Pribesh, Gavigan, & Dickinson, 2011). One can only think for a moment about the annual tradition of a school book fair and its impact on school and classroom libraries to visualize the disparities between lower-income neighborhood schools and their middle- and upper-class counterparts. Further - and sadly ironic - is the fact that many school library media centers are open less days of the week than their middle-class and upper-class counterparts, yet middle- and upper-class students frequent them *less* than lower-income students (Pribesh, Gavigan & Dickinson, 2011; Worthy, Moorman & Turner, 1999). The sheer accessibility to a variety of books and other texts has a great impact on reading achievement, as it is hard to read a book that does not exist within one’s community.

Access to books is linked to voluntary reading, especially when there is a wide variety of books from which to choose (Allington, 2014; McQuillan & Au, 2001). Voluntary reading means more time spent reading which, as has been discussed previously, has a direct impact on reading comprehension and reading achievement. Additionally, differences in access to a wide variety of

books and other print materials impact opportunities for learning and thinking that are related to reading achievement, reading comprehension, and reading growth (Neuman & Celano, 2001).

Allington (2014) conveys an important argument, when he states, “. . . when you live in a ‘book desert’, as do too many children from low-income families, one should not expect that these children will engage in much voluntary reading” (p. 21). Yet, simply increasing the access to texts that are of interest to children has a dramatic effect on reading comprehension, growth, and achievement, as has been discussed previously (see also Lindsay, 2013). Additionally, providing extended time to read quality literature in the classroom, especially classrooms which are composed of students whose families have limited economic means, can have great effects on reading comprehension, growth, and achievement. However, schools that serve largely lower-income students typically are in poorer physical condition, have fewer instructional resources, less rigorous curricula, less books per child, poorer quality books per child, fewer computers per child, lower expectations for achievement, and teachers and media specialists with fewer formal qualifications; this is overwhelmingly due to the social structures, including school funding issues (Neuman & Celano, 2001; Owens, Reardon, & Jencks, 2016), and all of these factors come into play with regard to achievement.

The Effects of Multilingualism on Reading Comprehension and Reading Achievement

As has been established in this review of the literature, strong literacy skills are a crucial component of academic achievement. The majority of assessments that students in the United States take to show mastery or proficiency in literacy/English language Arts/reading achievement are in English. In the state in which this study was conducted, public school

districts are mandated to administer the state standardized reading assessment beginning in grades three through eight, and once again in grade 10. However, classrooms across America continue to increase in diversity, and diversity of language. Nearly 45 million immigrants lived in the United States in 2018, the highest number recorded since any census records have been kept (Batalova, Blizzard, & Bolter, 2020). However, most of that population is over the age of 40. According to Batalova, Blizzard & Bolter (2020), “Fewer than 1 percent of immigrants were under age 5 in 2018. . . . Five percent of immigrants were aged 5 to 17 years” (para. 18). Most of the English Language learner (EL) students in schools are children of immigrants who were born in the United States, and much of the rise in overall diversity in schools comes from the rise of English learners (ELs), or multilingual learners (MLLs) (Brown, 2017; Slavin & Cheung, 2005). These learners live in families where the home language is different from the language dominant in school-based instruction in the United States, which is English, and it is important to emphasize that a majority of ELs live in poverty (Brown, 2017; Zong & Batalova, 2015).

English Language learners are often thought about in the collective; however, they are anything but. They come from all over the world, from cultures that speak myriad languages, and they all fall along a continuum of diverse, educational needs. These students must also take a yearly language proficiency assessment, gauging their proficiency in the English language in four domains: reading, writing, speaking, and listening, until they attain scores that show a level of proficiency where they can be exited from service (Minnesota Department of Education, 2020). While the goal of these regulations is college- and career readiness *in the English language*, the system cannot and should not ignore the language assets that students have and use outside of those that are assessed through formal schooling. They include rich language that

serves many communicative and cultural purposes and are found in normal, daily routines, situations, and interactions (Goodman, et al., 2017; Tong, Irby, Lara-Alecio & Koch, 2014).

Strong literacy skills are a crucial component of academic success, especially in subjects that are academically and conceptually demanding, such as science. Furthermore, the lack of strong literacy skills is evidenced by graduation and the high dropout rate among students who struggle in reading (Ardasheva, Y., Norton-Meier, L., & Hand, B, 2015; Cook, Pérusse, & Rojas, 2012; Hoff, 2013). In 2016 the national graduation rate for ELs was 67%, which is up from 2010, but still lagging far behind the non-EL average of 85% (U. S. Department of Education, “Graduation Rates,” n.d., para. 1). Latinx dual language learners make up the largest population of ELs in the United States, although the largest majority of them are United States citizens, born in the United States (Hoff, 2013; U. S. Department of Education “Who Are English Learners,” n.d., para. 1), and for the purposes of this study, this statistic is important: Latinx students make up the majority population of the ELs learners in the district in which this study took place.

A review of the literature showed that the development of literacy skills is quite similar whether a student is an EL learner or a student for whom English is their first language, and the learning of literacy skills in a student’s native language can form the foundation for a successful transfer of skills to a second language (Angiulli, et al., 2004; Brown, 2017; Palmer, Shackelford, Miller, & Leclere, 2007), but much depends upon the way transfer is taught. Like non-EL students who are from lower socioeconomic families, “[l]iteracy is not learned differently in school and out of school. If there is a difference in success, it is the way literacy is taught in school, not the way it is learned” (Goodman, et al., 2017, p. 93). Proficient bilingual readers have been explicitly taught both transfer skills and strategies, vocabulary acquisition strategies, and

were also taught to recognize the similarities and differences in each language (Brown, 2017; Palmer, et. al, 2007). There is a relationship between multilingual children's oral language skills in their heritage language and the acquisition of literacy in English, especially when the student's first language uses phonetic orthographies as English does (Slavin & Cheung, 2005). The skills of phonological awareness, awareness of morphology and higher-order comprehension that a child learns in their heritage language transfer to the learning of English literacy as well, and when measuring language knowledge in both languages combined, bilingual children are equal to, or sometimes even exceed, their monolingual counterparts in vocabulary acquisition (Hoff, 2013, p.10), concepts of print (Bialystok & Feng, 2011), and greater phonological awareness (Bialystock, 2003). This framing has strong implications for both instruction and learning, and ultimately academic success, especially when taken from an asset-based point of view.

While proficiency in the English language of ELs lags behind their English monolingual peers, especially with regard to English vocabulary knowledge and English word-learning strategies, strong instruction can help ELs catch up (Brown, 2017). However, the instruction must be carefully planned to reduce cognitive overload. EL students are learning content in tandem with language, and texts, especially informational texts in content areas, can be "lexically dense" - that is, have a high number of content words per sentence (Ardasheva, et al., 2015), which is difficult for many students, and can slow text processing and comprehension, especially for EL students who are acquiring both general and specific academic language. Furthermore, although explicit comprehension strategy instruction is beneficial, it, too, can overload EL learners, especially young EL students. Therefore carefully planned instruction that includes

modified approaches is more beneficial, such as visual and linguistic scaffolding, graphic organizers, cooperative grouping, and concrete examples (Brown, 2017; Ardasheva, et al., 2015).

Explicit vocabulary instruction and the minimization of the use of out-of-context instruction and memorization activities are two additional ways to strengthen comprehension instruction for all students, especially ELs and their low-socioeconomic peers. Out-of-context activities, such as the use of low-level worksheets and word lists counter the fact that people use literacy and/or language everyday, as literacy encompasses speaking and listening as well as reading and writing. Literacy is firmly rooted in social situations. Even reading a book in a solitary environment is a social situation, because the reader is interacting with the author's words, thoughts, purposes and intent. Communication is taking place. However, in a classroom, that social situation rooted in the dominant language may be unfamiliar to students for whom English is not their dominant language. Strong reading comprehension is linked to strong oral language skills, including a wide vocabulary and strong understanding of syntax (August & Shanahan, 2006; Hoff, 2013). The dominant language of American schools is English, and English is prolific in examples of figurative language, especially idioms, which teachers use in roughly 1 out of 10 words in their instruction (Palmer, et al.). Castles, et al.(2018) highlight the nuances of the English language, such as idioms and other figurative language, and their importance for second language learners: "For second-language learners, reading comprehension processes are not deficient in themselves, but limitations in reading comprehension might follow from differences in knowledge relative to children whose first language is the majority language" (p. 29).

An EL student may be deemed deficient in literacy, when the truth is that they may be lacking in the understanding of the nuances of the English language, and skills of academic literacy - reading, writing, speaking and listening across content in that dominant language of schools in the United States. However, bilingual children have experiences in another language that provide background knowledge for understanding but are not reflected in their English vocabularies (Hoff, 2013). Given the proper support, instruction, motivating activities connected to the students' lives, and adequate time, EL students can learn English at levels required to achieve academic success in school (Angiulli, et al., 2004; Hoff, 2013; Palmer, et al., 2007; Slavin & Cheung, 2005) and can use the language when needed throughout their professional and personal lives in a global society.

New Literacies, Online Reading, and the Changing Nature of Reading Comprehension

The Internet, one of our most transformative technologies, has rapidly become the defining place to find information and to communicate with others; indeed, the scale of change that the Internet has brought is unprecedented with regard to the use by the number of people in the number of places and in the short amount of time (Castek, et al, 2015; Coiro, Knobel, Lankshear, & Leu, 2008; Roser, Ritchie, & Ortiz-Ospina, 2020; Wyatt-Smith & Elkins, 2008). In 2016, 76% of the population in the United States was considered Internet users (Roser, Ritchie, & Ortiz-Ospina, 2020, para 6). Technology has changed the way texts are displayed and connected; therefore, technology has changed the way we acquire and read information. K-12 students in the United States, like adults, are increasingly using the Internet to find and process their information (Goldman, Braasch, Wiley, Graesser, & Brodowinska, 2012), and both the

Internet and wi-fi create new spaces for social interaction, which requires new social practices and understanding, including comprehension of those social practices, such as blogging, text messaging, and the use of email (Leu, et al., 2015).

While the term *online reading* continues to be used, it is gradually becoming engulfed in a more precise term, which not only eliminates the separation of online reading and offline (printed) reading, but encapsulates more what the reader is doing, which is utilizing strategic searching often to solve a problem or do research on an issue (Wharton-McDonald & Erickson, 2017), and “connect[ing] social practices, people, technology, values, and literate activity” (Selfe & Hawisher, 2004, p. 2, as quoted in Wyatt-Smith & Elkins, 2008). This term is called *new literacies* (Castek, Coiro, Henry, Leu & Hartman, 2015; Coiro, 2011a; Coiro, 2020; Coiro, Knobel, Lankshear, & Leu, 2008; Gallego & Hollingsworth, 1992; Haetman, Morsink & Zheng, 2010; Leu, et al., 2008; Leu, et al., 2015), which encompasses social practices, the act of writing (using and creating knowledge), and cultural contexts, including the literacies found in students’ communities and personal lives (Coiro, 2011a; Gallego & Hollingsworth, 1992; Wyatt-Smith & Elkins, 2008), as well as technical skills.

The term itself is often used in different ways, but it overarchingly reflects the belief that the idea of *literacy* (used here in the singular) is rapidly changing and transforming as new technologies emerge to include multiple *literacies* (used in the plural) of community literacy, disciplinary literacy, and social literacy, which is collaborative in nature (Gallego & Hollingsworth, 1992; Hartman, et. al, 2010; Leu, et al., 2015; Wyatt-Smith & Elkins, 2008), and for which multiple texts are inherently used in relation to other texts in the act of comprehending (Hartman, et al., 2010). The Internet is a global network capable of providing infinite, connected

information in a myriad of different text structures (blogs, wikis, videos, chats) with a simple click of a key on a keyboard. Literacy is no longer a static construct; it changes continually, and comprehension of all of the various texts, including evaluation with regard to accuracy and validity of those texts, becomes more complex and requires additional skills, placing more processing demands on the reader (Baker, 2010, Coiro, Knobel, Lankshear, & Leu, 2008; Leu, et al., 2015). However, traditional education, especially in the elementary years, has lagged in its ability to teach the skills required to navigate the demands that the new literacies require (vanDijk & van Deursen, 2014).

If skills required to become adept at online comprehension are not taught at an early age in school, the situation is even more dire, as there is still a strong digital divide outside of school, never more publicly pronounced than during the COVID-19 pandemic. According to recent research from the Pew Research Center, “35% of households with children ages 6 to 17 and an annual income below \$30,000 a year do not have high-speed Internet connection at home, compared with just 6% of such households earning \$75,000 or more a year,” and this issue is more pronounced for low-income students of color (Auxier & Anderson, 2020, para. 4). This is not a new issue; the Pew Research Center reported similar data in 2012 (Leu, et al., 2015), and is an important factor in the disenfranchisement of already marginalized students, as the home has become a key factor in learning digitally (Leu, et al, 2015; Rogers, 2016; Wyatt-Smith & Elkins, 2008).

While the term *digital divide* was coined during the Clinton administration to define the inequitable access to computers, the Internet, and other information and communication technologies (ICTs), the term has evolved over the last several decades to include inequalities in

technology skills, how those skills are acquired, and how the technologies are used in daily life (Rogers, 2016). In order to eliminate today's digital divide, students must be taught how to navigate digital texts, and must be provided with ample opportunities for practice with engaging tasks. The types of digital texts available through blogs, social media, websites and the like, have altered the landscape of what we read, and students even in elementary school must be taught how to navigate it in order to access, process, communicate, and comprehend the overwhelming abundance of information that is at their fingertips.

A testament to this altered landscape is the recent National Council of Teachers of English (NCTE) chat on Twitter and announced on an NCTE blog post: "Which qualities do you believe are the most important to be literate in this digital age?" (NCTE, 2020). However, as evidenced by the plethora of posts on social media and conflicting news reports, anyone can post just about anything on the Internet and tout it as "real" or "fake" information. As consumers of these texts, it is incumbent upon us as readers and users of the information to discern the accuracy of informational digital texts in order to make sense of them. This is part of comprehension: evaluating the validity of the information read in texts.

Unfortunately, students in the United States do not receive adequate, explicit digital reading comprehension skill instruction (Leu, et al., 2008), even though students can become better readers through the explicit teaching of comprehension strategies - strategies that are used for offline (printed) texts but that can be transferred to online reading environments (Almasi, et al., 2010; Brown, Pressley, Van Meter, & Schuder, 1996; Guthrie & Cox, 2001; Pressley & Allington, 2015). Digital reading skills have as their foundation the traditional printed text reading skills of vocabulary, word recognition, response to literature, and comprehension, but

offline reading comprehension skills and online, digital reading comprehension skills are not isomorphic (Leu, et al., 2013; Coiro, 2007; Mokhtari, Kymes, & Edwards, 2009). A person needs both types of comprehension skills to fully comprehend what they read online, and a broader understanding of reader, text, context and purpose, as well as environment, is needed by both the literary community and educators (Coiro, 2020). Specifically, Coiro (2003) outlined new reading practices gained through the use of the Internet to read, such as different interaction with text (e.g. hyperlinks), types of background knowledge; and new activities, such as creating and publishing multimedia projects and participating in digital conversations.

However, no state reading assessment to date includes the assessment of digital reading comprehension skills, nor does the National Assessment of Educational Progress (NAEP), even though the Common Core State Standards (CCSS), which the state in which this study took place is completely aligned, and actually has included additional media literacy standards, requires that students use technology and digital media to comprehend (English Language Arts Standards>Anchor Standards>College and Career Readiness Anchor Standards for Reading, n.d.; English Language Arts, n.d.). However, The Organisation for Economic Cooperation and Development (OECD) has shown it values reading in a digital environment. The OECD launched the Programme for International Student Assessment (PISA) for the first time in the late 1990s, and in 2018 the PISA reading assessment focused on “reading in a digital environment” (Leu, et al., 2008; Graesser, 2015; OECD, 2018). That said, the PISA assessment is not utilized by any state for educational accountability purposes under the Every Student Succeeds Act (ESSA), due to the fact that PISA uses a random sampling of 15-year old students from schools throughout districts and states, and from countries that volunteer to take part in the

assessment (OECD, 2018). This assessment has no consequences on schools and districts, unlike state standardized tests, which currently assess only offline reading skills but are used by states for accountability purposes to satisfy federal law. State accountability tests have public consequences and with them, the adage that what gets tested gets taught. In other words, state accountability tests impact the content and materials that teachers teach and students learn (“What Gets Tested Gets Taught,” 2018). With no current assessment of digital reading skills, online reading comprehension and strategy instruction is being under-taught, and under-assessed.

As Leu, et al. (2008) emphasize, “To continue ignoring online reading comprehension in reading assessments and during classroom reading instruction is to reify a static and increasingly less-relevant understanding of reading comprehension in a world that has gone online, global, and networked” (p. 335). Stated previously, students are increasingly using the Internet and other online and technology tools to find and process information, as the Internet and social media apps have a wealth of informational text. If students struggle in reading, however, they are inclined to dislike reading and to read less (Cunningham & Stanovich, 1997; Herbers, et al., 2012). New literacies present challenges, especially for students who already struggle with traditional print reading, in terms of fluency and critical reading habits (Dalton & Proctor, 2008). The less they read, the less motivated they are to read and the further they fall behind, leading to long-term academic trajectories that are hard to disrupt (Herbers, 2012). Motivation and engagement play a large part in student success, and technology can provide a helpful environment for that motivation and engagement, especially when students are taught how to navigate that environment. Digital texts can increase the engagement in the reading process for struggling readers through the use of multimedia, graphic images, and even the use of Command

+F, and various digital text features and approaches, such as multimedia and gaming support engagement as well (Dalton & Proctor, 2008; Leu, et al., 2013). Further, computer-based reading and learning provide the arena for independence, choice, and different formats in which to learn, and can provide opportunities for practice, intentional scaffolding, and tutoring (Hooshyar, Ahmad, Yousefi, Fathi, Abdollahi, Horng, & Lim; 2016). Multiple text options and opportunities for engagement through different online tools can influence students' self-regulation with regard to reading (Azevedo & Cromley, 2004; Kulikowich, 2008; Massey & Miller, 2017) and provide the environment in which reading can be engaging and students are motivated to learn.

The Role of Engagement, Motivation, and Attitude in Reading Comprehension

Because comprehension is inherently an interaction between the text and the reader, this section explores the role that engagement and motivation in the act of reading imparts on reading achievement. As stated previously, successful reading achievement leads to success in school and beyond. Two other factors that relate to school success are the engagement of the student in school, in school subjects, and the motivation to learn (Duke, 2000; Guthrie, 2015; Guthrie, et al., 2004; Reschly & Christenson, 2012; Troyer, et al., 2019), including the motivation to read and engagement in the act of reading, both within the school walls and outside of school, especially in the summer (Duke, 2000; Duke & Martin, 2015; Guthrie, et al., 2006; Mol & Bus, 2011; Troyer, et al., 2019).

Scholars have differed on their use of the terms *motivation* and *engagement* - some using the terms interchangeably, some keeping the two terms more distinct (Reschly & Christenson, 2012; Unrau & Quirk, 2014), but both terms have been used to describe factors that lead to

reading behaviors and reading achievement. Further, there is not full agreement in the research on the precise definitions of the two terms. *Motivation* is generally thought to be an internal and malleable process which includes emotions as well as thoughts and beliefs that is an influential force, but that can be shaped through the use of different factors (Guthrie, et al., 2006; Troyer, et al., 2019; Unrau & Quirk, 2014; Varuzza, Sinatra, Eschenauer, & Blake, 2014). *Engagement*, like motivation, also has many definitions but is connected to a person and their individual actions (Reschly & Christenson, 2012; Unrau & Quirk, 2014); as well, engagement also is thought to be malleable (Fredricks, Blumenfeld & Paris, 2004). That motivation and engagement are seen as being malleable is significant for education researchers and educators alike, as it means that both can change as a result of student experience. For the purpose of this study, engagement is viewed as action and motivation as intent - somewhat separate but very much related concepts. Further, and more importantly, both concepts are a significant predictor of students' reading comprehension and achievement (Guthrie, et al., 2010; Reschly & Christenson, 2012; Troyer, et al., 2019; Varuzza, et al., 2014).

Engagement inherently links different contexts to the students, including lived experiences outside of school; relationships with others, such as peers; and the school experiences themselves, including relationships with teachers. Students spend the majority of their formal school experience in classrooms with teachers, so the environment that teachers create in their classrooms, including the instructional practices they employ, affect how students see themselves as learners and help to shape their attitude toward reading (Varuzza, et al., 2014). When a student is engaged in a learning experience, they are active: they are active listeners, active participants in discussion, active writers, actively engrossed in a text; in other words, they

are actively learning. Varuzza et al. (2014) also found that students enjoyed reading activities that utilized oral language interaction - in other words, discussion that helped the students further understand and enjoy the readings. The study conducted by Varuzza and his colleagues was of particular interest, as their study involved large populations of Hispanic, low socioeconomic and English language learners (Varuzza, et al., 2014), which is critical to this study and to this literature review. It has been established in this literature review that low socioeconomic students, students of color (especially Black and Brown students) and students for whom English is not their first language continue to struggle in reading achievement. Further, as Guthrie and Cox (2001) explained, engaged readers “are intrinsically motivated to read for the knowledge and enjoyment it provides” (p. 284). They read often, learning about new worlds as they traverse their texts. They enjoy the act of reading, especially of and with texts that are of great interest to them.

Motivation, on the other hand, is more nuanced, as it encompasses values and beliefs, along with behaviors (Guthrie, 2015; Guthrie & Wigfield, 2000; Troyer, et al., 2019; Unrau & Quirk, 2014; Varuzza, et al., 2014). While motivation is a difficult concept to measure, as it is seen as multidimensional (De Naeghel, Van Keer, Vansteenkiste, & Rosseel, 2012; Varuzza, et al., 2014), as it encompasses feelings, emotions, and desires, it has been found to be a strong predictor of comprehension assessment scores, strategy use and engagement (Varuzza, et al, 2014). Motivation has classically been delineated into two types: intrinsic motivation and extrinsic motivation (De Naeghel, et al., 2012; Massey & Miller, 2017; Unrau & Quirk, 2014; Guthrie, 2015). While extrinsic motivation can propel our behavior, it is intrinsic motivation that has a long-term impact on reading achievement (Guthrie, 2015).

It is important to understand the concept of reading motivation in order to help students stay motivated to read, as different motivations can present themselves in either positive or negative forms, either driving students to reading or pushing them away from reading (Guthrie, 2015; Guthrie, et al., 2006; Naeghel, Van Keer, Vansteenkiste, & Rosseer, 2012). Motivation has been historically viewed in the United States as very individual (Massey & Miller, 2017; Guthrie & Wigfield, 2000), but reading comprehension strengthens as a result of the student being engaged in the text, motivated to comprehend with intentional reading purposes, and engaging with tasks within the context of interesting texts (Coiro, 2011a; Duke & Martin, 2015; Guthrie, et al, 2006), all of which can be influenced within a classroom context.

Engaged and motivated readers are also strategic; less engaged readers show less use of reading strategies to comprehend a text (Guthrie & Cox, 2001; Wigfield, et al, 2008). Strategy instruction can increase engagement and motivation along with reading comprehension, using several approaches, such as self-monitoring, gleaning main ideas, questioning, summarizing, paraphrasing, and inference (Wigfield, et al., 2008). Relevant to this research are those adopted in Concept-Oriented Reading Instruction (CORI; Guthrie & Cox, 2001; Guthrie et al., 1996, 2007; Wigfield et al., 2014). Concept-Oriented Reading Instruction is focused on informational texts to explicitly teach reading strategies, and the elements of CORI are sound instructional practices. Implemented in CORI are six teaching practices to increase student motivation: 1) providing thematic content information, 2) optimizing choice, 3) explicit teaching of reading strategies, 4) hands-on activities, 5) providing interesting texts, and 6) collaboration (Guthrie & Cox, 2001; Guthrie, et al., 1996, 2007). Other studies have shown that these six are effective, along with an additional variable, which is having reading goals (Guthrie & Cox, 2001; Wigfield,

et al., 2008). Students who experience teaching practices like those found in CORI have shown larger comprehension gains and demonstrated both greater reading strategy use and reading motivation than those given only strategy training or traditional reading instruction. These effects have been found at both third grade (Guthrie et al., 2004) and fourth grade (Wigfield et al., 2008).

Motivation to read begins to decline as children get older, beginning near the end of the elementary years (De Naeghel, et al., 2012; Skinner & Pitzer, 2012; Troyer, et al., 2019; Varuzza, et al., 2014; Wharton-McDonald & Erickson, 2017). However, this decline in motivation is more pronounced for students for whom reading is a struggle; they take less pleasure from reading and this has a cumulative effect on both reading achievement and the motivation to learn (Wharton-McDonald & Erickson, 2017). When students are not given choice in reading, or when students feel the texts are irrelevant or they do not find themselves or their experiences reflected in the books they read, their intrinsic motivation to read declines, as they feel devalued not only in the classroom, but in the larger society for which the classroom is an extension (Bishop, 1990). This issue can be mitigated, however, through the structure of a positive learning environment. Skinner and Pitzer (2012) called attention to the belief that students “come with a wellspring of intrinsic motivation that does not have to be acquired and cannot be lost” (p. 33). Gay (2010) spoke eloquently about the creation of learning spaces that celebrate students, especially students of color, asking teachers to engage students “to and through their personal and cultural strengths, their intellectual capabilities, and their prior accomplishments” (p. 26). The creation of a culturally inclusive, more engaging classroom environment that includes strong

pedagogy, can build student agency and offset the natural decline in reading motivation that students experience as they get older (De Naeghel, et al., 2012).

Culture and ethnicity play a central role in engagement, especially given the underachievement of African American, Latinx, and American Indian students in the United States and the achievement gap of these populations and their White peers (Bingham & Okagaki, 2012). Engagement and motivation take on a more urgent role for students who are experiencing structural racism within impoverished communities, negative stereotypes, and systemic racism in formal schooling whereby students of color do not feel included or acknowledged for who they are (Reynolds, Sneva, & Beehler, 2010; Tatum, 2006; Thomas, 2018), as their prior knowledge and lived experiences are less likely to be prominent in many of the instructional materials and assessments used in classrooms (McCullough, 2013). Additionally, many students of color lack positive role models within an academic setting - including teachers of color and positive representation in texts read in school, as it is as important for students to make personal connections to their school experiences and learning as it is to provide students with new experiences and learning (Bishop, 1990. Christ & Sharma, 2018; Tatum, 2006).

Bishop (1990) coined the terms *mirrors, windows, and sliding glass doors* (p. 1) to describe the endless possibility of experiences students of color could have in classrooms that would further engage and motivate them. Texts provide windows, or a way of seeing and viewing new or imagined worlds; they provide sliding glass doors which, like windows offer new and exciting views of the world but also offer the opportunity for students to see themselves in those new worlds; and they provide mirrors, wherein readers can see their “lives and experiences as part of the larger human experience” (Bishop, 1990, p. 1). Reading and learning

from relevant texts, then, can be not only a self-affirming experience, but an experience that strengthens students' self-efficacy, particularly for students of color.

Related to motivation and engagement is reading attitude. The attitudes that students bring to the act of reading are inextricably linked to motivation and engagement. Attitudes are tied to feelings and emotions, especially with regard to school in general and the act of reading specifically (Alexander & Filler, 1976; Fiedler & Beier, 2014; Logan & Johnston, 2009; McKenna, Kear & Ellsworth, 1995; Smith, 1990; Wade, 2012). Reading attitude, especially with regard to students' perceptions of themselves with regard to the act of reading, influences the amount of independent reading, involvement in activities related to reading, and use of cognitive strategies (Akbari, Ghonsooly, Ghazanfari, & Shahriari, 2017; Logan & Johnston, 2009; McKenna, et al., 1995; Varuzza, et al., 2014), as attitude contributes to a student embracing or evading a situation that involves reading (McKenna, et al., 1995).

McKenna, et al. (1995) stated that "an individual's attitude toward reading will develop over time principally as the result of three factors: normative beliefs, beliefs about the outcomes of reading, and specific reading experiences (p. 939). Further, reading attitude encompasses social norms, especially in a school setting where students are forming and re-forming identities and group affinities, students are looking for affirmation from teachers, and there is a perceived, if not real, competition for different statuses (e.g. academic, athletic, artistic, popularity). Unfortunately, as stated previously, positive reading attitudes can decline as students matriculate through the grades (Martínez, Aricak, & Jewell, 2008; McKenna, et al., 1995; Smith, 1990; Varuzza, et al., 2014).

Attitudes form as a result of experience, success and failure, and cultural expectations, including the expectations by gender (Akbari, et al., 2017; Logan & Johnston, 2009; McKenna, et al., 1995) as well as by ethnicity, socioeconomic status, and first language (Akbari, et al., 2017; McKenna, 19997; McKenna, et al., 1995; Mohd-Asraf & Abdullah, 2016; Wade, 2012). Therefore, the importance of attitude toward reading warranted a review of the literature focusing on gender, socioeconomic, ethnic, and language differences.

With regard to traditional gender, girls were found to have more positive attitudes toward reading, they read more, and had higher reading achievement than boys (Akbari, et al., 2017; Logan & Johnston, 2009; McKenna, et al., 1995; Mohd-Asraf & Abdullah, 2016; Swalander & Taube, 2007). This was also the case when socioeconomic status was a factor (McKenna, 1997). With regard to ethnicity and race, McKenna, et al. (1997), citing work from McDermott (1974) and Long (1963), stated that students of color could sense that teachers judged them and their abilities differently than the majority population, ignoring their cultural identity and forcing mainstream cultural norms upon them that felt oppressive (p. 939). Akbari, et al. (2017) emphasized that reading is a skill, no matter the first or home language; however, the attitude toward the home language was highly correlated to the attitude toward the second language (L2), and gender also played a role in the attitude toward L2 reading (Mohd-Asraf & Abdullah, 2016). Cultural norms, whether economic, linguistic, ethnic or genderized, are a factor with regard to reading attitude.

The Role of Culturally Relevant Texts on Successful Comprehension

The term *culture* is nuanced in meaning. Merriam Webster has several definitions of the term that reference shared experiences and features of groups of people and also institutions (Merriam-Webster, n.d.). Examples can include teen culture, school culture, hip-hop culture, and a myriad more. However, *culture* is often used when referring to the lived experiences of people of color. In that vein, the term *culture* can carry with it harmful baggage with regard to assumption and judgment and, as a result, the assignment of greater or lesser worth, with terms coined such as *cultural deprivation*, *cultural disadvantage*, and *culture of poverty* (Erickson, 2012, p. 561). When used, these terms assign a preconception of ability and validity to students based on their lived experiences. It is true that the faces that greet teachers in public schools in the United States continue to be more diverse with regard to ethnicity, culture, and language, but each of those students come with assets that others do not have. According to the National Center for Education Statistics (2019), of the projected 50.7 million public K-12 students in 2020, only 46.1% are White; the second most populous group identify as Hispanic, at 27.6%, followed by 15% who identify as Black, 5% who identify as Asian, 4.5% who identify as two or more races, 1% who identify as American Indian, and .3% who identify as Pacific Islanders (NCES, 2019, What are the demographics of public school students), with the population of Latinx, Black and Asian students increasing every year (Glass, 2019).

As established previously through a review of the literature, there is an alarming, yet persistent gap in reading achievement between students of color, students from low socioeconomic families, and EL students and their White, middle-class peers and, if not

mediated by the time students are in grades 3 and 4, the chances that students will catch up to their grade level peers is slim (Barber, et al., 2018). However, as Erickson (2012) emphasizes, outside lived experiences often “don’t fit well with the cultural practices of . . . classrooms” (p. 562); therefore, it becomes incumbent upon schools and teachers to become responsive to the students’ strengths and interests. While motivation for reading begins to decline in elementary school, the beliefs and practices that teachers bring into an inclusive classroom environment, including culturally relevant text selection and pedagogy, can support motivation and engagement, which in turn support positive reading achievement (Barber, et al., 2018; De Naeghel, et al., 2012; Christ & Sharma, 2018; Guthrie, 2015). Guthrie and Cox (2001) stated the use of relevant books quite succinctly: “For reading instruction, text is central” (p. 291). Using literature in reading instruction that is positively reflective of and relevant and interesting across different cultures and experiences, that reflects the students in the classroom and draws upon their backgrounds and languages, and with which the students can identify, has a positive impact on reading achievement and on readers’ self esteem (Barber, et al., 2018; Ebe, 2010; Ladson-Billings, 1995; Kourea, Gibson, & Werunga, 2017; Tatum, 2006, Troyer, et al., 2019).

High quality, engaging materials matter. When students have an opportunity to interact with high quality literature that reflects them and their lived experiences, reading comes to life, it takes on new meaning and urgency, and it becomes meaningful to the students (Keis, 2005). Troyer, et al., (2019) used the term “high reading quality” (pp. 1204, 1206) to describe texts that were matched to both the students’ reading ability and their interests, including their experiences outside of school, which Ladson-Billings (1992, 1995) describes as “culturally relevant” with regard to texts and teacher practice. Bringing students’ lived experiences into the classroom, and

finding materials to match them, celebrates the students and their cultures - in other words, it legitimizes them and their experiences. It “place[s] education into culture, rather than place[s] culture into education” (Pewewardy, 1993, p. 78) which, of course, is less surface culture and more authentic learning. However, as Ladson-Billings (1992) echoed, it is imperative that leaders in education, whether it be at national, state, district or classroom levels, use the culture of the students to help them understand themselves and to understand and interact with the world around them and to “conceptualize knowledge” (Ladson-Billings, p. 314) to challenge existing assumptions and structures in order to create endless opportunities for the future. In order to do that, students must be provided with texts that reflect themselves, and their lives, in ways that open doors.

Although the texts matter, there continues to be a struggle to find quality literature written by and about Black, Indigenous, and People of Color (BIPOC). Each year, the Cooperative Children’s Book Center, housed at the University of Wisconsin-Madison, which is a research library in service to librarians, teachers, early childhood providers, and others, provides information on diversity in publications for children and teens (Cooperative Children’s Book Center, n.d.). In June of 2020, they released the 2019 CCBC Diversity Statistics, which is later than usual due to the COVID-19 pandemic (The Numbers are In: 2019 CCBC Diversity Statistics, 2020, para.1). While three of the five identified ethnicities showed a slight increase in the number and percentage of books that represented BIPOC, the increases were quite slight: 0.5% increase for books that had significant Black/African content (from 11.7% to 12.02%), 0.2% increase for First/Native Nations (from 1.0% to 1.2%), and 0.5% increase for Asian/Asian Americans (from 8.5% to 9%). There was a *decrease* of 1.0% in the number of books that

significantly represented Latinx students (from 7.3% to 6.3%), and 2019 was the first year that Pacific Islander was a category of itself, with 0.1% of the total number of books representing students identifying in this category (The Numbers are In: 2019 CCBC Diversity Statistics, 2020, Percentage of Total Books Received by CCBC: About [US Publishers]).

The low numbers of books written by and for people of color are disconcerting given the fact that no one-size fits all curriculum benefits all children (Crowe, Connor, & Petscher, 2009). Our students of color, low socioeconomic students, and students for whom English is not their first language continue to achieve at lower levels than our White middle-class students. Culturally relevant texts are those texts that students can connect to on many levels, drawing on their life experiences and background knowledge to create new meaning (Ebe, 2010). Yet the number of books that are by BIPOC authors or about BIPOC main characters, which books could contribute to increased individual interest and which would lead to “increased attention, greater concentration, pleasant feelings of applied effort, and increased willingness to learn” (Krapp, Hidi, & Renninger, 1992, p. 9 as cited by Worthy, Moorman, & Turner, 1999, p. 15), continues to lag far beyond those books by White authors and about White main characters or about non-human characters. In fact, in 2019, nearly three-quarters of the children’s and young adult books published in 2019 featured white children or non-human characters (The Numbers are In: 2019 CCBC Diversity Statistics, 2020). The diversity of the students in our public schools, however, and the diversity of their lived experiences and those experiences of their families, call upon us to find as many books as we can that reflect our students in positive ways. Keis (2006), cited Rich (1986) by stating the following:

When those who have the power to name and to socially construct reality choose not to see you or hear you . . . when someone with the authority of a teacher describes our society and you're not in it . . . the experience becomes a moment of psychic disequilibrium, as if you looked into a mirror and saw nothing. (p. 199)

Finding and tapping into the assets that our students bring to the classroom everyday, and finding and intentionally using high quality, culturally relevant texts in the classroom, is to create an opportunity for our students to become engaged and motivated to learn more, and ergo to grow and flourish, because they will be validated, seen, and heard (Keis, 2006; Ladson-Billings, 1992; Ladson-Billings, 1995; Troyer, 2018).

