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Electronic Books: Educational Enhancement or Novelty?

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ELECTRONIC BOOKS: EDUCATIONAL ENHANCEMENT OR NOVELTY?

A Dissertation

by

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ABSTRACT

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The study's purpose was to explore if there was a statistically significant difference in reading comprehension of non-Limited English Proficient students when reading eBooks compared to printed books. Second, it explored if there was a statistically significant difference in Limited English Proficient students. Third, it explored if there was a statistically significant difference between non-Limited English Proficient and Limited English Proficient students while reading in neither format. The research sample of the study drew from the population (N=8,100) of students at the middle school level within a district in south Texas who participated in the Accelerated Reader program during the 2016-17 academic year. All students are predominately Hispanic and have low Social Economic Status, and the Limited English Proficient student population is nearly double in percentage compared to the State.

The study utilized a quantitative approach, using a causal-comparative research design with a retrospective orientation using archived data to test the three hypotheses. The Independent-Samples Kruskal-Wallis Test used the 95% confidence level ($p < .05$) as the criterion level for determining statistical significance. The results showed a statistically significant difference between categorical groups based on LEP status and book format combinations on student quiz scores; ($H(3) = 10.439$, $p = .015$ with a mean rank score of 539.71

for non-LEP pBook, 514.19 for non-LEP eBook, 469.76 for LEP pBook, and 487.34 for LEP eBook. The null hypothesis was not supported.

DEDICATION

This dissertation is dedicated to educators that devote their lives to helping students to improve their reading comprehension skills. They are the unsung heroes that make an overwhelming contribution to a student's educational journey as that student seeks to understand what the rest of us in their content areas have to offer so that they may succeed in whatever area of interest they pursue.

ACKNOWLEDGMENTS

I want to thank my advisor, Dr. Rene Corbeil, for his encouragement and mentorship during this long and often consuming journey as life continued to bring its challenges. Had it not been for him, the successful completion of this work would not have been possible for a struggling reader such as myself. The rest of the Dissertation Committee was likewise instrumental with each of their specialized talents in guiding me toward presenting this research, so it effectively contributes to the body of knowledge. I feel confident that others will continue the effort to add more tools that we, as educators, can employ to facilitate the task of learning to read for our students who struggle the most, and I thank them in advance. The university's progressive transition to online learning minimized time away from my family, and for that, I am thankful. Lastly, I thank my family for their enduring support as I focused on this personal challenge. I hope to have been a positive example and encourage them to never stop learning.

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CHAPTER I

INTRODUCTION

Reading comprehension is fundamental to learning, impacts all academic areas of study, and ultimately influences a student's ability to contribute to society. Taboada et al. (2009) have acknowledged the importance of students' reading comprehension skills to succeed in various school subject areas and other achievement outcomes. Given its importance to children's school success, researchers are investigating what predicts the growth of reading comprehension skills and supports their development. Studies have shown that motivational and cognitive variables are significant factors (Baker and Wigfield, 1999; Cardullo et al., 2012; Elliott & Dweck, 1983).

Reading is much more complicated than recognizing letters, words, and phrases. Thus, teaching students to read and comprehend requires patience, skill, knowledge, and effective instruction. Wigfield and Guthrie (1997) found that "for students who do not master reading skills early in their school years, reading may become a painful experience" (as cited in Ciampa, 2012, p. 2). Consequently, they may be more inclined to shy away from situations that include reading, causing them to fall further behind. On the opposite side of the spectrum, motivated readers independently read as much as three times the amount of text as unmotivated readers (Wigfield et al., 2004). Educators desperately need motivational tools and educational support to help weak readers close the reading comprehension gap with their counterparts (Conroy et al.,

2009; Gissel, 2015). One educational technology-related company at the forefront of web-based reading program management is Renaissance Learning, the maker of the Accelerated Reader program that provides both management and reading comprehension assessment.

Many school districts use the Accelerated Reader program to motivate readers to read more and increase their reading comprehension proficiency is continually adding quizzes based on the most popular book titles to meet student interest needs. The Accelerated Reader program uses a point system based on the book's designated reading level to guide students in selecting book titles within their Zone of Proximal Development, a term created by theorist Vygotsky (Elkind, 2004). The Accelerated Reader program awards credits for every completed quiz with a 70% score or above and maintains a cumulative comprehension proficiency percentage to monitor progress. Campuses assign point goals and recognize students who meet or exceed those goals as motivational incentives. However, motivation is only part of the equation, and technology advancements may need to provide another part of the solution.

One technological advancement that has gained traction is eBooks, but there is a need to assess the impact of recent advancements on reading comprehension. Developments resulting from a newly accepted digital publishing standard and the multitude of enhancements eReaders provide have dramatically enhanced their usability and educational potential. eBooks can include web links to enrich the reader's sensory experience through sight and sound, built-in glossaries at the touch of the word, and full color and animations, all contributing to students' motivation to read. These features are essential in filling the student's lack of background knowledge necessary to provide context and understanding. Those responsible for library book collection development have begun seeing the new format's value in improving student reading comprehension. However, even though districts are increasingly acquiring eBooks to provide

more access to students, it is with hesitance and caution without the data to support their acquisition.

Need for the Study

Finding valuable technological tools that enhance reading comprehension can exponentially affect students' academic success in our schools and, ultimately, our Nation's economic prosperity due to their increased workforce contribution. In 1983 the criticality of reading comprehension was brought to the forefront when The National Commission on Excellence in Education published its report titled "A Nation at Risk: The Imperative for Educational Reform," expressing a deep concern for where our Nation ranked globally in this area. In response, the adoption of the No Child Left Behind Act (NCLB) of 2001 began a push to improve the reading abilities of all students with a goal for every student, by the end of the third grade, to be reading at or above grade level (Jones, 2009). The purpose of NCLB was for every school in the country to have its children proficient in reading and math on state exams. It required states to disaggregate student achievement data by subgroups of students to track performance gains for all children. In 2015, the Every Student Succeeds Act, a reauthorization of the Elementary and Secondary Education Act of 1965, replaced the No Child Left Behind Act. This legislation supplied federal funds to support public education, particularly in resource-poor, low-income settings (Anderson, 2005), which have become prevalent in many of our states.

The Every Student Succeeds Act helps ensure that English learners and immigrant students have an equal opportunity to attain English proficiency and high academic achievement levels (Calderón et al., 2011), meeting the same challenging State academic standards that all children must meet (Thomas & Brady, 2005). The new measure maintains a handful of provisions from No Child Left Behind; most notably, it continues the requirement that schools

annually report students' achievement scores and break down that data by race, economic status, disability, and English learner status (Rockoff, 2004). As a result, districts assess what instructional tools are helping students within each demographic to maximize their learning and which new tools they need to invest in to promote student success.

The *Accelerated Reader* program provides teachers with essential information for monitoring students' comprehension development. Still, it is only one part of the equation, and educators must explore other variables. The impact of access to electronic formatted books on students' reading comprehension levels has received much study since the recent proliferation of reading devices, standardization of electronic format, the addition of enhancement tools, and the expanding title selection. However, few studies have found statistically significant findings indicating electronic books provide any meaningful reading comprehension benefit. If eBooks can contribute effectively to a student's reading comprehension, it could ultimately lead to support for expanded electronic book initiatives. This study examined if a causal relationship exists between comprehension scores when reading in electronic versus print-formatted books, as recorded by the *Accelerated Reader* program.

Statement of the Problem

Low reading comprehension in Hispanic, Limited English Proficient students negatively affects academic achievement, leads to grade retention, and is one of the strongest predictors of dropping out of school. Reading comprehension is vital to student learning across the curriculum, and technology needs to be fully engaged in addressing the reading comprehension deficit of students that struggle to read. Students exiting the educational system before completion can contribute less as valued community members. They are more likely to burden their families and social services and affect long-term economic prosperity. If eBooks and

eReaders are to provide a viable solution to the problem, school districts need data from research-based findings to support current and future technology investments to improve the reading comprehension of all students. Recent studies on eBooks and eReaders have yet to consider the improvements these technologies afford at-risk students in the schools and their home environment.

Purpose of the Study

The purpose of the study was to examine the extent to which reading books in electronic format affects students' reading comprehension at the middle school level within a school district in South Texas; and if Limited English Proficient students receive any additional benefit. The following research questions were developed for the study to achieve that purpose, and their associated hypotheses were tested.

Research Questions

The design of this study sought to answer the following three research questions concerning students' reading comprehension at the middle school level:

Research Question 1

What is the effect of reading books in electronic format on the reading comprehension of non-Limited English Proficient middle school students in a South Texas school district?

Research Question 2

What is the effect of reading books in electronic format on the reading comprehension of Limited English Proficient middle school students in a South Texas school district?

Research Question 3

What is the effect of reading books in paper versus electronic format on non-Limited English Proficient reading comprehension compared to Limited English Proficient middle school students in a South Texas school district?

Research Hypotheses

The research questions presented in the previous section are the basis for the following research hypotheses:

Research Hypothesis 1

Ho There is no statistically significant difference between the reading comprehension quiz score means of non-Limited English Proficient middle school students who read books in electronic format and the reading comprehension of non-Limited English Proficient middle school students who read books in print format.

Ha There is a statistically significant difference between the reading comprehension quiz score means of non-Limited English Proficient middle school students who read books in electronic format and the reading comprehension quiz score means of non-Limited English Proficient middle school students who read books in print format.

Research Hypothesis 2

Ho There is no statistically significant difference between the reading comprehension quiz score means of Limited English Proficient middle

school students who read books in electronic format and the reading comprehension of Limited English Proficient middle school students who read books in print format.

Ha There is a statistically significant difference between the reading comprehension quiz score means of Limited English Proficient middle school students who read books in electronic format and the reading comprehension quiz score means of Limited English Proficient middle school students who read books in print format.

Research Hypothesis 3

Ho There is no statistically significant difference between the reading comprehension quiz score means of non-Limited English Proficient and Limited English Proficient middle school students when they read books on paper versus in electronic format.

Ha There is a statistically significant difference between the reading comprehension quiz score means of non-Limited English Proficient and Limited English Proficient middle school students when they read books in paper versus electronic format.

This study provides relevant information to consider when investing in eBooks and related support devices. It was hypothesized that there would be a statistically significant difference in reading comprehension, as recorded by the Accelerated Reader Program, when reading is facilitated in electronic versus print format.