Conclusion

The act of reading is quite complex, situated in cognitive, social, linguistic, and socio-cultural contexts between the reader, the text, the context, and the situation. To further exacerbate the complexity, the United States has been long grappling with the ugly reality of reading achievement disparities between students of the dominant culture of White, western European, middle class culture and those students who are not of that culture - in particular, African American, Latinx, students of limited economic means, and students for whom English is not their first language. Quite often, one student can identify in all of those categories. Further, the review of the literature established that a crucial period of reading proficiency is grades 3 and 4; if a student is not proficient in their literacy skills by that time, they continue to fall further behind. Further, the landscape of literacy and texts continues to change with fast-paced advances in technology.

The goal of reading is to understand what is read; in other words, comprehending the text - in order to create new knowledge. Reading is fundamental to successful achievement in school. Therefore, it is imperative that education researchers and practitioners alike fully understand the barriers that keep students from successful comprehension, and create inviting, engaging, and affirming environments, opportunities, and interventions, both offline and online, that eliminate those barriers. In doing so, students will see themselves as strong and competent learners.

In that light, it was the goal of this research to study a particular intervention, the paraphrasing intervention, with students in grades three and four in an online environment, and the effects it has on student engagement and efficacy, as well as their comprehension of the informational texts they were provided as part of this research. The specific rationale for and methodology used in this study is discussed in Chapter Three.

CHAPTER THREE: METHODOLOGY

No research is ever quite complete. It is the glory of a good bit of work that it opens the way for something still better, and this repeatedly leads to its own eclipse.

-Mervin Gordon

Introduction

The purpose of this mixed-methods research study was to explore specific components of reading comprehension with regard to the role of texts and reading digitally. This study researched the impact of informational texts on reading comprehension skills. Specifically, the study looked at essential characteristics of informational texts with regard to comprehension intervention in an online format for students in grades three and four who were at-risk of reading difficulties or already struggling in reading comprehension. More precisely, the researcher examined those characteristics of informational texts utilized in an online comprehension intervention that lead to greater student engagement with the texts, and can also lead to comprehension success.

This design-based implementation and mixed-methods study explored reading comprehension and the role that texts and new literacies play in answering the central research question:

What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students?

This research study was further guided by the following two sub-questions:

- What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format?
- What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level?

This chapter introduces and reviews the methodology used for the study. The description and discussion of the methodology used in the study will center on each research question. This review of the methodology includes the rationale for the study; the research paradigm; the research setting and participants; overview of the data, including the methods and tools used for data collection; methods for analysis of the data; and ethical considerations, biases and limitations.

Rationale for the Study

While public education has had many goals since its inception in the early nineteenth century, one goal has remained consistent throughout the tenure of public education: to provide access to and equality of opportunity (Spring, 2018). To that end, early success in reading is a strong predictor of success in high school (Cunningham & Stanovich, 1997; Sparks et al, 2014). The goal of reading is to understand what is read - in other words, comprehending the text - in order to create new knowledge. Yet many students in the United States, and in Minnesota, where this study took place, continue to struggle in reading. Their struggle is evidenced by stagnant

reading proficiency scores over the last decade. Only one-third of fourth graders have met grade-level proficiency on assessments designed specifically to analyze trends and growth (National Center for Education Statistics, 2015; 2019), despite increased time dedicated to standardized assessment of students' ability to comprehend texts. Additionally, a significant gap persists for fourth grade students based on race and socioeconomic status (National Center for Education Statistics, 2019). Further, the results on state and national reading assessments indicate that students in the United States, and in Minnesota, continue to struggle to comprehend expository texts, which are used in content-specific instruction as students move up grade levels (National Center for Education Statistics, 2019; Minnesota Department of Education, 2020).

Much instruction at these grade levels continues to focus on more generic and low-level strategies to promote learning from texts, including recall of information or inferring word meanings from surrounding content (Goldman, et al., 2016). Students often do not have the requisite prior knowledge needed to comprehend expository texts fully, yet prior knowledge is an integral component of reading comprehension (Kendeou & O'Brien, 2016). Given these factors, and the results currently realized in reading achievement as evidenced by state and national reading assessments (National Center for Education Statistics, 2019; Minnesota Department of Education, 2020), there is a great need for explicit and effective reading comprehension instruction utilizing texts of all genres at the elementary level, beginning in the early grades; and for a strong system of comprehension intervention for students who are struggling with this skill. Furthermore, expository texts are necessary for comprehension and new learning in content areas such as social studies and science; therefore, identification of essential characteristics of

expository texts will further inform instructional practice as teachers continue to make decisions on what texts to place in front of their students.

Because of this need, there is currently a large national research study funded through the Institute of Educational Sciences (IES) that is developing a comprehension intervention tool, called the Interactive Strategy Training for Active Reading and Thinking for younger readers (iSTART-Early). The tool will be a web-based reading comprehension strategy tutor that will provide both instruction and opportunity for student practice. Once created, the tool will target students in grades 3 and 4, two years in a student's academic career that are critical for reading development.

Because this small research study is one leg of the larger national study focusing on grades 3 and 4, the target group of students for this study were third and fourth grade students who were identified, by the district through normed and standardized testing scores, as reading below grade level, and struggle to comprehend expository texts from which they are to acquire new knowledge (Duke, 2000; Jeong, et al., 2010, Pearson & Billman, 2016). Although these students struggle, they are maturing and many are becoming developmentally ready for introduction of higher-order cognitive processes which have the potential to improve reading comprehension (Del Giudice, 2014; Del Giudice, 2018). Additionally, there is an increase of expository texts in the curriculum beginning at this age and grade level, texts from which students are expected to gain new knowledge. However, as Duke (2000) and Jeong, Gaffney, and Choi (2010) examined, the majority of classroom print prior to third grade is narrative and the proportion of informational text is small, especially in schools with higher numbers of low-income students. The time spent on reading instruction specifically focusing on

informational text, including time spent on informational text structure, is but a miniscule portion of the student's school day (Beerwinkle, et al., 2018; Duke, 2000; Strong, 2020).

Compounding this issue is that the time students spend engaging in informational text, and the time spent instructing using informational text, may be miniscule compared to the school day itself (Beerwinkle, et al., 2018; Duke, 2000; Ness, 2011; Strong, 2020). These texts are used by students to acquire new meaning. However, the texts present challenges for which some students are unprepared, including increasing text complexity, density of language, increased length, lack of cohesion across text, and abstract concepts that require knowledge of the world that students may not have (Chall, 1983; Jeong, Gaffney, & Choi, 2010). This lack of exposure and preparation results in many fourth graders experiencing a decline in reading achievement, beginning during the transition from primary to intermediate grades in elementary school, and which continues into middle school (Best, Floyd & McNamara, 2008; Chall, 1983; Chall & Jacobs, 2003; Chall, Jacobs & Baldwin, 1990; McNamara, et al., 2011; Wharton-McDonald & Erickson, 2017). Further, this lack of exposure and preparation may also impede students' learning of the content in areas such as science and social studies.

This researcher made the decision to focus the research in this study specifically on science texts, and did so for two reasons. First, Minnesota adopted a new set of K-12 science standards in 2019 which included changes that have significant implications on instructional pedagogy, and for districts, initiates review of curriculum used in classrooms. Therefore, this work is timely with the shift in the standards. Second, the district historically placed less emphasis on science instruction in the elementary grades than instruction in literacy and math, because the state requires annual assessment in those two content areas beginning in third grade.

However, less science instruction means less exposure to topics of interest for a variety of students, especially students of color (Lee, 2020), and less exposure to content-specific vocabulary needed to successfully navigate science texts. As was discussed in Chapter Two, the reading of various texts provides students with the ability to gain knowledge of different topics, which aids the students in comprehending more complex texts (Goodman, et al., 2017; Kendeou & O'Brien, 2016). Since there was less science instruction throughout the day and week, there was less use of science texts for instructional purposes, and therefore less understanding by the students of science concepts, which contributes to comprehension difficulties. The use of science texts would provide participating students with another opportunity to read texts that focused on science concepts.

Additionally, a large achievement gap persists in the reading proficiency between White students and students of color (SoC), many of whom are multilingual learners and many of limited socioeconomic means (National Center for Education Statistics, 2019). These factors, through a review of the literature, contribute to reading difficulties, whether through language, vocabulary, or prior knowledge. Finally, review of the literature uncovered a need for teachers to better understand the comprehension skills needed to successfully read online texts and how those skills may be different than those needed to successfully read printed texts. This understanding will better equip teachers to help their students navigate through new literacies. Additionally, this understanding will help teachers realize what assets struggling readers do have and what skills they are still lacking, in order to make strong instructional decisions that lead to greater reading comprehension in both printed and digital text formats.

Because students are becoming increasingly exposed to digital text, this researcher, herself a former English language arts teacher and a current district administrator, built a strong partnership between the school district used for this study, and a major research university located in the same metropolitan area; this was a partnership that initially focused on the role that inference has to reading comprehension in the younger grades. The major research university has created online tools for improving inference-making in reading, which is a strategy known to increase reading comprehension (Kendeou, McMaster, & Christ, 2016; Wanzek, et al., 2018). The strong partnership between the district and the research university provided the opportunity to design a study that would help to inform the creation of a new web-based comprehension intervention tool titled Interactive Strategy Training for Active Reading and Thinking for young developing readers: iSTART-Early, designed specifically for students during a very critical period in reading development: grades 3 and 4. The iSTART-Early tool is currently being developed and, once created, will focus on the comprehension strategies of comprehension monitoring, paraphrasing, inference (prediction/bridging/elaboration), question asking, explanation, and summarization. The researcher, who was a district administrator overseeing the work of literacy in the district, spent the last several years disaggregating reading achievement data in the district, and knew that these years were critical for student success in reading. Therefore, she made the decision to focus this study on better understanding the role that the texts themselves play in students' reading success to help inform the types of texts that could be utilized in iSTART-Early.

The iSTART-Early tool has a module sequence that was designed similarly to its predecessor, iSTART, which was built for older students through funding from a national,

multi-year Institute of Educational Sciences (IES) grant. In iSTART-Early, there are five modules planned for the tool. They incorporate six reading comprehension strategies (paraphrasing, comprehension monitoring, question asking, elaboration, bridging, and summarizing). The five modules are as follows: Ask It, which is an overview of comprehension monitoring and question asking; Reword It, which incorporates the paraphrasing strategy; Find It, which also works with paraphrasing; Explain It, which works on elaboration, bridging, question asking, and paraphrasing, and Summarize It, which helps students with retelling and explanation, and also includes work on main idea. The modules are presented in sequential design, with the strategies building off one another. Paraphrasing is the first module in which students generate actual responses to text (the first module requires only identification tasks).

This study will help to inform the larger research study and the eventual creation of iSTART-Early by identifying essential text characteristics for texts that will be developed for the iSTART-Early tool, especially in schools and districts that serve a higher proportion of disadvantaged students, including students of color and English Language learner (EL) students.

Research Paradigm

In schools, most teachers use texts to teach reading and to teach content. Students increasingly use texts to gain new understanding, beginning in earnest in third grade. Thus, it is important to gather information from both users to ascertain the essential characteristics of an informational text to help improve reading comprehension. Teachers, who plan lessons and units using reading materials, must understand why the characteristics are important. Further, it is

imperative that researchers understand how students traverse through informational text. As McMillian and Schumacher (2010) illustrated, relying on just qualitative or quantitative methods can be insufficient to provide a complete picture for which the purpose of a study requires. Their statement rings true for the purposes of this research study; both qualitative and quantitative data was needed to help answer the research questions. This study analyzed teachers' input on the texts utilized in this study with regard to length, readability, structure, cohesion, interests and topics (qualitative data), and analyzed students' understanding of the texts through the strategy of paraphrasing, which is the first module in which students would engage in the final iSTART-Early intervention tool. Additionally, the students did so in an online format (quantitative data).

The theoretical framework for this study was guided by the construction-integration (C-I; Kintsch & van dijK, 1978; Kintsch, 1983; Snow, 2002) model of comprehension that provides a more individualized understanding of reading comprehension, such as variance by age, skill, format, and life experience (Fox & Alexander, 2017; Israel & Reutzel, 2017; Kintsch, 1998; Paris & Hamilton, 2005). The C-I model provides a more balanced view of reader and text, and provides an extremely important focus on context, which is a filter of sorts that people use to view the world and make meaning (Kintsch, 1988). Construction-integration brings together the reader, text, context and situation; the research design for this study provided the data needed to ascertain a holistic view of the type of texts needed for a diverse group of third and fourth graders who struggle with reading comprehension.

Because this study focused on the interaction of students with texts, this research was viewed through the lens of pragmatism, which as Cresswell and Cresswell (2018) explain, arises

out of “actions, situations, and consequences rather than antecedent conditions” (p. 10). This epistemological paradigm fits well in the theoretical framework of construction-integration with regard to reading comprehension. Readers interact with a text in a certain situation; they bring with them their lived experiences and other sources of knowledge that have helped to form their knowledge base, which may or may not be accurate (Kendeou & O’Brien, 2016; Kendeou, et al., 2016). Reading comprehension is the result of that interaction, those life experiences, prior knowledge and knowledge bases, and the situation in which the reader is engaged.

To account for these complex interactions, this study used both Design-based implementation research (DBIR; Fishman et al., 2013; Penuel, Fishman, Cheng & Sabelli., 2011) and Mixed Methods research. Design-based research (Cobb et al., 2003) is a research design with which Mills (2010) recommended increased use with regard to literacy. It fosters flexible conceptions of literacy, especially digital literacy, and provides formative data that is contextually situated. DBIR is an extension of design-based research that includes the active involvement of those who will ultimately be implementing the strategy intervention – for this study, it was teachers and students. This research approach involves iterative, collaborative design of solutions targeting multiple levels of the system: design that is informed by ongoing and systematic inquiry into implementation and outcomes. The four key principles of DBIR align well with education research, especially to the persistent low achievement in literacy, because DBIR includes the development and testing of ideas and innovations that can improve teaching and learning (Penuel, et al., 2011). Paraphrasing Fishman, et al., (2013, pp. 142-143), these four principles are:

- Focusing in persistent problems of practice, especially from multiple stakeholders' perspectives (in this case, teachers, students, researchers);
- Committing to a collaborative design that is iterative in nature (trying something out, analyzing data, revising, implementing again);
- Committing to developing both theory and knowledge of students' learning in the classroom, and the implementation of strong instructional practice through systemic inquiry;
- Committing to creating capacity for sustainable change in systems.

With DBIR, there is a common commitment to building theory and knowledge within the research community (Fishman, et al., 2013). It is not enough to know that an innovative intervention strategy is effective – it is also important to understand the key active ingredients and the underlying mechanisms that are related to promise and sustainable change; this ultimately informs practice in the classroom. For this study, there were two iterative cycles, a number which was unknown at the beginning of the research as the cycles were continually determined based on previous findings throughout the research phase of the study.

Mixed methods research (MMR, Johnson & Christensen, 2017) is the type of research in which the researcher combines elements of qualitative and quantitative research approaches. This research design can be very helpful in providing information in the way of themes, issues, and other information that will be the focus of quantitative research (McMillian & Schumacher, 2010). A mixed methods approach is congruent with the principles of DBIR, in that the two types of data obtained (qualitative and quantitative) can come from multiple stakeholders in the study. In this study, the researcher used qualitative research to obtain data from practitioners

(teachers and literacy experts) regarding types and characteristics of texts that they would use in literacy instruction with third and fourth grade students. That data was then used to create a set of texts used in a research environment where students in grades 3 and 4 interacted with the texts (reading and engaging in paraphrasing in an online environment, and answering questions focusing on how they felt about the texts they read) whereby quantitative data could be obtained. The researcher also gathered data on student participants' reading attitudes and their basic understanding of grade level science concepts, which data could be quantified and compared with the paraphrasing results. Finally, the researcher interviewed each participant individually at the end of the observation cycle to obtain information on what they remembered about the strategy used, and also about their own efficacy as a reader.

For the purposes of this study, the researcher utilized exploratory sequential mixed methods design (Cresswell & Cresswell, 2018). She began with qualitative research to explore the ideas, opinions, and views of practitioners. Analysis of that data informed the creation of tools used in the quantitative phases of the study. This process involved the creation of the texts used in the research, and also involved the students.

In the quantitative phase involving the students, this study used a single-group, quasi-experimental design, utilizing a single group of students in a pre-/post design which, according to McMillian and Schumacher (2010), is helpful in education research because it is often impossible to create random assignment of students. Therefore, in this study, the students were not randomly assigned to groups, and the original setting - the classroom and the summer targeted services context - was preserved as much as possible, given the limitations that the

COVID-19 pandemic placed on the original plans outlined for the district summer targeted services program.

By combining qualitative and quantitative data, the researcher augmented the quantitative data obtained from the students by including the perspectives of the practitioners. This aided in the development of a more thorough understanding of the relationship between the texts chosen for a reading comprehension intervention and how the students actually engaged with them. This fuller understanding could not be obtained through the use of only one method or the other. For the purpose of this study, the researcher leaned on Johnson, Onwuegbuzie, & Turner's (2007) definition of mixed methods:

research . . . in which a researcher . . . combines elements of qualitative and quantitative research approaches (e.g. use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and collaboration (as cited in McMillan & Schumacher, 2010, p. 396).

A deeper discussion of the methodology for this study takes place by discussing the qualitative and quantitative phases separately. To better understand the methodology, however, a discussion of the participants and research setting was warranted.

Research Setting and Participants

Research Setting

The setting for this research study was a small, first-tier suburban district in Minnesota, with a student population of approximately 4,100. The district was chosen for three reasons.

First, it is the district in which this researcher works as a district administrator. Secondly, this district has a partnership with the large research university which is developing iSTART-Early, the web-based reading strategy tutor. This research study helped to inform research on that tool. Finally, because this study was also focused on essential text characteristics appropriate for ethnically, linguistically and economically-challenged students, this district provided the population necessary to carry out the research.

While small, the district is extremely diverse, with no one federal race category that encompasses a wide majority of students. There are four elementary schools in this district that serve a very ethnically, culturally, racially, and socio-economically diverse student body. At the time this study took place, approximately 70% of the district's elementary students were students of color. The demographics follow in Table 3.1.

Table 3.1. *District Demographics as of June, 2020*

Federal Race Category	Percentage of District Students
American Indian	1.05%
Asian	5.45%
Black, Non-Hispanic	13.02%
Hawaiian/Pacific Islander	0.22%
Hispanic/Latino	39.71%
Two or More Races	10.37%
White	30.17%

Of the elementary students in the district, 60.62% qualify for free- or reduced-price lunch (FRP), with the number qualifying for free lunch approximately four times the number qualifying for reduced-price lunch. English Learners (EL) comprise 33.1% of the elementary students in this district, and 15.33% of the student body qualify for special education services.

The demographics for the district's third and fourth grade cohorts are quite similar to the overall district demographics. Table 3.2 below outlines the demographics for the district's third and fourth grade students.

Table 3.2. *Demographics of Third and Fourth Grade Students as of June, 2020*

Federal Race Category	Percentage of District Students
American Indian	0.88%
Asian	5.96%
Black, Non-Hispanic	14.91%
Hawaiian/Pacific Islander	0.35%
Hispanic/Latino	39.30%
Two or More Races	11.05%
White	37.54%

63.86% of the students in this grade band qualify for free- or reduced-priced lunch; 35.96% are English Learners (EL), and 17.02% of the students in this grade band qualify for special education services.

The large research university that is involved with developing the online comprehension intervention tutoring tool, iSTART-Early, has partnered with this district in the past, largely

because of the demographics of the students and the opportunity to conduct research that contributes to the larger body of research on reading achievement of various demographic groups. As discussed in Chapter Two, reading achievement continues to be largely predicted along the lines of race and socioeconomic status, and thus research that focuses on achievement of different demographic groups continues to be warranted.

The district's reading achievement continues to be a persistent issue and, like the state and the nation in general, continues to be largely predicted along the lines of race and socioeconomic status. In 2019, elementary reading proficiency on the state standardized test at grades 3 and 4 in the district was 40.7%, with a 30.5% proficiency gap between White students and students of color. English language learners had the largest gap at 45.6 percentage points: only 10.2% of the EL students were proficient, compared with 55.8% of the non-EL students. With regard to socioeconomic status, 30.2% of the students qualifying for free- or reduced-price lunch were proficient, compared with 61.9% of the non-FRP students, showing a 31.5 percentage point gap. The smallest gap was realized in the area of special education, with a 29.1% proficiency gap between students qualifying for special education services compared with their general education peers: 15.6% of students on IEPs were proficient in reading compared with 44.7% proficiency for those students not identified for special education services (Minnesota Report Card, 2020).

The research for this study took place during summer targeted services, known more commonly as summer school. In this district, students are identified for summer targeted services based upon achievement data in both math and reading, and are invited to participate in the targeted services summer program. Summer targeted services are not mandatory in this district;

therefore, parent consent for participation is required. Parents can opt their child(ren) out of summer targeted services.

As a result of this “opt-out” system, the number of students participating in the summer targeted services program from any one school are not necessarily a direct proportion of the total number of students in that building, by race, ethnicity, socioeconomic status, or identified service needs (e.g. special education or English Language [EL] services). A summer targeted services coordinator, who is an in-district elementary teacher, was hired to work through the logistics of the elementary summer programming and, in partnership with the classroom teachers, communicated with families of those identified students in the spring, inviting their child(ren) to participate in summer targeted services. This individual communication was especially important in 2020, given the upheaval this district experienced as a result of a highly contagious virus.

Interruption to the Research Setting

The COVID-19 pandemic caused schools in this state to cease all face-to-face learning in March of 2020, and turn to distance learning for the remainder of the school year. This was an immense shift to educational practices in the district, as most elementary teachers had very little experience in teaching from a distance. Prior to distance learning, the ratio of devices to students was not one to one, and a large number of families in the district did not have devices suitable for student learning in the home. Because the district did not have enough devices for every elementary student, the district made plans to get a device to every household that needed one, which meant that some students within one household shared a device for learning. Further, the district identified households for which reliable access to the Internet, or any access to the Internet, was an issue, providing hotspots it had on hand. Additionally, the district ordered as

many additional hotspots as was available from vendors. This type of technology was in great demand across the state and country, and much of the technology needed for remote learning was backordered. Many households in the district had limited or no connectivity to the Internet.

Prior to the COVID-19 pandemic and the shift to distance learning, the district had 532 students in grades K-7 registered for the 2020 summer targeted services program. However, because of the pandemic, this district, like all districts in the state, had to revise their traditional summer targeted services programs. The traditional elementary summer targeted services program for the participating district for this study was five weeks in length, four days a week, 6.5 hours a day (which included breakfast, lunch, and recess). This district revised its traditional model, creating a choice of elementary summer programming. The first choice offered was a fully-online elementary program where teachers would be instructing and students would be learning in a synchronous setting, meaning that the students would be online interacting with the teacher and each other live through video conferencing (in this case, Google Meet) as a group. This type of learning is the opposite of an asynchronous learning environment, where students are engaging in online learning at different times with no instructor present, sometimes watching pre-recorded videos of the teacher facilitating the lesson, interacting with students through discussion boards or contributing their comments in others' documents.

The second choice offered was an in-person option which could accommodate 14 classrooms of nine students each in grades K-4, to comply with mandated social distancing. The district prioritized certain students for the in-person model of summer targeted services; the coordinator of the program looked at those students for whom life circumstances, such as limited internet connectivity, or lack of engagement in the distance learning from March through early

June, caused a greater interruption of their learning. The coordinator also obtained lists of those students who did not engage in any online learning and just received physical learning materials during the distance learning period, lists that were updated weekly by the elementary school staff. She contacted each family individually to ascertain their preference.

A further change was in the length of the summer program. The program in both formats was shortened to three weeks, rather than the typical duration in this district of five weeks. The school day itself was shortened as well, from the typical 6.5 hour day to a four-hour day, which included breakfast, a take-home lunch, recess, and a strong focus on socio-emotional learning for the first hour of the day. However, the number of days a week remained consistent: a Monday through Thursday format. Once these plans were finalized, the district summer targeted services coordinator contacted parents and notified them of the changes in order to gauge their interest in an online targeted services program versus an in-person summer program and to finalize registrations.

Logistics and instruction for the two programs differed in several ways. Online instruction was synchronous, meaning students and teachers were online at the same time for the duration of each day. Students saw each other virtually; there were breaks built in, but no breakfast was served. For the in-person program, there were up to nine students to a teacher, and there were no support staff in the classrooms. Students were able to move about the room, interacting with physical materials such as books and math manipulatives, and they were able to interact with each other. In-person students received backpacks and their own school supplies, which mitigated the need to share materials. In-person classrooms had instructional technology at their fingertips, such as Smartboards, and teachers played calming background music during

periods of independent practice. Students had a scheduled recess each day with one class outside at a time.

The modified summer targeted services environment was not something students were accustomed to experiencing in school; furthermore, the students had not been in school physically for three months. Stickers on hallway floors helped students maintain proper distance needed for social distancing when outside of the classroom. Desks in classrooms were placed at least six feet apart. Staff were given face shields to wear. A mask mandate was declared in the state during the second week of the program, and the district required staff to shift to wearing masks indoors at all times, and masks worn by students were strongly encouraged, but not required. However, students were asked to wear masks when in less than a six-foot proximity to another person, and adults in the buildings worked with students to help them wear the masks properly. The state mask mandate declared by the governor presented a new challenge for in-person instruction, as it was impossible for students to see teachers' mouths as they talked. Additionally, voices were more muffled, many students had a hard time keeping masks on, and the masks presented a distraction when students were wearing them.

The change to in-person and virtual summer targeted services forced the researcher to choose which group of students were to be studied, as the two environments would provide vastly different learning experiences for the students. Therefore, for purposes of this study, the researcher chose to utilize the in-person summer targeted services program in order to physically observe the students interacting with the texts. The demographic breakdown of the 2020 in-person summer targeted services program participants is described below.

Overall and In-Person Student Participation in Summer Targeted Services

The district elementary summer targeted services program registered 255 students to participate in both elementary summer programs (distance-learning and in-person). Students identified for inclusion in this study were students participating in the district summer targeted services program who had been identified, through district standardized assessment data, as reading below grade level. Data for identification included a student's overall Rasch Unit (RIT score) on the fall Northwest Education Association (NWEA) Measures of Academic Progress (MAP) reading assessment. Students whose RIT scores were below grade level mean on the fall assessment were identified for inclusion in the summer targeted services program. Grade 4 students were identified through the use of results from both the MAP reading assessment and preliminary results of the Minnesota Comprehensive Assessment (MCA-III) reading assessment that is required beginning in spring of grade 3, but for which official results are not available until late summer of the year in which it is given. Students who scored in the ranges of partially meets or does not meet on the MCA-III were identified for inclusion in the summer targeted services program.

Because of the COVID-19 pandemic, it was determined by the district that further prioritization of students had to take place, due to limited space for in-person learning. First priority for in-person summer targeted services went to English learners, students who were designated as free- and reduced-price lunch students, and students who had been flagged by teachers, administrators, and/or families as having struggled in distance learning. Participating in summer targeted services programs in the participating district is not mandatory, meaning that

families may choose to have their children participate or not participate. Because of the COVID-19 pandemic, the district offered a choice of in-person participation or distance-learning. 47.06% of the enrolled summer targeted services students participated in in-person learning. Table 3.3 breaks down the enrollment by federal ethnic/racial designation, Limited English Proficiency, and Free- and Reduced-Price status:

Table 3.3. *Demographics of Student Participants in Summer Targeted Services*

Federal Category	# of Participants	Percent of Total
American Indian or Alaska Native	1	.39
Asian	18	7.06
Black/African American	34	13.33
Hispanic/Latino	152	59.61
Native Hawaiian or Pacific Islander	2	.78
Two or More Races	13	5.10
White	35	13.72
Limited English Proficiency (LEP)	153	60.0%
Free- and Reduced-Price Status (FRP)	198	77.6%

Because this research study was part of larger, national research that will lead to the creation of an online comprehension intervention tutoring tool for third and fourth grade students, this study focused solely on students in grades 3 and 4; therefore additional analysis of the data was warranted for those two grades specifically. Of the 255 total participants in the summer targeted services program, 55 students were in grade 3 and 33 students were in grade 4. Summer targeted services enrollment data specific to grade 3 and 4 was as follows:

- Grade 3: of the 33 total students registered for both in-person and distance-learning, four students dropped, and 14 of 29 remaining participated in the on-site program, for a 48.3% on-site participation
- Grade 4: of the 55 total students registered, 11 students dropped, and 18 of 44 remaining students participated in the on-site program, for a 40.9% on-site participation

As a result of these numbers, there were three classrooms of students in grade 3 (one was a combined grades 2 and 3 classroom due to space constraints) and two classrooms of students in grade 4. Table 3.4 below delineates the participation in summer targeted services for these two grades.

Table 3.4. *Grade 3 and 4 Students' Participation in On-Site Programming*

Grade	# of Participants in Person	# of Total Enrollment	% of Total Enrollment*
3	18	44	40.9
4	14	29	48.3

* Four on-site drops constituted 10.68% of total enrollment

The research for this study made use of in-person participation only, as the researcher wanted to physically observe the students interacting with texts, and wanted to interview the students in person at the end of the quantitative phase of the study. Further, the researcher had more control over the environment in which the student would be interacting with the online text. Finally, the in-person environment provided the only opportunity for students to engage in science texts that had been written based on the qualitative data provided by the teacher focus groups with regard to essential characteristics of informational texts - in this case, texts written

about science topics aligned to third and fourth grade state science standards. Because the students were attending school in person, the district technology department was able to batch upload the Qualtrics tool created for this study onto each computer assigned to the participating student.

In order to conduct this study, several steps were taken in preparation. First, this researcher contacted the summer targeted services coordinator. Through conversation, she explained the study and what effect, if any, it would have on teachers' plans; she also obtained the names of the teachers who were going to be teaching students in grades 3 and 4. Next, she contacted those teachers and obtained permission to conduct the study in their classrooms, explaining her methodology and timeline. All teachers eagerly granted their permission. The third step included contacting district technology staff to ensure that the Qualtrics tool could be loaded on to student devices, and that students would be using the same device every day (which, of course, they were because of the limited sharing of materials due to COVID-19), and obtained confirmation that the district technology staff would load the texts onto the specific Chromebooks to which individual students were assigned and that students were using in the in-person environment. The final step was to communicate with the teachers and finalize a schedule whereby the research could take place with no disruption to the teacher or classroom schedule. This research would take place within two of the three weeks of summer targeted services, after the teacher established a community of learners and students settled into in-person learning, something they had not engaged in since mid-March.

Demographics of In-Person Student Participation in Summer Targeted Services

There were 255 elementary students registered for summer targeted services in the district in 2020. Of those 255 students, 120 of them, or 47.06%, opted for in-person learning, which is less than half of the total elementary students enrolled. From that pool of 120 students, 17 were dropped; either they never attended or were dropped from the roster for various reasons once summer targeted services began.

Table 3.5 below shows the demographic breakdown of the total number of students participating in the district in-person elementary summer targeted services program.

Table 3.5. *Demographics of In-Person Student Participants in Summer Targeted Services, June, 2020*

Federal Category	# of Participants In Person	% of Total in Person Enrollment	% of Total Enrollment (both Distance and In-Person)
American Indian or Alaska Native	0	0%	0
Asian	7	5.83%	2.75
Black/African American	16	13.33%	6.27
Hispanic/Latino	77	64.17%	30.20
Native Hawaiian or Pacific Islander	0	0%	0
Two or More Races	2	1.67%	.78
White	18	15.0	7.06
Limited English Proficiency (LEP)	76	63.3%	29.8%

Free- and Reduced-Price Status	103	85.8%	40.4%
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Human Subject Review Institutional Review Board

For the purposes of this study, three Institutional Review Board (IRB) approvals were required. The first IRB was with a large research university that will utilize the data and results from this study in their federally-funded research project to develop the final comprehension intervention for use with third and fourth grade readers. The district in which this study took place had an existing IRB with the large research university. However, because the data and results of this study will be used in the larger research project, this researcher was required to obtain IRB approval with the large research university, which was obtained after the required training with that institution. This IRB dovetailed with the approved IRB obtained by the large research institution for future creation of the final online comprehension tutoring tool. The second IRB approval was with the school district itself. The third IRB approval was through the university in which this researcher was earning her doctorate in education.

Because this research study was an iterative mixed-methods study, it is best to discuss the methodology used for data collection in two phases. The first phase, helping to inform the first research question, concentrated on text creation.

Study 1: Data Collection with Teachers To Inform Text Creation

Stated previously, this was a mixed-methods study utilizing design-based implementation research (DBIR). Therefore, data collection followed iterative cycles, beginning simultaneously

with the gathering of qualitative data from the teacher participants and the creation of an initial corpus of texts that would be used to guide the discussion. This discussion, and the creation of the texts themselves, contributed to the exploration of not only the first research question of this study, but also of the first sub-question for this study:

What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format?

It was imperative to the researcher that she begin this research with a strong understanding of what teachers and literacy experts believe are important characteristics of texts used in literacy instruction. Qualitative research, according to Cresswell and Cresswell (2018), “is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem” (p. 4).

To assist in answering the first research question, this mixed-methods approach provided evidence, utilizing quantitative data from the creation of texts to gather qualitative focus group data from the practitioners themselves - the teachers and literacy experts in the district. Their work relies on high-quality intervention and their work will be more deeply informed by understanding *how* those interventions work with students in order to create sustainable change in practice and, ultimately, in student reading achievement. The voice and expertise of this cadre of teachers were needed to guide the creation of the texts that would ultimately be used with the students who participated in this study. The set of short texts that a team of researchers created

for the focus to read prior to meeting was necessary to ground the discussion in common texts that all could discuss.

Teacher Participants in the Research Study

Design-based implementation (DBIR) research includes involvement of all those who will be involved in implementation. Thus, it was imperative to gather qualitative data from the teacher practitioner perspective on informational texts to be used with students. This researcher, therefore, sought to bring a group of teachers together from the district in which this study was conducted to form a focus group.

Specific criteria for participation in this study required any participating teacher to have a background and school role related to literacy and instruction, to be between the ages of 18 and 75, to be an employee of the district in which the study took place, and to currently be providing classroom instruction or reading intervention to children in grades three or four, or providing literacy coaching to teachers. The researcher, through email communication, invited all qualifying current grades 3 and 4 teachers, elementary instructional coaches, and elementary reading interventionists in the district to be part of the focus group. This researcher was looking to recruit approximately 8-12 members. Participation in the focus group was voluntary, and was communicated very clearly as such. The problem that would be discussed during the focus group meeting was the low reading achievement of the students in the district, and the particular focus was on comprehension of informational text and characteristics of informational text that can enhance or impede comprehension, given the review of the literature outlining the need for explicit reading instruction using informational text.