Definitions of Terms

- Advantage - TASA Open Standard (ATOS): The School Renaissance Institute (2000) defines the Advantage -TASA Open Standard readability formula developed by Renaissance Learning, Inc., the Accelerated Reader provider, for categorizing books by readability and complexity.
- eBook: Vasileiou and Rowley (2008) termed an eBook as "a digital object with textual and or/other content, which arises as a result of integrating the familiar concept of a book with features that can be provided in an electronic environment" (as cited in Gibson & Gibb, 2011, p. 307).
- eBook Reader: Gibson & Gibb (2011) defines the eBook reader as "a device on which one reads an e-book," whether dedicated or multi-purpose (p. 306).
- English Language Learner (ELL): Palmer, Shackelford, Miller, and Leclere (2006) define English Language Learners as second language acquisition students unaware of figurative language in English text. They require "explicit instruction aids to understand not only the figurative expressions but also their cultural context" (p. 265).
- Limited English Proficiency (LEP): The Texas Educational Agency defines LEP as students with limited English proficiency.
- Reading Comprehension: The Rand Reading Study Group (Snow, 2002) defined reading comprehension as "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (as cited in Randi et al., 2006, p. 24).
- Zone of Proximal Development (ZPD): Kozulin (2003) describes the Zone of Proximal Development theorized by Vygotsky, as it applies to reading, as "… the range of book

readability levels that will challenge a student without causing frustration or loss of motivation" (p. 42) used to determine the reading level range in which students should be reading to experience the most growth.

- Reading practice quizzes: Renaissance Learning Inc., the provider of the Accelerated Reader program, defines their Practice Quizzes as assessments of student progress towards their individualized reading comprehension and close reading skill mastery goals as they work with fiction and non-fiction content. They determine if the student read the book, measure the student's literal comprehension, and provide immediate feedback.

Significance of the Study

This study sought to explore the impact of the eBook format on reading comprehension using data collected after the district initially implemented access enhancements to the latest advances in eBook and eBook reader technology available at the middle school level. It was hypothesized that there is a statistically significant positive difference in reading comprehension of Non-Limited English Proficient middle school students, as recorded by the *Accelerated Reader* program when reading is facilitated in electronic versus print format. It was further hypothesized that there is a statistically significant difference in reading comprehension of Limited English Proficient middle school students, as recorded by the Accelerated Reader Program, when reading is facilitated in electronic versus print format. These outcomes could significantly affect students' success across all subjects, given that reading comprehension is fundamental to learning across the curriculum.

One of the most common reasons immigrant Latino youths give as a reason for dropping out of school is that they struggle to complete homework and school assignments. Glennie and Stearns (2002); Perreira et al. (2006); and Rumberger (1995) argue that "Limited English

proficiency makes it difficult for Latino students to achieve in their classes and leads many to drop out." (as cited in Behnke, 2010, p. 387). These Limited English Proficient students' families migrated to attain a better life, and their children's success in school can mean the difference between becoming a contributing member of society or a burden. Education professionals must respond proactively for all students to benefit from greater reading comprehension and what technology can provide. Educational leaders, through this study, will have a deeper understanding of the eBook technology's impact on student reading comprehension. With that information, they can make informed decisions on eBook investment as they commit limited funds. Reading comprehension is vital to students learning, and improving this life skill will enable students' success across the curriculum. Higher students' academic success will lower dropout rates and positively impact the region's economic growth.

Summary

Reading comprehension is fundamental to learning and a complicated process. The adoption of the No Child Left Behind Act (NCLB) of 2001 began a push to improve the reading abilities of all students and institutionalized disaggregate student achievement reporting.

If the results of this study suggest that the introduction of eBooks has a significant positive impact on reading comprehension, it could help support further investments in that technology. This chapter provided some background and insight on an identified instructional problem, introduced the need and purpose for the study, identified three research questions and hypotheses, and sought to explain the significance of the study. The next chapter will present an overview of the relevant research related to reading comprehension theory, cognitive theory, learning theory, the impact of reading comprehension deficiency, those most affected, and the value added by eBook features.

CHAPTER II

REVIEW OF LITERATURE

For hundreds of years, the format in which people shared written text with others has evolved, but never has the change been so profound as in recent years. Technology innovation is often born out of necessity but also to fill the need for improvement. One such task considered pivotal to learning and, ultimately, the level of contribution to society a person achieves is the reading comprehension of written text. It is also challenging to assess comprehension proficiency because it is a skill observed indirectly. When comprehension moves a reader to the following text segment, it is difficult to see and verify that understanding occurred. Asking the reader to self-report if they understood or were confused by what they read and subjectively deciding on a comprehension level provides a minimal assessment. Educators generally default to quiz the reader in some way to see if they remember essential details by asking specific questions about the interpretation of its message.

To assist in questioning readers regarding what they have read, reading program management tools like the Accelerated Reader program are incorporated by schools into overall school reading programs for assessment. *Accelerated Reader* employs a multifaceted approach to address critical factors identified through reading comprehension research and the use of technology enhancement and program design to maximize outcomes. An important question is what other technological advancements educators can bring to bear on the issues facing struggling readers, such as the Limited English Proficient (LEP) student population. The Hispanic LEP student population has grown significantly throughout the country in the last two decades and will soon become a significant segment (Kohler & Lazarín, 2007). Educators face

the challenge of meeting the needs of these students on a shrinking budget while being bombarded by costly recommended solutions. One recent innovation showing promise is the introduction of the electronic book and the many enhancements made possible in conjunction with the assortment of eReaders with many varied features to help enhance the interpretation of the text. Recent studies show marginal results, if any, even after recent developments in the medium. Inconclusive results may have resulted from the limited size of the samples or duration of the studies, suggesting there may be a need for further research (Grimshaw et al., 2007; Hamdan et al., 2017).

This study hypothesizes a statistically significant difference in reading comprehension levels, which this population can achieve by reading text in electronic versus print format when evaluated over time as opposed to short-term assessment. This Chapter will review the historical background of reading comprehension, establish a theoretical framework used as a basis for the study's claims, provide a synthesis and analysis of current literature relating to reading comprehension, and explore the benefits of eBook integration. The primary purpose is to expose the actual value of eBooks as an educational enhancement for our most disadvantaged readers, the Limited English Proficient population.

Historical Background

Reading comprehension did not become an indicator of reading competence and performance until the mid-20th century. In the 17th to 19th centuries, oral capacity was measured by accuracy in word recognition or expressive fluency, and meaningful text interpretation was considered a sign of reading competence (Smith & Miller, 1966). The personal understanding of the text was not truly appreciated, other than demonstrating the potential for text memorization, the more highly regarded ability. It was not until the late 1890s

that basal reader authors began to include comprehension study aids for students. At the end of each section, authors provided study aids to prepare for a discussion and quizzes (Pearson, 2014).

In 1912 a separate Daily Lesson Plans book with recommended vocabulary and comprehension probes to introduce and discuss selections began to be published. At about the same time, teacher manuals with answers to the questions in the student books began to be published. By the 1920s, the Curriculum Foundation Series, most famous for Dick and Jane books, began influencing and shaping reading instruction courses through the late 1960s. It also became clear that if teachers taught comprehension, testing would soon follow (Pearson, 2014).

During the early 20th century, reading comprehension also debuted in instruction, mainly reactionary to the changing demographics of schooling in the United States and the start of the scientific movement. Schools had to adjust to rapid increases in enrollment due to massive immigration, a rapidly industrializing society, the prohibition of child labor, and mandatory school attendance laws. The need for a screening method to determine students' literacy levels emerged. It needed to be inexpensive and efficient. It seemed to be a calling for psychology which had embarked on a quest to gain the status of a *science* and been strongly influenced by the behaviorist schools of thought with a focus on measurable outcomes (Johnston, 1984). It quickly set the course for assessment which persisted for at least another 50 or 60 years. That same need for efficiency prompted the move to silent reading in classrooms, making it necessary to test in group settings instead of orally. Group-administered, multiple-choice, standardized testing was born. Revamping the curriculum led to the development of the skills required to show proficiency (Pearson, 2014). The requirement for reading skill identification quickly

pointed back to the skills that were a part of the basal reading programs for elementary and secondary schools of the period as the cornerstone for assessment.

Frederick Davis (1944, p. 236) developed an infrastructure of nine categories of reading comprehension skills, which became the standard:

1. Knowledge of word meanings
2. Ability to select the appropriate meaning for a word or phrase in the light of its particular contextual setting
3. Ability to follow the organization of a passage and to identify antecedents and references in it
4. Ability to select the main thought of a passage
5. Ability to answer questions that are answered explicitly in a passage
6. Ability to answer questions answered in a passage but not in the words in which the question is asked
7. Ability to draw inferences from a passage about its contents
8. Ability to recognize the literary devices used in a passage and to determine its tone and mood
9. Ability to determine a writer's purpose, intent, and point of view, i.e., to draw inferences about a writer. With a standard in hand came a push for identifying a theoretical framework that supported reading comprehension in practice

The development of theory over the 1950s and 1960s significantly molded comprehension views. According to Clymer (1968), the reader's background was a critical component of the comprehension equation. Background knowledge is essential to new

knowledge; how it becomes organized and later retrieved is considered pivotal to reading comprehension and is not always present (Duke & Pearson, 2009).

It was not until the 1970s that psychologists began studying complex phenomena, such as reading and drawing inferences based on externally observed behaviors. What followed was a proliferation of literature on the subject, which fell into one of two schools of thought regarding text comprehension:

1. Those who believed reader knowledge of text structure and organization was the dominant factor; and
2. Those that believed the topical knowledge that the reader brings to the printed page, which brought the re-emergence of Bartlett's (1932) schema construct to describe knowledge's role in comprehension (Pearson & Cervetti, 2017, p. 24)

Rumelhart (1984) argued that the Schema theory was not a theory of reading comprehension but a theory about knowledge structure as symbolized in the human brain's memory. Schemata are perceived as little containers into which we deposit the traces of experiences and the ideas that develop from those experiences (Pearson & Cervetti, 2017). How one draws from that collection requires specific strategical skills and cognitive processing resources for effective retrieval.

In the late 1970s, metacognition became the logical extension of the rapidly developing schema theory and text analysis study. According to Paris et al. (1983), the metacognitive turn helped us understand that reading involves many kinds of knowledge. It involves declarative knowledge, which includes our knowledge of the world at large and our knowledge of the world intricacies of the text. It also includes procedural knowledge, knowing how and all the strategies

we use to become aware of, monitor, evaluate, and repair our comprehension. The impact of schema theory and metacognition on pedagogy continued into the mid-1990s when they began to lose their position as the dominant theory of comprehension processing.