A total of eight staff volunteered to be part of this focus group: seven staff identified as female and one staff member identified as male. The eight volunteers were then sent a Google Form with questions that were created to ascertain demographic information, level of education obtained, and number of years of service, as well as their role in the district. To reiterate, the adult participants for the teacher focus group consisted of teachers, reading interventionists, and literacy experts in elementary schools in the district.

One teacher focus group participant identified as a person of color and Hispanic. The other seven participants identified as White. All participants had been teaching in the district for at least three years. Three of the focus group participants were fluent in the Spanish language, with one focus group participant being a native Spanish speaker. The teachers were verified as teachers of record by the researcher through contact with the district's Human Resources Department. Further, all participants were teachers the researcher knew well and with whom she interacted on a regular basis.

Prior to the first virtual meeting, the researcher sent, via email, initial questions with regard to demographics, years in education, and educational attainment of those who were participating in the teacher focus group. The results of this questionnaire are found in Appendix A. The use of email was appropriate for this part of data gathering, because the use of email is commonplace in the district for communication that is important, but not urgent. All communication to the focus group members prior to the first meeting was done via email. The work of the teacher focus group would concentrate on characteristics of texts, helping to answer the first research question, *What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading*

comprehension skills of diverse third and fourth grade students? The group provided data which was used to create informational texts that were ultimately used by the student participants in this study. In order to gather that focus group data, however, an initial corpus of texts were created to be read and used in the focus group discussion.

Focus Group Materials

In preparation for the work of the focus group, a set of short texts were created by a group of writers hired by the large research university which is developing iSTART-Early. For the purposes of this study, the texts created were informational texts focusing on science concepts taught at grades 3 and 4. These science concepts were identified and chosen by the researcher, who is a district curriculum administrator with 25 years of experience working with state and local standards. These concepts also aligned with the 2019 state academic standards in Science. An example of such a standard in third grade is the following:

3L.4.2.1.1 Obtain information from various types of media to support an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction . . . Examples of structures may include thorns, stems, roots, colored petals, heart, stomach, lungs, brain and skin. Examples of media may include electronic sources (Minnesota Department of Education, 2019, p. 15).

Once the standards-aligned concepts were identified, the commissioned writers then began creating an initial corpus of expository texts based upon what was deemed essential in terms of content, themes, structures, and interest. There were six general, standards-aligned scientific

themes outlined, with approximately 9-12 texts written under each theme, for a total of 67 texts.

All 67 texts written were analyzed through the use of a Natural Language Processor (NLP) tool.

Natural Language Processing (NLP) Analysis of Texts

To further explore both the first research question, *What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students* and to continue to explore the first sub-question, “What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format?” a set of texts with different levels that were appropriate for this study were created. To do this, a Natural Language Processing (NLP) tool with pre-populated indices was used. The tool used was the Coh-Metrix Common Core Text Ease and Readability Assessor, or T.E.R.A. (Jackson, Allen, & McNamara, 2016), a computational tool that uses natural language processing to produce indices of the linguistic and connected discourse representations of a text. Written text is considered discourse because its ideas are unified, it has purpose, and is connected logically (van Dijk & Kintsch, 1983).

The Coh-Metrix T.E.R.A. analyzes a text on five components: narrativity, syntactic simplicity, referential cohesion, deep cohesion, and word concreteness (Jackson, Allen, & McNamara, 2016). The Coh-Metrix T.E.R.A. tool informs writers (and teachers) of which components of a text are less cohesive, so that writers can revise the texts to make the reading easier, and teachers can work with students to help them recognize parts of texts that are less

cohesive and to build skills to overcome the obstacles that are naturally found in less cohesive texts. In addition, T.E.R.A. utilizes Flesch-Kincaid Grade Level Readability formula to identify a Flesch-Kincaid score (FK), which is a single dimension of text difficulty relative to grade level or the reading level of the student. This score can be very useful when assigning texts to students with varying reading levels (Graesser, McNamara, & Kulikowich, 2011; Jackson, Allen, & McNamara, 2016). The Flesch-Kincaid Reading Ease score is determined by sentence length and word length (numbers of letters in the words).

The Coh-Metrix T.E.R.A. calculates a number of linguistic indices related to various aspects of language that can be used to determine the quality, readability, or other specific properties of a written or spoken text. The system analyzes multiple levels and factors of texts in order to provide a multi-dimensional perspective of the text. The Coh-Metrix T.E.R.A. selects a set of those indices relevant for classroom texts. To illustrate, Coh-Metrix measures simple indices such as word frequency and sentence length as well as more complex indices, such as cohesion, and syntactic simplicity and complexity. Cohesion refers to the way the words within a sentence, and sentences themselves tie together (Jackson, et al., 2016). Syntactic simplicity and complexity refers to numbers of clauses, numbers of words in sentences, and the number of words used before the main verb in the sentence. The lower these numbers, the higher the Coh-Metrix score, and the easier the text is to read (Jackson, et al., 2016).

Coh-Metrix has been used to analyze texts for multiple educational tutoring systems and for a variety of purposes (McNamara et al., 2014). Though there are a multitude of indices produced by this tool, not all were relevant to this study. All indices relevant to reading comprehension are listed in Appendix B, but for the purposes of this study, six were determined

by the Principal Investigator of the iSTART-Early project and the university researchers to be appropriate for use. They include narrativity, syntactic simplicity, referential cohesion, deep cohesion, word concreteness, and the Flesch-Kincaid reading ease score (RDFRE), to allow for the eventual adaptability of the web-based comprehension intervention tool. The data on the complexity of each text used for this study is outlined in Appendix C.

The Coh-Metrix tool provided information on all of the texts in order to determine which of the corpus of texts were appropriate for this study. Of the 67 texts written, 23 were ultimately chosen to bring to the focus group, based upon having a Flesch-Kincaid Grade Level Readability score of <6.0 , meaning that all texts were at or below a fifth grade reading level. Those 23 texts were sent to the focus group ahead of the focus group meeting. The participants of the focus group were asked to read through the short texts in preparation for the meeting.

Focus Group Discussion

Prior to the group meeting, the researcher prepared questions (see Appendix D) to help facilitate the discussion. Those questions formed the foundation of the focus group conversation, with additional questions being asked based on the context of the discussion. The group members had widely varying educational experiences and backgrounds; therefore, it was important to the researcher that the conversation felt organic and that the members could add to and build upon one another's thoughts. The discussion was focused on the texts with which students typically engage in the classroom.

Because of the COVID-19 pandemic, the focus group took place virtually, using Google Meets. The meeting lasted approximately 65 minutes and was recorded. Additionally the

researcher took observational notes as the focus group conversation unfolded. The researcher acted as facilitator.

Members of this group worked together on identifying the core parameters for informational text development and selection. Creating and using a set of guiding questions for discussion, and keeping questions open-ended, invited the group members to build off of each others' thoughts. Leaving room for spontaneous follow-up questions based on answers given provided a better understanding as to how the teachers and literacy experts viewed texts and instruction, and what they valued in the texts themselves. The focus group helped to formulate the parameters that encapsulated the essential characteristics of informational texts: content, themes, text structures with regard syntactic structure (e.g. sentence length and placement of words within a sentence), the interests of the students, and the developmental appropriateness of such texts with regard to third and fourth graders. Scientific themes for the texts themselves were determined in tandem with text characteristics.

Knowing the curriculum and the diversity of the population of students in the district, including their ethnicity, socioeconomic status and native language, the focus group confirmed the texts' alignment to grade level standards that had previously been chosen by the researcher, and also whether the topics of the texts were engaging to students in the third and fourth grade age group, based on the group's prior experiences with the variety of students in that age group.

After the meeting ended, the recording was transcribed and coded for broad categories and themes. The focus group meeting was recorded on Google Meet, a transcription was created from that recording, and notes were taken during the discussion. The qualitative data collected as

a result of the group discussion was coded authentically for themes. No themes were identified by the researcher prior to coding.

The researcher identified overarching categories of the focus group responses specifically with regard to feedback on the created texts. This information was sent to the team ultimately responsible for creating the comprehension intervention tool, and was also sent to the team of writers responsible for creating the texts for this study. The cadre of writers utilized the feedback and made ample revisions to the texts. hence the iterative nature of this phase of qualitative research.

Once revision was done, the texts were again scored using the Coh-Metrix Common Core Text Ease and Readability Assessor (T.E.R.A., Jackson, Allen, & McNamara, 2016). The decision was made by the larger research university to choose the topics of animals, outer space, human body, and geological catastrophes. Once the topics were identified, the two texts with the lowest Flesch-Kincaid scores per topic were chosen to be tested by the student population, for a total of eight texts. The range of readability of those eight texts was 2.7 (second grade, seventh month) to 5.5 (fifth grade, fifth month). See Appendix C for a detailed analysis of the eight texts.

The eight texts were loaded into Qualtrics, which is an online tool used for many purposes, including surveys, evaluations, and higher education research. They were presented to the students in order from easiest to most difficult. However, before the students interacted with the texts, it was paramount to collect data from the students to better understand the students' attitude toward reading in general, and their basic understanding of grade level science concepts.

This data would be triangulated with the data collected from the interaction with the texts in order to help answer not only the main research question but the sub-questions as well.

Study 2: Data Collection with Students To Inform Text Development

The main objective of this research study was to identify essential characteristics of texts that can be used to train reading comprehension strategies in order to improve the reading comprehension of a diverse population of third and fourth grade students. To guide that research, a third sub-question was created:

- What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level?

The term *diverse*, like many words in the English language, has multiple meanings. For the purposes of this study, the researcher used the Cambridge Dictionary's first definition of the term: "including many different types of people or things" (diverse, n.d.). This research study focused on students of color (SoC) and English Language Learners (ELs) who were below grade level in reading, as their reading achievement is continually lower than those of their White, native English-speaking peers (National Center for Education Statistics, 2019; Minnesota Department of Education, 2020). The students who participated in this research study are discussed in the next section.

Student Participants in the Research Study

The iSTART-Early intervention tool, once created, will focus on comprehension intervention for students in grades 3 and 4. Because this study's results contributed to the corpus of research that informed the ultimate creation of iSTART-Early, the students participating in this study were required to be in grades 3 or 4. There were two classes of grade 3 students, two classes of grade 4 students, and one class of grades 2 and 3 students combined, which was due to the limits to class size. Children with significant cognitive disabilities, sensory impairments (blind/visually impaired or deaf/hard of hearing), or children who did not have sufficient English language skills (below WIDA Level 3) to be able to engage with English texts and respond to instructions given in English were excluded from the study. All student participants were identified by the district as achieving below grade level proficiency in reading at grades 3 and 4.

This researcher visited every classroom, introduced herself and the purpose of the study, and handed out the Informed Consent to Participate forms, which were written in English and translated into Spanish. Of those 33 students, 19 obtained parental consent to participate in this study, for an initial 57.6% participation rate. The demographic breakdown of students is shown in Table 3.6 below.

Table 3.6. *Research Study Student Participant Demographics*

Federal Category		Grade 3	Grade 4
Gender	Male	3	4
	Female	6	6
Ethnicity	Asian	1	0
	Black/	0	1

	African American		
	Hispanic	8	9
EL Status	Y	8	8
	N	1	2
Free/ Reduced- Price Lunch Status	Free	7	8
	Reduced	0	2
	None	2	0

Throughout the duration of the on-site research, student absenteeism was an issue. While the number of students originally providing consent to participate was 19, that number slowly dwindled throughout the week. Data collected for the purposes of this study was not consistent across the entire population of students, with only 11 students attending the final day of the data collection to interview on their experiences in the study. As this was a mixed-methods study utilizing design-based implementation research (DBIR), data collection followed iterative cycles, and both teacher data and student data was needed. It was important to understand the role student efficacy as it relates to reading, as research continues to show that reading self-efficacy is both a contributor to and a predictor of successful reading comprehension (Guthrie, et al., 2007; Ortlieb & Schotz, 2020; Solheim, 2011). Therefore, this study used two tools to gain a deeper understanding of what the participating students believed of themselves when it came to reading. The first tool used was a reading attitude survey.

Elementary Reading Attitude Survey Data Collection

Students' attitude toward reading has an effect on reading achievement (McKenna, Conradi, Lawrence, Jang, & Meyer, 2012; McKenna, et al., 1995; McKenna & Kear, 1990; Petscher, 2010; Smith, 1990, Varuzza, et al., 2014; Wade, 2012; Walberg & Tsai, 1985). Further, a review of the literature showed that there is a difference in reading attitude based on gender and language, two important areas of interest for this study (Akbari, et al., 2017; Logan & Johnston, 2009; Martínez, et al., 2008; McKenna, et al., 2012; Mohd-Asraf & Abdullah, 2016). Therefore, it was prudent to collect data on the participating students' attitudes toward reading.

To collect reading attitude data, the researcher administered to each participating student the Elementary Reading Attitude Survey (ERAS, McKenna & Kear, 1990; 1999), which is a tool that measures both recreational and academic reading attitudes. This instrument was chosen for this study for several reasons. First, it has a large normative frame of reference; it is valid and reliable, with reliability coefficients ranging from .74 to .89; of the 18 coefficients computed, 16 were at least .80 (Martinez, Aricak & Jewell, 2008; McKenna, Kear & Ellsworth, 1995; McKenna & Kear, 1990). The ERAS is a 20-item pictorial rating scale which uses a Likert-type scale of four possible responses, called *nodes*. The pictorial format uses the image of the cartoon character Garfield the Cat, appealing to younger students, for the nodes. All items have a short, simply-worded question about reading, which is followed by four pictures of Garfield ranging from very happy to very angry, which pictorially represent feelings in the range from very positive to very negative. Each mode is then assigned 1, 2, 3 or 4 points, with a 1 indicating the most negative and a 4 indicating the most positive. The use of an even number of nodes

eliminates the possibility of a neutral, or non-committal response (McKenna, Kear & Ellsworth, 1995). The survey takes approximately ten minutes to administer.

The 20 items are broken into two 10-item subscales measuring recreational reading and academic reading attitudes. Therefore, each participating student received three scores: one for recreational reading, one for academic reading, and one for total reading attitude. The assessment provides general characterizations of reading attitude on those two dimensions (recreational and academic) as well as a total reading attitude score. The scores were also reported as percentages.

The data was analyzed to find mean and standard deviation, in order to gain understanding of the significance between the students' attitudes toward the two types of reading. As the review of the literature shows that girls have a more positive attitude toward reading than do boys (Logan & Johnston, 2009; Martínez, et al., 2008; McKenna, et al., 2012; Mohd-Asrat & Abdullah, 2016), this data was further disaggregated by gender. Once the researcher administered the Elementary Reading Attitude Survey, she came back to the classrooms on a different day to gather data on general science knowledge.

General Science Knowledge Data Collection

The researcher determined that a base understanding of student grade level science knowledge was warranted. Due to time constraints with the students because of the altered summer targeted services program day, and the suspension of the state standardized testing in the spring, the decision was made to assess the students on their knowledge of grade level science standards using a modified yet appropriate version of the fourth grade NAEP Science Assessment (National Assessment for Educational Progress, 2009, see Appendix E), which was

created by the research team at the large research university overseeing the iSTART-Early research. Questions on this pre-assessment correlated with the themes of the texts students read. There were eight questions on the assessment, and students earned one point for each correct response. The scores were reported as percentages, and analyzed to find mean and standard deviation.

Again, the assessment took little time to administer. However, some students struggled with reading the assessment. Since the goal of the assessment was an overall understanding of students' science knowledge, and not an assessment of reading skill, both teachers and the researcher helped students who were struggling to read the assessment, which is not uncommon. Of the 17 students who took the science assessment, four needed help reading some of the items. This totaled 23.5% of the students taking the assessment. As is discussed in Chapter 5, this finding has implications for future research and practice in the classroom.

The disaggregated data from both the ERAS and the science assessment were used alongside the analysis of the students' paraphrasing results, to better understand the students' comprehension of the texts. To gather the paraphrasing data, it was next necessary to have the students read the texts that were created for this study and use a strategy to paraphrase sentences that would help the researcher better understand the students' comprehension.

Data Collection on Text Reading and Paraphrasing

The central research question for this study focused on essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension of diverse third and fourth grade students. That question is

further guided by a sub-question focusing on specific text characteristics, including length, readability, structure, cohesion, and topics that can be used for teaching reading strategies. To gain a deeper understanding of the role of text characteristics in successful reading comprehension, students engaged in reading and paraphrasing the texts created for this study.

The eight revised texts from the original corpus of 23 were loaded into Qualtrics, which is an online tool used for many purposes, including surveys, evaluations, and higher education research. This tool in particular was used because it could somewhat simulate the experience that the ultimate web-based tutoring tool, once developed, will provide. As mentioned previously the texts were loaded from easiest to most difficult; this is an important point to emphasize, as no student got through all eight texts. The third and fourth grade student participants read these texts during the summer targeted services day and paraphrased predetermined target sentences throughout each text. The students typed their paraphrases into the Qualtrics tool at predetermined times throughout each text. The sentences to be paraphrased were chosen by the Principal Investigator for the iSTART-Early project, who is a nationally recognized expert in reading comprehension, cognition, linguistics, and learning.

Prior to the students actually reading and paraphrasing the texts, the students needed to learn a paraphrasing strategy. Because of the COVID-19 pandemic and resulting modification of the summer targeted services program, this researcher had limited time with the students to teach them a paraphrasing strategy. Therefore, the researchers at the large university created a short, student-friendly instructional video that students individually watched on their computer and could access at will throughout this portion of the research study.

The video was four minutes, eight seconds in length and used what Roehler and Duffy (1984) explained as direct explanations of comprehension processes. The video explained, in student-friendly language, what paraphrasing was and listed four strategies that one can use to paraphrase. Further, the video provided modeling of each of the strategies and provided wait time so students could think about the sentences and practice. This wait time provided the students time to think about words they could use, prior to the narrator continuing the explanation of the strategy. This researcher, along with the staff at the large university, deemed that the length and the pace of the instructional video was appropriate for students this age.

After watching the video, the students then began to read subsets of the texts developed and engaged in paraphrasing specific target sentences throughout each text. Understanding the students' engagement in the tasks was warranted, as the Construction-Integration (C-I) model of reading illustrates that the act reading is a relationship between the reader, text, context and situation (C-I; Kintsch & van Dijk, 1978; Kintsch, 1983; Snow, 2002). Therefore, observation of the students actually reading and paraphrasing was critical to this study.

The researcher, using a modified observation form (Kendeou & McMaster, 2016, see Appendix F), informally observed students watching the instructional video and reading and paraphrasing the texts. This observation form provided quantitative data on the number of observations made regarding four tasks in which the students engaged. The tasks identified for this study included reading, paraphrasing, engaging in a vocabulary task (such as trying to figure out the meaning of a word), or "other" - an act that did not have anything to do with the texts themselves, including watching the instructional video. This quantitative data was analyzed to

find mean and standard deviation, and to gain understanding of the significance between different tasks in which students were engaged.

Additionally, qualitative observational notes were taken on each student during each session. The researcher took narrative notes on the behaviors of the students, including frustration and how the student worked through that frustration, engagement, or off-task behaviors. The quantitative data provided the researcher data on the students' time spent on various tasks; the qualitative observational data collected provided the researcher with real-time narrative data on student behaviors, perceived attitudes, struggles, and engagement with the tasks.

Observation of students engaged in reading and paraphrasing the texts took place over the course of a week, spending approximately one hour at a time in each classroom at a time during the students' literacy block. During this time, those students not participating in the study were engaged in other reading tasks, most often independent reading - either online or with a printed book. This schedule provided the most cohesive environment for all students - on the surface, all students looked engaged in a similar activity, which this researcher deemed to be important to the overall experiences of the students. At the end of the study, participating students received their choice of a pencil and eraser as a reward for their efforts.

During the reading and paraphrasing of the texts themselves, students were asked to rate each text after they read it, as students typically like some texts more than others. To rate the text, a short, student-friendly survey tool was created and placed at the end of each text. This tool included a short phrase and an accompanying emoticon. This tool provided information on what students thought about each text they read, and what they thought about paraphrasing. Students

were asked to rate the text for ease of reading and interest level (if they liked reading the text), and ease of paraphrasing and interest level (whether they liked paraphrasing the sentences). To do this, the following questions were asked:

- Did you like reading the text passage?
- How easy was it to read the text passage?
- Did you like paraphrasing the sentences?
- How easy was it to paraphrase the sentences?

Ratings were displayed on the screen both in written form and pictorially: for text ratings, a green happy face stood for “I liked it!”; a yellow emotionless face stood for “It was okay.”; and a red sad face stood for “I didn’t like it.” For paraphrase ratings, a green happy face stood for “It was easy!”; a yellow emotionless face stood for “It was okay.”; and a red sad face stood for “It was hard.” Students chose the icon that best matched their opinion. An analysis of the answers to these questions provided additional information with regard to students’ interests, as ultimately the web-based comprehension intervention tool, iSTART-Early, will need to be populated with informational texts that match students interests, thus providing the opportunity for greater motivation to read.

Next, the paraphrases themselves were analyzed in order to better understand the students’ comprehension of the texts. The paraphrases produced by the students were scored using a modified version of a rubric developed by McNamara and colleagues (2007a, see Appendix G). This approach correlated with the first generative strategy used in the first module of iSTART-Early, which is paraphrasing. This strategy provided information on how well the

students comprehended the texts. A rubric was used to score the paraphrases, and the raters were trained on the rubrics.

The paraphrases themselves were first filtered for any responses that were irrelevant, too short, or direct copies or clause reversals of the target sentences. Remaining paraphrases were dichotomously coded for the presence of eight different factors: paraphrase presence, lexical similarity, syntactic similarity, semantic similarity, elaboration, inaccuracy, and other content. Finally, paraphrases were scored on a scale of 0-2 for overall quality: 0 indicating a poor paraphrase, 1 indicating the presence of paraphrase strategies but a need for improvement, and a 2 indicating a high quality paraphrase. Two researchers coded all responses separately, and then met to create inter-rater reliability, coming to consensus on each code in order to determine final scores.

Finally, every student who participated in the study was individually interviewed by the researcher, in person, at the end of the quantitative phase of the study. The researcher asked the same three questions of each student participant, and recorded their answers on a form. The three questions are as follows (asked in order):

- Do you remember what paraphrasing is?
- How did you figure out how to paraphrase the sentences?
- Do you think paraphrasing helped you to read better? Why?

The length of each interview depended upon how well the student elaborated on each answer.

There were no follow-up questions. This researcher analyzed the qualitative data of each response to provide additional information with regard to the impact of the study on each student's attitude toward their comprehension, their experience paraphrasing with an online

science text, and their reading self-efficacy. Their explanations were analyzed to determine overall themes in the use and effectiveness of paraphrasing in this setting, and its impact on their identity as a reader in general.

Data Analysis

This study was designed to study text characteristics that were essential for use in reading strategy instruction, specifically strategy training that will involve the creation of a strong comprehension tutoring tool for third and fourth grade students struggling in reading. This research study aimed to answer the question, *What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students?* This question is further informed by asking the following sub-questions:

- What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking in a digital format?
- What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level?

To understand the role of informational texts used in comprehension intervention, specifically with regard to the paraphrasing strategy used in this mixed-methods, iterative study, it was important to gather and analyze multiple points of qualitative and quantitative data at different points throughout the study, beginning with the texts themselves. Through the use of

nationally-recognized and research-based readability tools, texts were created and underwent an iterative process of quantitative analysis to ensure proper readability for students.

Qualitative data was obtained from practitioner (teacher) focus group conversations and analyzed for broad themes and categories that were brought back to the text writers in order to revise the student texts and to create the corpus of texts that were included in this study and used by students to read and paraphrase. More qualitative data was collected from the participating students at the end of the study and is discussed below.

A broad understanding of the students themselves required obtaining **quantitative data** on the students prior to their engagement in the texts and the paraphrasing activity. A short science pre-assessment, using a modified but appropriate version of the fourth grade NAEP Science Assessment (National Assessment for Educational Progress, 2009, see Appendix E) provided data on students' basic science knowledge. It was scored and analyzed to find mean and standard deviation. The questions on this pre-assessment correlated with the themes of the texts students read and paraphrased. The Elementary Reading Attitude Survey (ERAS, McKenna & Kear, 1990; 1999) was administered to students that provided data on reading attitude, which research shows has an effect on reading achievement (McKenna, et al., 1995; Petscher, 2010; Smith, 1990, Varuzza, et al., 2014; Wade, 2012; Walberg & Tsai, 1985). The survey measured recreational and academic reading attitude separately, and also provided a total reading score. This data was analyzed for reliability coefficient, and was also analyzed for mean and standard deviation.

Observational data was gathered while students read the short texts and engaged in a paraphrasing strategy in order to gauge their engagement in the reading and paraphrasing tasks.

The observational data collected was both quantitative and qualitative. First, the system was loaded onto each student computer, and students read the texts online, stopping to paraphrase sentences. After each text was read, students answered a short set of questions about their attitude toward the text and the act of paraphrasing. Using a modified observation form (Kendeou & McMaster, 2016, see Appendix F), the researcher quantitatively observed the students in four areas: reading, paraphrasing, engaging in some sort of a vocabulary activity (such as trying to figure out the meaning of a word), or some other activity. This quantitative data was analyzed to find mean and standard deviation, and to gain understanding of the significance between the different tasks in which students were engaged. The researcher also took narrative notes on the behaviors of the students, including frustration, engagement, or off-task behaviors. This qualitative data was analyzed alongside the quantitative data from the observation form to glean a deeper understanding of the student behavior in the four areas, such as how a student worked through frustration when trying to figure out the meaning of a word.

The **paraphrases** themselves were scored using a coding rubric (see Appendix G). Paraphrases were scored based on five criteria: whether or not the paraphrase was too short; a copy/paste; a clause reversal; garbage, meaning it was gibberish; or irrelevant, meaning it had no connection to the text. This methodology provided quantitative data from the results of students engaged in paraphrasing short science texts and was analyzed for the length and quality of each paraphrase, which correlated to the students' understanding of and comprehension of the text. Data was also obtained on how many texts students read and paraphrased.

The last data obtained was through a short, three-question interview with the final participating students remaining in the summer targeted services program on their experience

with paraphrasing, which provided qualitative data on each student's experience and understanding of paraphrasing, and how they felt as a reader as a result of the exercise. While short, the responses were still coded for themes. No codes were identified prior to the analysis; rather, they were identified authentically as a result of student answers and analyzed student by student.

All of this data were triangulated in order to identify emerging patterns and themes, such as the relationship between the qualitative data (e.g. whether or not the student liked the texts and paraphrasing, and whether or not they thought paraphrasing made them a better reader) and the quantitative data (e.g. paraphrasing scores, science assessment scores, and reading attitude survey) in order to understand if the texts were appropriate for the web-based comprehension intervention tool. The researcher used the data not only to help answer the research questions, but also to understand the relationship between the results of this study and the review of the literature to determine recommendations for future practice and research. Data obtained through this study, including paraphrasing scores, science assessment scores, and reading attitude survey results, were also analyzed and used within the larger study protocol.

For all data collection involving students, each student was given a numerical identification, to which all data, both qualitative and quantitative, was assigned. This provided the researcher with the ability to analyze the data at both a group and individual level, taking into account student demographics, such as gender, race/ethnicity, language, grade level, and socioeconomic status.

Conclusion

The purpose of this chapter was to review and provide the rationale for the methods used in this study, which was a mixed-methods research study to explore the role of informational texts and specific components of reading comprehension while reading digitally. The methodology chosen for this study delved into the impact of informational texts on reading comprehension skills, and their essential characteristics with specific regard to comprehension intervention in an online format for students in grades 3 and 4 who are at risk of reading difficulties or already struggling in reading comprehension. This researcher examined characteristics of informational texts that can lead to greater engagement in and comprehension success with the reading content created for an online comprehension intervention, and taught and used the paraphrasing strategy to determine that comprehension success.

A review of the literature detailed the fact that these two grades are a critical time in a student's literacy development, especially as demands on learning new content through reading increase. Further, a detailed review of the literature confirmed that there is a continued, pervasive, and large achievement gap between students of color, students of limited socioeconomic means, and students for whom English is not their dominant language and their White, middle class peers.

This study was part of a larger, federally-funded study to develop an online, automated comprehension strategy tutor for students in grades 3 and 4, called the Interactive Strategy Training for Active Reading and Thinking for Young Developing Readers, or iSTART-Early. This tutor will ultimately support both teachers and students in the classroom, as teachers will be

able to assign texts and monitor students' comprehension progress. Therefore, this study focused on the text characteristics of informative texts that will ultimately populate this tool, and how students interfaced with the informative texts in an online format.

A detailed description of the participants and setting of this study, and a detailed description of the creation of the texts used in the study was warranted for this chapter, as this study was conducted in a very diverse school district with a large population of students of color, students living in poverty, and English Language learners; additionally, the district had a large percentage of students scoring partially proficient on the standards or not meeting standards, and the district has a large achievement gap between their students of color and English Language learners and their White, middle-class peers.

Finally, and unexpectedly, this chapter outlined what the effects that the COVID-19 pandemic, an unparalleled event in American education, and an unanticipated event with regard to this research, had on the study itself. A thorough analysis of demographic data, teacher and literacy expert focus group data, and student reading data was undertaken in order to identify emerging themes. Chapter Four provides an in-depth analysis of the data as it relates to results.

CHAPTER FOUR: ANALYSIS AND RESULTS

Our understanding of the human brain can be dramatically accelerated if we collect and share research data on an exponentially wider scale.

-Tan Le

Introduction

The majority of students in grades 3 and 4, not only in the United States but in the district in which this study took place, are not proficient readers as measured by national and state standardized assessments (National Center for Education Statistics, 2019; Minnesota Department of Education, 2020). These statistics are alarming, as this grade level band has been identified as a critically important time period in young readers' lives. They are being asked to learn content from increasingly complex informational and expository texts, yet their exposure to and instruction in these non-fiction texts has lagged (Beerwinkle, et al., 2018; Castles, Rastle, & Nation, 2018; Chall, et al., 1990; Duke, 2000; Jeong, et. al., 2010; Strong, 2020). Further, as was established previously through a review of the literature, there is an elusive and persistent gap in reading achievement between White, middle-class students and students of color, students from low socioeconomic families, and students for whom English is not their first language. The researcher, herself being a former English language arts teacher and K-12 literacy director with over 25 years in education, has witnessed firsthand students struggling to understand what they are reading and has dedicated her work as an educator to eliminate reading achievement disparities which are predictable across federal categories.

One of the ways this researcher has tried to increase reading achievement for students has been to seek and foster relationships with research institutions. She had the opportunity to collaborate with a large research university to provide data that would aid in the eventual creation of a web-based comprehension intervention, called iSTART-Early. This study was designed to answer the following question: *What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students?*

Further, the main research question was guided by the following sub-questions:

- What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format?
- What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level?

This chapter presents the findings of the Design-based implementation research (DBIR) and mixed methods research study designed to answer the research questions. Design-based implementation research includes the active involvement of those who will ultimately be *implementing* the strategy intervention which, for the purpose of this study, are third and fourth grade teachers and their students. Data were collected in iterative phases. First, data collected from the teachers were analyzed, and informed the creation of expository science texts that were

read by students. The data collected from the students were analyzed to answer the research questions.

The central question, *What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students?* was answered through multiple stages of research in this study. The first phase began with the initial creation of a corpus of texts prepared for the teacher focus group discussion. This work was done through collaboration with this researcher and researchers at the large research university. The data collected from the focus group were used to revise the initial corpus of texts in order to create a final set of texts for use by the students in this study. Below is a discussion of the findings of this phase of the research.

Study 1: Data Analysis To Inform Text Creation

In the first phase of the study, the researcher obtained qualitative data from a focus group made up of teachers and literacy experts on their experience with and opinions regarding informational texts appropriate for use in grades three and four for strategy training. The focus group members worked on identifying the core parameters for informational text development and selection. This group read informational texts created specifically for this study that aligned with state grade-level science standards. Members of the focus group provided feedback on the texts, including their appropriate use with third and fourth grade students. Data from a quantitative analysis of the initial set of texts were used to create the final corpus of eight texts used with students in this study.

Natural Language Processing (NLP) Analysis of Texts

The first stage of this study required that texts be created to populate a tool students would use to read and show comprehension of the texts. These texts were created through an iterative process. First, this researcher and several university researchers came together to identify broad science themes that could be used to create texts aligned to state standards for third and fourth grade. This researcher had strong knowledge of the state science standards and was able to guide the university researchers through the standards to build understanding. Once the topics were identified, writers created 67 initial texts based upon the identified science themes. These writers were hired based upon their previous experience in writing, their previous experience in a school setting with elementary students, or a combination of both experiences.

The initial corpus of texts written were analyzed by word count, Flesch-Kincaid (FK) scores, and Lexile range, as the developers of those texts knew that the texts would change as a result of feedback. Those with FK scores greater than a score 6.0 were removed, as they would have been too difficult for the students at these grade levels to read. This left a corpus of 23 texts, which were presented to a focus group with eight members consisting of teachers, reading interventionists, and literacy specialists. The group was asked to read the texts prior to the convening of a virtual meeting to discuss the texts, and were given a week to read them. All of the texts were short - approximately 400-650 words each. The virtual meeting took place via video conferencing, in this case Google Meet, which was the district's approved method of video conferencing. Additional analysis of the 23 texts occurred after the focus group feedback. The text titles and data on the 23 texts presented to the focus group are found in Table 4.1 below.

Table 4.1. *Text Titles and Characteristics*

Text Title	Word Count	Lexile Range	Flesch-Kincaid Score
Zoos & Humane Treatment	363	610-800	5.9
Bioluminescence	310	410-600	5.3
Ostriches	358	410-600	3.7
Sloths	387	610-800	5.4
Starfish	397	410-600	3.8
Platypus	329	410-600	3.5
Avalanches	359	610-800	5.6
Quicksand	317	610-800	5.3
Wildfires	237	610-800	5.1
Flooding	384	810-1000	5.0
Using 10% of Brain	312	610-800	5.5
Eating Turkey	208	610-800	5.2
Eating Healthy	399	410-600	3.8
Blood	388	410-600	3.9
GroupThink	237	410-600	3.5
Venus	352	810-1000	6.0
Pluto	403	610-800	5.6
Meteors	372	610-800	4.8
The Universe	285	410-600	4.9
A Visit to Mars	361	410-600	2.8
How a Star is Born	243	410-600	2.8

Lightning	344	610-800	5.2
Magnets	231	610-800	5.3

Focus Group Qualitative Data Analysis

Because meeting as a group was not possible due to the COVID-19 pandemic, the researcher convened the focus group via Google Meet. This video conferencing tool offers a service whereby the meeting can be recorded; a copy of that recording is sent to the organizer of the meet within a few hours after the meeting has ended. All teachers who volunteered to participate were present in the meeting, they agreed to be recorded, and the meeting lasted slightly over one hour.

During that meeting, participants discussed what they noticed in and about the texts. The researcher had pre-planned questions (see Appendix D) to be used as conversation starters, but additional questions were asked as a follow-up depending on the conversation that ensued, to continue the engagement in the topic about grade level texts. This researcher recorded the Google Meet and obtained a recording of it that she then transcribed. The transcription of the meeting was analyzed for the emergence of overarching themes and categories, which were then categorized. Table 4.2 below outlines the thematic categories, with the number of mentions for each theme and percentage of total mentions for each theme, in descending order.

Table 4.2. *Teacher Focus Group Themes*

Category	# of Mentions	% of Total Mentions
Text Structures	67	30.7
Instructional Pedagogy	42	19.3

Engagement	31	14.2
Vocabulary	29	13.3
Connections	14	6.4
Self-Efficacy	14	6.4
Motivation	13	6.0
Prior Knowledge	8	3.7

The analysis of the focus group data determined broad themes. The importance of those themes, as evidenced by the number of mentions, was valuable information which this researcher brought back to the text writers. They used this information to revise the texts which would be used in this study. It was obvious that text structure was important to the teachers and literacy experts. Vocabulary was also identified as a strong theme. However, the original literature review had little emphasis on vocabulary. Because of its importance in the focus group discussion, it was imperative that vocabulary be included as a focus in the review of literature for this study. Vocabulary, as will be discussed later, became a central issue with regard to student comprehension of the texts.

This analysis of the focus group data was provided to the original team of literacy experts who wrote the texts, and aided in their revision of the texts. During this time, the district's learning environment was hugely disrupted due to the COVID-19 pandemic, and there was much interruption to the original parameters of this study. The end of the school year was altered significantly and moved to distance learning. As a result, this researcher found it impossible to reconvene the teacher focus group in its entirety, even virtually, as the teachers who participated

expressed feelings of stress and exhaustion after the events of the spring, and stated that they needed to separate from their professional life as an educator. This researcher, in collaboration with the team writing and revising the texts, determined that there was enough information gleaned from the focus group discussion to move ahead with revision and finalization of the 23 Chapter three texts to create the cadre of texts that would be used by the students in this study.

Analysis of the Texts Created and Used

The writers revised the initial set of 23 texts based upon the themes gleaned from the focus group data, especially with regard to text structure and vocabulary. Next, the texts were further analyzed using reading indices. All reading indices related to reading comprehension are found in Appendix B. For the purposes of this study, six components of the Coh-Metrix Common Core Text Ease and Readability Assessor (T.E.R.A., Jackson, Allen, & McNamara, 2016) were used, five of which are described below. The sixth, the Flesch-Kincaid Readability Score, has been previously described in Chapter Three. No text was included in the set presented to students that had a Flesch-Kincaid Readability Score (FK) of >6.0 . For each of the remaining five T.E.R.A. components, generally speaking, the higher the score, the easier a text is to read (Jackson, Allen, & McNamara, 2016). These five components are briefly described in Table 4.3 below.

Table 4.3. *Components of the Coh-Metrix Text Ease and Readability Assessor (T.E.R.A.)*

T.E.R.A. Component	Brief Description
Narrativity	Genre: how story-like the text is
Syntactic Simplicity	Complexity of sentences: use of clauses, number of words in a sentence, number of words before the verb

Word Concreteness	Use of words for things one can see, hear, taste, smell, touch
Referential Cohesion	The overlap of words or concepts from one sentence or section of a text to another
Deep Cohesion	How well the events, ideas, and information from the whole text is tied together - the use of connectives, e.g. “after” or “because”

Although a corpus of 23 texts was created for this study, not all were used with the student sample. Due to the COVID-19 pandemic, the summer targeted services program was altered, and the length of time reduced. Therefore, the use of 23 texts was not feasible. Once revision of the 23 texts was completed, the decision was made by the staff at the large research university, and confirmed by this researcher, to choose four science topics and to include two texts per topic. Those four topics were animals, outer space, the human body, and geological catastrophes. They were chosen because of their alignment with the state science standards for grades 3 and 4, and an understanding of general student interest at those two grade levels.

The two texts selected per topic were those with the lowest Flesch-Kincaid scores and the highest Coh-Metrix T.E.R.A. scores. The range of Flesch-Kincaid readability scores on the eight selected texts was 2.7 (second grade, seventh month) to 5.5 (fifth grade, fifth month). The word count for the texts ranged from 275-398; the number of paragraphs for each text ranged from three to 16; and the sentence count for each text ranged from 20 to 39. Data on the eight texts used with students in this study are found in Appendix C.

The Coh-Metrix T.E.R.A. tool scored each text on the five previously mentioned components: narrativity, syntactic simplicity, word concreteness, referential cohesion, and deep cohesion. Each component earned a score out of 100 and is represented as a percentile; the

higher the score in each area, the easier the text was to read. Of the 40 scores earned for the texts (five scores for each of the eight texts), there were 24 scores of 60 and above, and 16 scores of 59 and below. The mean score and standard deviation for each of the T.E.R.A. components are found in Table 4.4 below.

Table 4.4. *Mean Scores and Standard Deviation for Coh-Metrix T.E.R.A. Components*

T.E.R.A. Component	Mean	Standard Deviation
Narrativity	53.49	10.63
Syntactic Simplicity	80.14	13.22
Word Concreteness	70.71	21.18
Referential Cohesion	65.29	22.57
Deep Cohesion	54.43	28.64

Because all texts used for this study were expository science texts, the T.E.R.A. scores for narrativity were predictably lower, with no text earning a score above 67. Therefore, the narrativity component had the lowest mean score, and also the lowest standard deviation.

Of particular interest was the finding on the component of deep cohesion, which measures how well the information of the whole text is tied together. This component had the second lowest mean score, meaning that the texts used for this study had a lower number of connectives and/or they did not incorporate other components that helped students make inferences. However, this component also had the highest standard deviation, which meant there was considerable variation on the deep cohesion of each text. Text 4 had a deep cohesion score of 24, compared to Text 3, which had a deep cohesion score of 99. According to Jackson, et al.

(2016), in the case of informational text, “the lack of deep cohesion may pose challenges, particularly for low knowledge readers” (p. 55). Further, according to Jackson, et al., a score for deep cohesion is extremely informative for expository texts that may need more explicit cues to help the reader make sense of the text. Further analysis of the texts coupling the T.E.R.A. components with paraphrase data will be discussed later in this chapter.

In order to fully answer the first research question, *What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students?* the students needed to interact with the texts by reading them and paraphrasing sentences to gain an understanding of their comprehension. Therefore, once the analysis of all texts was completed, they were populated into Qualtrics, and that tool was loaded onto each participating student’s computer. The tool was created in Qualtrics in such a way that the participating students had to complete reading, paraphrasing, and rating each text before they were able to move on to the next text. Because of this particular format of the Qualtrics tool, the texts were ultimately presented to the students in order from easiest to most difficult. In the next phase of the study, qualitative and quantitative data were collected by the researcher on the students’ interactions with the text.

Study 2: Student Data Analysis

In this second phase of the study, qualitative research focused on observation of students reading and paraphrasing the texts, and a short interview was conducted with all remaining students who participated in the research. As was discussed in previous chapters, and will be

discussed more thoroughly in the Limitations section of this chapter, there was an unforeseen yet sizable interruption to the research setting due to the COVID-19 pandemic. This researcher had fewer students with whom to work, and less time with the students. Therefore, the decision was made to focus on one reading strategy from which to gather data - the paraphrasing strategy.

Paraphrasing is an effective comprehension strategy (Hagaman, et al., 2016; Hagaman, et al., 2012; Kletzien, 2009), and can be taught effectively to younger students to help them monitor and increase their comprehension (Kletzien, 2009, Pearson & Billman, 2016). Paraphrasing is sometimes considered a form of summarization (Kletzien, 2009). However, it is a skill that can be learned before a student learns the more complex and formal skill of summarizing, because paraphrasing means putting content into one's own words. This researcher taught her students to remember the short adage, "Say it the way *you'd* say it!" Paraphrasing, like any comprehension strategy or skill, needs to be explicitly taught to students. To do this, a short, student-friendly instructional video on the paraphrasing strategy was created and loaded onto each participating student's computer. The students watched the video and could access it at will throughout the paraphrasing process.

The quantitative research in this second phase was multifaceted, and included analysis of the following:

- pre-assessment data on the students' reading attitudes
- student results on a short grade level science assessment to ascertain base level science understanding
- observational data while students engaged in watching the instructional video, reading, and paraphrasing texts

- paraphrase data, which included the number and quality of students' paraphrases

After students watched the paraphrasing strategy instructional video and read and paraphrased the texts, data were analyzed to understand the effects of the paraphrasing strategy instruction on the reading comprehension of the participating third and fourth grade students.

The next step in analysis was informed by the two sub-questions:

- What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format?
- What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level?

While the analysis of the text themselves, especially with regard to the six reading indices used for this study, helped to inform the first sub-question, data were gathered from students while they read and paraphrased the texts, which aided in answering the second sub-question.

In this phase of this study, students watched the instructional video on the paraphrase strategy, and worked with the texts that were created in Qualtrics and loaded onto their computers. They were asked to read short science texts, paraphrase specific, pre-determined sentences, and rate each text and paraphrase activity before going on to the next text. Prior to analyzing the paraphrase data, it was important to this researcher to better understand the students in two particular areas: their attitudes toward reading, and their general understanding of

grade level science knowledge aligned to the texts created for this study. The next section discusses the students who participated in this study.

Student Participant Data

There were a total of 33 students in grades 3 and 4 who initially registered to participate in the in-person summer programming for this district. The researcher visited all third and fourth grade classrooms, introduced herself and explained the research process and explained to each class that they would need to obtain permission from their family in order to participate in the research study. Providing the students with Consent to Participate forms, which were written in both English and Spanish, the researcher explained that their parents or guardians would need to sign the form, and they would need to bring the signed form back in order to participate.

Of the group of 33 total students, 19 students obtained permission to participate in this study. There were 12 female participants; six were in grade three and six were in grade four. There were seven male participants; three were in grade three and four were in grade four. All students participating in this study were BIPOC (Black/Indigenous/Students Of Color). Three federal race categories were represented in this population of participants. Asian (one participant) and Black/African American (one participant) comprised 10.5% of the participants; Hispanic (17 participants) comprised 89.5% of the group participating in this research study. Of the participating students, 84.2% were identified by the district as English Language Learners, and 89.5% qualified for free- or reduced-price lunch. Grade, gender, ethnicity, language, and socioeconomic data on each student are presented in Table 4.5.

Table 4.5. *De-Identified Student Data*

De-Identifier	Grade	Gender	Ethnicity	EL	FRP
10001	4	F	Hispanic	Y	Free
10002	4	M	Hispanic	Y	Reduced
10003	3	F	Hispanic	Y	None
10004	4	M	Hispanic	Y	Free
10005	3	F	Hispanic	Y	Free
10006	3	M	Hispanic	Y	Free
10007	4	F	Hispanic	N	Free
10008	3	F	Hispanic	Y	Free
10009	3	F	Hispanic	Y	Free
10010	3	F	Hispanic	Y	Free
10011	4	M	Black/ Af. Am	N	Free
10012	3	F	Hispanic	Y	Free
10013	3	M	Hispanic	Y	Free
10014	4	F	Hispanic	Y	Free
10015	4	F	Hispanic	Y	Free
10016	4	F	Hispanic	Y	Free
10017	4	M	Hispanic	Y	Free
10018	4	F	Hispanic	Y	Reduced
10019	3	M	Asian	Y	None

Student Pre-Assessment Data.

Data were obtained from each student prior to students reading the science texts and paraphrasing sentences. Of particular interest to this researcher was the students' attitude toward reading and their base knowledge of grade level science concepts, as this data align with the review of the literature emphasizing the positive effect that engagement (DeNaeghel, et al., 2012; Guthrie & Cox, 2001; Guthrie & Wigfield, 2000; Reschly & Christenson, 2012; Skinner & Pitzer, 2012; Unrau & Quirk, 2014; Varuzza, et al., 2014; Wigfield, et al., 2008) and prior knowledge (Coiro, 2011a; Kendeou & O'Brien, 2016; Kendeou & van den Broek, 2007; Lipson, 1982; McCullough, 2013; McNamara, et al., 2011) have on successful reading comprehension. The data points from both pre-assessments were used in the analysis of the students' paraphrasing results. All de-identified student pre-assessment data can be found in Appendix H. This section analyzes the data from both pre-assessments, beginning with the participating students' attitudes towards reading.

Elementary Reading Attitude Survey (ERAS).

The review of the literature confirmed that attitude impacts learning (McKenna, et al., 1995; Petscher, 2010; Smith, 1990, Varuzza, et al., 2014; Wade, 2012; Walberg & Tsai, 1985). Because reading is such a fundamental component of school success, it is important to understand all of the components that lead to reading success. A review of the literature has shown that reading attitude can affect reading performance (McKenna & Kear, 1990; Petscher, 2010; Walberg & Tsai, 1985). Therefore, it was important to understand the reading attitudes of the students participating in this research study.

To gauge a general understanding of the students' attitudes towards reading, this researcher administered the Elementary Reading Attitude Survey (ERAS, McKenna & Kear, 1990; 1999) on the second day she was with students. The Elementary Reading Attitude Survey is a tool that measures both recreational and academic reading attitudes. This tool contains 20 items, each having four possible responses, called *nodes*, in a pictorial format that is appealing to younger students. The use of an even number of nodes eliminates the possibility of a neutral, or non-committal response (McKenna, Kear & Ellsworth, 1995). Each mode is then assigned 1, 2, 3 or 4 points, with a 1 indicating the most negative attitude and a 4 indicating the most positive. The survey takes little time to administer.

The 20-item assessment consists of two subsets: one 10-item subset focused on *recreational reading* attitudes and one 10-item subset focused on *academic reading* attitudes. Students are asked to score every item in the subset; therefore, they earn a score between 10-40 on each subset, and can earn a score between 20-80 for the overall reading score. The three scores are each converted to percentiles, which are based on national norms and are grade-specific. The assessment provides general characterizations on reading attitude on those two dimensions as well as a total reading attitude. The survey is widely understood to be very reliable, with reliability coefficients ranging from .74 to .89; of the 18 coefficients computed, 16 were at least .80 (McKenna, Kear & Ellsworth, 1995). Participating students took this survey in one sitting. The reliability coefficient for combined ERAS reading scores for this small group was .67, which falls within a low but acceptable range. De-identified reading attitude scores can be found in Appendix I; however, a detailed analysis of the data is below.

Scores for the recreational reading component of the Elementary Reading Attitude Survey for the students participating in this study ranged from 17-37, with percentiles ranging from the 1st percentile to the 90th percentile. The mean score in recreational reading was 29.47, which was 61.2% of the total score possible, showing that overall, the group of students enjoyed recreational reading more than the average student. This is an interesting finding, considering that these students are all struggling readers. Standard deviation in recreational reading attitude scores was 5.004, showing that the scores were somewhat dispersed, although the sample size was small. Of the 19 participating students who took this assessment, 15 were within one standard deviation of the recreational mean score. That number represents 78.9% of the participating students.

Next, the data were analyzed by gender and grade level. A review of the literature showed that grade level and gender have effects on reading attitudes. First, there is a difference in reading attitude based on gender and language, two important areas of interest for this study (Akbari, et al., 2017; Logan & Johnston, 2009; Martínez, et al., 2008; McKenna, et al., 2012; Mohd-Asraf & Abdullah, 2016). Secondly, positive reading attitudes can decline as students matriculate through the grades (Martínez, Aricak, & Jewell, 2008; McKenna, et al., 1995; Smith, 1990; Varuzza, et al., 2014).

Breaking the data down by gender, there was a relatively significant difference in recreational scores at both grade three and grade four. Females in both grades had higher recreational reading attitude scores than males in this study. The difference was six points at grade 3 and 7.08 points at grade 4, which corroborates with the review of the literature. Further, scores for the girls in grade 4 had little variability, with a standard deviation of 1.972.

When looking at the data by grade level, however, the mean recreational reading scores for both males and females increased from grade three to grade four by approximately 10%, and the standard deviation decreased from grade three to grade four. This finding was somewhat surprising, given that a review of the literature showed that reading attitudes decline as students move through grade levels. Table 4.6 below shows the mean recreational reading attitude data and the standard deviation for the participating students delineated by gender and grade level.

Table 4.6. *Mean Recreational Reading Attitude Score Data by Gender and Grade Level*

Grade 3	Male	Female
	Mean: 24.33 SD: 5.44 N= 3	Mean: 30.33 SD: 3.14 N= 6
Grade 4	Mean: 26.25 SD: 4.02 N= 4	Mean: 33.33 SD: 1.97 N= 6

The data were disaggregated by gender and grade level only, because all students participating were students of color, only three of the 19 students (15.8%) were not English Language Learners (ELs), and only one student was not under free/reduced lunch (FRP) status. Therefore, this researcher did not compare the differences in reading difficulties between these groups.

Scores in academic reading ranged from 21-37, with percentiles ranging from the 20th percentile to the 95th percentile. The mean score in academic reading was 29.11, which was 61.2% of the total score possible. Similar to the recreational reading scores, students in this study had a more positive attitude toward academic reading than the average student. Standard

deviation in academic reading attitude scores was 4.677. Of the 19 student participants, 12 were within one standard deviation of the academic mean score. That number represents 63.2% of the participating students. Table 4.7 below shows the mean academic reading attitude data and the standard deviation for the participating students delineated by gender and grade level.

Table 4.7. *Mean Academic Reading Attitude Score Data By Gender and Grade Level*

Grade 3	Male	Female
	Mean: 28.67 SD: 4.99 N= 3	Mean: 30.0 SD: 4.12 N= 6
Grade 4		
	Mean: 25.75 SD: 5.78 N= 4	Mean: 30.67 SD: 4.59 N= 6

Breaking the scores down by gender, while there still was a difference in academic reading attitude scores between males and females, there was less of a difference in academic reading attitude scores between males and females in grade three (difference of 1.33) than in grade four (difference of 4.92), and less overall difference in academic reading attitude scores at both grade levels than differences in recreational reading attitude scores. The academic reading attitude of males in this study declined from grade three to grade four by over 10%, which is in keeping with the review of the literature. However, there was no decline in female academic reading attitudes; the scores from grade three to grade four stayed relatively stable. Again, this researcher disaggregated the data by gender alone, as all students participating were students of color, only three of the 19 students (15.8%) were not English Language Learners (ELs), and only one student was not under free-/reduced lunch (FRP) status.

Overall reading attitude scores (combining both recreational and academic reading scores) ranged from 39-72, with percentiles ranging from the 9th percentile to the 91st percentile. The mean total score was 58.59, which was 62.12% of the total score possible. Standard deviation in total reading attitude scores was 8.853. Of the 19 students participating, 14 were within one standard deviation of the total reading score. That number represents 73.68% of the participating students. Table 4.8 below shows the mean total reading attitude data and standard deviation for participating students delineated by gender and grade level.

Table 4.8. *Mean Total Reading Attitude Score Data By Gender and Grade Level*

Grade 3	Male	Female
	Mean: 53.0 SD: 9.89 N= 3	Mean: 60.33 SD: 6.52 N= 6
Grade 4	Mean: 52.0 SD: 6.67 N= 4	Mean: 63.5 SD: 5.94 N= 6

When analyzing the total reading attitude scores by gender, there was a relatively significant difference in mean scores between males and females at both grade levels, although the sample size was small. The girls participating in this study indicated a more positive overall attitude toward reading as evidenced by a mean score difference of 7.33 points at grade three and a mean score difference of 11.5 points at grade four. This finding is in agreement with the review of the literature.

Raw scores for recreational and academic are approximately the same (recreational mean = 29.47; academic mean = 29.10), but the percentiles slightly favored a preference for academic

reading (recreational mean percentile = 50.8; academic mean percentile = 59.7). The fourth grade students participating in this study slightly preferred reading in both recreational and academic categories, although the sample is too small to say the difference is significant. Overall, the students' mean percentile for reading attitudes is in the 55th percentile, showing that this was a fairly balanced group.

Science Pre-Assessment.

Prior knowledge plays a pivotal role in reading comprehension and in content learning, because people learn things from what they read, and they apply that knowledge to new texts in order to comprehend them (Afflerbach, 1990; Wharton-McDonald & Erickson, 2017). The greater the background knowledge, the more a student is able to draw on it as they read, and the more profound the effects on reading comprehension (Afflerbach, 1990; Castles, Rastle & Nation, 2018; Kendeou & O'Brien, 2016; Oakhill, Cain, & Bryant, 2003; Pearson & Billman, 2016; Wharton-McDonald & Erickson, 2017; Willingham, 2017; Willingham, 2006). The research has shown that when a person is reading and can make connections to the text from existing knowledge they have on a subject, comprehension is enhanced (Afflerbach, 1990; Castles, Rastle, & Nation, 2018; Kendeou, McMaster, & Christ, 2016; Kendeou & O'Brien, 2016; Spilich, Vesonder, Chiesi & Voss, 1979). Thus, it was essential to gain an understanding of the participating students' general knowledge of grade level science concepts, especially those concepts that aligned to the themes of the texts they would be reading for the purposes of this research study.

To assess the students' base knowledge of science concepts, an eight-item science assessment was created by the research team at the large research university overseeing the iSTART-Early research. The team used a modified yet appropriate version of the fourth grade NAEP Science Assessment (National Assessment for Educational Progress, 2009, see Appendix E). Questions on this pre-assessment correlated with the topics chosen for the texts students read and paraphrased. Students earned one point for each correct answer on this modified assessment, for a total possible of eight points. The students' science pre-assessment data are found in Table 4.9 below.

Table 4.9. *Science Pre-Assessment Data*

Student	Gender	Grade Level	Score (out of 8 total possible)	Percentage:
10001	F	4	6	75%
10002	M	4	5	62.5%
10003	F	3	2	25%
10004	M	4	7	87.5%
10005	F	3	4	50%
10006	M	3	ABSENT	
10007	F	4	5	62.5%
10008	F	3	1	12.5%
10009	F	3	ABSENT	
10010	F	3	2	25%
10011	M	4	1	12.5%
10012	F	3	3	37.5%

10013	M	3	3	37.5%
10014	F	4	6	75%
10015	F	4	6	75%
10016	F	4	2	25%
10017	M	4	4	50%
10018	F	4	6	75%
10019	M	3	4	50%
Mean Score: 3.94117647		SD: 7.6773157		Mean Percentage: 49.26%

Students scored between 1-7 on this assessment, with two students absent during this part of the research. Two students scored a 1 out of 8, and one student scored a 7 out of 8. The overall mean score earned on this assessment was 3.9412, a number just below 50% of the total points possible. Only three students scored a 4 out of 8, which was just over the mean. The standard deviation was 7.6773, which meant that every student was within one standard deviation of the mean. The number of items on this assessment was small, hence the large variability between scores. While the mean percentage score on the science assessment was 49.3%, fourth grade students earned, on average, a higher mean score (60%) than the third grade students earned (33.9%), which is not surprising, given the fact that they are one year older.

Breaking down the data further by grade level and gender, some interesting findings were made. Table 4.10 below shows the mean score breakdown by grade level and gender.

Table 4.10. *Mean Science Pre-Assessment Data by Gender and Grade Level*

Grade 3	Male	Female
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	Mean: 3 N= 2	Mean: 2.2 N= 5
Grade 4	Mean: 4.25 N= 4	Mean: 5.17 N= 6

Females in grade 3 earned a higher score than males at that grade level. Interestingly, girls at grade 4 outscored boys in both grades three and four with a mean score of 5.17, which represents 64.25% of the total score possible. Overall, however, the result of this assessment revealed that knowledge of grade level science concepts was limited. The purpose of this assessment was to show science knowledge, not reading ability; therefore, support from the classroom teacher or researcher was warranted if students were struggling to read the assessment.

The results of both pre-assessments were used when analyzing the paraphrasing results for each student and the group as a whole. The next step in the research process entailed students learning about the paraphrasing strategy, and reading and paraphrasing texts. While the students engaged with these tasks, the researcher gathered both quantitative and qualitative observational data. Once done, the paraphrases themselves were analyzed. The next section will analyze both the qualitative and quantitative data gathered from the act of paraphrasing.

Student Paraphrase Data.

Comprehension, as evidenced by the review of the literature, is an integral part of academic success, as it is a required skill in schools in order to learn new content. However, comprehension is not a singular skill; rather it is a conglomeration of many component skills and

activities (Kendeou, van den Broek, White, & Lynch, 2007; Rapp & van den Broek, 2005), and are developed early in a child's life, outside of reading (Kendeou, van den Broek, White, & Lynch, 2007). As part of this study, students were asked to read subsets of the texts developed and paraphrase selected sentences. Paraphrasing is a strategy that has shown to be an effective comprehension strategy (Hagaman & Casey, 2016; Hagaman, et al, 2016; Hagaman, et al., 2012; Kletzien, 2009).

The decision to focus only on paraphrasing was one made as a result of the significant alterations to the traditional summer targeted services program in the district. As has been previously established, there were unforeseen disruptions to the traditional summer targeted services programming caused by the COVID-19 pandemic. As a result, original plans for the summer targeted services program were altered significantly, and the researcher had limited time with the students. Therefore, the decision was made by the researcher, along with the team of researchers at the large research university, to focus on the paraphrasing strategy to help understand how students were comprehending the text, as this is the first strategy in the ultimate iSTART-Early web-based comprehension intervention tutoring tool where students generate responses. Further, the paraphrasing strategy, along with comprehension monitoring and inference-making, are strategies that are needed for higher order cognitive processing in order to comprehend texts, such as utilizing prior knowledge to integrate ideas (Kintsch, 1988, 1998) and students in this age range and grade level band are developmentally ready for interventions that will help increase their use of comprehension strategies (Del Giudice, 2014; Pearson & Billman, 2016). To ensure that students had an understanding of the paraphrasing strategy, an instructional

video explaining the paraphrasing strategy was created for students to watch prior to reading the texts.

The researcher gathered qualitative data on students' engagement with and concentration on the instructional video, and also while they worked on reading and paraphrasing texts. This work was done individually on each student's computer; they watched the instructional video, read portions of a text and were asked to paraphrase sentences by typing them on their computer. The qualitative data were analyzed for overarching themes, which will be discussed in the next section. Additionally, the researcher gathered quantitative data on both the acts of watching the instructional video, and of reading and paraphrasing by the students (see Student Observation Form Text Reading and Responding, Appendix F). This student observation form was used to gather quantifiable data on what activities the students engaged in during a set observation time, and included reading, watching the short instructional video, paraphrasing, and engaging in vocabulary activities. The quantitative observational data will be discussed in the next section.

At the end of reading and paraphrasing each text, a set of questions were shown on the screen. Students were asked to rate each text and the act of paraphrasing sentences in each text. This provided data on students' perceptions of the texts. Results of the students' text and paraphrase perceptions can be found in Appendix K. Next, the paraphrases were scored to gather data on the quality of each paraphrase (see Coding Table for Student Paraphrasing Responses, Appendix G). In order to answer the research questions, the researcher analyzed and triangulated all data. This researcher collected both qualitative and quantitative data on students' engagement with the work required of them in this study: watching the instructional video, reading the texts, and paraphrasing the selected sentences. These data are discussed in the next two sections.

Student Engagement in Reading and Paraphrasing.

Engagement is a critical factor in successful reading for many students. More engaged readers are more motivated, have higher reading self-efficacy, and tend to utilize strategies to continue comprehending the text (Castles, Rastle, & Nation, 2018; Massey & Miller, 2017; Wigfield, et al., 2008; Willingham, 2017). The third research question focuses on a diverse population of students: What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level? Therefore, it was important to understand the interactions and experiences a diverse body of students have with texts, in order to provide the best texts possible in a reading comprehension intervention.

All students participating in this study were students of color, most of whom were English Language Learners (ELs). The role of engagement and motivation is found to be a greater problem for students of color, for whom dropout rates are the highest (Fredricks, Blumenfeld, & Paris, 2004; Rumberger, 1987; Rumberger, 1995). Thus, it was imperative to observe all students in the act of reading and paraphrasing to gauge their engagement in the various tasks that comprised this research. Observational data was collected both qualitatively and quantitatively. That data will be discussed in the next two sections.

Qualitative Observational Data Analysis.

Observational data was gathered in each classroom over two non-consecutive days. Sixteen students in five classrooms were observed for 240 minutes over that two-day period. The researcher gathered data on six activities: watching the instructional video, ease and/or difficulty

of passage reading, activities related to vocabulary, activities related to paraphrase creation, alignment of the paraphrase content, and engagement in the task, which the researcher gauged through observations of the students' concentration. Once the data was collected, the researcher authentically coded the qualitative data for themes; no codes were created prior to the data collection. Four themes emerged as having an observable impact on the work in which the students were engaged. They are found in Table 4.11 below. A complete table of qualitative observational data can be found in Appendix J.

Table 4.11. *Themes from Student Observations*

Theme	Brief Description
Engagement	Looked at concentration level of student while working on the task at hand
Stamina	Looked at how long student persisted with the task at hand
Text	Difficulty of text Difficulty of vocabulary Alignment to paraphrase task
Paraphrase Creation	Thoughtfulness of the paraphrase Ability to type

On the days scheduled for observation, there were four students absent, three male and one female. Because of the absences, there were 15 students over the course of two days for whom observational data were taken. Of those 15 students, 11 were female and four were male. Every student who was observed identified using the federal category of Hispanic. The researcher took careful notes with regard to students' actions as they watched the instructional video, read the passages, and typed their paraphrases of the predetermined sentences.

All students watched the instructional video, with 14/15 completely immersed in the task. One female student in grade 3 became distracted with the actions of other students while watching the video, and was reminded by the researcher to keep watching. Of the 15 observed students, three watched the video more than one time. Two students needed help with the directions. One third grade male student needed support from the researcher in reading the directions. While this student began to read the first text, he began to play with the buttons on the computer and, after 20 minutes, asked the researcher, “Do I have to continue?” Another third grade female began watching the video intently right away. However, she began to be distracted by noises nearby, and was redirected by the researcher. Once this student began reading the text, she needed to be reminded of the directions; after 12 minutes working on the activity she claimed, “I’m stuck.”

All students were observed to have an initially positive attitude toward the activities involved in this study. Once the students began to read and paraphrase, however, the researcher noted behaviors that indicated some students were struggling to read the texts. One female third grader moved her face closer to the screen when reading, furrowed her brow and began to point to the screen. One student needed to have the directions read to him by the researcher. One third grade student struggled so much that, on the second day of observing her, the researcher helped her to read many words in the passage, yet she still struggled to understand the meaning of the passage. What is interesting to note about this student, however, is that when generating a paraphrase for a sentence, she wanted to use the word *equipment* and asked for help spelling it.

From observing the students interacting with the texts, the researcher found that the vocabulary in the texts was difficult for students in both grades 3 and 4. Several students asked

for help with vocabulary words. One student asked, “What does ‘clump’ mean?” Another student could not read the word *nutrient*. When the researcher read the word to the student, they asked, “What is a nutrient?” Several students needed help with the word *Fahrenheit*. One student in fourth grade, rather than ask the researcher for help, used an online search engine to try to determine the meaning of words. This was especially noteworthy, as the students were demonstrating persistence and problem-solving skills to help them through the text.

The researcher noticed, as students were reading the texts, that some difficult words were not defined within the context of the text (e.g. *satellite*); rather, it was assumed by the text creators that the students would know the word. Other words were defined within the tool *after* the sentence needed paraphrasing, yet understanding of informational text, especially science texts that use content-specific words, requires knowledge of a vast array of content-specific words (Santoro, et al., 2016). One keenly interesting observation was of a third grade student who exhibited a larger oral vocabulary, using the term *research* when trying to explain to the researcher the ideas of *satellite* and *telescopes*, but the student could not transfer that idea in written form. A further notable observation by the researcher was that students were struggling with spelling and were intent on spelling the words correctly. This need to spell every word correctly slowed the generation of their responses considerably.

The researcher noted that two girls in one third grade classroom struggled to read the very first text, which was the easiest of the eight used in this study. Both girls, however, were interested in the task and asked for help. One of the two girls tried hard to sound out words, pointing to the screen. Eventually they both became distracted, with one talking about school and

one playing with the computer cord. During this observation, both female students abandoned the text after 27 minutes.

The act of reading and paraphrasing sentences on a computer was important for the researcher to observe, as these behaviors help to inform the second research question, What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format? The researcher was interested to see how students interacted with the activities in a digital format. Several very important observations were made.

On the first day of observation, one student's computer did not have the Qualtrics link loaded. This issue was quickly resolved by a district technology staff member; however, the student was unable to begin the task at the same time as the other classmates. Once the link was loaded, the student began the task in earnest. However, during the first day of observation, this student was unable to get through one passage.

Tools available on the computer were both a help and a hindrance. Some students used Spellcheck to help with their spelling. Others used a search engine to try to spell words correctly. Because the instructional video was available on demand, some students took advantage of that availability and were observed watching the instructional video more than once during this study, with one student watching it twice in a row. One student, on the second day of observation, clicked out of the Qualtrics tool and ended up on a different site. The student stopped, looked at another student, and began to laugh. When she realized she was being observed by the researcher, she went back into the Qualtrics tool and began to type. During the second day of

observation in a different classroom, another student inadvertently clicked out of the Qualtrics tool but immediately got back in again and continued the work. One student was observed simply looking at the keyboard while playing with the computer cord.

The physical act of typing the sentences was troublesome for all but one student, slowing them down considerably when creating their paraphrases. The researcher repeatedly recorded students struggling with typing and struggling to find the correct key on their computer. Four students were observed using one finger to type words. The other students used their two index fingers to type, but it was obvious to the researcher that all but one of the students were still learning the location of letters on the keyboard. One female student began typing her paraphrase using two fingers, but after struggling to find the letters on the keyboard switched to one-finger typing.

Another very interesting observation with regard to paraphrase generation is that it seemed to be more difficult for students to paraphrase shorter sentences. The Qualtrics tool was created in such a way that the passage would break after the target sentence was presented. The student would paraphrase the target sentence before continuing with the passage. The researcher observed several students staring at the screen displaying a short sentence that needed to be paraphrased; one student asked, “How can you change that?” On the first day of observations, the researcher noticed that it took approximately 30 minutes for one student in one fourth grade classroom to read and paraphrase one text. Two students were unable to complete even one text. They abandoned the exercise after the first paraphrase; therefore, no Qualtrics data was available for them.

The behaviors the students were displaying as they watched the instructional video and read and paraphrased the texts was of keen interest to the researcher, as behaviors can change if frustration levels rise (Halladay, 2012; Ilter, 2017). All students engaged in the video for the entire four minutes and eight seconds, although one third grade female became briefly distracted by nearby people. However, she re-engaged quickly after being encouraged by the researcher. Further, all students exhibited a willingness to try hard and concentrate at the beginning. When students began to struggle, however, is when the researcher observed engagement waning and their behaviors shifting.

The students began to exhibit struggle with the task by looking away from the screen. Further, difficulty in typing led to disengagement in the task. Students were observed simply stopping their typing and getting up and stretching, playing with the computer cord, or looking out the window. Those students also asked how many passages they needed to complete. However, when the researcher provided some help to the student, such as providing the definition to a word, the student exhibited engagement once again. Surprisingly to the researcher, some students were quite intent on spelling words correctly before moving on in the typing of their paraphrase. They concentrated for some time on this task as they tried to figure out how to correctly spell a word, even using a search engine to attempt to spell the word correctly.

The researcher noted several times during the observations that reading was somewhat easier for students in grade 4 than those in grade 3. Stamina, in the form of lost concentration, was an impediment to the work in both third and fourth grade. This can be illustrated by the question that one third grade female asked the researcher, "How many do we have to do?" Another third grade student, after completing paraphrases on two texts, asked the researcher,

“Can I be done?” One female student in grade four stood up, fixed her hair, sat back down and began playing with a pencil. After one minute, this student went back to reading the passage. However, stamina was not an issue for three students in fourth grade. They kept engaged with the reading and paraphrasing and were observed completing at least three texts.

The qualitative notes that the researcher took while observing the students provided a rich narrative to the activities through which the students worked. However, the researcher also wanted to gather quantitative data while observing the students. The analysis of the data that was amassed quantitatively is presented in the next section, with comparisons made to the qualitative data gathered.

Quantitative Observational Data Analysis.

The researcher, using a modified observation form (Kendeou & McMaster, 2016, see Appendix F), informally observed students engaging in reading and paraphrasing of the texts. She spent time in each classroom observing students while using this form. This observation form provided quantitative data on the number of observations made regarding tasks in which the students engaged. There were four engagement indicators for observation. These indicators are briefly described in Table 4.12 below.

Table 4.12. *Engagement Indicators*

Indicator	Brief Description
Reading	The student is engaged with the screen (other than video). Could include student whispering/saying words or phrases
Paraphrasing	The student appears to think about the sentence that requires paraphrasing or is actively typing a paraphrase response
Vocabulary	The student seems to be rereading to determine meaning or is actively

	trying to determine the meaning of the word through other means
Other	The student displays appropriate behavior and engagement for a task not previously described (e.g. watching instructional video).