Reading comprehension did not take hold until the 1980s, when theory and research formally worked their way into classroom instruction. Coincidently, that was just after publishing A Nation at Risk (1983), which put education on notice and started significant federal intervention. However, just as quickly as it became prominent in theory, research, and practice conversations, reading comprehension suddenly faded into the woodwork from the mid-1990s to the mid-2000s Pearson (2014).

Theoretical Framework

The complexity of processes and the multitude of influences that affect reading comprehension impede study holistically at the theoretical level. To work through these obstacles, researchers have taken a more targeted approach to reading comprehension by working at the framework level to understand the process interactions and comprehension components, such as addressing the role of memory, using inferences, and updating mental models. Scholars have offered numerous theories, frameworks, and models of reading (Cohen & Upton, 2006; Goodman, 1967; Just & Carpenter, 1980; Kintsch & Van Dijk, 1978; Perfetti & Stafura, 2014) to pare down the task. All these theorists recognize the reading process as combining bottom-up visual information with the top-down world knowledge the reader brings to the task. However, they have differing views on the importance given to each and how the reader combines the two sources of information.

Piaget and Cook (1952) referred to an organized thought pattern used to explain experiences as a scheme. Cognitive scientists since then have used the term schema to describe how prior knowledge is activated to understand, organize, and store new information (Gillani, 2010; Vacca & Vacca, 2005; Zhang, 2010). Rumelhart (1984) referred to the schema as the building blocks of cognition since they serve as the network of information through which people make sense of new experiences. Schema theory expands this meaning to include the importance of general knowledge and concept understanding in reading comprehension, specifying that most reading difficulties originate with insufficient prior knowledge (Anderson & Pearson, 1988). Schema theory originated with Goodman's (1967) psycholinguistic model. The model views reading as a psycholinguistic guessing game involving interaction between thought and language, based not on a precise understanding of each element within the reading but on an ability to partially understand the material to process the unknown and make decisions regarding meaning. Proper anticipation relies upon keyword understanding, and schema theory suggests keywords and concepts presented to the reader through the text, allowing the reader to temporarily transfer information stored in long-term memory to short-term memory and use the information to interact with and construct an understanding of the new information (Pardo, 2004). However, this does not guarantee that comprehension will transpire.

When comprehension does not occur, Rumelhart (1981, p. 28) says there are at least three reasons in schema theory as to why this would happen:

1. The reader may not have the appropriate schemata, and this leads to not understanding the concept communicated;
2. the reader may have the appropriate schemata, but the clues provided by the author are insufficient to suggest them, leading the reader not to understand the text; or

3. the reader may find a consistent understanding of the text but may not find the one intended by the author, leading the reader to understand the text but misunderstand the author.

Constructivist theory dovetails well with schema theory, highlighting the importance of the learner's active construction of new knowledge based on prior knowledge and experiences (Matthews, 2003). Within constructivist theories, the basis of learning is a child-determined exploration and guided discovery rather than direct teaching. The constructivist theory also emphasizes that learning should be authentic and that learning needs to meet real-life experiences. Thus, educators' belief in teaching is that reading instruction should be grounded in contexts that are familiar to students. Hooper and Rieber (1995) concurred and believed learning in a familiar context may make learning more personally relevant, allowing access to prior knowledge to enhance text interpretation resulting in meaning-making and increasing student motivation to read.

Vygotsky (1978), a proponent of Constructivist Theory, considered that much of development resulted from expert-facilitated scaffolding. He believed the beginner first experiences a particular set of cognitive activities in the presence of experts and only gradually comes to perform these functions by themselves. First, an expert (parent, teacher, master craftsman) guides the beginner activity, doing most of the cognitive work, putting the beginner in the role of the spectator; then, as a novice, he is responsible for an increased level of cognitive work. As the novice becomes more experienced and capable of performing more complex aspects of the task, they have repeatedly seen modeled by an expert; the expert gradually yields them greater responsibility. At a point, the expert and novice share the cognitive work, with the novice taking the initiative and the expert correcting and guiding where they falter. Finally, the

expert allows the novice to take over the prominent thinking role and adopts the stance of a supportive observer. To a large extent, Vygotsky's theory of the Zone of Proximal Development mutually supports the constructivist view. He asserted that children learn comfortably within this zone when others are involved. The Zone of Proximal Development involves the social constructivist method, where students act independently on what they can do. Then, with assistance from the teacher, they learn the new concept based on what they were doing individually and the expanded knowledge attained with assistance. The Accelerated Reader program uses the Zone of Proximal Development as a fundamental concept.

Reader-response theory, another closely integrated concept that puts the reader at the helm, suggests the reader constructs meaning through a transaction between the reader and the text within a particular context. Readers assume multiple roles when responding to a variety of forms of literature. Developing responses enables active and meaningful reading and increases emotional and intellectual participation in the text, ultimately providing learners with better comprehension and awareness (Mart, 2019).

Researchers have shown that children with high self-efficacy are willing to try more challenging activities, do better on different achievement activities, and persist even when they have trouble completing them (Zimmerman, 2000). Involving intrinsic and extrinsic motivation and the individual's purposes for achievement play an integral role in the decision to perform activities and the amount of effort exerted in the chosen activities (Baker & Wigfield, 1999; Wigfield et al., 1998). Student motivation is an essential aspect and requirement of constructivism and the building of new knowledge (Amineh & Asl, 2015).

Wigfield and Eccles (2000) state that motivation is influenced by the participant's expectation of failure or success and by the attractiveness or value the participant places on the

task. Wigfield et al. (2009) focused on the expectancy-value theory's effect on reading motivation by stating that readers will only be motivated to read materials perceived to have personal value or practical importance. Reading motivation and engagement are positively affected when high-interest material is available (Jones & Brown, 2011; Flowerday et al., 2004). Students who perceive reading to have personal value and importance engage with the text to a much greater extent (Ames & Archer, 1988; Elliot & Dweck, 1983; Gambrell et al., 1996; Paris & Oka, 1986). Engagement with the text accurately predicts reading motivation and achievement (Jones & Brown, 2011; Wigfield et al., 2008). Students who succeed at reading and comprehend easily are more motivated to read. Students who struggle with comprehension do not perceive reading as valuable and do not display a continued motivation to read. Students motivated to read show more academic achievement (Cox & Guthrie, 2001; Sankaran & Bui, 2001).

Building the Case for Technological Reading Support

Little research exists concerning the impact of eBooks on the comprehension of struggling readers and students with reading disabilities (Gonzalez, 2014). This section will sample the findings of reading experts in the field to ascertain the current research on reading comprehension and how technology can help struggling readers succeed. Two complementary ideas have propelled the modern study of reading comprehension, one concerning an enriched level of comprehension beyond the literal meaning of a text, the reader's situation model (Van Dijk & Kintsch, 1983), and one about the cognitive dynamics of text comprehension, the construction-integration C-I model (Kintsch, 1988). The C-I model made general assumptions about the reader's cognitive construction and text devices that support comprehension. An essential value of the C-I theory was its demonstration that text comprehension is an interactive

combination of top-down and bottom-up processes. Farr and Carey (1986) remarked that there is widespread research focused on understanding reading comprehension but much disagreement concerning each aspect of the reading process.

Nevertheless, they suggest that one joint proposition emerged from the discord: "the purpose of reading is comprehension" (Farr & Carey, 1986, p. 37). Comprehension occurs when the reader's interaction with a text result in meaning acquisition (McNeil, 1984, cited in Matthew, 1997). Given the powerful and pervasive influence of the Internet on today's youth, it is not surprising that online technologies, such as electronic storybooks, now known as eBooks, provide promise in promoting children's language and literacy skills (Blok et al., 2002; Castek et al., 2006; Korat & Shamir, 2006; Lefever-Davis & Pearman, 2005; Plowman & Stephen, 2003; Wepner & Ray, 2000).

The eBooks industry has taken traditional oral or print stories and added multimedia and multisensory features such as animated illustrations, sound effects, and entirely digitized audio narration accompanied by highlighting of the text, all of which offer young children and struggling readers interactive eBook feature choices to assist them in reading independently (Castek et al., 2006). eBooks let children activate the reading of words, phrases, or pages in any order they want and are typically equipped with sound and animations activated by the student (Reinking & Watkins, 2000). The children can also use a function that allows them to reread or relisten to the highlighted text by clicking an arrow that repeats it (Korat & Shamir, 2006). Children's attention focuses on the relationship between the text and oral reading by the progressive highlighting of written text as it is read (de Jong & Bus, 2004; Ciampa, 2012)

This evidence suggests that the features embedded within these eBooks contribute to children's early reading development; further research documenting students' experiences,

attitudes toward, and motivation for reading these digital texts in the early primary grades seems warranted. However, Krendl and Clark (1994) note that despite the potential effectiveness of computer-based learning, studies on this type of instruction have limitations. Uncontrolled effects, including novelty effects, note that high motivation and attention levels are often associated with new activities. The criticism of these findings is that the inflated motivation and engagement by the novelty of the computer application likely accounts for enhanced learning outcomes and positive attitudes that result. The implication is that the positive effects of learning from the new medium and having more positive attitudes about learning will decline as the technology becomes more familiar with the technology (Ciampa, 2012).

Techniques and resources that show the potential to aid children's reading skill development and motivate them towards further reading are always of interest to educators and those involved in educational research. Struggling readers have the most to gain, but we will reap the benefits as a society. Unsurprisingly, the increased availability of children's storybooks in electronic format makes it a prime area of research interest (Grimshaw et al., 2007). Impact of Poor Reading Comprehension suggests that reading is essential because few abilities impact a student's overall achievement in the education process (Sackstein et al., 2015).

Impact of Reading Comprehension Deficit

Alexander et al. (1997) concluded that reading comprehension deficit overshadows the curriculum in the primary grades, which is the foundation of almost all later learning. His study discovered that 80 percent of the first-grade repeaters were also in low-reading groups or received special education services. The results indicated that retaining a student produced a slightly higher performance the following year, but assignment to a low reading group depressed academic performance. He argued that falling behind in reading comprehension at that early

stage would negatively affect academic success, lead to dropping out, and could have lifelong consequences. Therefore, evidence-based educational services for English Language Learners, one of the largest segments of struggling readers, are crucial to dropout prevention (Shore & Shore, 2009).