The engagement indicator titled “Other” included activities such as watching the instructional video, figuring out how to spell a word or checking the spelling of a word. If the student’s computer showed the text, the researcher coded the observation either in the “Reading” or “Vocabulary” engagement indicator, depending upon what task the student was observed doing. If the student’s computer showed that a paraphrase was needed, or if the student was active in creating a paraphrase, the researcher coded the observation in that engagement indicator. If the student was active in that task, they scored a 1 for that observation in that category. All disengagement displayed by the students scored a 0.

The researcher spent 10 seconds observing a student before moving to the next student. The researcher used a timer on her phone when observing the students in all classrooms. Using a timer ensured consistency. The students in each classroom were observed in order. For four of the five classrooms, there were a total of 120 10-second observation intervals, but each classroom had a different number of students being observed; therefore, the number of times a student was observed differed from class to class. One classroom had only one student being observed, and in that classroom, the researcher made an observation mark every 30 seconds. This student was struggling and wanted to end early. Therefore, there were 31 30-second observation interval notations for this student.

The number of scores (either 1 or 0) in an engagement indicator was then counted, and a percentage of the total number of observations (120 for four classrooms, 31 for one classroom) was calculated. The initial data provided the researcher with an understanding of how much time was spent by the students on an observable task at hand and, conversely, how much disengagement they showed for an engagement indicator. The researcher then calculated the number of 1s and 0s in each engagement indicator to better understand the overall student engagement/disengagement in the paraphrasing activity. This set of data is broken down by classroom in Table 4.13 below.

Table 4.13. *Engagement Observed in Paraphrasing Activity*

Classroom	Reading Observations Mean %: 24.08	Paraphrasing Observations Mean %: 25.86	Vocabulary Observations Mean %: 5.48	Other Observations Mean %: 39.56	Disengagement Observations Mean %: 12.4
1 (120 Observations) 5 Students	28/120 23.3%	41/120 34.1%	13/120 10.9%	38/120 31.7%	9/120 7.5%
2 (120 Observations) 3 Students	53/120 41.2%	31/120 25.8%	9/120 7.5%	27/120 22.5%	5/120 4.2%
3 (120 Observations) 2 Students	46/120 38.3%	43/120 35.8%	2/120 1.6%	29/120 24.2%	32/120 26.7%
4 (120 Observations) 4 Students**	32/120 26.7%	21/120 17.5%	5/120 4.2%	44/120 51.7%	5/120 4.2%
5 (31 Observations) 1 Student	4/31 12.9%	5/31 16.1%	1/31 3.2%	21/31 67.7%	6/31 19.4%

**In this classroom, there was a technical issue with one student's computer. The Qualtrics tool was not loaded on the computer, so the student had to wait until the tool was loaded. The

observer coded the student waiting for the technician to load the tool in “other,” as the student simply waited patiently to begin and seemed eager to begin the task.

Of the five classrooms of students being observed, two were fourth grade, two were third grade, and one was a second/third multi-grade classroom. The means of each engagement indicator were calculated using percentages, because the number of observations differed between Classroom 1-4 and Classroom 5. Looking at the data, there are some interesting observations to be made. First, the engagement indicator of “Other” had the highest single mean percentage of all engagement indicators, with the mean percentage at 39.56%. This observation is not surprising, as it took students some time to watch the instructional video and some students watched it more than one time. Additionally, other activities, in particular using a search engine to check the spelling of a word, was categorized under “Other.”

Next, the vocabulary engagement indicator had the lowest number of observations; the mean percentage for this indicator was 5.48%. This observation was somewhat surprising. Many of the students struggled to read the passages, yet they were not actively trying to determine meanings of individual words. Some did through asking what a word meant or even looking up a word in a search engine. The mean percentages of both the “Reading” engagement indicator and “Paraphrasing” engagement indicator were quite close, being 24.08% and 25.86%, respectively; the two categories of engagement indicators together accounted for 49.94% of all observations.

Classroom 4 had the highest number of students who watched the instructional video more than once, which accounts for the high number in the engagement indicator of “Other.” Two classrooms of third grade students had the highest number of observations of disengagement. Interestingly, Classroom 1 and Classroom 3, one a fourth grade classroom and

one a third grade classroom, had the highest number of observations in the paraphrasing engagement indicator.

Classroom 5 was the only multi-age classroom, with students in grade two and grade three in the classroom. This class had just one student whose family provided consent to participate in this study. The student, a third grader, struggled with this activity. The student was easily distracted; they watched the video more than one time to try to better understand, which led to a higher percentage of observations in the engagement indicator of “Other.” The student typed with only one finger, so it took them longer to finish a paraphrase. This accounted for a greater number of observations in the paraphrasing engagement indicator than in the reading indicator; 16.1% of the observations for this one student was in the paraphrasing indicator. However, the student’s percentage of observations in the “Other” engagement indicator was 67.7%, by far the highest percentage of all five classrooms and all four engagement indicators. The student needed to watch the video more than once and also was very distracted. This student was able to complete only two paraphrases of the first text.

Analyzing the observational data by gender rendered some interesting observations. First, the only students overtly concerned with correct spelling were male, across all classrooms. Disengaged observations were gender-agnostic; that is, struggles with a task were displayed by both genders. However, more frequent and lasting distracted behavior was displayed by female students; male students displayed distraction or struggle for shorter periods of time before reengaging in the task. Female students asked the researcher for help more than did male students. The quantitative observational data were not broken down by ethnicity or language

status, as all students were students of color and all but one student participating in the study qualified for free- or reduced-price lunch.

Observational data gathered provided the researcher with the behaviors of the students while working through the tasks of reading and typing paraphrases of short science texts. Qualtrics captured the paraphrases themselves and the number of paraphrases completed by each student. It is important to note that no student completed all eight texts, but the students completed 187 paraphrases. Prior to discussing the quality of the paraphrases themselves, it is important to discuss how the paraphrases were coded.

Student Paraphrase Coding.

The paraphrases produced by the students were scored using a modified version of a rubric developed by McNamara and colleagues (2007a, see Appendix G). The use of a paraphrase activity correlates with the first generative strategy which will be used in the first module of iSTART-Early, which is paraphrasing. This strategy provided information on how well the students comprehended the texts. The modified rubric was used to score the paraphrases, and the scoring of the paraphrases was three-phased.

Paraphrase Filter.

The first phase involved the use of a filter. The participating students generated 187 paraphrases for this study. Prior to coding the paraphrases for quality, the paraphrases were first filtered for any responses that were irrelevant, too short, or direct copies or clause reversals of the target sentences. First, if the paraphrase could not be read or if it was irrelevant or it was difficult to derive any meaning from it, scoring for that paraphrase ended, and the paraphrase

earned a score of 9, meaning that the paraphrase was not gauged for any quality. If a paraphrase earned a score of 0 for length, it was looked at for the next filters, which were copy/paste and clause reversal; a clause reversal is a modified copy/paste, in that the clauses are reversed. If a paraphrase earned a 1 in any of those categories, scoring ended for the paraphrase and it earned a 9, meaning it was not further gauged for any quality. A score of 9 indicated that the paraphrase was filtered out. Of the 187 paraphrases, 69 were filtered out, which accounted for over one-third of the total paraphrases that the students generated. Table 4.14 below illustrates the paraphrase filter data.

Table 4.14. *Paraphrase Filter Data*

Filter	Number Filtered	Percent of Total Paraphrases (n=187)	Percent of Filtered Paraphrases
Clause Reversals	2	1.069	2.899
Copy/Paste	39	20.856	56.522
Too Short	14	7.487	20.289
Garbage (Nonsense)	8	4.278	11.594
Irrelevant (Not related to topic)	6	3.209	8.696
Total:	69	36.898	100

Paraphrase Numerical Coding.

The second phase took place once the filtering was completed. The remaining paraphrases were dichotomously coded (using 0 or 1) for the presence of eight different factors: paraphrase presence, lexical similarity, syntactic similarity, semantic similarity, elaboration,

inaccuracy, or other content. For the categories of paraphrase presence, lexical similarity, syntactic similarity, semantic similarity, and elaboration, a score of 1 meant that the particular factor was present in the paraphrase, and a 0 meant that the particular factor was not present. For inaccuracy and other content, a score of 0 meant a higher quality paraphrase, in that there was either no inaccuracy or other content. Once the individual factors were scored, the paraphrases were given an overall score on a scale of 0-2 for quality: 0 indicating a poor paraphrase, 1 indicating the presence of paraphrase strategies but a need for improvement, and a 2 indicating a high quality paraphrase.

The third phase of scoring involved the creation of inter-rater reliability. Two researchers from two different research institutions coded all paraphrases separately. They then met to discuss their results in order to establish inter-rater reliability. They did so by resolving all disagreements and differences and coming to consensus on each code in order to determine final scores for each paraphrase generated by students. The paraphrase quality data are discussed in the next section.

Paraphrase Quality Data.

The two researchers scored each paraphrase separately and came to consensus on each of the paraphrase quality scores. This paraphrase quality data set is shown in Tables 4.15 below.

Table 4.15. *Paraphrase Quality Score Data*

Paraphrase Quality Score	Number of Paraphrases	Percentage of Paraphrases
0	24	12.834%
1	63	33.690%

2	31	16.578%
9 (paraphrases filtered out)	69	36.898%
Total	187	100%

This researcher disaggregated the paraphrase quality data by individual text, as the texts were populated into Qualtrics in order of least to most difficult. This data set is shown in Table 4.16 below.

Table 4.16. *Paraphrase Quality Data by Text*

Text Number and Title	# of Paraphrases Scoring 2	# of Paraphrases Scoring 1	# of Paraphrases Scoring 0	# of Paraphrases Filtered	Total Paraphrases
1 How A Star Is Born	12	16	7	17	52
2 Eating Healthy	6	15	6	18	45
3 A Visit to Mars	3	13	9	10	35
4 Wildfires	8	6	1	10	25
5 Blood	1	4	1	4	10
6 Ostriches	0	4	0	6	10
7 Starfish	2	4	0	4	10

Because the texts were presented to students in order of easiest to most difficult, this researcher predicted that the students would have the most success on the first text. As predicted, Text 1, “How a Star is Born,” had the highest number of paraphrases generated (N=52), and the highest number paraphrases earning a score of 2, 1, or 0 (N=35). Total paraphrases generated for each text declined with each subsequent text, which is also predicted, given that the texts increased in difficulty and many students stopped paraphrasing after the third text. An additional five students stopped paraphrasing after the fourth text, and two students paraphrased seven texts.

However, when looking at the percentages of paraphrases earning a score of 2, 1, or 0, “A Visit to Mars,” which was the third text presented to students, had 71% of the total paraphrases earning a score of 2, 1, 0, which was the highest percentage of the seven texts paraphrased by students. “How a Star is Born,” the first text in the series, had 67% of its total paraphrases earning a score of 2, 1, or 0. When analyzing the paraphrase quality by score (not filtered out), “Wildfires,” which was Text 4, had the highest percentage of paraphrases earning a quality score of 2, at 53%.

Interestingly, the two most difficult texts that students paraphrased, which were Texts 6 (“Ostriches”), and 7 (“Starfish”), generated 20 paraphrases total. However, half of those paraphrases earned a score of 2 or 1. Additionally, two earned a paraphrase quality score of 2, which is 20% of the total paraphrases for those texts, and eight earned a score of 1, which is 40% of the total paraphrases generated for those two texts.

As the researcher continued to disaggregate data, it was important to analyze the student behaviors with regard to paraphrase generation. Several interesting observations with regard to

student paraphrase responses were noticed. First, as time went on, many students stopped trying to create paraphrases. Some just started typing in nonsense, but many would just retype the sentence verbatim (or change only a word or two). There were two students in particular that got farther than their peers in paraphrasing; one completed 19 paraphrases and one completed 34 - but for the later half of their responses, they were just retyping the sentences. They were able to produce more answers because their typing did not get in the way, as it did for others.

There were two other students, however, who also completed 19 paraphrases and 34 paraphrases, and their paraphrase data was of higher quality than the other two students who completed just as many. Utilizing the qualitative observational data gathered while students were watching the instructional video, reading the texts, and paraphrasing the predetermined sentences, the researcher observed that one of these two students watched the video more than two times. The other student whose paraphrases were of higher quality worked through four texts rather quickly and wanted to stop for the day on the first day of paraphrasing; however on the next day that student began the task again.

There were two student participants in this study who did not submit even the first set of paraphrases into Qualtrics. Therefore, Qualtrics was unable to capture data on those two students. Each of the remaining 13 students' paraphrase quality data are illustrated in Table 4.17 below.

Table 4.17. *Paraphrase Quality Data By Student*

Student ID	Grade	Gender	Total Paraphrases	# Scoring 2	# Scoring 1	# Scoring 0	# Filtered
10001	4	F	4	2	0	0	2

10002	4	M	19	9	10	0	0
10003	3	F	4	1	2	1	0
10004	4	M	14	4	2	7	1
10005	3	F	9	1	4	0	4
10010	3	F	19	0	1	0	18
10012	3	F	19	0	1	9	9
10013	3	M	9	0	2	0	7
10014	4	F	34	4	25	1	4
10015	4	F	34	5	11	4	14
10016	4	F	14	0	5	0	9
10017	4	M	4	2	1	0	1
10018	4	F	4	3	0	1	0
Totals			187	31	64	23	69

The paraphrase quality data were further analyzed by grade level and gender. Because of dwindling numbers in the in-person summer school targeted services program, the remaining student participants were 100% English language learners (ELs), and all but one qualified for free- or reduced-price lunch; there was no need for the data to be analyzed by those particular strands. Therefore, the researcher next analyzed the data by gender first. This data set is presented in Table 4.18 below.

Table 4.18. *Paraphrase Quality Data by Gender*

Gender (% of Total)	Total Paraphrases (%)	# Scoring 2 (%)	# Scoring 1(%)	# Scoring 0 (%)	# Filtered (%)
Female	141 (75.4%)	16 (51.6%)	49 (76.6%)	16 (69.6%)	60 (87.0%)

(69.2%)					
Male (30.8%)	46 (24.6%)	15 (48.4%)	15 (23.4%)	7 (30.4%)	9 (13.0%)
Mean:	Female: 23.5 Male: 11.5	Female: 1.78 Male: 2.5	Female: 5.44 Male: 3.75	Female: 1.78 Male: 1.75	Female: 6.67 Male: 2.25

Female student participants made up 69% of the students on which the researcher was able to gather paraphrase quality data. It would be logical, then, to assume that the girls would generate more paraphrases, which they did. However, they outperformed the boys' generation of paraphrases slightly based on their numbers. Girls generated 75.4% of all paraphrases; the mean paraphrase generation number for female participants was 23.5. Male student participants made up 30.8% of the population, but they generated only 24.6% of all paraphrases. Mean paraphrase generation number for male student participants was 11.5.

When looking at the paraphrase quality data, however, interesting observations were made. Girls did not generate paraphrase quality scores of 2 commensurate with their numbers of paraphrases generated. The female participants in this study generated 16 paraphrases that earned a quality score of 2, which is 51.6% of all paraphrases earning that score. However, that number constituted only 11.3% of the female paraphrases overall. The male participants generated 15 paraphrases earning a 2, or 48.4% of the total paraphrases earning that score. However, that number constitutes 32.6%, or nearly one-third of the total paraphrases the male students produced. They generated less paraphrases, which was predicted, given the fact that they only made up approximately one-third of the student participants; however, they generated nearly half of the paraphrases earning a quality score of 2.

The female student participants earned a paraphrase quality score of 1 on 49 paraphrases, which was 76.6% of the total paraphrases earning that score. Additionally, that number constitutes 34.8% of all paraphrases generated by the girls. Their percentage of paraphrases generated that earned a score of 1 (76.6%) is just slightly more than the percentage of total paraphrases generated by the girls (75.4%). However, females made up only slightly more than two-thirds of the total student participants in this study. Male student participants scored a 1 on 15 paraphrases, which was 23.4% of the total paraphrases earning this score; however, that number constituted 32.6% of all paraphrases generated by the boys. Their percentage of paraphrases generated that earned this score (23.4%) is nearly even with the percentage of total paraphrases generated by the boys (24.6%). Girls outperformed the boys in paraphrases earning a quality score of 1.

The female participants earned a paraphrase quality score of 0 on 16 paraphrases. This number constitutes 69.6% of the 23 total paraphrases earning a score of 0, which is only 0.4% off from the total percentage of female participants generating paraphrases in this study (69.2%). Further, that number constitutes 11.3% of all paraphrases they generated. In this category, the girls earned a score of 0 which is commensurate with their percentage of participation. The same can be said about the performance of the male student participants earning a paraphrase quality score of 0. The boys earned a quality score of 0 on 7 paraphrases, which is 30.4% of the total paraphrases earning that score. The boys earned a score of 0, which is commensurate with their percentage of participation. This number constituted 15.2% of the total paraphrases they generated.

With regard to the final category, the number of paraphrases that had been previously filtered and therefore unscorable, the male student participants generated far less paraphrases that were filtered than their female counterparts. The total number of paraphrases generated by the male student participants was 9, or 13.0% of the total number of paraphrases filtered. This percentage is over 17 percentage points lower than the percentage of male student participants generating paraphrases in this study. Further, the number of paraphrases generated by males that were filtered out constituted 19.6% of all paraphrases they generated. Female student participants, on the other hand, generated 60 paraphrases that were previously filtered out. This number represents 87.0% of all paraphrases filtered prior to scoring, and is nearly 18 percentage points higher than the percentage of girls who generated paraphrases for this study. Further, that number is 42.6% of all paraphrases the girls generated.

Overall, while females generated over three times as many paraphrases than males in this study, 65.2% of the paraphrases that the males produced scored a 2 or a 1 for paraphrase quality, compared to 46.1% of the paraphrases generated by the females earning those scores. Conversely, females had a much higher number of paraphrases earning a score of 0 (69.6%) or being filtered out prior to scoring (87%), than did the males' paraphrases that earned those scores (30.4% and 13%, respectively). While the number of paraphrases the males generated was lower than that of the females, their paraphrases overall were stronger.

The paraphrase quality data was also disaggregated by grade level. That data set is found in Table 4.19 below.

Table 4.19. *Paraphrase Quality Data by Grade Level*

Grade Level (% of Total)	Total Paraphrases (%)	# Scoring 2 (%)	# Scoring 1 (%)	# Scoring 0 (%)	# Filtered (%)
Grade 3 (38.5%)	60 (32.1%)	2 (6.5%)	10 (15.6%)	10 (43.5%)	38 (55.1%)
Grade 4 (61.5%)	127 (67.9%)	29 (93.5%)	54 (84.4%)	13 (56.5%)	31 (44.9%)
Mean:	Gr. 3: 12.0 Gr. 4: 15.9	Gr. 3: 0.4 Gr. 4: 3.6	Gr. 3: 2.0 Gr. 4: 6.7	Gr. 3: 2.0 Gr. 4: 1.6	Gr. 3: 7.6 Gr. 5: 3.9

When disaggregated data by grade level, the paraphrase quality data uncovered few surprises. Students in third grade struggled more with the work. Grade 3 students wrote fewer paraphrases, and had more paraphrases filtered out. The percentage of paraphrases falling in each group (e.g. total paraphrases, total paraphrases filtered out) was not commensurate with the participation of grade 3 students, which was 38.5% of the total student participation. The closest came in the number of paraphrases generated, with the grade 3 students generating 32.1% of the paraphrases. The third grade students had fewer paraphrases that scored a 2 or a 1; however, they did have more paraphrases that scored a 0.

Overall, while nearly 13% of the paraphrases scored a 0, and nearly 37% of the paraphrases had been previously filtered out, over 50% of the paraphrases earned a score of 1 or 2. This data point meant that the paraphrase strategy was present in over half of the paraphrases generated by the students. Conversely, this data point also reveals the struggle that students had in reading and paraphrasing the texts. Considering the fact that these students had previously

been identified as below grade-level readers, and pre-assessment data revealed gaps in students' basic science knowledge, this paraphrase quality data revealed both problem and promise.

Comparison of Paraphrase Data to Text Indices Data

The researcher next compared the paraphrase data to the data gathered on the reading indices on the texts used. Doing this analysis provided additional information on the nuances of each text with regard to the Text Ease and Readability (T.E.R.A.) components of narrativity, syntactic similarity, word concreteness, referential cohesion, and deep cohesion (for an explanation of these components, see Table 4.3 presented previously in this chapter). As would be expected, Text 1, "How a Star is Born," generated the most paraphrases (N=57), as it was the easiest text presented to students. It had the second-highest narrativity score (63), the second-highest deep cohesion score (90), a high syntactic simplicity score (91), and strong word concreteness and referential cohesion scores (75 and 74, respectively). However, while it had the highest number of paraphrases earning a score of 2, it did not have the highest percentage of paraphrases earning a score of 2. The text with the highest percentage of paraphrases earning a score of 2 was "A Visit to Mars," which was the third text presented to students.

An interesting finding was revealed with regard to Texts 3 ("A Visit to Mars") and 4 ("Wildfires") when analyzing individual paraphrase scores for these two texts. Text 3, "A Visit to Mars" had a deep cohesion score of 24, which was the lowest of the eight texts. Text 4, "Wildfires" had a deep cohesion score of 99, which was highest of the eight texts. The two texts combined had a total of 60 paraphrases generated - 35 for "A Visit to Mars" and 25 for "Wildfires," a difference of 10. Of the 35 paraphrases completed for "A Visit to Mars," 25

earned a paraphrase score of 2, 1, or 0, which comprised 71.4% of the corpus of paraphrases generated for this text. Text 4, “Wildfires,” on the other hand, had 25 total paraphrases, 15 of which earned a score of 2, 1, or 0. That number accounts for 60% of the total number of paraphrases generated for “Wildfires.” The paraphrase quality data for these two texts are found in Table 4.20 below.

Table 4.20. *Paraphrase Quality Data for “A Visit to Mars” and “Wildfires”*

Text	# of Paraphrases Scoring 2	# of Paraphrases Scoring 1	# of Paraphrases Scoring 0	Paraphrases Filtered Out
A Visit to Mars (N=35)	3	13	9	10
Wildfires (N=25)	8	6	1	10

The deep cohesion scores of the two texts differed by 75, which is the largest difference between scores in any component category. However, the overall paraphrase quality data did not fully reflect that wide difference, which means that other differences in the components (narrativity, syntactic simplicity, word concreteness, and referential cohesion) were factors. The T.E.R.A. component scores for these two texts are found in Table 4.21 below.

Table 4.21. *T.E.R.A. Component Scores for “A Visit to Mars” and Wildfires”*

Text	Flesch-Kincaid Score	Narrativity	Syntactic Similarity	Word Concreteness	Referential Cohesion	Deep Cohesion
Mars	3.0	60	79	30	88	24

Wildfires	5.1	47	90	74	44	99
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Text 4, “Wildfires,” had three T.E.R.A. component scores which were higher than those for “Mars.” Further, “Mars” had a higher narrativity score than “Wildfires,” and the narrative genre is generally easier to read than expository text (Beck & Kucan, 2002; Jackson, et al., 2016; Perfetti, 2007). Yet, while “Mars” had more paraphrases, “Wildfires” had a higher number of paraphrases earning the highest quality score. “Mars” had three paraphrases that earned a quality score of 2, which is 12% of the paraphrases for that text earning a score and not filtered out, which was the second lowest percentage of the seven texts paraphrased by students. After completing the comparative analysis of the paraphrase quality data to the text component data, the researcher then did an analysis of paraphrase data to the students’ pre-assessment data.

Comparison of Paraphrase Data to Pre-Assessment Data

Paraphrase Data and Science Pre-Assessment Data.

To further guide an understanding of the essential characteristics of texts needed for a reading comprehension strategy intervention tool, the researcher compared the paraphrase data with each student’s pre-assessment data. First, it was important to this researcher to compare the paraphrase quality data of each student to their science pre-assessment scores to determine any correlation or predictable patterns. Table 4.22 below outlines the students’ paraphrase scores of 0, 1, and 2, and their science pre-assessment scores.

Table 4.22. *Comparison of Students’ Paraphrase Quality Scores to Science Pre-Assessment*

Student Number	Total Paraphrases	% of Paraphrases	% of Paraphrases	% of Paraphrases	# of Paraphrases	Science Pre-Assessment
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		Scoring 2 (#)	Scoring 1 (#)	Scoring 0 (#)	Previously Filtered Out	Percentage
10001	4	50% (2)	0	0	9	75%
10002	19	47.4% (9)	52.6% (10)	0	0	62.5%
10003	4	25% (1)	50% (2)	25% (1)	0	25%
10004	14	28.6% (4)	14.3% (2)	50% (7)	1	87.5%
10005	9	11.1% (1)	44.4% (4)	0	4	50%
10010	19	0	5.3% (1)	0	18	25%
10012	19	0	5.3% (1)	47/4% (9)	9	37.5%
10013	9	0	22.2% (2)	0	7	37.5%
10014	34	11.8% (4)	73.5% (25)	2.9% (1)	4	75%
10015	34	14.7% (5)	32.4% (11)	11.8% (4)	14	75%
10016	14	0	35.8% (5)	0	9	25%
10017	4	50% (2)	25% (1)	0	1	50%
10018	4	74% (3)	0	25% (1)	0	75%

Next, the researcher grouped the paraphrase data by science pre-assessment score. That set of data is found in Table 4.23 below.

Table 4.23. *Paraphrase Data by Science Pre-Assessment Score Percentage*

Science Pre-Assessment Percentage	Student Number (Gender)	Total # of Paraphrases Scored	Total # of Paraphrases Scoring a 2	Total # of Paraphrases Scoring a 1	Total # of Paraphrases Scoring a 0	# of Paraphrases Previously Filtered Out	Total # of Paraphrases Scored (Not Filtered)
Below 50%	10003 (F)	4	1	3	0	0	4
	10010 (F)	19	0	1	0	18	1

	10012 (F)	19	0	1	9	9	10
	10013 (M)	9	0	2	0	7	2
	10016 (F)	14	0	5	0	9	5
Total Below 50%		65	1	12	9	43	22
50% - 74%	10002 (M)	19	9	10	0	0	19
	10005 (F)	9	1	4	0	4	5
	10017 (M)	4	2	1	0	1	3
Total 50%-74%		32	12	15	0	5	27
75%-100%	10001 (F)	4	2	0	0	2	2
	10004 (M)	14	4	2	7	1	13
	10014 (F)	34	4	25	1	4	30
	10015 (F)	34	5	11	4	14	20
	10018 (F)	4	3	0	1	0	4
Total 75%-100%		90	18	38	13	21	69

Only one student with a science pre-assessment score of less than 50% had any paraphrase quality score of 2, but those students with a science pre-assessment score of less than 50% collectively scored a paraphrase quality score of 1 on 12 paraphrases. Students scoring 75% and

higher on the science pre-assessment collectively earned a quality score of 2 on 18 paraphrases, and a quality score of 1 on 40 paraphrases. Interestingly, the students could be grouped based on the number of paraphrases completed; there were five groups of students who had the same number of paraphrases (19, 34, 14, 4, and 9, respectively). The researcher deemed that a further analysis was warranted on their scores within the grouping, both individually and collectively by score.

Three students completed 19 paraphrases: Students 10002, 10010, and 10012. Student 10002, however, had quite different scores on the paraphrase data and the science pre-assessment data than the other two students. With regard to the paraphrase data, Student 10002 had nine paraphrases that scored a 2, 10 paraphrases that scored a 1, and no paraphrases that scored a 0 or were filtered out.

Conversely, neither Student 10010 nor Student 10012 had any paraphrases that earned a quality score of 2. Those two students collectively had five of their paraphrases which scored a 1, and seven paraphrases which scored a 0. Student 10010 had 18 paraphrases that were filtered out, and one paraphrase that earned a score of 1. Student 10012 had nine paraphrases that were filtered out, one paraphrase that earned a score of 1, and nine paraphrases that earned a score of 0.

With regard to the science pre-assessment data, Student 10002 scored 5 out of 8, or 62.5% on the science pre-assessment, whereas student 10010 scored 2 out of 8, or 25%; and 10012 scored 3 out of 8, or 37.5%, on the science pre-assessment. Student 10010 was one of three students who scored the lowest on the science pre-assessment, and Student 10012 was one of two students who had the second lowest scores. It is interesting to note that, although student

10002 earned a lower science pre-assessment score than five other of their classmates, this student had the highest number of paraphrases earning a quality score of 2, had no paraphrase score of 0, or had any paraphrases filtered out.

Two students, 10014 and 10015, completed 34 paraphrases. They earned a paraphrase quality score of 2 on a similar number of paraphrases (4 and 5, respectively), but their other paraphrase quality scores varied rather considerably. Student 10014 earned a paraphrase score of 1 on 25 of their paraphrases, compared to 11 for Student 10015, although it must be noted that these two students had the highest number of paraphrases of all the students that earned a quality score of 1. Further, Student 10015 had 14 paraphrases filtered out, compared to just four for Student 10014. They collectively earned a score of 0 on five paraphrases; Student 10014 earned that score on only one of their paraphrases, whereas student 10015 earned that score on four of their paraphrases. Their science pre-assessment scores, on the other hand, were exactly the same at 75%.

Two students, 10004 and 10016, completed 14 paraphrases, yet their science pre-assessment scores had the largest difference (87.5% and 25%, respectively). It is well worth noting that their paraphrase quality scores also differed, although the differences did not fall within a predictable pattern. Student 10004, who had a science pre-assessment score of 87.5%, generated four paraphrases with a quality score of 2, compared to zero for Student 10016. Further, Student 10004 had only one paraphrase filtered out, whereas Student 10016 had nine paraphrases filtered out. However, Student 10004 had only one paraphrase that earned a quality score of 1, and had seven paraphrases that earned a quality score of 0. Student 10016 had five

paraphrases that earned a quality score of 1, and had no paraphrases that earned a quality score of 0.

Four students, 10001, 10003, 10017 and 10018, completed four paraphrases, and again, their science pre-assessment scores varied. However, their paraphrases did not fall within a predictable pattern. Student 10003 earned the lowest science pre-assessment score, which was 25%. However, this student had one paraphrase that earned a quality score of 2, two that earned a quality score of 1, one paraphrase that earned a quality score of 0, and none that were filtered. Student 10017 earned a score of 50%. This student had two paraphrases earning a quality score of 2, one paraphrase that earned a quality score of 1, and one that was filtered out. Two students, 10001 and 10018, scored 75% on their science pre-assessment. Student 10001 earned a quality score of 2 on two of their paraphrases, and two paraphrases were filtered out. Student 10018 had three paraphrases that earned a quality score of 2, and none were filtered out.

Two students completed nine paraphrases, Student 10005 and Student 10013, yet their science pre-assessment scores varied by one question: Student 10005 earned a score of 50%, and Student 10013 earned a score of 37.5%. Student 10005 had higher paraphrase quality scores than did Student 10013: this student had one paraphrase that earned a quality score of 2, four that earned a quality score of 1, and four that were filtered out. Student 10013 had seven paraphrases filtered out, two paraphrases that earned a quality score of 1, and none that earned a quality score of 2 or 0.

Following the analysis of paraphrase quality scores to science pre-assessment scores, the researcher conducted a comparison of each student's paraphrase data to their reading attitude survey data.

Paraphrase Data and Elementary Reading Attitude Survey Data.

Each student's paraphrase data were compared to their Elementary Reading Attitude Survey (ERAS) scores. As previously established through a review of the literature, that reading attitude can affect reading performance (McKenna & Kear, 1990; Petscher, 2010; Walberg & Tsai, 1985). Therefore, the reading attitude survey data were compared with students' paraphrase data to identify emerging patterns or trends. The students' paraphrase data, coupled with their reading attitude scores, are found in Table 4.24 below.

Table 4.24. *Comparison of Students' Paraphrase Data to ERAS Scores*

Student Number	Total Paraphrases Scored	% of Paraphrases Scoring 2 (#)	% of Paraphrases Scoring 1 (#)	% of Paraphrases Scoring 0 (#)	# of Paraphrases Previously Filtered Out	Rec. Reading Attitude Score/%	Acad. Reading Attitude Score/%	Total Reading Attitude Score/%
10001	4	50% (2)	0	0	9	32/84th	32/79th	67/83rd
10002	19	47.4% (9)	52.6% (10)	0	0	28/41st	26/46th	43/41st
10003	4	25% (1)	50% (2)	25% (1)	0	28/38th	34/83rd	62/64th
10004	14	28.6% (4)	14.3% (2)	50% (7)	1	31/60th	28/58th	59/59th
10005	9	11.1% (1)	44.4% (4)	0	4	31/57th	32/74th	63/67th
10010	19	0	5.3% (1)	0	18	29/45th	28/52nd	57/48th
10012	19	0	5.3% (1)	47/4% (9)	9	37/90th	35/88th	72/91st
10013	9	0	22.2% (2)	0	7	17/1st	22/22nd	39/6th
10014	34	11.8% (4)	73.5% (25)	2.9% (1)	4	36/88th	34/87th	70/89th
10015	34	14.7% (5)	32.4% (11)	11.8% (4)	14	33/72nd	31/75th	64/75th
10016	14	0	35.8% (5)	0	9	34/78th	37/95th	71/91st
10017	4	50% (2)	25% (1)	0	1	26/26th	28/58th	54/41st
10018	4	74% (3)	0	25% (1)	0	32/66th	24/35th	56/48th

Next the researcher grouped the paraphrase data by ERAS total reading score percentile groups. That set of data can be found in Table 4.25 below.

Table 4.25. *Paraphrase Data by Elementary Reading Attitude Survey Total Reading Percentile*

Percentile Group	Student Number	Total # of Paraphrases	Total # of Paraphrases Scoring a 2	Total # of Paraphrases Scoring a 1	Total # of Paraphrases Scoring a 0	# of Paraphrases Previously Filtered Out	Total # of Paraphrases Scored (Not Filtered)
Below 50th%	10002	19	2	10	0	0	
	10010	19	0	1	0	18	
	10013	9	0	2	0	7	
	10017	4	2	1	0	1	
	10018	4	3	0	1	0	
Total Below 50th%		55	14	14	1	26	29
51st-75th%	10003	4	1	3	0	0	
	10004	14	4	3	7	1	
	10005	9	1	4	0	4	
	10015	34	5	11	4	14	
Total 51st-75th%		61	11	19	12	19	42
76th-99th%	10001	4	2	0	0	2	
	10012	19	0	1	9	9	
	10014	34	4	25	1	4	
	10016	14	0	5	0	9	

<i>Total 76th- 99th%</i>		71	6	31	10	24	47
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When disaggregating the data by the elementary reading attitude total score and grouping by percentile group, the data fell into predictable patterns in two areas: total number of paraphrases and total number of paraphrases scored (not previously filtered out). The group scoring at or below the 50th percentile on their total reading attitude survey score had the least number of total paraphrases and the least number of paraphrases scored and not filtered out. The group scoring between the 76th - 99th percentile on their total reading attitude survey score had the highest number of total paraphrases and the greatest number of paraphrases scored and not previously filtered out. The data on the number of paraphrases filtered out, however, did not fall within a predictable pattern. The students in the group with the highest ERAS percentiles (76th - 99th) had 24 paraphrases filtered out, which number was the middle of the three groups.

The researcher noticed very interesting dichotomies when analyzing the paraphrase data to the elementary reading attitude survey data. The first was with Student 10012. This student had the second highest academic survey score and the highest total reading attitude survey score. This student generated 19 paraphrases, which was in the top four of all students. However, this student's paraphrases were of low quality, with none scoring a 2, only one scoring a 1, nine scoring a 9, and nine filtered out.