Belfield and Levin (2007), in their study conducted on California's high school dropout rate, state that, unlike high school graduates, dropouts have higher unemployment rates, fewer earnings, poorer health, and higher rates of criminal behavior. The bottom line is that these adverse dropout outcomes generate substantial social costs. However, by investing in proven research-based solutions, costs are reduced and, with time, turn into profits. Accounting for additional tax revenues and the reduction of the social burden, Belfield and Levin estimated the state would collectively gain $392,000 over the lifetime of each additional graduate. The Federal Government could also realize savings of $115,000.

The Population Struggling Most with Reading Comprehension

There is clear and consistent evidence that academic achievement is lower among less proficient English Language Learners in the United States. The National Center for Education Statistics (1978b) provided data from a survey of 51 independent state samples of some 160,000 households showing that language minority status is a powerful predictor of lower academic achievement resulting in grade retention (Steinberg et al., 1984). Recent National Assessment of Educational Progress (2015) estimates show that 64% of fourth graders, including almost 80% of Black and Hispanic students, perform at or below proficient levels on standardized reading assessments. Among Hispanics, both English-speaking and non-English-speaking, the dropout rate has risen steadily from approximately 30% in 1974 to 40% in 1979. In contrast to black students, Hispanics drop out far more than the national average (Steinberg et al., 1984).

The Challenges of the Struggling Reader

Much research on reading comprehension has focused on identifying skills that may account for shortcomings in the struggling reader. Oakhill et al. (2003) described those weaknesses as likely to stem from various cognitive deficits, including a limitation in vocabulary and grammar, making inferences, prior knowledge; identifying referent pronouns; and skill in using context clues, especially when abstract thinking is involved.

Lack of Prior Knowledge

Struggling readers have one primary deficit that eBooks can address with several available features. Anderson (1978) states that in the form of schemata, prior knowledge influences comprehension much more than earlier research suggested. So prevailing is the influence of prior knowledge on comprehension that Johnston (1984) found that prior knowledge of the topic is a better predictor of comprehension than an intelligence test score or a reading achievement test score.

Carrell (1988) stresses that successful reading comprehension is the interaction of text-based processes and processes related to the reader's existing background knowledge or schemata. He also believes that students of English as a Second Language (ESL) tend to over-rely on one or the other process for comprehension, excluding the other. He hypothesizes this could result from any or all the issues the English as a Second Language reader confronts: lack of schema availability, schema activation, skill deficiencies, misconceptions about reading in a second language, and individual differences in cognitive learning style. The absence of content and formal schemata appropriate to a particular text can cause processing interference. When schema is available, the text may need more lexical cues to activate them. Students may also

need to understand the purpose of the reading and the processes expected of them. The overemphasis on the decoding process, reading passages irrelevant to readers' interests, and tests stressing literal content may make the purpose unclear to the English as a Second Language student (Carrell, 1988).

Gough and Tunner (1986) acknowledge that readers show different text-based and knowledge-based processing patterns under different conditions. However, in his view, reading is considered a product of word decoding and language comprehension, and he concludes that without one or the other, reading cannot occur.

Lack of Motivation

Students who experience early and repeated difficulties with reading may develop a self-concept as lousy readers, which then influences their prospect of engaging in other reading tasks. As a result, they will likely avoid practice opportunities, putting themselves at greater risk of falling behind. At the other end of the spectrum, successful, motivated readers may independently read as much as three times the amount of text as unmotivated, struggling readers (Ciampa, 2012). Teachers have long recognized the link between motivation and reading success and that the more books children are exposed to and know about, the more books they are likely to read. Huang's (2012) study at the middle school level found that students learn more capably when given a choice in what they read, resulting in increased reading interest and motivation. If the added features of electronic books can increase the children's enjoyment and engagement with the text, it may also facilitate comprehension and enthusiasm for reading (Grimshaw et al., 2007). Increasing reading competence motivates students, and increasing motivation leads to more engaged reading time (Guthrie et al., 2000). The amount and frequency that students read directly correlate to increased text comprehension (Guthrie et al., 1999).

Lack of Students' autonomy or self-regulation

The individual manipulation of the eBook features affords students autonomy or self-regulation in the learning process, factors that can motivate and strongly influence a student's reading success (Schunk, 2001). Greenlee-Moore and Smith (1996) suggest that one benefit of the electronic condition is the privacy of failure. The request for help is private when the student selects a support icon within the computer software (Grimshaw et al., 2007).

Support the eBook and eReader can Provide

The following features are becoming more readily available in recently published eBooks. A wide range of mobile devices such as eReaders, cellular phones, and portable laptop computers with an Internet connection supports them. Many students are using technology and are far more comfortable with technology than some of the adults teaching them. The struggling reader benefits the greatest from the scaffolding support provided by eBooks as skills develop, and they can slowly reduce their reliance as they advance toward proficiency.

Animation Feature

Animations can effectively activate nearly all the student's senses to help them gain background knowledge they have not acquired earlier quickly and effectively. A text link associated with the content providing difficulty is readily available. Barger & Notwell (2013) provides a tremendous amount of student perspectives expressed in their own words, compelling arguments for eBooks' appeal for the various types of learners struggling to read in our classrooms: kinesthetic, auditory, and visual. Alfuqaha (2013) states that facilitated learning of complicated content and validation of prior knowledge through simulations and visualization tools through animations is critical to learning.

Dictionary and Thesaurus Feature

The on-demand dictionary access to vocabulary words used in the text that the reader may not have previously used is critical to allowing the reader to advance toward comprehension of the text segment with minimal interruption. Grimshaw et al. (2007) state that if the child is not required to search alphabetically, this eliminates the need for the reader to remember the word's spelling while searching, reducing the effort. He points out that the definition must match the child's reading level for the student to benefit. The struggling reader seamlessly progresses through the reading task, avoiding any embarrassment concerning the ignorance of the word's meaning, which remains private (Greenlee-Moore & Smith, 1996). Grimshaw et al. (2007) found that comprehension scores were higher in the electronic condition. The results validated the benefits of instant pronunciation and the definition of difficult words in the electronic condition. The information provided by illustrating and integrating the meaning of the text goes beyond that offered in the printed versions.

Word Pronunciation

Word pronunciation greatly supports the English as a Second Language (ESL) reader as they work toward phonological skill attainment. Barger & Notwell (2013) found that students loved seeing the word broken down and hearing it pronounced. One of the students shared that she could better understand the text because she could hear words she could not pronounce. Building student confidence promotes risk-taking and growth in a student's reading ability.

Language Translation Feature

The language translation feature allows the English as a Second Language (ESL) reader to leverage their native language competence to transition to English proficiency. That prior

knowledge boost provided by the language-translation feature can help propel the ESL enough to motivate the student to persist and make significant gains in language acquisition.

Read-a-loud Feature

Compared with printed books, the primary benefits to children's reading of electronic storybooks were the provision of narration, accompanied by animated pictures and sound effects related directly to the storyline. Electronic books incorporating these features can increase children's comprehension and enjoyment (Grimshaw et al., 2007). Barger and Notwell (2013) found that several features of eBooks appealed to students, and the read-aloud feature was the most popular. One of the perks of the read-aloud feature is that it makes academic content accessible for struggling readers. One of the students commented that sometimes they got more information from the book if someone read it to them instead of them reading. Many readers talked about how they liked how some eBooks would highlight the words while it was reading, helping them to stay on track. Many students knew their learning styles and how eBooks helped them learn. Macaruso et al. (2006) concluded that using oral support and feedback for word attack skills from eBooks could be beneficial. Campbell and Mechling (2009) describe using computer-assisted instruction to support teaching letter sounds via an interactive whiteboard as beneficial (Burnett, 2010).

Text-size Adjustment Feature

The text-size adjustment feature may seem insignificant, but considering the social environment adolescents find themselves in at school, wearing glasses can become a formidable roadblock. Holguin et al. (2006), in a study conducted in southern Mexico, found that of the 493 participants randomly selected with visual impairment due to refractive error and provided

glasses, only 66 children wore the corrective spectacles during an unannounced follow-up visit up to 18 months after distribution. The oldest children and children in urban–suburban areas were significantly more likely to list concerns about the appearance of the glasses or being teased than younger, rurally resident children. English as a Second Language learners trying to fit in may resort to using language as an excuse for poor Reading performance when the reality is that they have vision issues. The decision can have detrimental long-term consequences.

Hyperlink Feature

Egan et al. (1991) stated that students using digital hypertext to find specific information had greater accuracy than students using paper textbooks. Dillon and Gabbard (1998) also found that reading was better with an e-book than a paper book when performing extensive searches or manipulating and comparing visual object details. Matthew (1997) conducted experiments with elementary school students to study the effect of using electronic texts on reading comprehension. Matthew compared students who read stories on a CD-ROM and the print versions of the same books. She found that students who read the CD-ROM versions of the books had significantly higher mean comprehension scores, as measured by their ability to retell the story. Electronic books capture students' attention and stimulate their imagination.

Search, Highlighting, Bookmark, and Notations

ChanLin (2013) studied the necessity level of e-book features and found that many features had a significantly higher necessity level in academic reading than leisure reading for the following items: page search, print, hyperlink access through the table of contents, and keyword search in full text. Participants' interview data revealed that when searching for keywords through the search engine, that information allowed them to see things from different

perspectives. ChanLin concluded that the search engine efficiently helped students' comprehension content read. E-book systems provide various support features, such as an electronic highlighter, a bookmark, a record of reading history, and electronic notations to support users' practice of cognitive strategies (ChanLin, 2013).

The features highlighted in this section are merely a sampling of those currently incorporated as supports the reader can use to facilitate text comprehension by reducing the burden of using these tools. Development continues as more studies reveal limitations that technological solutions can reduce.

Limitations of eBooks and eReader Use

Research has shown that reading from screens is frequently slower (Gould et al., 1987; Grimshaw et al., 2007), less accurate (Wilkinson & Robinshaw, 1987), and more fatiguing due to poor legibility and screen size (Cushman, 1986; Jeong, 2012). Reading on a standard computer display is more error-prone and is approximately 20 percent slower than reading on paper, according to Jeong (2012). This study's findings are reaffirmed in a study by Mayes et al. (2001), who collected data from 50 students from the University of Bristol reading from a paper book is significantly faster and slower on-screen. McKnight et al. (2020) explicitly concluded that there was no significant difference between paper and hypertext regarding comprehension. After studying 27 libraries and information science students' use and experience with e-books, Chu (2003) indicated the primary reason for not using e-books was the difficulty of moving within an e-book.

Lefever-Davis and Pearman (2005) observed first-grade students using CD-ROM storybooks with optional Text-To-Speech (TTS) for selected words, sentences, or the whole

story. They found that some students relied too much on the TTS function and often did not try to decode words independently. Furthermore, the students often clicked on words that had previously been read aloud or had words that they could decode independently on a previous occurrence.

Summary

Recent eReader developments are changing the nature of learning in and out of our classrooms, interweaving into their everyday lives. Once cost prohibited, mobile devices such as eReaders, cellular phones, and portable laptop computers are increasingly available to all. The development of these user-friendly electronic reading devices has made great strides in support of establishing eBooks as a critical component of the educational environment necessary to enhance our student's reading competence. The available features offer young children struggling to read the tools to support reading independently and comprehending what they have read. The research text indicates that reading comprehension deficit overshadows the curriculum in the primary grades and impacts almost all later learning. Academic achievement is lower among less proficient English Language Learners. The Hispanic dropout rate far exceeds all other demographic groups and shows the most significant growth nationwide. Electronic books and eReaders have limitations, but technology has resolved many of those that have presented themselves. The expectation is that future versions will provide enhancements that will improve the reading experience.

CHAPTER III

RESEARCH METHODOLOGY

Introduction

The purpose of the study was to examine the extent to which reading books in electronic format affects students' reading comprehension at the middle school level within a school district in South Texas; and if Limited English Proficient students receive any additional benefit. The design of this study sought to answer the following three research questions concerning students' reading comprehension at the middle school level through causal-comparative quantitative methods. The following research questions were developed for the study to achieve that purpose, and their associated hypotheses were tested.

Research Questions

Research Question 1

What is the effect of reading books in electronic format on the reading comprehension of non-Limited English Proficient middle school students in a South Texas school district?

Objective. Compare the reading comprehension quiz scores of non-Limited English Proficient middle school students who read books in electronic format to those who read books in print format to examine the impact of using the electronic format for reading.

Research Question 2

What is the effect of reading books in electronic format on the reading comprehension of Limited English Proficient middle school students in a South Texas school district?

Objective. Compare the reading comprehension quiz scores of Limited English Proficient middle school students who read books in electronic format to those who read books in print format to examine the impact of using the electronic format for reading.

Research Question 3

What is the effect of reading books in paper versus electronic format on non-Limited English Proficient reading comprehension compared to Limited English Proficient middle school students in a South Texas school district?

Objective. Compare the reading comprehension quiz scores of non-LEP to LEP middle school students who read books in electronic format and those who read books in print format to examine the impact of book format on reading.

Research Hypotheses

Research Hypothesis 1

H_o There is no statistically significant difference between the reading comprehension quiz score means of non-Limited English Proficient middle school students who read books in electronic format and the reading comprehension of non-Limited English Proficient middle school students who read books in print format.

H_a There is a statistically significant difference between the reading comprehension quiz score means of non-Limited English Proficient middle school students who read books in electronic format and the reading comprehension quiz score means of non-Limited English Proficient middle school students who read books in print format.

Research Hypothesis 2

H_o There is no statistically significant difference between the reading comprehension quiz score means of Limited English Proficient middle school students who read books in electronic format and the reading comprehension of Limited English Proficient middle school students who read books in print format.

H_a There is a statistically significant difference between the reading comprehension quiz score means of Limited English Proficient middle school students who read books in electronic format and the reading comprehension quiz score means of Limited English Proficient middle school students who read books in print format.

Research Hypothesis 3

H_o There is no statistically significant difference between the reading comprehension quiz score means of non-Limited English Proficient and Limited English Proficient middle school students when they read books on paper versus in electronic format.

H_a There is a statistically significant difference between the reading comprehension quiz score means of non-Limited English Proficient and Limited English Proficient middle school students when they read books in paper versus electronic format.

This chapter describes the methodology proposed to test these hypotheses. The chapter is divided into the following subsections: (1) introduction, (2) research design, (3) participants, (4) instrumentation, (5) data collection procedures, (6) data analysis procedures, and (7) limitations of the study. A summary concludes the chapter.

Research Design

The study utilized a quantitative approach, using a causal-comparative research design with a retrospective orientation. Due to the educational environment in which the study was conducted and ethical considerations, it was impossible to design an experimental study in which all participants were randomly assigned to a treatment group where one could manipulate independent variables or assign them to a control group. After considering: (1) the purpose of the study; (2) the nature of the participants; (3) that a control group was not possible; and (4) that variables could not be manipulated; a causal-comparative research design was selected to explore the phenomenon presented within four categorized sample groups. The causal-comparative design method will allow the researcher to study cause-and-effect relationships between variables under conditions where experimental manipulation of independent variables is difficult or impossible (Frankel & Wallen, 1993), as cited in Frankel and Wallen, 2009.

To test Hypothesis 1: *There is a statistically significant difference between the reading comprehension quiz score means of non-Limited English Proficient middle school students who*

read books in electronic format and the reading comprehension quiz score means of non-Limited English Proficient middle school students who read books in print format; the dependent variable, the non-Limited English Proficient students reading comprehension proficiency as determined by Accelerated Reader quiz scores were compared to the independent variable, the electronic or printed book format read by each student in the sample group.

To test Hypothesis 2: *There is a statistically significant difference in Accelerated Reader quiz scores of middle school Limited English Proficient students when reading electronic books compared to printed books*; the dependent variable, the Limited English Proficient students' reading comprehension proficiency as determined by Accelerated Reader quiz scores were compared to the independent variable, the electronic or printed book format read by each student in the sample group.

To test Hypothesis 3: *There is a statistically significant difference between the reading comprehension quiz score means of non-Limited English Proficient and Limited English Proficient middle school students when they read books in paper versus electronic format*; the dependent variable is the non-Limited English Proficient students' and the Limited English Proficient students' reading comprehension proficiency as determined by Accelerated Reader quiz scores, as compared to the independent variable, the electronic or printed book format read by each student in the sample group.

Participants

The research sample (n=1,000) for this study was drawn from a population (N=8,100) of middle school students from a district in south Texas who participated in the Accelerated Reader program during the 2016-17 academic year. Students are predominately Hispanic and classified

as having low Social Economic Status. The Limited English Proficient (LEP) population of students is classified as English Language Learners (ELL) for reporting and nearly double in percentage compared to the State. The population demographic distribution shown in Table 3.1 is representative of the sample drawn, other than where purposive sampling was necessary, non-Limited English Proficient (50%) and Limited English Proficient (50%).

Table 3.1

Demographic Information about the Enrollment for the Academic Year 2016-17

Enrollment by Race/Ethnicity	District		State	
American Indian or Alaska Nat	*	*	20,765	0.4%
Asian	83	0.2%	225,287	4.2%
Black or African American	49	0.1%	674,678	12.6%
Hispanic/Latino	46,106	98.4%	2,809,235	52.4%
Native Hawaiian/Other Pacific	7	0.0%	7,700	0.1%
Two or More Races	*	*	115,902	2.2%
White	629	1.3%	1,505,306	28.1%
Enrollment by Sub-population	**District**		**State**	
Economically Disadvantaged	44,960	95.9%	3,159,220	59.0%
English Language Learners	15,626	33.3%	1,010,728	18.9%
Special Education	5,113	10.9%	477,251	8.9%

Table 3.1 cont.

Table 3.1 cont.

Enrollment by Sub-population	District		State	
Female	22,942	48.9%	2,610,425	48.7%
Male	23,938	51.1%	2,748,448	51.3%

To protect student confidentiality, small numbers are masked as asterisks (*).

Instrumentation

This study calls for collecting and systematically analyzing data regarding middle school students' Accelerated Reader quiz scores. The proposed school district uses the Accelerated Reader program to track reading participation and comprehension proficiency. The Accelerated Reader program assigns an Advantage -TASA Open Standard readability level to each book that considers predictors of text complexity—average sentence length, average word length, and word difficulty level to a wide range of book titles.

Accelerated Reader is web-based and collects quiz data results to maintain a cumulative percentage reflecting the level of reading comprehension proficiency and provides a reading incentive mechanism reflecting the accumulation of points per quiz. Students must read books within their assigned Advantage -TASA Open Standard level range, also known as the Zone of Proximal Development. The Accelerated Reader program assigns a percentage score for each quiz taken in the student record. Quizzes have a set level score of 85% to be proficient in reading comprehension.

The Accelerated Reader program is designed to allow a supervising teacher to place a student at a designated reading level based on prior performance. The teacher can track the

student's progress through quiz results after reading a book and then adjust the Accelerated Reader level within the student's Zone of Proximal Development to help them succeed. Students can select any Accelerated Reader designated book from the school library print and electronic collection available through the District's Destiny Management System. Printed books are available in their school library. In contrast, electronic books are available through download to any eBook-capable device for a pre-set period or can be read online through the Destiny Management portal from anywhere with an Internet connection. Accelerated Reader quizzes designed to assess reading comprehension are taken online under the teacher's supervision, provide immediate feedback through scoring, and are archived in a database hosted by Renaissance Learning, the Accelerated Reader parent company.

Students take Reading Practice Quizzes, the most common quiz type, to determine if they have read the book by demonstrating a measure of literal comprehension. Accelerated Reader quiz results provide immediate feedback to (1) help teachers monitor and manage student reading and (2) motivate students to read. Depending on a book's length and ATOS book level, a reading practice quiz comprises 5, 10, and 20 items. The 5-item quizzes primarily cover short books read by emergent readers, while 20-item quizzes cover longer books at higher readability levels. The most common quiz length is ten items, which covers mid-range, medium-length books. Quiz questions typically focus on significant events, characters, and other literal features, and questions appear in an order that matches the chronology of a book to reinforce story grammar. Stiggins (2005) noted that poor readers, nonreaders, and emergent English readers could not take selected-response (multiple-choice) assessments in English successfully. To help, Accelerated Reader offers Recorded Voice Quizzes and Spanish Quizzes, which teachers can administer without extra assistance to preliterate and emergent readers as well as Spanish

bilingual, English as a Second Language, English Language Learners, and Spanish language learning students.

Recorded Voice Quizzes in English and Spanish are Reading Practice Quizzes intended for preliterate, struggling, and emergent readers. The quizzes are professionally recorded by a narrator who reads the quiz questions and answers choices as they appear on-screen. The sound can be turned on or off, depending on the student's independent reading ability. One use for Recorded Voice Quizzes is to provide a student who has been read a book because of some limitations. The same accommodation is provided while taking that book's Accelerated Reader quiz.