The second observation involved student 10016. This student had the highest academic survey score and the second highest total reading attitude survey score. This student generated 14

paraphrases. However, while none of the student's paraphrases scored a zero, none scored a 2, five scored a 1, and nine were filtered out.

The analysis of student 10002 was also notable. The student's academic survey score was 26, which is three points lower than the mean academic score of the group, and their total survey score was 54, which is over four points lower than the mean total score of the group. But this student outperformed all other students in paraphrase quality, with nine paraphrases scoring a 2, ten paraphrases scoring a 1, and none that scored a zero or were filtered out.

The next data which were analyzed were the student text perception and paraphrase perception data. These were the data points provided by the students at the end of each text, when they were asked to rate the text itself and to rate the work of paraphrasing the predetermined sentences. These data are explored in detail in the next section.

Student Perceptions of Text and Paraphrase Difficulty

Questions were populated in Qualtrics at the end of each text, requiring students to rate the text itself and the act of paraphrasing the sentences. Ratings were displayed on the screen both in written form and pictorially: for text ratings, a green happy face stood for "I liked it!"; a yellow emotionless face stood for "It was okay"; and a red sad face stood for "I didn't like it." For paraphrase ratings, a green happy face stood for "It was easy!"; a yellow emotionless face stood for "It was okay"; and a red sad face stood for "It was hard." Students chose the icon that best matched their opinion. The Qualtrics tool was created in such a way that a student could not move on to the next text until they rated both the text and the act of paraphrasing sentences. This text and paraphrase perception data provided the researcher a better understanding of what the

students thought about the texts that increased in difficulty, and their thoughts as they paraphrased increasingly difficult sentences. Students provided a total of 40 ratings each for text perception and paraphrase perception. Overall text and paraphrase perception data are found in Appendix K.

There were very few students who indicated that they disliked a passage, even the four students who completed only one passage. For all eight texts combined, there were only three ratings of “dislike”; interestingly both of the texts that received that rating were on the topic of space: “How A Star Is Born” and “A Visit To Mars.” However, those two texts also received two of the highest percentage of ratings indicating the students “really liked” them, 54% and 57%, respectively. With regard to the difficulty of the passages, there were four students who indicated that a text was “hard,” and three texts earned at least one of those ratings, including “How A Star Is Born” and “A Visit To Mars.” However, those same two texts were rated overall the easiest to read, with 54% and 57% of the responses, respectively.

Looking at the data by text and student, the rating of “dislike” with regard to the text did not correlate with the rating of “hard” with regard to paraphrasing the sentences. Further, it is important to remember that fewer students completed the latter texts as the texts increased in difficulty. Text and paraphrase perception data by individual student and individual text are found in Table 4. 26 below. No student read or paraphrased the last text in the set; therefore, “n/a” was used in the individual tables for any student who did not read or paraphrase the particular text.

Table 4.26. *Text and Paraphrase Perception Data by Student and Individual Text*

Text 1: A Star is Born

Student #	Liked text?	Easy to read?	Liked Paraphrasing?	Easy to Paraphrase?
10001 (gr 4, F)	Really Liked	Easy	Really Like	Easy
10002 (gr 4, M)	Really liked	Easy	Really like	okay
10003 (gr 3, F)	Okay	Hard	Really liked	hard
10004 (gr. 4,M)	Really liked	easy	It was okay	easy
10005 (gr 3, F)	Okay	Okay	Really liked	okay
10010 (gr 3, F)	Didn't like	Okay	It was okay	okay
10012 (gr 3, F)	Okay	easy	It was okay	okay
10013 (gr 3, M)	Didn't like	hard	It was okay	okay
10014 (gr 4, F)	Really liked	easy	Really liked	easy
10015 (gr 4, F)	Really liked	okay	Really liked	okay
10016 (gr 4, F)	Really liked	okay	Really liked	okay
10017 (gr 4, M)	Okay	easy	Really liked	easy
10018 (gr 4, F)	Really liked	easy	It was okay	okay

Text 2: Eating Healthy

Student #	Liked text?	Easy to read?	Liked Paraphrasing?	Easy to Paraphrase?
10001 (gr 4, F)	n/a	n/a	n/a	n/a
10002 (gr 4, M)	Really liked	Okay	Really like	easy
10003 (gr 3, F)	n/a	n/a	n/a	n/a
10004 (gr. 4,M)	Really liked	easy	Really liked	easy
10005 (gr 3, F)	Okay	Okay	Really liked	okay
10010 (gr 3, F)	okay	hard	It was okay	okay
10012 (gr 3, F)	Okay	okay	It was okay	okay
10013 (gr 3, M)	Really liked	easy	Really liked	okay
10014 (gr 4, F)	Really liked	easy	Really liked	easy

10015 (gr 4, F)	okay	okay	Really liked	okay
10016 (gr 4, F)	Really liked	okay	Really liked	okay
10017 (gr 4, M)	n/a	n/a	n/a	n/a
10018 (gr 4, F)	n/a	n/a	n/a	n/a

Text 3: A Visit to Mars

Student #	Liked text?	Easy to read?	Liked Paraphrasing?	Easy to Paraphrase?
10001 (gr 4, F)	n/a	n/a	n/a	n/a
10002 (gr 4, M)	Really liked	easy	Really like	okay
10003 (gr 3, F)	n/a	n/a	n/a	n/a
10004 (gr. 4, M)	Really liked	easy	Really liked	easy
10005 (gr 3, F)	n/a	n/a	n/a	n/a
10010 (gr 3, F)	Didn't like	hard	It was okay	okay
10012 (gr 3, F)	Okay	okay	Didn't like	okay
10013 (gr 3, M)	n/a	n/a	n/a	n/a
10014 (gr 4, F)	Really liked	easy	Really liked	easy
10015 (gr 4, F)	okay	easy	okay	okay
10016 (gr 4, F)	Really liked	okay	Really liked	okay
10017 (gr 4, M)	n/a	n/a	n/a	n/a
10018 (gr 4, F)	n/a	n/a	n/a	n/a

Text 4: Wildfires

Student #	Liked text?	Easy to read?	Liked Paraphrasing?	Easy to Paraphrase?
10001 (gr 4, F)	n/a	n/a	n/a	n/a
10002 (gr 4, M)	Really liked	easy	okay	okay
10003 (gr 3, F)	n/a	n/a	n/a	n/a

10004 (gr. 4, M)	n/a	n/a	n/a	n/a
10005 (gr 3, F)	n/a	n/a	n/a	n/a
10010 (gr 3, F)	okay	hard	It was okay	okay
10012 (gr 3, F)	Okay	okay	Really liked	okay
10013 (gr 3, M)	n/a	n/a	n/a	n/a
10014 (gr 4, F)	Really liked	easy	Really liked	easy
10015 (gr 4, F)	okay	okay	okay	okay
10016 (gr 4, F)	n/a	n/a	n/a	n/a
10017 (gr 4, M)	n/a	n/a	n/a	n/a
10018 (gr 4, F)	n/a	n/a	n/a	n/a

Text 5: Blood

Student #	Liked text?	Easy to read?	Liked Paraphrasing?	Easy to Paraphrase?
10001 (gr 4, F)	n/a	n/a	n/a	n/a
10002 (gr 4, M)	n/a	n/a	n/a	n/a
10003 (gr 3, F)	n/a	n/a	n/a	n/a
10004 (gr. 4, M)	n/a	n/a	n/a	n/a
10005 (gr 3, F)	n/a	n/a	n/a	n/a
10010 (gr 3, F)	n/a	n/a	n/a	n/a
10012 (gr 3, F)	n/a	n/a	n/a	n/a
10013 (gr 3, M)	n/a	n/a	n/a	n/a
10014 (gr 4, F)	Really liked	easy	Really liked	easy
10015 (gr 4, F)	Really liked	okay	okay	okay
10016 (gr 4, F)	n/a	n/a	n/a	n/a
10017 (gr 4, M)	n/a	n/a	n/a	n/a
10018 (gr 4, F)	n/a	n/a	n/a	n/a

Text 6: Ostriches

Student #	Liked text?	Easy to read?	Liked Paraphrasing?	Easy to Paraphrase?
10001 (gr 4, F)	n/a	n/a	n/a	n/a
10002 (gr 4, M)	n/a	n/a	n/a	n/a
10003 (gr 3, F)	n/a	n/a	n/a	n/a
10004 (gr. 4, M)	n/a	n/a	n/a	n/a
10005 (gr 3, F)	n/a	n/a	n/a	n/a
10010 (gr 3, F)	n/a	n/a	n/a	n/a
10012 (gr 3, F)	n/a	n/a	n/a	n/a
10013 (gr 3, M)	n/a	n/a	n/a	n/a
10014 (gr 4, F)	Really liked	easy	Really liked	easy
10015 (gr 4, F)	okay	okay	okay	okay
10016 (gr 4, F)	n/a	n/a	n/a	n/a
10017 (gr 4, M)	n/a	n/a	n/a	n/a
10018 (gr 4, F)	n/a	n/a	n/a	n/a

Text 7: Starfish

Student #	Liked text?	Easy to read?	Liked Paraphrasing?	Easy to Paraphrase?
10001 (gr 4, F)	n/a	n/a	n/a	n/a
10002 (gr 4, M)	n/a	n/a	n/a	n/a
10003 (gr 3, F)	n/a	n/a	n/a	n/a
10004 (gr. 4, M)	n/a	n/a	n/a	n/a
10005 (gr 3, F)	n/a	n/a	n/a	n/a
10010 (gr 3, F)	n/a	n/a	n/a	n/a
10012 (gr 3, F)	n/a	n/a	n/a	n/a
10013 (gr 3, M)	n/a	n/a	n/a	n/a
10014 (gr 4, F)	Really liked	easy	Really liked	easy

10015 (gr 4, F)	okay	okay	okay	okay
10016 (gr 4, F)	n/a	n/a	n/a	n/a
10017 (gr 4, M)	n/a	n/a	n/a	n/a
10018 (gr 4, F)	n/a	n/a	n/a	n/a

There were some interesting findings when looking at the data by student. The researcher compared students who completed a similar number of paraphrases. Four students completed four paraphrases and only got through one text. All of the paraphrases created by Student 10003 earned a score - one earned a score of 2, two earned a score of 1, one earned a score of zero, and none were filtered out. However, this student found the text hard to read and the paraphrases hard to create. Further, although Student 10003 found the text and paraphrase creation hard, they gave the highest ratings to both the text and the activity of paraphrasing. Student 10001 as well gave the highest rating possible to both the text and the act of paraphrasing. It was very interesting that this student completed only one text. Students 10017 and 10018 had nearly equal yet opposite ratings of the text and paraphrasing; Student 10017 thought the text was just “okay” but thought it was easy to read; they really liked paraphrasing and thought creating them was easy. Student 10018 really liked the text and thought it was easy; however, this student gave ratings of “okay” to the paraphrase activity. They thought that creating the paraphrases was just okay, and thought that the difficulty of creating them was just okay as well.

Two students completed 19 paraphrases. Nine of the paraphrases created by 10002 earned a score of 2, ten scored a 1, and none scored a 0 or were filtered out. This student gave the rating of “really liked” to all of the texts they read, and gave a “really like” rating to the act of

paraphrasing for three of the four texts. However, the student rated the ease of paraphrasing as only “okay” three out of four times. Student 10012 had no paraphrases that scored a 2, one paraphrase that scored a 1, nine paraphrases that earned a score of 0, and nine were filtered out. This student rated the act of paraphrasing as “really liked” for only one text. Every other rating given by this student, whether it was for their liking of the text, the ease of the text, or the ease of paraphrasing, was “okay.”

Students 10014 and 10015 completed the most texts and created the most paraphrases (34 paraphrases each). They had a similar number of paraphrases that scored a 2 (4 and 5, respectively). However, Student 10014 had 25 paraphrases that scored a 1, and only four that were filtered out. This student gave the highest ratings possible to every text, rating all texts and the acts of paraphrasing as “really liked.” Student 10015, on the other hand, had 11 paraphrases that scored a 1, and 14 paraphrases that were filtered out. This student rated their liking of the text and the ease of the text “okay” 12 out of 14 times, equaling 87.5% of the text ratings. The student also rated their liking of the paraphrase activity and the ease of paraphrasing “okay” 12 of 14 times, again equaling 87.5% of the paraphrase ratings.

Once the text perception ratings and paraphrase ratings were disaggregated by text, the researcher further analyzed the data by gender. This data set is presented in Table 4.27 below.

Table 4.27. *Text and Paraphrase Perception Data By Gender*

Text Rating (N=40)							
Gender	Number Really Liked (%)	Number Okay (%)	Number Disliked (%)	Number Easy (%)	Number Okay (%)	Number Hard (%)	Total Ratings
Male	8 (80%)	1 (10%)	1 (10%)	8 (80%)	1 (10%)	1 (10%)	10

Female	14 (46.7%)	14 (46.7%)	2 (6.7%)	11 (36.7%)	15 (50%)	4 (13.3%)	30
Total	22 (55%)	15 (35%)	3 (10%)	19 (47.5%)	16 (40%)	5 (12.5%)	40
	Total Ratings Really Liked (%)	Total Ratings Okay (%)	Total Ratings Disliked (%)	Total Ratings Easy (%)	Total Ratings Okay (%)	Total Ratings Hard (%)	
Male	36.4	6.7	33.3	42.1	6.3	20	
Female	63.6	93.3	66.7	57.9	93.7	80	
Paraphrase Rating (N=40)							
Gender	Number Really Liked (%)	Number Okay (%)	Number Disliked (%)	Number Easy (%)	Number Okay (%)	Number Hard (%)	Total Ratings
Male	7 (70%)	3 (30%)	0 (0%)	5 (50%)	5 (50%)	0 (0%)	10
Female	17 (56.7%)	12 (40%)	1 (3.3%)	9 (30%)	20 (66.7%)	1 (3.3%)	30
Total	24 (60%)	15 (37.5%)	1 (2.5%)	14 (35%)	25 (62.5%)	1 (2.5%)	40
	Total Ratings Really Liked (%)	Total Ratings Okay (%)	Total Ratings Disliked (%)	Total Ratings Easy (%)	Total Ratings Okay (%)	Total Ratings Hard (%)	
Male	29.2	20	0	35.7	20	0	
Female	70.8	80	100	64.3	80	1	

Female student participants provided more ratings because the two students who had the most paraphrases were female. They completed more texts. When analyzing the ratings, it would then make sense that the overall number of ratings would be higher for females. A deeper analysis was warranted into each of the genders' individual ratings. The male students as a group liked both the texts and the paraphrase activity more than the female students did as a group.

Male students' ratings of "really liked" was 80%, compared to only 46.7% of the female text ratings. Additionally, female students had lower ratings for the ease of the texts: While 80% of the male student ratings were "easy," only 36.7% of the female students' ratings were "easy." This is a significant difference; there was a difference of only three ratings between males and females here, but females had three times the number of overall ratings than males. The findings are somewhat surprising given that females at both grade levels had higher academic reading attitude scores than did the males (see Appendix I). While the sample size is small, these findings do corroborate the research favoring male academic reading attitude.

A similar finding was made for the ease of paraphrasing. Male students' ratings of "really liked" was 70%, compared to 56.7% of the female paraphrase ratings. Again, female students had lower ratings for the ease of paraphrasing: 30% of the female student ratings on paraphrasing were "easy," compared with 50% of male students' paraphrase ratings.

Female students gave a rating of "okay" four times as often as the male students for the paraphrase activity. When rating the texts, there were 31 ratings of "okay" for whether the students liked the text and the ease of the text; female students accounted for 29 of those 31 ratings, or 93.5%. Female students also had more ratings of "hard" for both the text and paraphrase perceptions, and more ratings of "dislike" for the texts and the act of paraphrasing.

Overall, the text perceptions and paraphrase perceptions were positive. Of the 80 total text perception ratings (40 for how the students liked the text and 40 for the ease of the text), only 8, or 10%, were negative (that the student disliked the text or found it hard). Similarly with the paraphrase perception ratings: of the 80 total ratings provided by the students, only two were negative, or 0.25%. Conversely, 41 of the 80 ratings for text perception, or 51.2%, were very

positive (the students really liked the text and they found it easy). Paraphrase perception ratings were similarly positive. 38 of the 80 ratings for paraphrase perception, or 47.5%, were very positive.

Analysis of Text and Paraphrase Perception Data with Paraphrase Quality Data

When looking at the text and paraphrase perception data alongside the paraphrase quality data, there were some predictable patterns. The text perception responses decreased with every subsequent text until Text 5, “Blood.” At that point, there were only two students left who were reading and paraphrasing the texts, and they both stopped with “Starfish,” so the last three texts had the same number of ratings. This researcher wanted to see how the text and paraphrase perception data compared to the paraphrase quality data. This correlation of data can be found in Table 4.28 below.

Table 4.28. *Comparison of Text and Paraphrase Perception Data to Paraphrase Quality Data*

Text #: Text Name	Paraphrase Quality Score N=52 (%)			
Text 1: How A Star is Born	# Scoring 2	# Scoring 1	# Scoring 0	# Filtered
	12 (23.1%)	16 (30.8%)	7 (13.4%)	17 (32.7%)
	Text Perception Data N=13 (%)			
	# Really Liked	# Okay	# Disliked	
	7 (53.8%)	4 (30.8%)	2 (15.4%)	
	Paraphrase Perception Data N=13 (%)			
	# Really Liked	# Okay	# Disliked	
	8 (61.5%)	5 (38.5%)	0 (0%)	
Text 2: Eating Healthy	Paraphrase Quality Score N=45 (%)			
	# Scoring 2	# Scoring 1	# Scoring 0	# Filtered

	6 (13.3%)	15(33.3%)	6 (13.3%)	18 (40.0%)
	Text Perception Data N=9 (%)			
	# Really Liked	# Okay	# Disliked	
	5 (55.6%)	4 (44.5%)	0 (0%)	
	Paraphrase Perception Data N=9 (%)			
	# Really Liked	# Okay	# Disliked	
	7 (77.8%)	2 (22.2%)	0 (0%)	
Text 3: A Visit to Mars	Paraphrase Quality Score N=35 (%)			
	# Scoring 2	# Scoring 1	# Scoring 0	# Filtered
	3 (8.6%)	13 (37.1%)	9 (25.7%)	20 (28.6%)
	Text Perception Data N=7 (%)			
	# Really Liked	# Okay	# Disliked	
	4 (57.1%)	2 (28.6%)	1 (14.3%)	
	Paraphrase Perception Data N=7 (%)			
	# Really Liked	# Okay	# Disliked	
	4 (57.1%)	2 (28.6%)	1 (14.3%)	
Text 4: Wildfires	Paraphrase Quality Score N=25 (%)			
	# Scoring 2	# Scoring 1	# Scoring 0	# Filtered
	8 (32.0%)	6 (24.0%)	1 (4.0%)	10 (40.0%)
	Text Perception Data N=5 (%)			
	# Really Liked	# Okay	# Disliked	
	2 (40.0%)	3 (60.0%)	0 (0%)	
	Paraphrase Perception Data N=5 (%)			
	# Really Liked	# Okay	# Disliked	
	2 (40.0%)	3 (60.0%)	0 (0%)	
Text 5: Blood	Paraphrase Quality Score N=10 (%)			

	# Scoring 2	# Scoring 1	# Scoring 0	# Filtered
	1 (10%)	4 (40.0%)	1 (10.0%)	4 (40.0%)
	Text Perception Data N=2 (%)			
	# Really Liked	# Okay	# Disliked	
	2 (100%)	0 (0%)	0 (0%)	
	Paraphrase Perception Data N=2 (%)			
	# Really Liked	# Okay	# Disliked	
	1 (50.0%)	1 (50.0%)	0 (0%)	
Text 6: Ostriches	Paraphrase Quality Score N=10 (%)			
	# Scoring 2	# Scoring 1	# Scoring 0	# Filtered
	0 (0%)	4 (40.0)	0 (0%)	6 (60.0%)
	Text Perception Data N=2 (%)			
	# Really Liked	# Okay	# Disliked	
	1 (50.0%)	1 (50.0%)	0 (0%)	
	Paraphrase Perception Data N=2 (%)			
	# Really Liked	# Okay	# Disliked	
	1 (50.0%)	1 (50.0%)	0 (0%)	
Text 7: Starfish	Paraphrase Quality Score N=10 (%)			
	# Scoring 2	# Scoring 1	# Scoring 0	# Filtered
	2 (20.0%)	4 (40.0%)	0 (0%)	4 (40.0%)
	Text Perception Data N=2 (%)			
	# Really Liked	# Okay	# Disliked	
	1 (50.0%)	1 (50.0%)	0 (0%)	
	Paraphrase Perception Data N=2 (%)			
	# Really Liked	# Okay	# Disliked	
	1 (50.0%)	1 (50.0%)	0 (0%)	

Given that only two students completed the last three texts, the researcher first focused on the four other texts that were completed by more students. The first text, “How a Star is Born,” had the highest number of paraphrases and the highest number of perception responses, which is predictable given it was the first text. It was also the least difficult text, with a Flesch-Kincaid level of 2.7 (grade 2, seventh month), and strong T.E.R.A. component scores, including 91 for syntactic simplicity and 90 for deep cohesion. However, this text had neither the highest percentage of paraphrases scored of the first four texts, nor the lowest percentage of paraphrases filtered out. Interestingly, “How a Star is Born” also did not have the highest text perception ratings or the highest paraphrase perception ratings of the first four texts.

Again, the interesting findings came with Text 3, “A Visit to Mars,” and Text 4, “Wildfires.” Text 3, “A Visit to Mars,” had the lowest number of paraphrase quality scores earning a 2 of this corpus of four texts, and it was the only text that earned a “dislike” rating from a student for the paraphrase perception. Although it was the third text presented to students, with a Flesch-Kincaid score of 3.0 (third grade, zero month), it was a hard text for students. “Wildfires,” on the other hand, while a text less liked and harder to paraphrase according to the perception data, had more paraphrase quality scores of 2 than “A Visit to Mars” (8 versus 3, respectively). “Wildfires” had a high T.E.R.A. component score for syntactic simplicity (90), and a word concreteness score of 74, which refers to the use of concrete nouns (those things one can hear, see, taste, smell, touch). It also had the highest deep cohesion component score. This analysis aligns with the review of literature on text structure and text features (Duke, 2000; McNamara, et al., 2011; Santoro, et. al, 2016).

When comparing the text and paraphrase perception data with the paraphrase quality data by gender, there were few surprises. Males had more favorable perceptions of the texts and the paraphrasing, and their paraphrases, while fewer in number, were of higher quality than those generated by the females. This finding aligns with the review of the literature in that texts that students find interesting across different cultures and experiences, that reflects the students in the classroom and draws upon their backgrounds and languages, and with which the students can identify, has a positive impact on reading achievement and on readers' self esteem (Barber, et al., 2018; Ebe, 2010; Ladson-Billings, 1995; Kourea, Gibson, & Werunga, 2017; Tatum, 2006, Troyer, et al., 2019). See Table 4.26 for a breakdown of text and paraphrase perception data by text and gender.

It was important to this researcher to gather qualitative data from the students after they had completed the tasks of reading and paraphrasing the texts presented to them in the Qualtrics tool. Because the students participating in this study were struggling readers and all remaining participants were English language learners, this researcher wanted to gain a better understanding of what the students remembered about the paraphrase strategy and their reading efficacy as a result of the activity. The data were gathered through a short, one-on-one guided conversation with each student. The analysis of this qualitative data is provided below.

Qualitative Student Interview Data

After the students completed their text reading and paraphrasing, the researcher interviewed each student who was still present in the summer targeted services program about their experience with paraphrasing. Absenteeism continued to be an issue; 11 students were

present for this interview, 10 females and one male. Three questions were created: a *what* question, a *how* question, and a *why* question. The *what* question would address the students' understanding of paraphrasing; the *how* question addressed their mental processes while paraphrasing, and the *why* question addressed their reading efficacy. The three questions are as follows, in the order asked by the researcher:

- Question 1: Do you remember what paraphrasing is?
- Question 2: How did you figure out how to paraphrase the sentences?
- Question 3: Do you think paraphrasing helped you to read better? Why?

Of the 11 students interviewed, four, or 36.4%, could not describe the paraphrasing strategy. This was an interesting finding by the researcher, as the students had spent time over two days working through the activity of reading and paraphrasing the texts in Qualtrics. One student stated at first that they could not remember, but subsequently described the strategy. Seven students, or 63.6%, could articulate how to paraphrase. One female student in particular described paraphrasing quite well, utilizing one of the strategies taught in the instructional video, which was substituting words: "if there's like a word that you don't know, you could ... put it in a new word, like if it was like 'perfect' you could say...is 'perfect' like 'great'? It is, so instead of saying 'perfect' you can say 'great'."

The most interesting finding came with the answers to the *why* question. Every single student responded that paraphrasing helped them become a better reader. Three of the 11 students, or 27%, explained that it helped them make more sense of the text. Six of the 11 students, or 54.5%, explained that paraphrasing helped them with words, whether it was putting

others' words into their own words, making the words smaller, or reading and understanding words better. Student responses to the three interview questions can be found in Appendix L.

Conclusion

As was established at the beginning of this chapter, the majority of students in grades 3 and 4 in the district in which this study took place are not proficient grade level readers. This is an issue that must be addressed and eradicated, because this grade level band is a critically important time period in the life of a student. They are expected to learn content from increasingly complex informational and expository texts that are much more complex in structure, vocabulary, and content. Additionally, more and more reading is taking place digitally. However, as was established from a review of the literature, students' exposure to, and direct reading instruction using informational texts, and reading in an online format, is not adequate to ensure students' success as readers and learners. Further, as was established previously through a review of the literature, there is an elusive and persistent gap in reading achievement between White, middle-class students and students of color, students from low socioeconomic families, and students for whom English is not their first language. Chapter 5 synthesizes the results of this study and provides recommendations for future research. The chapter outlines the many limitations of this study that were unforeseen to the researcher when designing this study. Finally, and for this researcher most importantly, Chapter 5 discusses implications and possibilities for classroom instruction.

CHAPTER FIVE: DISCUSSION, RECOMMENDATIONS, AND IMPLICATIONS

If we teach children today as we taught yesterday, then we rob our children of tomorrow.

-John Dewey

Introduction

The research that took place during the course of this study was born from my desire to better understand the role of the text and its characteristics in students' comprehension. Further, I wanted to better understand the struggle students from different backgrounds and lived experiences face when "reading to learn." Finally, I was keenly interested in how students interact with text in an online format, as new literacies continue to evolve and technology is changing the way we learn. While research on online and digital reading has been part of the literature for the past several decades, it is still in its relative genesis because, as Baron (2017) eloquently states, "digital technology is still in its relative infancy. We know it can be an incredibly useful educational tool, but we need much more research before we can draw firm conclusions" (para. 6). The more digital technology evolves, the more it finds its way into our teaching and learning, and as a district administrator overseeing teaching and learning, I need to bring the most effective programs, pedagogy, and resources to my district in order to help students navigate and comprehend the texts they are reading.

As stated in Chapter One, comprehension is the ultimate goal of reading. It is being able to both understand text and make new meaning from it. Therefore, scaffolding and support for comprehension early on is critical to later success as a reader, as a communicator, and as a

critical thinker. Strong readers read more often, and the amount and the variety of reading in which they engage directly contributes to their academic achievement skills and their ability to obtain a good education (Cunningham & Stanovich, 1997; Rapp, van den Broek, McMaster, Kendeou, & Espin, 2007; Sparks, 2014). Unfortunately, as the reading struggle for many students persists year after year, the capacity of some students to learn and deeply understand new and more complex content and topics dwindles. Additionally, poor reading skills can lead to less motivation to read, which may in turn lead to less time reading and less development of comprehension skills (Cain & Oakhill, 2011; Guthrie, 2015; Troyer, Kim, Hale, Wantchekon, & Armstrong, 2019). As a researcher, district leader and educator, I am plagued by the persistent fact that a majority of students in the district in which this study took place cannot comprehend grade level text. This trajectory must change, and at a pace not yet realized.

It is for all the reasons mentioned above that I conducted this mixed-methods study, which was designed to answer the question, *What are the essential characteristics of informational texts that can be used for training reading comprehension strategies in order to improve the reading comprehension skills of diverse third and fourth grade students?* I wanted to better understand how educators could ensure that the texts used for strategy instruction were appropriate to the task, the environment, and the child. As the nature of texts continually change in a digital world, and as we continue to serve an increasingly diverse population of students in our public schools, the question was further guided by the following sub-questions:

- What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching

reading comprehension strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format?

- What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level?

To answer the questions, I used a design-based implementation and mixed-methods approach for research. Because of the iterative nature of this research study, I collected qualitative and quantitative data from both practitioners and students. The data collection methods of a focus group, student reading attitude inventory, observational notes, paraphrasing quality data, and short student interviews were used to explore answers to the above questions. The data shed light on basic background knowledge of the students with regard to grade level science topics, their attitudes toward reading, and how well they were able to paraphrase short texts that they read. It was important for me as a researcher to include the voice of the educators and the experiences of the students. These are the voices of the practitioners and the ones for whom the research will ultimately benefit. Design-based implementation research (DBIR) can be tested and refined in the classroom where the real differences are found.

The results from this study provided interesting information for future research and classroom implementation. This chapter presents a discussion of the findings and conclusions from the research, focusing on each research question. It discusses overarching themes that emerged from data collection and analysis, and connects those learnings to the extant literature. Several delimitations and unforeseen limitations to the research design and process both existed and presented themselves while conducting this research, and are discussed in detail. This

chapter further discusses how this study informed the larger research university study for the creation of the iSTART-Early online comprehension intervention tutoring tool.

Recommendations for future research are offered, especially with regard to comprehension and vocabulary instruction; gender, grade and informational text; teacher preparation and the influence of gender; reading intervention; and the use of online text and digital tools in teaching reading. Beyond recommendations for research, however, the current research must also inform practice. As I am not only the researcher, but also a public school district administrator overseeing curriculum and instruction, I offer implications for classroom practice as they align to current and future research. Finally, I also offer my reflections and myriad learnings that emerged throughout the process of conducting this study.

Discussion of the Findings

As was established firmly through the review of the literature for this research study, reading comprehension is complex and is the interaction of a reader's cognitive processes on the text, such as background knowledge, goals and purposes for reading a text (such as for academic or recreational purposes), and text structure (Castles, Rastle, & Nation, 2018; Pearson & Cervetti, 2015). Further, a focus on *situation*, which is an expansion of the idea of *context*, brings into play a sociocultural element, which includes an implied or stated task for reading (Fox & Alexander, 2017; Hartman, Morskin, & Zheng, 2010), and can include such elements as attitude or motivation, self-efficacy, and content knowledge. The construction integration (C-I) model (Kintsch & van Kijk, 1978; Kintsch, 1983; Snow, 2002) provided the structure for this research study in that I was trying to gain a greater understanding of reading comprehension through a

more balanced view of identified struggling readers and informational texts they were being asked to read in the context of summer targeted services. The C-I model provided me with the framework of understanding when analyzing my findings, as it uses both bottom-up processes, such as what foundational skills were needed to understand unfamiliar words, and top-down processes, such as prior knowledge. Further, it helped me to better understand how the students were showing their comprehension of the texts presented to them through a web-based format.

Essential Characteristics of Informational Texts

The main question guiding this research study focused on essential text characteristics of informational texts needed in the selection of texts for use in an online reading comprehension strategy tutoring tool for struggling students in grades three and four. Expository and informational texts have structures that need to be taught while teaching reading; they have increasingly complex structures and require more demanding processing skills in order to comprehend them (McNamara, et al., 2011; Santoro, Baker, Fien, Smith, & Chard, 2016). They have, as Duke (2000) pointed out, strong noun and verb constructions and text structures that are unique, such as graphs and diagrams. These are all essential text components students can begin to learn early on in school. If they do so, this knowledge will lead to strong reading comprehension later because, as McNamara et al. (2011) emphasize, using knowledge to comprehend depends in part on the text genre and text features.

For the purposes of this study, a focus group of current teachers and literacy experts was gathered; they read texts created for this study to identify core parameters for informational text development and selection. The results of the focus group discussion on essential characteristics

of texts revealed a number of themes that were used to create texts for this study. The theme of text structure had the highest number of mentions, followed by instructional pedagogy, engagement and vocabulary. Interestingly, the themes of self-efficacy, motivation, and prior knowledge, while identified as themes throughout the discussion, had the lowest number of explicit mentions by the focus group. While conducting the review of the literature, however, I found that prior knowledge was a critical component of successful reading comprehension; a solid knowledge base of content, vocabulary and text structure helps students navigate increasingly complex texts that are used in schools to teach content and to build new knowledge (Afflerback, 1990; Bailey & Heritage, 2008; Goodman, et al., 2017; Kendeou & O'Brien, 2017; Kendeou & O'Brien, 2016; Nagy, et al, 2012; Pearson & Billman, 2016; Rupley, 1075; Willingham, 2017; Willingham, 2006). The fact that these themes had the lowest number of mentions tells me that we can and should provide more professional learning for teachers on the importance of these themes in successful reading comprehension.

When creating the texts, structure was a central focus, once determination of the topics was complete. The texts used for this study were short, with a mean word count of 351.7 and a mean paragraph count of 6.3. The texts had low Flesch-Kincaid (FK) scores, with the mean FK level at 4.3 (fourth grade, third month). No text had a Flesch-Kincaid level higher than a 5.5 (fifth grade, fifth month), and all students in the study stopped reading and paraphrasing prior to reading that text. The first three texts had a mean FK level of 3.1 (third grade, first month). The informational science texts used for this study were then analyzed using the Coh-Metrix Text East and Readability Assessor (T.E.R.A.), and when analyzing both the paraphrase quality data and text and paraphrase perception data, I found the components of the Coh-Metrix T.E.R.A. for

each text to be invaluable. The texts themselves were presented to the students in order of easiest to most difficult, based on five T.E.R.A. text dimensions: narrativity, syntactic similarity, word concreteness, referential cohesion, deep cohesion. Additionally, the Flesch-Kincaid (FK) readability score of each text was also used as a determinant of ease. Of these components, generally, the most widely known by staff in the schools is the FK score. However, the other five are extremely important for practitioners to understand, as informational text has structures that differ from purely narrative texts, such as short stories and novels, and a student's comprehension of a text is influenced by the structure that is used to convey the information (Kendeou & Van den Broek, 2007; McNamara, et al., 2011).

The Coh-Metrix analysis of the texts used in this study revealed that while the texts were expository, which is a genre that is generally more difficult to process, comprehend and remember, they were cohesive, syntactically simple, and had relatively high word concreteness. Further, the texts had Flesch-Kincaid scores that were appropriate for the grade levels of students participating in this study. Given this analysis, the texts were appropriate for use in an online format by the students participating in this study. However, both qualitative and quantitative data revealed that students struggled to read them.

When analyzing the paraphrase data and looking at the nuances of each text with regard to Coh-Metrix T.E.R.A. data analysis, no one component was found to be a prime factor in the ability of students to paraphrase the texts. In fact, the component scores that may have predicted higher paraphrase scores, such as a higher narrativity component score or a high deep cohesion score, did not positively correlate to higher paraphrase scores. I analyzed the students' paraphrase scores coupled with the component scores of the reading indices, and I found that a

less difficult or complex text structure itself was not enough to ensure student success. The students needed exposure to many different text structures in order to build their capacity to navigate through them. The students struggled with all of the texts presented to them, regardless of the structure.