Reading Practice Quizzes in Spanish, intended for native Spanish bilingual, English as a Second Language, English Language Learners, and Spanish language learning students, are written and edited by native Spanish speakers and are available for best-selling Spanish titles. Well-liked bilingual books have two quizzes available, one in English and one in Spanish, to provide students and teachers with added flexibility (as cited in The Design of Accelerated Reader Assessments, 2011). Renaissance Learning has continuously refined its process for developing its reading comprehension assessment instrument to ensure its product represents a student's understanding of what has been read.

Quiz Development

Accelerated Reader quizzes present "a meaningful, interesting, and reasonably demanding challenge" (Black & William, 1998, p. 24), and the development of each quiz entails a multistep editorial process with checks at several points to ensure quality. Content developers and editors from Renaissance Learning, the company that developed the Accelerated Reader

program, create and edit quizzes following guidelines for designing multiple-choice assessments recommended by several researchers (e.g., Frary, 1995; Haladyna, Downing, & Rodriguez, 2002; Stiggins, 2005). Two primary goals guide this process: Make sure quiz questions (1) are vital to the text or significantly advance the plot and (2) are not guessable without reading the book.

The quiz-writing process begins with a content developer reading a book and drafting items that reflect crucial points in the text or plot. Each book's quiz is written at or below its Advantage -TASA Open Standard book level to ensure students understand what is being asked. At least three editors review the quiz at various stages of the editorial process to evaluate the content, plausibility, spelling, usage, grammar, punctuation, and conformation to quiz style. Particular attention is paid to the incorrect answer choices to ensure they are plausible and similar to the correct answer.

Following these reviews and any necessary modifications, an editor evaluates the quiz to determine if the software will recognize the correct responses. Quiz reliability and validity are continually assessed and updated as needed (Renaissance Learning, 2010). A point value is assigned to each book based on the number of words it contains and its Advantage -TASA Open Standard book level. After completing each quiz, students receive a point value based on the correct percentage of questions answered. Points indicate the amount of time a student has engaged in reading practice in preparation for the quiz based on the level of the book.

Reliability, Validity, and Usability

The internal reliability of *Accelerated Reader* quiz scores where reliability increases as quiz length increases and students accumulate a longer record of quizzes. *Accelerated Reader* quizzes are tied directly to the content of a specific book or passage and focus on facts rather

than conjecture. *Accelerated Reader's* computerized, multiple-choice quizzes are easy to use and efficient regarding time and cost. The assessments provide a high degree of useful information while consuming relatively few teacher resources, such as time.

All Accelerated Reader quizzes have a median time of fewer than 10 minutes per quiz; the median time to complete the most used quiz type (the 10-item Reading Practice Quiz) is just over 3 minutes. Quizzes also save teachers time because they do not need to be scored individually or administered one-on-one. Stiggins (2005) noted that Selected-response tests are efficient because large numbers of multiple-choice or true/false test items can be conducted per unit of testing time. Thus, quizzes allow for sampling widely and draw relatively confident generalizations from the content sampled.

Standardization and Consistency

Accelerated Reader quizzes fit the definition of standardized given by Popham (1999) in that they are "administered and scored in a predetermined, standard manner" (p. 1). This characteristic is important because it ensures that the quizzes are fair. Also, the consistent way Accelerated Reader quizzes are developed and administered means the information they provide is comparable over time and from student to student. To maintain fairness and consistency, Accelerated Reader does not allow teachers to alter a quiz in any way. Allowing such flexibility would render the information collected meaningless because data would not be comparable from student to student (as cited in The Design of Accelerated Reader Assessments, 2011).

Data Collection Procedures

Step 1

The researcher was granted approval to access archival data (N=8,100) through a Request for Public Information Disclosure submitted to the targeted school district (Appendix A). The request detailed the specific information needed to conduct the study, which included: (1) the Accelerated Reader program archived electronic records of all district middle school participants for the 2016-17 academic year, in Excel format, with the following data fields: Participant ID; Export Grade; Gender; Characteristics; School Name; Date Taken; Quiz Title; Author; Percent Correct; and Fiction or Non-Fiction; (2) Collection listings of all book titles as well as the author which are available to students in print format for each separate middle school; and (3) collection listings of all book titles as well as the author which are accessible to students in electronic format for each middle school.

Step 2

The researcher divided the combined Accelerated Reader student's quiz records file provided in Excel format into the ten separate middle schools studied. The campus book collection files and eBook subscriptions were also merged into one listing for each school with a format designation column added as either a paper format book (pBook) or electronic format (eBook).

Step 3

The researcher used Excel to calculate quiz score means, and the total number of books read in each format for each student. Only necessary columns from the Excel data file were used for analysis, which included: MaskedID, the anonymous number assigned to replace personally

identifiable information for each Accelerated Reader program quiz entry; Gender, student identifier as either male or female; Quiz %, individual quiz scores stated as a two-place decimal; At Risk, students considered to be falling behind academically in jeopardy of being retained; SES, students classified as low Socio-Economic Status; LEP, students classified as Limited English Proficient; and SpEd, students considered Special Education having disabilities. All other columns not needed were hidden. A book Format column was temporarily created to identify each quiz title as either electronic or paper. The following columns were created for the results of the formulas applied to the data: pBook Quiz %, the mean quiz score of all quizzes taken on titles identified as paper format; pBook Total, the total number of books read based on quiz title identified as paper format; eBook Quiz %, the mean quiz score of all quizzes taken on titles identified as electronic format; eBook Total, the total number of books read based on quiz title identified as electronic format. The resulting layout of the Excel worksheet is shown in Table 3.2 below.

Table 3.2

Participant Excel Data Table Layout

Masked ID	Gender	pBook Quiz %	pBook Total	eBook Quiz %	eBook Total	At Risk	SES	LEP / Non-LEP	SpEd
9023	M	0.84	7	0.75	50	At Risk	SES	LEP	
8713	M	0.95	3	0.97	23		SES	Non	
1687	M	0.87	7	0.78	65	At Risk	SES	LEP	SpEd

Step 4

The Accelerated Reader quiz and book format listings were then compared by matching titles and using Excel to identify/exclude duplicates in both formats. Quizzes not matched were excluded because of the inability to determine in which format they were read. All campus Accelerated Reader format annotated quiz listings were then consolidated.

Step 5

The purposive sampling method was used to select members from the population (N=8,100) who had taken a minimum of six pBook quizzes or nine eBook quizzes for group assignments within each categorical sample group, pBook or eBook, with priority for selection to eBook. The participants who did not meet the minimum total book criteria in either format were excluded. The resulting sample (n=1,525) was divided using the stratified sampling method from the Accelerated Reader quiz score spreadsheet to identify non-Limited English Proficient (non-LEP) and Limited English Proficient (LEP) status students to form corresponding categorical sub-groups. The researcher conducted an analysis using the Statistical Package for the Social Sciences to test for the Inter-Quartile Range, 1st Quartile, and 3rd Quartile of the data set of each categorical sample group: sub-group non-LEP (n=619), and sub-group LEP (n=904) to identify extreme outliers (291) for the researcher to consider for exclusion based on the total books read in each format by group members.

Step 6

The resulting sub-groups: sub-group non-LEP (n=540) and sub-group LEP (n=692), were used for purposive sampling based on the number of books read in each format to form two

Categorical/Format sub-sample groups. Within each categorical sample sub-group: non-LEP pBook (n=273) and non-LEP eBook (n=267), plus LEP pBook (n=299) and LEP eBook (n=393).

Step 7

After each sub-group was randomized using Excel random number generator, each group was resorted based on the random number. The first 123 females (49%) and 127 males (51%) listed in the Categorical/Format sub-sample randomized participant list were selected for each of the four groups, finalizing the total study sample (n=1,000).

Step 8

The researcher conducted a statistical analysis using the Statistical Package for the Social Sciences to test for the Inter-Quartile Range, 1st Quartile, and 3rd Quartile of the data set for the four categorical sample groups: to identify extreme outliers (105) based on the quiz score for the researcher to consider for exclusion. The Inter-Quartile Range rule multiplier of 1.5 was used to identify the extreme outliers. Outliers removed were replaced by alternates from the randomized list for each group.

Step 9

The Statistical Package for the Social Sciences was used to analyze the data with the Kruskal-Wallis nonparametric individual samples test, which included the Pairwise Comparisons of Groups to test the three research hypotheses.

Data Confidentiality

The researcher will keep the data confidential by taking the following actions to safeguard the information.

- The request for data from the study district was approved, provided Personal Identifiable Information be removed before release, where a participant's anonymous identification number is assigned to each Accelerated Reader program quiz record.
- Ensure the data is secured and only used for this study.
- After the study concludes, the information will be archived in cloud storage for three years and then deleted.

Data Analysis Procedures

The data collected using previously described procedures was analyzed using a Kruskal-Wallis nonparametric individual samples test statistical technique using the Statistical Package for the Social Sciences (SPSS). The 95% confidence level ($p < .05$) was used as the criterion level for determining statistical significance. The results of these analyses are reported in tabular, graphic, and narrative form in Chapter IV; the descriptive and inferential analyses are presented.

Limitations of the Study

As with all studies, aspects of this study may limit the validity and generalizability of the results obtained. This section acknowledges those limitations and that every attempt was made to minimize the effects of extraneous variables on the study results.

Use of Causal-comparative Research Design

A causal-comparative research design was used to achieve the purpose of the study in an educational environment. Gall, Borg, and Gall (1996) noted that in studies employing a causal-comparative research design, determining causal patterns with any degree of certainty is difficult.

Convenience Sampling Use

Convenience sampling pertains to two aspects of the study sampling.

1. The school district selection for the study was at the researcher's convenience for ease of communication when requesting the data. Even though the district is representative of the other 33 districts in the region, with a primarily Hispanic, low Socio-Economic Status student population, it is widely different from the rest of the State. Consequently, the results of this study may not be generalizable to populations with a more diversified range of race/ethnicity or affluent means. Students from more affluent backgrounds could have more developed technology adaptation skills, resulting in easier eBook use. More access to eBooks and eReaders outside of school could also promote the use of supports built into eBooks and eReaders.
2. The initial selection of the participants from the middle school level as the population (N=8,100) of interest was restricted to students who participated in the Accelerated Reader program during the academic year studied retrospectively. The researcher used the Accelerated Reader program assessment instrument, quiz scores, to measure reading proficiency because of the convenience that the instrument was already used at the district during the study period to track reading comprehension.