These findings were of great interest to me as both a teacher and administrator, as they confirm the review of the literature with regard to the influence of text structure in comprehension (see Duke, 2000; Kendeou & Van den Broek, 2007; McNamara, et al., 2011). Successful student comprehension of the texts did not fall within the predictable pattern of easiest to most difficult text. There were, not surprisingly, nuances in the students' success with the texts, which can be partly illustrated by the differences in the structural components of each text. However, the findings of this study corroborate what the literature continually affirms: the need for students to be exposed to, and explicitly taught, myriad informational text structures and syntax as well as the content (Duke, 2000; Greenleaf & Valencia, 2016; Jeong, Gaffney & Choi, 2010; Kendeou & Van den Broek, 2007; Lipson, 1982; McNamara, et al., 2011; Ness, 2011; Santoro, et al., 2016). Further, the literature affirms the need for students to learn new information, including text structure and syntax, correctly at the outset in order to mitigate the need to correct inaccurate information later on (Afflerbach, 1990; Goodman, et al., 2017; Kendeou & O'Brien, 2016; Lipson, 1982).

When the text structure is more difficult for or less familiar to the reader, motivation and engagement in the subject matter or content of the text play an important role in helping students navigate more complex texts. Therefore, it was important to analyze the data collected on the students' perceptions of the texts they were reading and paraphrasing. This was particularly

important given the fact that the students had rather limited knowledge of grade level science concepts, illustrated by a mean percentage score of 49.26% on the science pre-assessment.

Motivation and Engagement With Digital Text

Motivation and engagement play a large role in student success with reading comprehension (Barber, et al., 2018; Christ & Sharma, 2018; Christenson, 2012; De Naeghel, et al., 2012; Guthrie, 2015; Guthrie & Cox, 2001; Guthrie & Wigfield, 2000; Guthrie, et al., 2010; Resley & Christenson, 2012; Skinner & Pitzer, 2012; Troyer, et al., 2019; Unrau & Quirk, 2014; Varuzza, et al., 2014; Wigfield, et al., 2008). Further, technology can provide help or hindrance for students, depending on how they have been taught to navigate the environment (Dalton & Proctor, 2008; Leu, et al., 2013). The qualitative observational data I gathered aligned with the review of the literature. When analyzing the observational data collected while students were engaged in particular tasks, I was able to focus on the behaviors of the students. There were several elements that the data analysis revealed that appeared to affect students' motivation and engagement.

Student Engagement in Watching, Reading, and Paraphrasing.

The first activity that the students engaged in was the short instructional video on paraphrasing, and it appeared that video was an engaging medium for the students. It was noted that all students but one were intently watching the video, and the one who was distracted was able to be quickly redirected. Some students watched it more than one time before they began to read. The qualitative observational data reflected their engagement; the indicator of "Other" on the student observational form for text reading and responding (see Table 4.13) had the highest

single mean percentage of all engagement indicators. This finding was not surprising, as it took students over four minutes to watch the instructional video one time and during this time it was noted that only one student was distracted and redirected two times. The students seemed comfortable and familiar with the format.

Second, engagement and motivation were affected by the act of reading and paraphrasing. Initially, the students appeared eager to begin reading and paraphrasing, and began this activity within a reasonable amount of time. However, some students began showing signs of disengagement nearly right away. For the most part, students were easily redirected to the task of reading and paraphrasing, as there were few minor distractions in the classrooms themselves. Analysis of the observational data showed that students spent approximately half of their time actively engaged in reading and paraphrasing. This finding was not surprising; watching the instructional video on paraphrasing took time. Also, students also engaged in other activities related to reading and paraphrasing, such as using a search engine to check the spelling of a word.

There were other mitigating factors that affected the engagement and motivation of the students. During the reading of the passages, many students struggled with vocabulary. While the amount of text displayed at one time on the screen was relatively small, I observed that there were, at times, more difficult words displayed on the screen that were not defined for the students until after they had to paraphrase a sentence that included the more difficult vocabulary. Those students who were more adept in technology skills utilized Spellcheck and a search engine to both help them understand what a word meant or how to spell it correctly. Some students simply asked me for help in defining a word. The qualitative observational data showed that

many students appeared to concentrate very intently on attempting to spell words correctly, which was something I did not anticipate observing. It is presumed that the desire to spell words correctly also slowed them down in their paraphrasing.

Another skill that led to a decrease in the rate of paraphrasing had nothing to do with the reading of the passage, but affected the creation of paraphrases and again, it was something I did not anticipate. Nearly all students were not adept in using a keyboard. They appeared to exert considerable time and effort looking for the right key on the keyboard, which again slowed the process of paraphrasing considerably. Students who struggled to type while they were reading the texts appeared to become less engaged in the texts. Two students in the study could not complete even one text; they simply gave up on the task and asked to be done. Their work was not captured in the Qualtrics tool.

Texts as Factors in Engagement and Motivation

I analyzed the Coh-Metrix components of each text compared to the students' perceptions of the text to gauge a better understanding of engagement. The texts were presented to the students in the Qualtrics tool in order from least to most difficult. However, the nuances in text components, such as narrativity (how a text is more or less narrative in nature) and deep cohesion, (how well the ideas and information of the whole text are connected) may have been a factor in the unpredictability of paraphrase quality, other than the first text presented. "How a Star is Born," the first text presented to the students, had the highest number of paraphrases and the highest number of text and paraphrase perceptions. More students completed that text than any other. It was the first text and the first time students engaged in the task of reading and

paraphrasing. When looking at the possibility that this was a text students really liked, the text received two of the three total ratings of “didn’t like” among all texts, and 46% rated it “okay” or “didn’t like,” which was somewhat in keeping with the ratings of all the texts, although it did receive two-thirds of the rating of “didn’t like.” Furthermore, given the fact that this text was considered the easiest of the texts, it was somewhat surprising that this text did not have the highest percentage of paraphrases scored of the first four texts, or the lowest percentage of paraphrases filtered out, something that may have been predicted given its relative ease. This finding seemed to validate the literature emphasizing the need for texts that students like and want to read.

This study focused on characteristics of texts that could be used in an online comprehension intervention. Therefore, I wanted to see the role that technology possibly played in student success. Technology is rapidly changing, and is changing the way students interact with texts. Focusing on the first sub-question was vital to better understand how the students interacted and struggled with the texts in an online format, what were reasons for their experiences, and what factors of being a diverse learner in terms of language, ethnicity, and socioeconomic status played a role in their success and/or struggle to comprehend.

Essential Text Characteristics in a Digital Environment

The first sub-question guiding this research focused on texts presented to students in an online format, as the research was informing a larger research project to create an online comprehension strategy tutoring tool for struggling students in grades three and four. The question, *What are essential text characteristics (length, readability, structure, cohesion, topics) for the selection of informational texts that can be used for teaching reading comprehension*

strategies, such as paraphrasing, self-explanation, summarization, and question asking, in a digital format?, aimed to inform the role of technology in the student experience.

As mentioned previously, technology continues to change how we interact with text; therefore, literacy continues to evolve (Hartman, et al., 2010; Leu, et al., 2015; Leu, et al., 2013). Additionally, technology has changed the way we acquire and read information - from 240-character news “articles”, blog posts and text messaging to using the Internet to find and process information (Goldman, et al., 2012; Leu, et al., 2015). Technology has also enabled classrooms to utilize programs and other software to provide students with the opportunity for independence, additional practice, and different formats in which to learn (Dalton & Proctor, 2008; Hooshyar, 2016). However, students must be taught how to use the technology. The term *digital divide* defines the inequitable access to computers, the Internet, and other technologies. This inequitable access results in inequitable technology skills that are needed for online reading.

While some students in this study understood how to access a search engine (a more advanced online skill), most had extreme difficulty typing (a basic technology skill), which slowed them down considerably. Some students typed with just one finger, hunting and pecking to find the correct key to press. Others typed with two fingers; they were a bit faster in construction of their paraphrases, but not much faster. I observed one student, however, who was quite familiar with a keyboard. This student was able to complete more texts and generated a high number of paraphrases. Not all of their paraphrases were of high quality; however, the student used less cognitive load in the act of typing than did others who were struggling in their typing.

While technology brings exciting opportunities, access to technology is quite limited for many students, especially those from lower socioeconomic means and low-income students of color (Auxier & Anderson, 2020). This lack of opportunity continues to disenfranchise already marginalized students, and my observations of the students interacting with the technology confirmed the review of the literature on the digital divide. Nearly all struggled with technology.

Diversity of Students in Grades Three and Four

The second sub-question for this research study focused on the students themselves, by asking, *What are additional considerations when selecting appropriate texts for (a) a racially and ethnically diverse population of third and fourth grade students and/or (b) students who read below grade level?* The students who initially obtained permission to participate in this study were all in third and fourth grade, the target grades for this research, and all had been identified by the district as reading below grade level. All but two students qualified for free- or reduced-price lunch, and all were students of color. Furthermore, all but two students were English language learners (ELs). Research cited previously (Hoff, 2013; Neuman & Celano, 2001; Neuman & Moland, 2019) pointed out that the literacy achievement gap between these populations of underserved students and their White, middle-class peers begins in kindergarten and continues to persist as they matriculate through the grades. Culture and ethnicity play a central role in engagement and motivation (Bingham & Okagaki, 2012). Research cited previously (Allington, 2014; Lindsay, 2013; Luo, et al., 2019; McQuillan & Au, 2000; Neuman & Celano, 2001; Neuman & Moland, 2016) cites the need for students of color and low socioeconomic students to have easy access to books, as access to resources and quality reading time positively affect reading comprehension, growth, and achievement. The more students read,

the more they are building prior knowledge, including vocabulary and exposure to structure and syntax, and the more they are able to apply that knowledge to new texts in order to comprehend them (Afflerbach, 1990; Kendeou & O'Brien, 2017; Kendeou & O'Brien, 2016; Pearson & Billman, 2016; Rupley, 1075; Wharton-McDonald & Erickson, 2017; Willingham, 2017; Willingham, 2006). However, students from low-income families and multilingual learners, often from low-income families, face challenges in procuring the types of resources needed to build language and literacy skills. These challenges affect their ability to build the foundational concepts and knowledge needed to grow in reading success and achievement, including academic vocabulary (Allington, 2014; Pribesh, Gavigan, & Dickinson, 2011; Townsend, et al, 2020).

My observations of the struggles the students experienced while participating in the reading and paraphrasing of texts validated the research uncovered through the review of the literature. As I analyzed my qualitative observational notes, I found many students trying, often unsuccessfully, to decode a word or figure out its meaning. They were having difficulty, and yet the literature confirms that both decoding skills and comprehension skills contribute to reading comprehension performance (Kendeou, et al., 2009; Shanahan & Shanahan, 2008; Storch & Whitehurst, 2002). Further, EL students have smaller English vocabularies, which will affect their ability to comprehend a text, and those gaps widen with age (Graves, 2015; Hart & Risley, 1005; Hoff, 2013; White, Graves, & Slater, 1990). This finding from the review of the literature was evident in this study: students in grade 4 generated over twice the number of paraphrases as did their third grade counterparts, with over ten times the number of paraphrases earning the highest score and less paraphrases filtered out.

Because the amount of prior knowledge that a student has on a particular subject has such influence on comprehension of that subject-area text, it was important to gain an understanding of the students' background knowledge in grade-level science concepts. When analyzing the students' scores on the science pre-assessment, it became clear that students had limited knowledge of basic grade-level science concepts. In looking at the data, the students who had the highest science pre-assessment scores (75-100%) also had the highest total number of paraphrases, and the highest number of paraphrases earning scores of 2 or 1. This group also had the lowest number of paraphrases that were previously filtered out. Conversely, while the group of students scoring below 50% on the science pre-assessment had a greater number of total paraphrases than the group of students scoring from 50%-74% on the science assessment, they had the lowest number of paraphrases earning a score of 2 or 1 and the highest number of paraphrases that were previously filtered out. This finding is in line with the review of the research on prior knowledge and warrants continued research on the effects and successful ways of building background knowledge of young learners as they continue on their reading journey.

I found that the lack of prior knowledge of science concepts was evidenced also by the students' struggle with vocabulary, and this contributed to the students' struggle with comprehension and paraphrasing. Knowledge of content-specific vocabulary is crucial to navigating unfamiliar informational texts in an academic setting (Bailey & Heritage, 2008; Nagy, et al., 2012), especially for English learners (Graves, 2015; Hart & Risley, 1995; Hoff, 2013; White, et al., 1990) and this study confirmed the evidence found in the literature: Vocabulary was one of the biggest obstacles the students encountered when trying to comprehend the texts. This finding is unsurprising for a few reasons. First, the score of the narrativity component of the

Coh-Metrix T.E.R.A. analysis was the lowest score of all dimensions. Low narrativity component scores are common with expository texts, which typically have a lower narrativity component (Jackson, et al., 2016) and which have more complex structures and vocabulary that need to be understood to make meaning (Duke, 2000; Nagy, et al., 2012). Texts that score high in narrativity may have a relatively large number of more common words and more verbs, which help students make connections (Jackson, et al., 2016).

Second, both the quantitative and qualitative data gathered in this study revealed the students' struggle with the words they were reading, yet strong comprehension skills are linked to a wide vocabulary and strong understanding of syntax (Anderson & Freebody, 1981; August & Shanahan, 2006; Chall & Jacobs, 2003; Hoff, 2013; McKenna & Dougherty Stahl, 2015; Rupley & Nichols, 2005; Stahl & Fairbanks, 1986; Wharton-McDonald & Erickson, 2017). As the texts presented to the students in this study became more difficult, fewer students completed them and, for those who did complete them, the number of paraphrases earning higher scores dwindled as well. This finding confirms the review of the literature which emphasized that a primary grade focus on foundational reading skills, a greater use of narrative texts, less focus on comprehension and text structure (especially with informational texts), and less explicit meaning-making strategy instruction, puts students at a disadvantage (Beerwinkle, et al., 2018; Chall & Jacobs, 2003; Chall, et al., 1990; Duke, 2000; Jeong, et al., 2010; Strong, 2020).

As mentioned earlier, while conducting observations, I noticed that the text on the screen that students were asked to paraphrase was presented to them *prior* to more difficult vocabulary being defined. In short, the definitions of vocabulary words were presented after the paraphrase was captured by Qualtrics. This sequence neither helped the students make meaning nor helped

them create quality paraphrases. Some students were pointing at the computer screen, trying to sound out words, asking me what words meant, and even using a search engine. While their limited vocabulary hindered comprehension of the texts presented to them, it was both fascinating and encouraging to observe them actively trying to problem solve to continue with the text. At least initially, most students appeared to be motivated to continue.

Observing this motivation to continue was not lost on me. Engagement and motivation is more of a concern for students of color (Fredricks, Blumenfeld, & Paris, 2004; Rumberger, 1987; Rumberger, 1995) and, as stated previously, the students participating in this research study were all students of color. Furthermore, they were identified by the district as below-grade level readers, using state and local assessment data. Therefore, it was essential to capture the students' general attitudes towards reading.

The Elementary Reading Attitude Survey (ERAS; McKenna & Kear, 1990; 1999) was used to gather data on the students' recreational reading and academic reading attitudes, and provided an overall reading attitude score. The review of the literature revealed that attitude impacts reading achievement (McKenna & Kear, 1990; Petscher, 2010; Walberg & Tsai, 1985), and when analyzing the paraphrase quality data with the ERAS data, findings were predictable in the total number of paraphrases generated and total number of paraphrases scored (not filtered out). The group of students scoring between the 76th - 99th percentile on the total reading attitude survey score generated the highest number of paraphrases and had the lowest number of paraphrases filtered out, which validates the review of the literature on the positive impact of reading attitude on comprehension.

Disaggregating the data by gender uncovered some very interesting findings. First, girls had higher Elementary Reading Attitude Survey (ERAS) scores across the board, including academic reading scores, than did the boys. This was somewhat surprising, given the general view that boys tend to like non-fiction texts more than girls. While the boys in this study had lower reading attitude scores than the girls in both grades 3 and 4, they gave higher text perception ratings to the texts used than did the females, and while they generated fewer paraphrases, their paraphrases were of higher quality than those generated by the females.

The girls in grade 4 also outperformed the boys on the science pre-assessment, which is interesting, because it is in keeping with their academic reading attitude at that grade level: there was also a five point difference between girls and boys in their academic reading attitude scores in fourth grade. Although boys made up only 30.8% of the students participating in reading and paraphrasing of texts, they generated nearly 50% of the paraphrases earning a quality score of 2. Overall, while boys had lower ERAS scores, lower science pre-assessment scores, and lower numbers of paraphrases, their paraphrase quality was stronger, which translated into better comprehension of the texts. These findings suggest a potential dissociation between attitudes and interest: While the boys had lower academic reading attitude scores than the girls, they were more interested, and ultimately more successful, in navigating the science texts. Thus, when contemplating informational texts used with third and fourth graders, it would be wise to consider interests by gender at that age. When analyzing the findings I could not help but wonder whether other texts related to the same topics would have been more interesting for the girls.

While the boys gave higher text perception ratings to the texts than did the girls, the text topics were of overall interest to all students as evidenced by their ratings of the texts. Of the 40

ratings given on whether or not the students liked the texts, 55% were “really liked” and another 37.5% were “okay.” There were only three ratings of “didn’t like,” constituting 7.5% of the total ratings. These findings are encouraging; the review of the literature showed that interest contributes to comprehension (Barber, et al., 2018; Ebe, 2010; Ladson-Billings, 1995; Kourea, Gibson, & Werunga, 2017; Tatum, 2006, Troyer, et al., 2019), and the texts overall received positive ratings, which is a factor of text selection for all instructional purposes, but especially for use with reading comprehension intervention instruction. Populating an intervention tool that students will access independently with texts that match their interest will aid in the engagement with the intervention.

Of the 187 total paraphrases that students generated, 31 earned a 2, the highest score, which equals 16.6% of the total number of paraphrases. Further, 64 paraphrases, or 34.2% of the total number, earned a paraphrase quality score of 1. Adding these two groups together, 95 paraphrases scored a 1 or 2, which is 50.8%, or slightly over half of all paraphrases generated. This was a promising number, despite the struggles the students displayed when reading and paraphrasing the texts.

Both the qualitative and quantitative data confirmed that all of the students did indeed struggle to read and comprehend the texts presented to them in Qualtrics. However, they also engaged in behaviors, such as watching the instructional video more than once, sounding out words, and using a search engine. In my over 25 years in education, I have encountered teachers, administrators, and other staff who continually view English learners (ELs), students of color, and students from low socioeconomic families from a deficit lens - that they are somehow unable to learn at levels of their White, middle class peers. I argue that these preconceived notions

perpetuate the reading achievement gap that continues to persist. Furthermore, I argue that the students in this study were trying hard to be successful.

The belief in students and their efficacy must take a more prominent role in schools, especially for students who are experiencing structural racism within impoverished communities, continued negative stereotypes, and systemic racism in their schooling (Reynolds, Sneva, & Beehler, 2010; Tatum, 2006; Thomas, 2018). Watching the students reading and paraphrasing texts for this study confirmed to me that prior knowledge and lived experiences are less likely to be prominent in many of the instructional materials and assessments used in our classrooms (McCullough, 2013). It is as important for students to make personal connections to their school experiences and learning as it is to provide students with new experiences and learning (Bishop, 1990; Christ & Sharma, 2018; Tatum, 2006). Additionally, it is imperative that we see them as capable, resilient, determined learners. The students in this study engaged in behaviors that showed their determination to succeed. Observing them engaging in this type of problem-solving, especially utilizing online resources such as search engines, holds great promise for future research. This view of students is not limited to the grade level students who participated in this study. We must hold this view of promise for all students, beginning with our youngest learners. This study, however, focused on third and fourth grade and used specific texts, which delimitations will be discussed in the next section.

Delimitations to the Research Design

Delimitations to this particular research study are based upon the online reading strategy tool that will be ultimately created and for which this study provided initial data. This research

helped to inform a larger study funded by the Institute for Educational Sciences (IES), which is being conducted in conjunction with a partnership between two highly-respected research universities in the United States. This partnership was developed to create a comprehension strategy tutoring tool that will be ultimately created for third and fourth grade students across the United States who are struggling with reading comprehension. The tutoring tool will focus specifically on the comprehension of informational, expository texts, based upon the research that shows early elementary literacy instruction focuses little on informational texts (Beerwinkle, et al., 2018; Duke, 2000, Jeong, et al., 2010; Strong, 2020), yet beginning in fourth grade there is a marked increase of informational texts used to learn content (Castles, Rastle, & Nation, 2018; Goldman, Snow, & Vaughn, 2016; Guthrie, et al., 2004; Sweet & Snow, 2003). Therefore, because of the scope of the larger study, the cohort of students participating in this study were limited to third and fourth grade students. While limiting, this factor helped to focus on two important grade levels in a student's academic and literacy trajectory.

A second delimitation was that the texts were limited to expository texts. In the case of this study, texts focusing specifically on grade level science concepts as determined by the state science standards. This is an important focus, however, because science is a subject that is language-rich, requiring students to develop strong background knowledge and academic language (Nagy, et al., 2012; Townsend, et al., 2020). I chose to use science texts for this study because limited time has been given to science instruction in the elementary grades and this provided another avenue for students to read about science topics. The iSTART-Early comprehension intervention strategy tutoring tool, currently being created by researchers at the large university with which my district partnered, will focus on expository text, and it will

require a large bank of accessible expository texts for students to read, including texts that continually expose students to science concepts, among others. This will be a very useful tool for students and teachers.

I was excited for the scope of the i-START-Early research and my contribution to it, given my background as a strong literacy educator and my position as a district administrator overseeing K-12 literacy. Further, there was a strong partnership between the district and the large research university for the past several years, with the district agreeing to be part of research that focused on the creation of an intervention tool for inference in the primary grades. My research study was helping to inform texts which would be populated in the iSTART-Early comprehension intervention tutoring tool, and served research already in progress. When initially designing this research, neither I nor anyone on the university's research team could possibly imagine what would face us beginning in the spring of 2020.

Limitations to the Research Design

The COVID-19 pandemic disrupted the face of K-12 public education, not only in the United States, but around the world, with 188 countries closing or severely limiting in-person learning (Hebebcı, Bertiz, & Alan, 2020) in the spring of 2020. The district in which this study took place closed schools and hastily turned to distance learning. Further, the district altered its summer targeted services program. All of these factors led to significant limitations in both phases of this research study. The first limitation came with regard to the work of the focus group.

Limitations of Study 1

Focus Group Work. In the case of the district in which this study took place, all pre-K-12 in-person student learning was suspended beginning on March 17, 2020 (March 15, 2020 personal communication). The district struggled to provide devices to families who needed them, and reliable access to the Internet in the homes of many district families was a considerable issue with regard to student learning. The district was able to purchase a limited number of hotspots, but it was not enough to satisfy the widespread need of families. Those staff not directly interacting with students on a daily basis, including literacy experts and district administrators, shifted focus to the creation of math and literacy materials that could be either picked up by families who did not have access to the Internet, or mailed or driven to their homes. These materials were created weekly and took up a tremendous amount of time and energy to produce and distribute.

End-of-year state-required and district-required standardized testing was suspended. This meant that teachers attempted to assess locally in reading and math; district staff and the literacy experts, among others, were charged with helping teachers create and administer assessments. These efforts were not always successful because of mitigating factors, such as sporadic access to students. The rapid switch to distance learning and all that it required, including the need for preparation and the full teacher, student and family support limited the focus group in two areas: first, it limited the number of people who were willing to volunteer to be on the focus group, and it limited the ability of the focus group to convene more than one time.

Because the focus group could only meet one time, the number of texts initially included for them to read and review was limited as well. The group was provided with 23 short texts to read prior to meeting, and they provided feedback on those texts. Because of the inability to meet again, I coded the feedback to identify themes that I then sent to the text writers. They

communicated that this information was enough to create texts to be used for the study.

However, had the focus group been able to convene more than once, I believe that we could have delved deeper into the themes initially identified to gain a better understanding of what were important text characteristics to include for this tutoring tool.

Limitations of Study 2

The Summer Targeted Services Program. This study was planned to take place during summer targeted services at the outset, which was an ideal time to focus on new ways of teaching and learning. Further, because this study was helping to inform a larger study on reading intervention, the students participating in summer targeted services were an ideal population on which to focus. My original plan was to spend time with the students, teaching them specific reading comprehension strategies and gathering a great deal of observational data as part of this research. However, due to the continuation of the COVID-19 pandemic, the traditional summer targeted services program was considerably altered in terms of the following: the length of the summer program, the length of the day, and the format for learning, which now was required to include both distance and in-person learning. This meant a significant decrease in the number of students who attended in person.

The length of the summer targeted services program was reduced by 40%, from five weeks to three weeks. However, the traditional number of days per week, which was four, remained the same. The length of the day was reduced by one-third, from six hours to four hours. Prior to 2020, the typical summer targeted services day started at 8:00 a.m. and ended at 2:00 p.m., with breakfast and lunch served on site, extensive academic programming, and recess. Because of COVID-19, the hours were 8:00 a.m. until noon. These four hours included breakfast and recess, but a take-home lunch was given to students as they left for the day.

The format of learning was considerably altered as well. The time still included breakfast and recess as in the past. However, 25% of the summer targeted services instructional time was devoted to social-emotional learning. This meant a marked decrease in the time devoted to academic learning, including time for structured literacy work. The abbreviated literacy time frame meant that, for the purposes of methodology, only one reading strategy could be taught and assessed to show comprehension of texts created for the purposes of this study.

The decision to provide parents choice of in-person or remote learning for their students further caused me to choose how I was going to conduct my research. I chose to conduct this study on the students who were participating in person, rather than remotely, as I had more control over their physical environment. Working with students in this environment enabled me to engage with the students physically, encouraging them to stay engaged and helping them with questions or issues that arose. Also, this environment enabled me to observe students both individually and collectively. I was, however, only able to work with one reading strategy.

Finally, choice itself provided limitations. Due to the severe restrictions placed on school districts, the choice given to families with regard to delivery of instruction, and the fear many families had of their students being in person, there were a considerably smaller number of students who were available to participate in this study than had been originally planned. Social distancing considerably restricted the numbers of students attending the summer targeted services program in person. There was limited space available for in-person instruction. Physical classrooms for the elementary program were limited to nine students, with desks spaced a minimum of six feet apart. There were strong recommendations on mask usage.

Many families chose to keep their children at home to participate in summer targeted services remotely, and the decrease in in-person attendance was not consistent across demographics, with decreases ranging from 49% (White participation) to 85% (students identifying as two or more races). Students identifying as Hispanic/Latino had the highest percentage of students participating overall in summer targeted services. Their in-person numbers, although having decreased by 51% as a result of the choice of in-person or remote services, was still the largest population attending summer targeted services in person. There were few students who identified as Asian, White, and identifying as two or more races, which meant a limited range of demographics of students participating in this study.

Comprehension Intervention Research Focus.

This study provided essential information for the eventual creation of the comprehension intervention tool for students in grades 3 and 4, called iSTART-Early. This tool has a module sequence that was designed similarly to its predecessor, iSTART, which was built for older students of adolescent age and above. In iSTART-Early, there are five modules planned for the tool. They incorporate six reading comprehension strategies (paraphrasing, comprehension monitoring, question asking, elaboration, bridging, and summarizing). The five modules are as follows:

- Ask It, which is an overview of comprehension monitoring and question asking;
- Reword It, which incorporates the paraphrasing strategy;
- Find It, which also works with paraphrasing;
- Explain It, which works on elaboration, bridging, question asking, and paraphrasing, and

- Summarize It, which works on summarization and also includes work on finding the main idea.

The modules are presented in sequential design, with the strategies building off one another.

Reword It, or paraphrasing, is the first module in which students generate responses (the Ask It module requires only identification tasks).

Because of the COVID-19 pandemic, the researcher had limited time with the students. Therefore, the team building the eventual comprehension intervention tool for third and fourth grade, along with this researcher, made the decision to begin with the lowest level generative strategy only, which is the paraphrasing strategy. Further, due to the little time I could be in front of the students, the research team created a short paraphrasing strategy instruction video, which each student accessed via their computer and a set of headphones. The video was a little over four minutes long. I observed the students and recorded data as they watched the instructional video.

The paraphrasing video contained modeling of the strategy, and the video could be accessed over and over again during their time interacting with the texts. However, it was more difficult to ascertain the level of understanding and learning of the paraphrasing strategy than it would have been with live, direct instruction. Because of my experience as a teacher, I would have preferred to use the gradual release of responsibility strategy through modeling, partnering, and finally individual practice with the strategy to better assess student understanding. The natural disconnect created between the student and the teacher as a result of the use of a video may have impacted motivation, engagement, and ultimately the success of the paraphrasing.

Student Participation Due to Absence.

The rapid spread of the virus during what was still an early phase in the pandemic touched the families and the students who were part of this study. Even during the research phase of this study, the recommendation of wearing face shields was first promoted and then rescinded. Staff began the summer targeted services program by wearing face shields, which provided the opportunity for students to see their teachers' full faces when talking. Shortly into the summer targeted services session, however, the recommendation of the use of face shields was replaced with a recommendation for the use of face masks, by all teachers and students. Young students were still learning how to wear a mask, and despite their best efforts, it was hard for many young students to wear the masks properly; the masks also were observed to be somewhat of a distraction to students who were not used to them. The virus spread very rapidly in the early summer, and sickness and positive COVID diagnoses of students and/or family members required a number of students who were attending in person to be absent from in-person learning, with some of the students, including some of those participating in this research study, not returning at all.

The absences were more numerous than was typical in a summer targeted services program in this district (personal communication, June, 2020). Students who began the study were absent one or more times, or left the summer program altogether. Although 19 students originally participated in this research study, complete data sets on only eleven students were possible due to absences. Teachers did not know, from day to day, who would be coming back to

school. As the researcher, I was in constant contact with the teachers of the participating students, and they kept me informed as to the status of the students.

Researcher and Teacher.

I would be remiss not to include the biases that I as a former teacher carry with me that could have influenced the interpretation of the results of this study. The abbreviated time spent with students required a change in delivery of instruction on paraphrasing. I was unable to build strong connections with the students and get to know them better as learners, scaffolding as appropriate and gathering formative data on their understanding of the paraphrasing strategy. Having worked in this diverse district for over six years, I understand the role that relationship plays, especially with students of color.

Because of these limitations, which led to the small number of participants and an abbreviated time frame, there is an inability to generalize the results of the study. However, the data obtained from in-person observations, focus group discussion, and short student interviews provided this researcher with information that helped the large research university in their creation of iSTART-Early. That information will be shared in the next section. Further, it provided recommendations for further research on reading comprehension pedagogy and the selection of texts to utilize with students, as it is imperative that the trajectory for a child who is struggling in reading be shifted. As has been amply supported by the literature, and observed firsthand during this study, a child's struggle to read can lead to a much larger struggle in learning content. That fact alone was my purpose for research in the first place, and I was

fortunate to be able to partner with a large research university in their creation of an online comprehension tutoring tool that will ultimately help mitigate that struggle.

The Use of This Study in the Creation of the iSTART-Early Interface

Over the last several years, I was honored to have built a strong, collaborative partnership between the school district used for this study and a major research university located in the same metropolitan area. This was a partnership that initially focused on the role that inference plays in successful reading comprehension in the younger grades. The major research university had created online tools for improving inference-making in reading; a strategy known to increase reading comprehension (Kendeou, McMaster, & Christ, 2016; Wanzek, et al., 2018).

The strong partnership between the district and the research university provided me the opportunity to design a study that would help to inform their creation of a new online comprehension intervention tool titled Interactive Strategy Training for Active Reading and Thinking for young developing readers (iSTART-Early), designed specifically for students during a very critical period in reading development: grades three and four. This tool is a version of the Interactive Strategy Training for Active Reading and Thinking (iSTART) tool, which was previously developed for older students. The iSTART-Early tool will focus on informational texts, particularly science texts. Doing so will provide additional instruction and practice for students who are struggling with the comprehension of more challenging science texts, thus improving their comprehension and knowledge of the content. The iSTART-Early tool will focus on the strategies of comprehension monitoring, paraphrasing, inference (prediction/bridging/elaboration), question asking, explanation, and summarization by providing

comprehension instruction and practice that is adaptive in nature and is supplemental to direct instruction from the classroom teacher. For the purposes of this study, and due to the limited time spent with students, the decision was made to focus on the paraphrasing strategy.

Paraphrasing is a strategy that can help a reader clarify the meaning of a text, whether it is a sentence or a paragraph, and thus help improve understanding of main ideas and details in a text (Hageman, et al., 2012; Nicola, Dascalu, Newton, Orcutt, & McNamara, submitted for publication). Creating an online tool that would provide feedback to students regarding the quality of their paraphrases, rather than just letting them know if they paraphrased or not, will provide an additional layer of understanding for both the student and the classroom teacher. Using a tool such as this will provide both the student and teacher clarity in *how* the student paraphrased the text, such as using semantic similarity or elaboration. The larger research study needed benchmark information from students to help make decisions on how to populate the iSTART-Early intervention tool with texts.

The target population for iSTART-Early is students specifically in grades three and four; therefore, obtaining paraphrases from students in those grades would help build a corpus of paraphrases that could continue the research on iSTART-Early. This research study on essential text characteristics provided that opportunity. This study faced significant limitations and challenges due to the COVID-19 pandemic; however, it obtained a small but significant corpus of paraphrases which were used in the next steps of iSTART-Early research (Nicola, et al., submitted for publication).

The paraphrases that students generated during summer targeted services were used to create three algorithms designed to assess the quality of student paraphrases, which will then

provide immediate feedback to the students when they are working in the iSTART-Early tool.

The original algorithm was built to analyze adult paraphrases, and the researchers tested it with the paraphrases generated in this study to see if the algorithm worked on children's responses.

The algorithm was successful on children's responses. As a result of the paraphrases collected during this study, analyses were made on those paraphrases that are able to be generalized across different texts, levels of reading, and language (Nicula, et al., submitted for publication).

Along with the quantitative data collected, the qualitative data compiled through this study can inform continued research in several different areas, including the behaviors of students when reading and comprehending, as reading is a complex cognitive process. In the next section I will discuss recommendations for future research.

Recommendations for Future Research

This study attempted to answer questions related to texts needed for an online reading comprehension intervention that focused specifically on historically underserved struggling readers in third and fourth grade. The topic is a significant one in public education, as some students continue to struggle in proficient reading comprehension. The topic is a timely one as well, given that digital literacies continue to change the landscape of reading. I will discuss several recommendations for future research.

First, research on reading comprehension strategies in a general education classroom lag behind the research on basic reading skills. Therefore, more implementation research is needed to better understand the impact of teaching reading comprehension strategies. The literature is replete with evidence that the use of informational text helps students build knowledge across a

wide range of content areas and subject matter. However, the review of the literature also shows that, especially in the primary grades, the explicit use of informational text to teach reading is still minimal, despite the findings of Nell Duke over 20 years ago. Narrative text is still widely used for read-alouds and explicit instruction in decoding and fluency. Informational texts, though, can have complex structures that students must be taught to navigate, and the texts require the student to utilize multiple comprehension strategies, which they also must be taught to use when reading. Further, informational text provides students with rich, foundational and content-specific vocabulary that can be connected to other subjects and other words, and the texts provide readers with windows to the world they might not otherwise encounter. Conducting studies that focus on explicit instruction in reading comprehension strategies and skills using informational text, especially with younger students, would well serve to inform the body of literature on reading comprehension.