Recent eBook Implementation

The district only began funding eBook and eReader resources two years before the academic year studied, and the initiative may still be in its infancy. Students and teachers need time to adopt new technology to maximize the full use of eBook featur

Lack of Longitudinal Perspective

The study data spans one year of Accelerated Reader quiz-taking. Although it would have been beneficial to track students through the three years of Middle School to gauge improvement, it was beyond the scope of this study.

Socio-economic Status

Although 95.9% of students in the population are classified as having low Socio-Economic Status, students will have varying levels of access to technology at school and home. Thus, students from higher-income families may gravitate more toward reading e-books, which may skew the results.

Summary

This causal-comparative study sought to examine if there is a statistically significant difference in Accelerated Reader quiz scores of middle school non-Limited English Proficient students when reading eBooks compared to printed books. Secondarily, it explores if there is a statistically significant difference in Accelerated Reader quiz scores of middle school Limited English Proficient students when reading eBooks compared to printed books. Furthermore, thirdly, if there was a statistically significant difference in Accelerated Reader quiz scores of middle school non-Limited English Proficient and Limited English Proficient students when reading electronic books compared to printed books. This study intended to assess these research questions in the students' most permissive environment, where they could choose the titles that interest them in reading and in the format they choose over an extended period.

CHAPTER IV

RESULTS

Introduction

Reading comprehension is vital to student learning across the curriculum, and technology innovation has yet to fully address the reading comprehension deficit of students who struggle to read. The purpose of this study was to examine the extent to which reading books in electronic format affects students' reading comprehension at the middle school level within a school district in South Texas; and if Limited English Proficient students receive any additional benefit. For the study to achieve that purpose, the following research questions were addressed, and associated hypotheses were tested:

Research Questions

The design of this study sought to answer the following three research questions concerning student's reading comprehension at the middle school level through causal-comparative quantitative methods:

Research Question 1

What is the effect of reading books in electronic format on the reading comprehension of non-Limited English Proficient middle school students in a South Texas school district?

Research Question 2

What is the effect of reading books in electronic format on the reading comprehension of Limited English Proficient middle school students in a South Texas school district?

Research Question 3

What is the effect of reading electronic format books on non-Limited English Proficient reading comprehension compared to Limited English Proficient middle school students in a South Texas school district?

Considering the data available, the scope of the problem to be addressed, and the feasibility of the research task, the researcher determined that the Independent-Samples Kruskal-Wallis Test was the best solution for effectively analyzing the data. The initial task was to confirm that the Independent-Samples Kruskal-Wallis Test assumption requirements were met.

Independent-Samples Kruskal-Wallis Test Assumptions Testing

The assumptions testing for the statistical method selected, the Independent-Samples Kruskal-Wallis Test, was satisfied as follows:

1. Independence: The observations within and between different groups were independent and met through the Accelerated Reader Program procedures, requiring each quiz (observation) to be independently taken.
2. Data: The student quiz score means (dependent variable) was in nominal data form and measured at the interval level.
3. Same group distributions shape: The groups compared have the same shape, as shown in Figure 4.1. The distributions' spread, skewness, and kurtosis were roughly similar across the groups, as shown in Table 4.1.

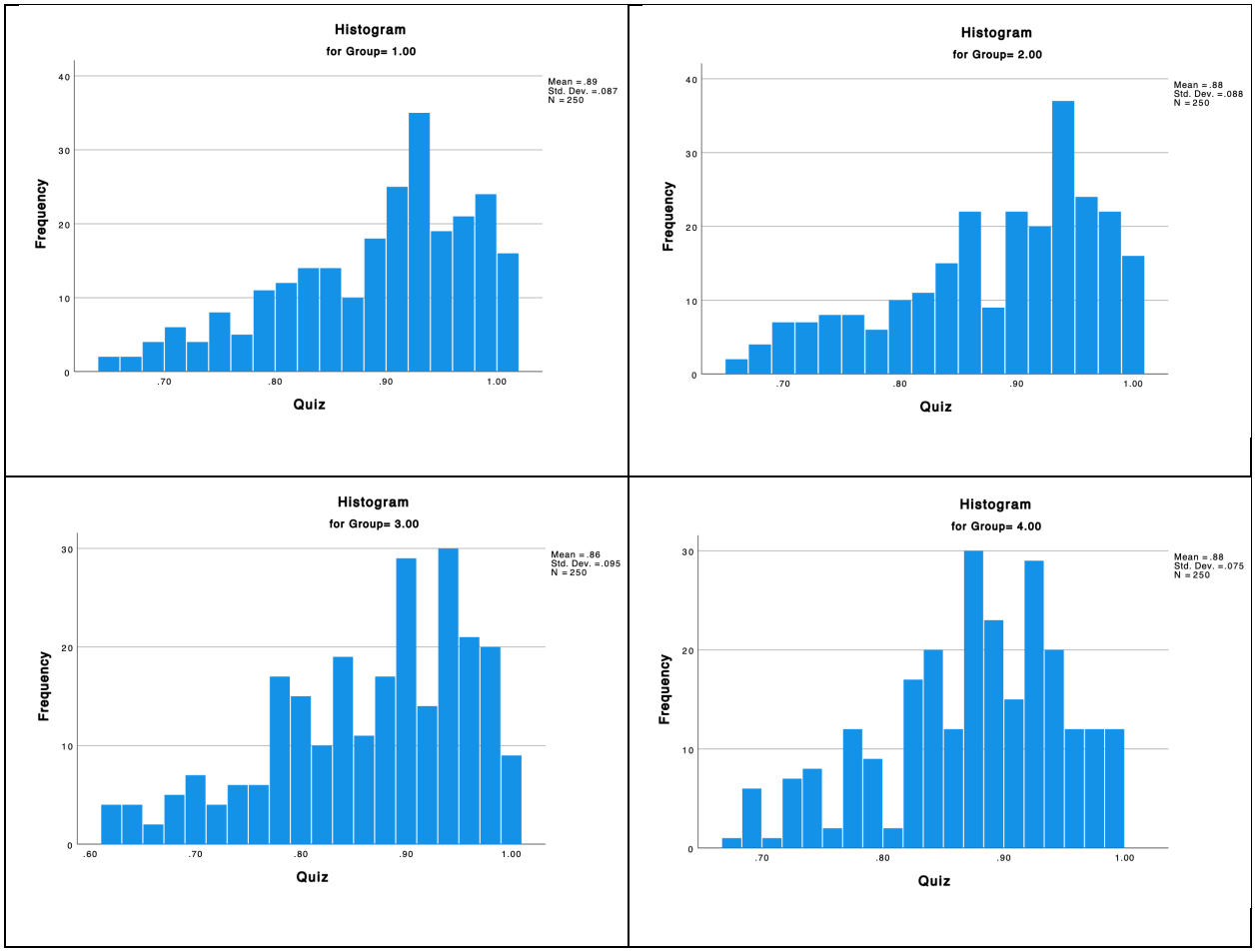

Figure 4.1

Histogram Reflecting Sample Group Shapes

Table 4.1

Group Distribution Descriptives

Group	Variance	Skewness	Kurtosis
Group 1 - Non-LEP pBook	.008	-.750	-.215
Group 2 - Non-LEP eBook	.008	-.706	-.436

Table 4.1 cont.

Group 3 - LEP pBook	.009	-.703	-.253
Group 4 - LEP eBook	.006	-.588	-.254

4. Random sampling: The data were collected using a random sampling method once categorical grouping for formed to ensure that each observation had an equal chance of being included in the sample to minimize biases.
5. No significant outliers were present after the Statistical Package for the Social Sciences analysis of the Inter-Quartile Range, 1st Quartile, and 3rd Quartile identified the outliers.

The researcher determined to replace outliers from the randomized list of alternates, as evidenced in the boxplot below, Figure 4.2.

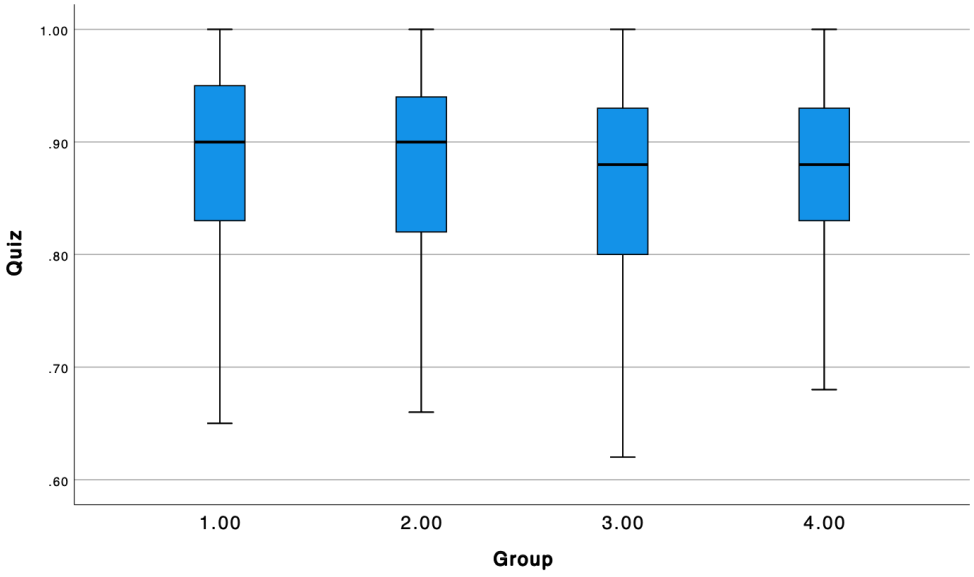

Figure 4.2

Boxplot Showing No Outliers in any Group

6. The Statistical Package for the Social Sciences Independent-Samples Kruskal-Wallis Test was then used to compute the data and see if there was a significant difference in student reading comprehension scores based on the book format. This chapter summarizes the data for each research question and provides a detailed description of the decisions regarding the research hypotheses for this study.

Descriptive Statistics

Descriptive statistical analyses were performed on the sample groups to understand the effect of book format on reading comprehension. Measures of central tendency (means and other percentiles) and dispersion (standard deviations) were computed. The descriptive statistics for each group are reported in the following Table 4.2.