Second, many students who are part of families with limited economic resources, students of color, and students for whom English is not their first language continue to achieve much lower than their White, middle class peers. This persistent achievement gap is caused by factors that, despite best intentions, have not been eradicated. Not all students of color are struggling readers, but many are, and we need continued research that focuses specifically on how educators can and are connecting with and engaging struggling readers of color in the classroom. Oftentimes, instruction and materials, including texts, are not inclusive of or responsive to many students' lived experiences and the assets that come with the varying cultures, languages, genders, and races that are and can be enjoyed in classrooms of diverse students. Many teachers bring their own class and experience-based beliefs to the classroom, and

can often have lower expectations for English learners and other underserved students (Almasi, et. al, 2010; Emdin, 2016; Jiménez, et al., 2015; Marx, 2000; Moje, 2000; Redding, 2019). A deeper understanding by teachers of the affective factors that impact reading for students of all demographics, languages, and lived experiences continue to be warranted. These affective factors include attitude and motivation, and the role of texts that are culturally relevant, dispel demographic stereotypes, and empower students to believe in themselves. When analyzing the qualitative observational data in this study, I was struck by the initial eagerness of the students to successfully complete the tasks of reading and paraphrasing; for some students that eagerness waned considerably early on when they realized the task was hard for them. I was also struck by the determination of some students to persist and problem-solve when they encountered challenges in making meaning from the texts. Because the texts were presented to the students in an online format, they had tools at their ready that may not be available when reading printed text with no device nearby. When observing the students try to use search engines and Google to help them, I could not help but wonder how teachers can leverage those skills in the classroom. I also wondered what the teachers would need as far as professional learning to help leverage those skills that their students have. Studies focusing on students' reading stamina, persistence, determination and engagement in informational text, particularly, is warranted, as is a better understanding of teachers' perceptions of their students' assets.

Future research could also focus on the role technology can play in helping to eliminate gaps between underserved students and their White, middle class peers. Using technology that is interactive, such as hyperlinks to word definitions, text-to-speech capability, and automated speech recognition (ASR) for reading response, may provide invaluable scaffolding for

struggling readers who spend more effort trying to figure out a word than figuring out a main idea. As I witnessed firsthand during this research study, if the students had been able to take advantage of such advances in technology, I can only wonder how the results could have been different. This is a burgeoning field for researchers. Additionally, exploration of the use of graphics and gamification (such as the use of leveling up, badges, and tokens) and their effects on engagement, motivation, and ultimately reading comprehension for struggling readers is a burgeoning field of research to be explored.

With regard to student use of technology for literacy instruction, the well-quoted adage in schools that “what gets assessed gets taught” must be considered. State assessments currently do not assess online, digital reading comprehension, but only offline text skills in a computerized format. The National Assessment of Educational Progress (NAEP) is still in development of a new reading framework; therefore, this would be an area of research to provide recommendations. Since research can and does often influence policy, future research showing students’ variance in digital versus offline reading comprehension would be warranted. Districts are under tremendous pressure to raise reading test scores that currently only assess offline skills (Leu, et al., 2008), yet students are spending increasing amounts of time reading using new literacies, such as social media, blog posts, and apps. As discussed through the review of the literature, new literacies present challenges, especially for students who already struggle with traditional print reading, in terms of fluency and critical reading habits (Dalton & Proctor, 2008). Students need to engage in specific reading comprehension instruction using online and digital resources. Whether or not states assess digital literacy skills, research on digital literacy comprehension would serve to inform the body of literature and teachers in the classroom.

Finally, I believe that this study should be replicated on a larger scale. Because of the varied impacts of the COVID-19 pandemic and the small targeted sample, no finding could be generalized. However, this study utilized design-based implementation research (DBIR), which is a research framework that has been recommended for use with literacy (Mills, 2010). The research design develops both theory and knowledge of students' learning in the classroom, as well as implementation of strong instructional practice (Fishman, et al., 2013). There was much rich data and I was able to glean themes that I want to share with teachers and administrators in my district to strengthen literacy instruction, especially in the grades leading up to those on which this study focused. However, if this study could be replicated on a larger scale, with more students and with more time, I believe we could learn much from the data and analysis that could have far-reaching implications for future research and classroom practice.

Implications for Classroom Practice

I believe that research without implementation is just fun reading. My deep belief that research should inform practice is the reason that I conducted a design-based implementation (DBIR) research study. Designing and conducting a study using DBIR, no matter the limitations, helped me to see my work as both a researcher and educational leader with fresh eyes, and I am compelled to use the knowledge that I have gained to help improve classroom practice. Having the results of research is one thing; seeing those results make a difference in the daily instruction of teachers and the learning of students is what I believe is most important. I believe that my research has several implications for classroom practice.

There are wide disparities in and low levels of reading achievement in the district in which this study took place. I have since moved to a different district, and the story is similar: students of color, students of limited socioeconomic means, and English learners achieve at rates much lower than their White, middle class counterparts. These realities in different districts solidify my belief that implementation of the recommendations of reading research in classrooms is absolutely necessary. “Most education research must be situated - framed locally by the conditions of class, community, program, local history, gender, teacher, and many other factors even while employing disciplined, trust-inducing approaches” (Shulman, 1999, p. 163). One of the reasons for my second sub-question for the research, which focused on racially and ethnically diverse third and fourth grade readers, was because I could not ignore class, gender, ethnicity, culture, and socioeconomic influences in my research on texts, just as I cannot ignore these factors in district decision-making. Not only as a researcher but as a district leader, I am delving into what I have squarely learned about so far in my research on the history of comprehension, the construction-integration model of comprehension, that takes into account the interstices of reader, text, and context/event/experience. I am bringing what I have learned through this research study to conversations during curriculum review cycles and to professional development planning for teachers and building and district leaders.

This research study cemented both my agreement with and my commitment to the work. In other words, research must inform practice and it is the obligation of educators and education leaders to conduct it, and/or read it, and finally use it both in the classroom and when making systemic decisions. Researchers, administrators, and classroom teachers need to understand what works for students - and not just what works, but what works well so that the achievement

disparities that continue to persist can be eradicated. To do this, we can and must create systems that provide time to read research and plan how to implement what we learned from it.

The use of informational text with third and fourth grade readers made clear the continued need to increase the use of informational text with early and intermediate readers. The use of informational texts to teach comprehension skills proved successful albeit the small number of participants. However, the results of this study aligned with the review of the literature, once again confirming what many educators and researchers know: Reading instruction with well selected informational texts is necessary. There are young children, much like my son when he was younger, who love informational text and would choose to read it over narrative text. Both types of texts are needed for sound literacy instruction at all grade levels. The texts matter.

One effective instructional method using informational texts is to include them for explicit reading strategy and skill instruction. Paraphrasing is an extremely important comprehension skill. Students were engaged in the paraphrasing video used in this study, and there were promising data on their creation of paraphrases. While this study focused only on paraphrasing, using informational text to teach a variety of comprehension strategies (such as comprehension monitoring, inference, question-asking, elaboration and summarizing) is necessary, as these skills and strategies are needed to fully comprehend informational and expository text.

Another sound idea is to use informational texts for read-alouds, including modeling of think-alouds while the teacher is reading. Using informational text for read-alouds takes some planning, especially with regard to connection across content areas and teachers' use of

think-alouds while they are reading, but the benefits are invaluable. If teachers use informational text to explicitly teach reading comprehension skills and strategies, they are helping students gain access to the world of key ideas and details. They are providing opportunities for focused learning on concepts students may never have known before. Finally, the teachers are helping all students build vocabularies and an understanding of text structure that helps to ensure students' ability to traverse complex text structure without having to work mightily to figure out the meaning of multiple words in a sentence, a struggle I observed the students grapple with in my research.

Yet another way we can improve the achievement of students in the classroom is to take advantage of changing technology. I will begin by discussing the Coh-Metrix Text Ease and Readability Assessor, which is an online tool that is free for educators to use. Before I conducted this study, I had no idea this tool existed, even though I was a classroom teacher for 13 years and a building and program coordinator for another three years. It is an easy tool to use: all teachers need to do is create an account. Once that is done, they can then enter a short passage into the tool, which will create a profile of the text. The profile includes percentile comparisons to other texts, and a description of the component dimensions of the text itself. Introducing this tool to teachers would require some professional learning on their part, but frankly not a lot, and this would be a great tool for teachers when they are planning for small group reading instruction.

A second way of taking advantage of technology is thoughtful planning for reading instruction and intervention with the technology at the forefront of the planning for instruction. The district in which this study took place, and now my new district, transformed into 1:1 districts as a result of the COVID-19 pandemic, meaning that every student, K-12, in the district

has a device for learning. This fact alone can and should transform how technology is used in the classroom for literacy instruction. However, students need to be taught how to use the technology. I am having this conversation with my district as we plan for fall re-opening. The district I am currently working in, as did the district in which this research took place, became a 1:1 district because of the COVID-19 pandemic. Having all students back in person provides a necessary opportunity to think through how we are utilizing technology in the classroom. Thoughtful planning on the part of the teacher or the grade level team could provide students with greater and more relevant opportunities to build students' background knowledge on topics being read and learned in school, and provide opportunities for integration across content areas. While conducting my research, I observed students using a search engine to find answers. Teachers can leverage what students can do with technology, such as using a search engine, to find, read, and evaluate online texts. Teachers can then plan ways to assess their students' understanding of the texts they are reading online.

Using technology as a tool for formative and summative assessment of students' comprehension can be very beneficial for both students and teachers. As students read the texts in this study, they paraphrased sentences, which were captured in Qualtrics. This was real-time assessment data that teachers would have at their fingertips. The same can be said about the ratings that the students gave to both the texts and the paraphrase ease. Qualtrics is used as a survey tool in both the district where this study took place and also in my current district. It can provide a real-time dashboard for teachers to see where their students are at and where they are struggling. As I mentioned earlier, technology can level the playing field for those students historically underserved in our schools. However, districts must provide online professional

development for teachers, as this type of planning has not traditionally been taught in teacher preparation programs, the tools are newer, and many teachers are not yet familiar with the endless possibilities that technology can provide for their instruction and student learning.

Finally, it is important to create assessments that are authentic to what it is they are assessing. In this study, the students struggled to read the science pre-assessment. The goal of that assessment was to gauge their understanding of science concepts, not their reading ability. Therefore, both I and their teachers helped them to read the words. If we rely solely on reading for assessment, such as the use of multiple-choice tests, we miss an opportunity to understand what our students know.

Concluding Thoughts

I began teaching in 1995, starting out in elementary school and moving to the secondary level. This experience provided me with a broad range of understanding of what students experience as they go through their educational journey. In addition to teaching English Language Arts and literacy, I taught social studies and math to general education students, many of whom struggled to comprehend texts. It was my responsibility as a teacher to assess what my students knew, understood, and could do with the content in front of them. The barrier to comprehension of that content made assessment of their learning much more difficult. While I focused a considerable amount of my undergraduate learning on literacy, I was more determined than ever as an educator to continue my journey on helping students to read successfully. My masters thesis focused on literacy, and this doctoral journey continues that focus, especially as technology continues to morph at warp speed.

This research study cemented in my mind the importance of strong reading comprehension instruction, beginning in the early years. From the review of the literature, my observations of struggling readers, and the quantitative research I amassed during this study, I am fully convinced that as educators our work must not only continue, but we must understand that the early years in education are crucial to success later on in a student's academic career. Instruction in phonics and phonemic awareness, while foundational to reading success, must not take the place of opportunities to build background knowledge, provide exposure to a wide body of vocabulary, and create endless opportunities to show young students how they already comprehend so much. We must build on the funds of knowledge, understanding, and the many assets that students bring with them everyday to our schools and classrooms.

We must use every minute we have with our students efficiently. In order to help them make connections in their learning, we must integrate literacy into science, social studies, and math, and bring knowledge of the world into literacy learning, which means an increase in the use of informational text in literacy instruction. Furthermore, we must bring students' knowledge of their experiences, and their funds of knowledge, into literacy instruction, and connect their understanding of the world with new knowledge that they are amassing. We must carefully and intentionally plan learning experiences for students that continue to build their knowledge and understanding, that help them see themselves as capable and contributing. To do this, we must intentionally choose materials that not only engage our students but continue to build their knowledge of the world. The texts matter.

In order to provide opportunities for readers to work on areas of difficulty, we need to continue to leverage the advantages of technology, and we can do this by teaching literacy skills

through printed and digital literacies. We can implement interventions using online, web-based platforms to take advantage of automated speech recognition, instantaneous definitions of words, and the ability to listen to the text while reading - all that can be done by an independent learner while the teacher is working with other students. Utilizing technology in this way can continue to build what the data in this study showed as important: background knowledge, strong vocabularies, and strong skill in reading on a computer screen.

When former President Barack Obama spoke to members of the American Library Association, he remarked, “Reading is the gateway skill that makes all other learning possible” (Obama, 2005). His words were focused on the change in skills needed for a successful American workforce in the 21st century - a shift predicated on the revolution of technology and the global connection requiring strong literacy and communication skills. He called this economy “the knowledge economy” (Obama, 2005, para.15), and at its center is the ability to read well. His words, spoken in front of librarians, have been my mantra ever since becoming a teacher.

I believe wholeheartedly that all students can and want to learn, and I am confident that this research will impact reading instruction in my district. I have been hired to guide the trajectory of students and, although I am no longer in the classroom, I am responsible for creating systems that will ensure all students are prepared for a successful life after they graduate. I feel a personal call to action after having conducted this research that compels me to continue on my literacy journey.

The third and fourth grade students with whom I interacted in the summer of 2020 will graduate in 2028 and 2029. I will continue to carry their experiences and their faces with me as I research and learn, and as I lead. My journey, really, has only just begun. I contemplate Dewey’s

words that began this final chapter. As a result of this dissertation journey, I am more equipped and feel more confident than ever before to create a brighter future, a different tomorrow, for all of my students, no matter where the journey takes me.

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APPENDIX A

Teacher Focus Group Demographic Survey Responses

Yrs in Education	Yrs in District	Yrs in Current Role	School	Grades Taught	Age group	Gender	Race/ Ethn.	Native Language	Degree	Area of licensure	Other areas in which you are licensed
29	29	1-3	R-STEM	K-5 specialist/coach	51-65	Female	White	English	Ed. Specialist or 6th year	Elementary Education	Middle School Math
5	5	1-3	RDLS	K-5 specialist/coach	21-30	Female	White	English	Masters Degree	Elementary Education	NA
22	2	1-3	RDLS	Grade 3	41-50	Female	White	English	Ed. Specialist or 6th year	K-12 ESL, Other	K-12 Spanish, K-12 Principal
13	4	4-10	SH	K-5 specialist/coach	31-40	Female	White	English	Masters Degree	Elementary Education, K-12 Reading	NA
13	4	4-10	SH	Grade 4	31-40	Female	White	English	Masters Degree	Elementary Education, K-12 Reading	Reading specialist
31	7	15+	RDLS	Grade 4	51-65	Male	Two or more Races	Spanish	Doctorate	Elementary Education, Other	Elementary Principal - Administrative License, K-9 Spanish
40	5	4-10	SH	K-5 specialist/coach	51-65	Female	White	English	Masters Degree	Elementary Education	NA
26	21	4-10	R-STEM	K-5 specialist/coach	51-65	Female	White	English	Masters Degree	Elementary Education	N/A

APPENDIX B

Indices Relevant to Reading Comprehension

Lexical Sophistication	
Psycholinguistic properties	Features related to word concreteness, familiarity, imaginability, age of acquisition, meaningfulness, hypernymy, polysemy, word neighborhood effects, and word recognition norms
Academic Terms	Words and phrases common in academic discourse
Association Measures	Number of strong associations averaged across words
Syntactic Complexity	
Clausal and Phrasal Complexity	Average number of words, structures, and dependents per clause or t-unit
Syntactic Sophistication	Frequency, type token ratio, attested items, and association strengths for verb-argument constructions
Syntactic Similarity	Similarity between sentences in terms of POS tags and syntactic parses
Text Cohesion	
Givenness	Semantic similarity between given and new text
Lexical Repetition	Type-token ratio
Temporal Cohesion	Repetition of tense and aspect
Causal Cohesion	Use of causal verbs and particles
Local Cohesion	
Connectives	Frequency of connectives and conjunctions in the text
Lexical Overlap (sentence)	Word overlap between sentences
Semantic Overlap (sentence)	Semantic overlap between sentences
Global Cohesion	

Lexical Overlap (paragraph)	Word overlap between paragraphs
Synonym Overlap (paragraph)	Overlap of words and synonymy between paragraphs
Semantic Overlap (paragraph)	Semantic overlap between paragraphs

Indices Relevant to Reading Comprehension (Continued)

Readability	
RDFRE	Flesch-Kincaid Reading Ease Score
RDFKGL	Flesch-Kincaid Grade Level
RDL2	Second Language Readability Score
Syntactic Pattern Density	
Noun Phrases	Incidence of noun phrases
Verb Phrases	Incidence of verb phrases
Prepositional Phrases	Incidence of prepositional phrases
Rhetorical Features	
Amplifiers	Incidence of amplifiers (e.g. “very”)
Private verbs	Incidence of private verbs (e.g. “think”)
Hedges	Incidence of hedges (e.g. “maybe,” “likely”)
Connectives	
Causal	Incidence of causal connectives
Logic	Incidence of logic connectives
Temporal	Incidence of temporal connectives

APPENDIX C

Summer Targeted Services Text Data

Title	Word Count	Paragraphs	Sentences	FK Grade	Text (In Order Presented)	Narrativity (percentile)	Syntactic Simplicity (percentile)	Word Concreteness (percentile)	Referential Cohesion (percentile)	Deep Cohesion (percentile)
How a Star is Born	275	6	33	2.7	1	63	91	75	74	90
Eating Healthy	384	16	35	3.7	2	54	93	80	44	89
Mars	375	5	38	3.0	3	60	79	30	88	24
Wildfires	254	3	20	5.1	4	47	90	74	44	99
Blood	361	5	32	4.3	5	67	57	97	100	50
Ostriches	390	5	35	4.0	6	53	69	83	49	30
Starfish	398	6	39	4.8	7	59	81	70	75	44
Avalanches	300	4	27	5.5	8	34	92	61	57	45
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
	351.71	6.29	32.29	4.34	5.0	53.43	80.14	70.71	65.29	54.43
	SD	SD	SD	SD	SD	SD	SD	SD	SD	SD
	54.01	4.39	6.73	0.86	2.16	10.63	13.32	21.18	22.57	28.64

APPENDIX D

Focus Group Initial Questions

1. How long have you worked in [the district]? *(Follow up: How long have you taught 3rd or fourth grade?)*
2. How has reading comprehension instruction changed, if at all, in [the district where this study took place] since you have been here?
3. What do you notice about the types of texts students in third and fourth grade like to read? *(Follow up: Is this true for groups of students or just some? Elaborate.)*
4. In thinking about the texts that your students in third and fourth grade read, what do you think are beneficial characteristics of texts to include for reading comprehension instruction? *(Follow up: Why?)*
5. Think in terms of length, readability, cohesion (how the text “flows”), and subject matter. What is important with regard to all of this when picking texts for students to read?
6. What do you think of your colleague’s answer just now? Anything you would like to add?
7. What gaps do you think exist in the kinds of texts that your students are reading in school? Think specifically about science texts.

APPENDIX E

Science Assessment (Modified from NAEP)

1. The surface of the Moon is covered with craters. Most of these craters were formed by
 - A. eruptions of active volcanoes
 - B. the impact of many meteoroids
 - C. shifting rock on the Moon's surface ("moonquakes")
 - D. tidal forces caused by the Earth and Sun
2. Which statement explains why light from the Sun can warm up water in a glass?
 - A. Light travels very fast.
 - B. Light travels in straight lines.
 - C. Water reflects light energy.
 - D. Water absorbs light and energy.
3. Which animal develops inside its mother before it is born alive?
 - A. Butterfly
 - B. Duck
 - C. Cat
 - D. Frog
4. When you are riding a bicycle at night, your bicycle's reflectors help people in cars see your bicycle. How do bicycle reflectors work?
 - A. They are made of a special material that gives off its own light.
 - B. They are hooked up to batteries that allow them to produce light.

- C. They bounce light back from other sources.
 - D. They are covered with paint that glows in the dark.
5. A farmer thinks that the vegetables on her farm are not getting enough water. Her son suggests that they use water from the nearby ocean to water the vegetables. Is this a good idea?
- A. Yes, because there is plenty of ocean water.
 - B. Yes, because ocean water has many natural fertilizers.
 - C. No, because ocean water is too salty for plants grown on land.
 - D. No, because ocean water is much more polluted than rainwater.
6. Where does water in a lake get most of its energy to evaporate?
- A. The sun heating the lake
 - B. Green plants living in the lake
 - C. Streams entering the lake
 - D. Cold springs under the lake

APPENDIX F

Student Observation Form Text Reading and Responding

Paraphrasing Observation Form

Date:	Number of students observed:
Start time:	End time:

Fidelity Check Instructions: Observe students as they work through one text. Complete the checklist to the extent that the components were observed, and write detailed notes regarding these or other components observed.

In preparation. Gather/complete the following information *prior* to the observation.

- List of students who you will be observing
- List of ID numbers for the students being observed

Observation Notes:
<p>Student(s) are seated in an area that is not overly distracting (i.e., student is able to focus on the module the majority of the time).</p> <p><i>Very few minor to no distractions</i> <i>Some distractions</i> <i>Very distracting for the majority of the time</i></p> <p>Were the student(s) able to get started on the activity (begin loading a module) within a reasonable amount of time (e.g., 2 minutes) of transitioning? <i>Yes</i> <i>No</i></p> <p>Anything else to note regarding the environment, tech issues, behavior of the children, or other things noteworthy:</p>

Instructions and Code.

Use *momentary time sampling* (look to the designated student at each interval and determine whether or not they are displaying the desired behavior at that moment in time). Select a logical order of students to observe and rotate through, looking at one student and then the next for each time interval. Focus only on the designated student for that interval and record only on that student's behavior when your interval timer beeps. Write a *, 1, or a 0 in the column under the text title section indicating the observed behavior. If the student had a glitch, place an "X" in this column and simply skip over student during their interval. Observe their use of directions and record in this column as well.

*** Glitch (e.g., freezing, link did not work, etc.)**

1 Engagement was observed

0 Engagement was not observed

Observation Order	Student ID	Text Title /Directions
1		
2		
3		

Time	Student	Reading	Paraphrasing	Vocabulary	Other
0:10	1				
0:20	2				
0:30	3				
0:40	1				
0:50	2				
1:00	3				
1:10	1				

1:20	2				
1:30	3				
1:40	1				
1:50	2				
2:00	3				
2:10	1				
2:20	2				
2:30	3				
2:40	1				
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18:30	3				

18:40	1				
18:50	2				
19:00	3				
19:10	1				
19:20	2				
19:30	3				
19:40	1				
19:50	2				
20:00	3				
Subtotals: column observations/possible		$\frac{\quad}{\quad} = \quad \%$	$\frac{\quad}{\quad} = \quad \%$	$\frac{\quad}{\quad} = \quad \%$	$\frac{\quad}{\quad} = \quad \%$
Overall Total: total observations possible				$\frac{\quad}{\quad} = \quad \%$	

APPENDIX G

Coding Table for Student Paraphrase Responses

FILTER: Too short	0 = the response is more than one word long	1 = the response is only one word DO NOT CONTINUE SCORING
FILTER: Copy/Paste	0 = the response is not a copy/paste of the target sentence (minor morphological changes do not count, i.e. “don’t” to “do not” or “big” to “bigger”)	1 = the response is a copy/paste or retyping of the sentence without anything added (e.g., only one word is different but it is a stem or slight morphological change); if some minor words are cut out and no new words are added, it is counted as a copy/paste; it does not have to be the entire TS copied, but counts if the entire response was directly copied from the TS; ask yourself: would I want to give the respondent feedback of “please try again and please change some more words” DO NOT CONTINUE SCORING
FILTER: Clause Reversal (copy and paste)	0 = no clause reversal	1 = Copy and paste of the target sentence, just reversed clauses DO NOT CONTINUE SCORING
FILTER Garbage	0 = the response makes sense and uses words, the response is meaningful and makes sense	1 = the response is garbage, difficult to derive meaning from response DO NOT CONTINUE SCORING
FILTER: Irrelevant	0 = the response is at least partially relevant to the text	1 = the response is irrelevant information to the text DO NOT CONTINUE SCORING
Category	Rating	

Paraphrase Presence	0 = no attempt at paraphrasing the target sentence	1 = attempt at paraphrasing the target sentence
Lexical similarity	0 = Low similarity in exact words from target sentence	1 = Uses a majority of the same words (emphasis on the content words) to the target sentence, regardless of syntax (words can be in a random order essentially)
Syntactic similarity	0 = Low similarity in syntactic forms; adding a clause/prepositional phrase does not suffice if the main clause is similar	1 = High syntactic similarity (uses similar grammatical forms); look at the main subject-verb clause; if a prepositional clause simply move locations in the sentence, this does not count as syntactic dissimilarity
Semantic similarity	0 = response not semantically similar to the TS	1 = most (~60-100 percent) of the subjects/verb/meaning captured
Elaboration (or bridging) <i>Refers to a response regarding the theme of the target sentence rather than a restatement of the sentence.</i>	0 = No added relevant content beyond the target sentence	1 = Other ideas are included beyond the information from the target sentence, such as, elaborations or previous ideas from the text. Also includes anaphoric references (the direct object a pronoun is referring to); the purpose is to see if there is added content to the sentence that is not a direct paraphrase of the target sentence; a synonym replacing a word from the target sentence is not sufficient
Inaccuracy	0 = No misconception/misinformation present; the paraphrase accurately reflects the idea(s) of the target sentence	1 = Misconceptions or misinformation present; change of meaning/semantics
Other content	0= No other content included beyond relevant content (paraphrase, elaborations, bridges)	1 = Other content is included beyond the information from the target sentence and is NOT elaborating/bridging

Paraphrase Quality	0 = Poor paraphrase, does not demonstrate the use of paraphrasing strategies	1 = Fair quality paraphrase, demonstrates the use of at least 1 paraphrase strategy, but there is room for improvement; captures only half (or less) of the main ideas	2 = High quality paraphrase, uses at least 1 paraphrasing strategy; captures most of the main ideas
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APPENDIX H**De-Identified Student Pre-Assessment Data**

De-Identifier	Grade	zGemder	Ethnicity	EL	FRP	Reading Rec/%	Reading Acad/%	Reading Total/%	Science Assess (out of 8)
10001	4	F	Hispanic	Y	Free	35/84th	32/79th	67/83rd	6
10002	4	M	Hispanic	Y	Reduced	28/41st	26/46th	54/41st	5
10003	3	F	Hispanic	Y	None	28/38th	34/83rd	62/64th	2
10004	4	M	Hispanic	Y	Free	31/60th	28/58th	59/59th	7
10005	3	F	Hispanic	Y	Free	31/57th	32/74th	63/67th	4
10006	3	M	Hispanic	N	Free	30/51st	30/63rd	60/58th	absent
10007	4	F	Hispanic	N	Free	30/54th	26/41st	56/44th	5
10008	3	F	Hispanic	Y	Free	29/45th	28/52nd	57/48th	1
10009	3	F	Hispanic	Y	Free	28/38th	23/26th	51/28th	absent
10010	3	F	Hispanic	Y	Free	29/45th	28/52nd	57/48th	2
10011	4	M	Black/ Af. Am	N	Free	20/6th	21/20th	41/9th	1
10012	3	F	Hispanic	Y	Free	37/90th	35/88th	72/91st	3
10013	3	M	Hispanic	Y	Free	17/1st	22/22nd	39/6th	3
10014	4	F	Hispanic	Y	Free	36/88th	34/87th	70/89th	6
10015	4	F	Hispanic	Y	Free	33/72nd	31/75th	64/75th	6
10016	4	F	Hispanic	Y	Free	34/78th	37/95th	71/91st	2
10017	4	M	Hispanic	Y	Free	26/26th	28/58th	54/41st	4
10018	4	F	Hispanic	Y	Reduced	32/66th	24/35th	56/48th	6
10019	3	M	Asian	Y	None	26/26th	34/83rd	60/58th	4

APPENDIX I

Elementary Reading Attitude Survey Data

Student	Recreational Score/Percentile	Academic Score/Percentile	Total Score//Percentile
10001	35/84th	32/79th	67/83rd
10002	28/41st	26/46th	54/41st
10003	28/38th	34/83rd	62/64th
10004	31/60th	28/58th	59/59th
10005	31/57th	32/74th	63/67th
10006	30/51st	30/63rd	60/58th
10007	30/54th	26/41st	56/44th
10008	29/45th	28/52nd	57/48th
10009	28/38th	23/26th	51/28th
10010	29/45th	28/52nd	57/48th
10011	20/6th	21/20th	41/9th
10012	37/90th	35/88th	72/91st
10013	17/1st	22/22nd	39/6th
10014	36/88th	34/87th	70/89th
10015	33/72nd	31/75th	64/75th
10016	34/78th	37/95th	71/91st
10017	26/26th	28/58th	54/41st
10018	32/66th	24/35th	56/48th
10019	26/26th	34/83rd	60/58th
Recreational Score Mean: 29.47 Academic Score Mean: 29.11 Total Score Mean: 58.58		Recreational Score SD: 5.0 Academic Score SD: 4.68 Total Score SD: 8.85	

APPENDIX J

Themes from Student Observations

Activity	Notes
Video	<ul style="list-style-type: none"> • Students engaged in watching video • Too many strategies all at one time – students had a hard time retelling any strategies (observer asked for a retell/summary from each student) • 3/16 students watched the video more than one time
Passage Reading – Ease/Difficulty	<ul style="list-style-type: none"> • Two students were unable to complete even one passage. They abandoned it after the first paraphrase. • One student was only able to complete one passage in two sessions equaling 35 minutes. • Reading seemed easier for 5 of the 8 fourth grade students. • Reading was hard for all third grade students • Reading stamina was an issue for many students observed, in both third and fourth grade. • Reading stamina was <i>not</i> an issue for three students (all fourth grade).
Passage Reading - Vocabulary	<ul style="list-style-type: none"> • Vocabulary is an issue with students: e.g. “what is a clump?” <i>Fahrenheit</i> was a difficult word for all students. • Some difficult words were not defined within context (e.g. “satellite”). • Some difficult words were defined <i>after</i> the sentence needed paraphrasing (e.g. “nutrient”). • Students exhibiting need for ability to have passage read and to have definition available via technology • One student exhibited a larger oral vocabulary (used the term “research” to combine the ideas of “satellite” and “telescopes”) than ability to use vocabulary in written form • Several students exhibit rereading and attempting to sound out words

Paraphrasing – Content	<ul style="list-style-type: none"> • Some students seemed to simply begin to retype highlighted sentence • Several fourth grade students got through several passages of paraphrasing in one sitting of 30 minutes • Shorter highlighted sentences seemed harder for students to paraphrase
Paraphrasing – Creation	<ul style="list-style-type: none"> • Typing was hard for all but one student – all students used either one or two fingers to type. All but two third graders typed with one finger. The reverse is evident in fourth grade: all but one student in fourth grade typed with two fingers. • Over half the students exhibited a strong focus on correct spelling • Some students exhibited frustration when trying to paraphrase (e.g. “I’m stuck” and “How do you put it in a sentence?”) • Need for ASR for students to create a paraphrase more quickly. Frustration came with typing.
Engagement in Task	<ul style="list-style-type: none"> • All students engaged in video for the entire time • All students exhibited a willingness to try hard at the beginning • Engagement wanes immediately when students begin to struggle – either with reading or with paraphrasing – exhibiting disengagement by looking away from screen • Difficulty in typing led to disengagement • Once a student disengaged, s/he had a hard time re-engaging on his/her own • Struggling students were more easily distracted by classroom noises • When observer provided help to a student, the student exhibited engagement again • Disengaged students asked how many they had to do • Engagement in correct spelling, even if it slows down the student (e.g. asking how to spell a word, going into Spellcheck, using Google)

APPENDIX K

Student Text and Paraphrase Perception Data

Text Perceptions

Text Name	# of Responses	Text Perception			Text Difficulty Perception			Text Perception (%)			Text Difficulty Perception (%)		
		Dislike	Okay	Liked	Hard	Okay	Easy	Dislike	Okay	Liked	Hard	Okay	Easy
How a Star is Born	13	2	4	7	2	4	7	15%	31%	54%	15%	31%	54%
Eating Healthy	9	0	4	5	1	5	3	0%	44%	56%	11%	56%	33%
A Visit to Mars	7	1	2	4	1	2	4	14%	29%	57%	14%	29%	57%
Wildfires	5	0	3	2	0	3	2	0%	60%	40%	0%	60%	40%
Blood	2	0	0	2	0	1	1	0%	0%	100%	0%	50%	50%
Ostriches	2	0	1	1	0	1	1	0%	50%	50%	0%	50%	50%
Starfish	2	0	1	1	0	1	1	0%	50%	50%	0%	50%	50%

Paraphrase Perceptions

Text Name	# of Responses	Paraphrase Perception			Paraphrase Difficulty Perception			Paraphrase Perception (%)			Paraphrase Difficulty Perception (%)		
		Dislike	Okay	Liked	Hard	Okay	Easy	Dislike	Okay	Liked	Hard	Okay	Easy
How a Star is Born	13	0	5	8	1	8	4	0%	38%	62%	8%	61%	31%
Eating Healthy	9	0	2	7	0	6	3	0%	22%	78%	0%	67%	33%
A Visit to Mars	7	1	2	4	0	5	2	14%	29%	57%	0%	71%	29%
Wildfires	5	0	3	2	0	4	1	0%	60%	40%	0%	75%	25%
Blood	2	0	1	1	0	1	1	0%	50%	50%	0%	50%	50%
Ostriches	2	0	1	1	0	1	1	0%	50%	50%	0%	50%	50%
Starfish	2	0	1	1	0	1	1	0%	50%	50%	0%	50%	50%

APPENDIX L

Student Interview Constructed Responses

Student ID	Question 1: Do you remember what paraphrasing is?	Question 2: How did you figure out how to paraphrase the sentences?	Question 3: Do you think paraphrasing helped you read better? Why?
10001	It's like just, if there's like a word that you don't know you could like, put it in a new word, like if it was perfect you could say...is perfect like great? It is, so instead of saying perfect you can say great.	All I really did was I just read the entire word. And then in my head I started adjusting words, and then when I got the perfect one I wrote it down. Like I typed it.	Yeah, it helped me because at home I even use it. My brother would say... "give it to you" and I was like, I don't know what that means. You should really start paraphrasing because don't use long words around me because I don't know much words, okay? Because I don't have a dictionary.
10005	Change a couple words because if you don't know the sentence, makes more sense to you.	I don't know.	Uh huh, because you can make sense to you. Helps you out to make more sense.
10008	No	I don't really know.	Mmm hmmm (shakes head yes). Paraphrasing helps me read better from harder books and easy books. It helps me read a little bit of words.
10009	Mmm hmmm (shakes head). Paraphrasing is... I forgot... it is something to do with sentences	I just take them and see in my head. And then, and then I started to write on a piece of paper.	Yeah. Because it helps me learn much better and read better and write better.
10010	No.	Don't remember.	Yeah. Sometimes when I read and write, it shows how to read more.
10012	Like changing sentences and making them up again but with your own words.	My mind just start with, hey, let's do a new word for paraphrasing something. My mind just thought of new words.	Yep. It did. It helped me with a lot of chapter books. Not a lot, one chapter book.
10014	Describing things you read in your own words	I remembered different words to use for another word.	Yes, because it's like when we do like an essay we can use our own words.
10015	Um... like changing something, to make it like more sense, and better. Like at the beginning, instead of saying... um, it's like having to say... and like... and so in the end it's like you say something at the end.	Yeah, like if they don't say then, I should have put like that thing in a words that says then... and they... (listing words "then," "they," and "and")	Yeah. Because it makes more sense

10016	When you take your own words and put it... when the author writes sentences you put it in your own words. Put it in a paragraph	Read the sentence first. And then, I was thinking what should I write. And then I got it and wrote it in my words.	Yeah. Because it helped me make a sentence in my own words.
10017	No. [Then] I had to try to make it like smaller, like the sentence, a little bit shorter.	Like... different things, like... after running out of space and you still have a lot. You like kind of have to like make the words a little bit shorter for to make more space. I tried to find the words that are like kind of not important. Like, I can just take those out and put, like, just leave an empty for to make it smaller.	Yeah, because I'm reading the word, and I'm learning to like make them smaller, like the ways to make it small.
10018	I don't remember stuff	I don't remember	Yeah, because I'm sometimes... I don't understand words and that helps me a little bit to do.