Table 4.2

Descriptive Statistics for Reading Comprehension Based on Group Assignment

Sample Groups	*n*	*M*	*SD*	*MR*
Group 1 - non-LEP pBook	250	.89*	.087	539.71
Group 2 - non-LEP eBook	250	.88	.088	514.19
Group 3 - LEP pBook	250	.86	.095	460.76
Group 4 - LEP eBook	250	.88	.075	487.34

***** Confidence level ($p < .05$)

Inferential Statistics

The researcher ran an Independent-Samples Kruskal-Wallis Test in SPSS with categorical groups formed based on LEP status and book format combinations as the independent variable and reading comprehension quiz scores as the dependent variable. The Independent-Samples Kruskal-Wallis Test used the 95% confidence level ($p < .05$) as the criterion level for determining statistical significance. The results showed a statistically significant difference between categorical groups based on LEP status and book format combinations on student quiz scores; ($H(3) = 10.439$, $p = .015$ with a mean rank score of 539.71 for non-LEP pBook, 514.19 for non-LEP eBook, 460.76 for LEP pBook, and 487.34 for LEP eBook. The null hypothesis was not supported.

Pairwise Comparisons of Groups Analysis

Pairwise comparisons of groups within the Independent-Samples Kruskal-Wallis Test were used to determine which comparison of means contributes to the overall significant difference observed in the computation of the H statistic.

Table 4.3

Pairwise Multiple Comparisons - Dependent Variable: Quiz - Kruskal-Wallis

Sample 1	Sample 2	Test Statistic	Std Error	Std. Test Statistic	Sig.	Adj. Sig. [a]
Group 3	Group 4	-26.584	25.811	-1.030	.303	1.000
Group 3	Group 2	53.434	25.811	2.070	.038	.231

Table 4.3 cont.

Group 3	Group 1	78.950	25.811	3.059	.002	.013
Group 4	Group 2	26.850	25.811	1.040	.298	1.000
Group 4	Group 1	52.366	25.811	2.029	.042	.255
Group 2	Group 1	25.516	25.811	.989	.323	1.000

Each row tests the *null* hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed.

The significance level is 0.05 level.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

To test the first research hypothesis: there is a statistically significant difference between the reading comprehension of non-Limited English Proficient middle school students who read books in electronic format and the reading comprehension of the non-Limited English Proficient middle school students who read books in print format, Pairwise comparisons of groups analysis revealed that Group 1, non-LEP pBook and Group 2, non-LEP eBook are not statistically significantly different from each other (p=0.323). Therefore, Research Hypothesis 1 was not supported.

Regarding the second research hypothesis, there is a statistically significant difference between the reading comprehension of Limited English Proficient middle school students who read books in electronic format and the Limited English Proficient middle school students who read books in print format.

Pairwise comparisons of groups analysis revealed that Group 3, LEP pBook, and Group 4, LEP eBook are not significantly different from each other (p=0.303). Therefore, Research Hypothesis 2 was not supported.

To test the third research hypothesis: there is a statistically significant difference between the reading comprehension of non-Limited English Proficient middle school students who read books in print or electronic format and Limited English Proficient middle school students who read books in print or electronic format:

Pairwise comparisons of groups analysis revealed that the score means of Group 1, non-LEP pBook was statistically significantly different from that of Group 3, LEP pBook (p=0.002). The score means of the Group 2, non-LEP eBook is not statistically significantly different than in Group 4, LEP eBook (p=0.298). The null hypothesis that there is not a statistically significant difference in the student quiz scores between categorical groups based on non-LEP and LEP student status and book format combinations was not supported.

Summary

The data presented in this chapter were used to determine the effect of book format on the reading comprehension of non-Limited English Proficient and Limited English Proficient middle school students in a school district in South Texas. The results suggest there is not a statistically significant difference in reading comprehension scores between the electronic and print formats for either categorical group: non-Limited English Proficient or Limited English Proficient. The exception is that non-LEP students' reading comprehension scores are statistically significantly different than those of LEP students reading pBook.

The next chapter will delve into what conclusions can be drawn from the results of the data analysis presented in this chapter. It will also provide an interpretation of the results based on the additional information gleaned from the literature review to help provide a vision for implications in practice and end with recommendations for future research.

CHAPTER V

CONCLUSIONS, INTERPRETATIONS, AND IMPLICATIONS

Introduction

Students' reading skills are one of the major predictors of success in school and careers later in life. Technology is shaping how young and old students access reading materials more than ever. Those responsible for library book collection development have begun seeing the new format's value in improving student reading comprehension. However, even though districts are increasingly acquiring eBooks to provide more access to students, it is with hesitance and caution without the data to support their acquisition decisions.

The purpose of the study was to examine the extent to which reading books in electronic format affects students' reading comprehension at the middle school level within a school district in South Texas; and if Limited English Proficient students receive any additional benefit. The three research questions and research design were structured in a way that directly opposed the two variables from different perspectives through sample group composition to assist in differentiating the cause of the effect. By all accounts, the results are accurate, but the conclusions may be subject to interpretation. The research questions will be the focus as conclusions are presented. This chapter will present conclusions derived from the statistical analysis results, provide interpretations within the body of knowledge explored during the literature review, weigh implications for practice as a way forward, and conclude with recommendations for future research and a closing summary.

Conclusions and Interpretations

To address the research questions, an Independent-Samples Kruskal-Wallis Test was used to compare the four sample groups' reading comprehension quiz scores means. The grouping was based on a cross-composition of the two book formats (print and electronic) a nd the two categorical populations (non-Limited English Proficient and Limited English Proficient). The results showed an expected outcome of a statistically significant difference between the groups.

Conclusions and Interpretations for Research Question 1

What is the effect of reading books in electronic format on the reading comprehension of non-Limited English Proficient middle school students in a South Texas school district?

The first research question focuses on the difference within the groups as they are paired for comparison. To that end, the Pairwise Comparison of Groups section was reviewed. The pairing of interest for this research question was between the two non-Limited English Proficient sample groups, which only differed in the dependent variable, the reading comprehension quiz means, based on either the paper or the electronic book format. The results showed that the non-Limited English Proficient paper book format and the non-Limited English Proficient electronic book format groups were not statistically significantly different, and the null hypothesis was accepted.

While the findings of this study did not support the hypothesis, as other previous studies have found (Tanner, 2014), s ome factors almost certainly affected the results. A possible explanation for this outcome can be attributed to the relatively recent implementation of the district's eBook adoption initiative, two years before the academic year used for the study.

Students and teachers needed time to adapt to the new technology and were still adjusting and only beginning to exploit its full capabilities. The fact that the format was still evolving made eBook implementation much harder. Recognizing that the full potential of this technology may only become apparent over an extended period. As the adoption and utilization of eBooks progress, subsequent investigations may yield distinctly different results.

Electronic reading devices offer several benefits, such as increased access to a wider variety of texts and the convenience of carrying multiple texts in a single device (Gounder, 2011). It may be beneficial for educators to offer various reading options to students, including both electronic and print formats, to accommodate the diverse learning needs and preferences of different learners. A concerted effort to promote school-wide awareness of the electronic format's embedded features could benefit all students while providing scaffolding support to struggling readers.

It is incumbent upon educators to persistently monitor the consequences that accompany any new implementation, and the eBook is no exception. Moreover, the literature review highlighted potential drawbacks of electronic reading devices, including a higher inclination for multitasking and distraction (Liu, 2022). This study's greater-than-anticipated usage and reading comprehension quiz scores imply that reading in the electronic format does not harm comprehension.

Conclusions and Interpretations for Research Question 2

What is the effect of reading books in electronic format on the reading comprehension of Limited English Proficient middle school students in a South Texas school district?

To address the second research question, a Pairwise Comparison of Groups was used to compare the four sample groups' reading comprehension quiz scores means. The grouping was based on a cross-composition of two book formats (print and electronic) and two student population groups (non-Limited English Proficient and Limited English Proficient). The results showed an expected outcome of a statistically significant difference between the groups. The null hypothesis was not supported.

However, the importance of this research question focuses on the difference within the groups as they are paired for comparison. To that end, the Pairwise Comparison of Groups section was reviewed. The pairing of interest for this research question was between the two Limited English Proficient sample groups, which only differed in the dependent variable, the reading comprehension quiz means, based on either the paper or the electronic book format. Much like the previous hypothesis, it revealed that the LEP pBook and LEP eBook groups were not statistically significantly different, and the null hypothesis was accepted.

While the findings of this study did not support this hypothesis, as other previous studies have found (Wright, 2013), the Limited English Proficient students performed considerably better in the electronic format than the Limited English Proficient students reading in the paper format. The electronic book features such as instant translation, text-to-speech, and hyperlinks to expanded informational resources are literally at the student's fingertips and seem to have made a difference. Building student confidence promotes risk-taking and growth in a student's reading ability. Greenlee-Moore and Smith (1996) suggest that one benefit of the electronic condition is the privacy of failure and the availability of resources to provide immediate scaffolding support.

One possible explanation for the lack of more significant difference in the study results could be that the district's eBook adoption initiative had only begun two years prior. Both

students and teachers still needed time to adapt to the new technology and maximize its full potential. The eBook implementation was still in its infancy. Guthrie and Davis (2003) found that many struggling readers, especially middle school students, disengage in reading comprehension when difficulties persist. Adapting to a new format for reading may have provided a level of frustration that may have also affected their reading comprehension.

Struggling readers are not restricted to the Limited English Proficient population but are present in all segments. eBooks may encompass distinct features facilitating reading comprehension across student populations, such as integrated dictionaries and customizable font sizes (Baron, 2015). These outcomes necessitate further exploration to clarify the specific elements contributing to reading comprehension for both Limited English Proficient and non-Limited English Proficient students when engaging with different book formats. Many of the features that eBooks bring, including text-to-speech, highlighting-as-read, and links to online resources, provide critical scaffolding supports for struggling readers who lack prior knowledge of the topic they choose to read. Anderson (1978) states that in the form of schemata, prior knowledge influences comprehension much more than earlier research suggested. So prevailing is the influence of prior knowledge on comprehension that Johnston (1984) found that prior knowledge of the topic is a better predictor of comprehension than an intelligence test score or a reading achievement test score.

Constructivist theory, in many ways, reinforces schema theory in highlighting the importance of the learner's active construction of new knowledge based on prior knowledge and experiences (Matthews, 2003). Vygotsky (1978), a proponent of Constructivist Theory, considered that a significant amount of development resulted from expert-facilitated scaffolding. He believed the beginner first experiences a particular set of cognitive activities in the presence

of experts and only gradually comes to perform these functions by themselves. The features made available through the electronic book can provide that expert-facilitated scaffolding that students need to build an understanding of what they have read when they lack prior knowledge.

Despite the study's limitations, the findings suggest moderate progress of 33% gain in the Limited English Proficient eBook group mean rank (*MR*=487.34) when comparing the difference in the Limited English Proficient pBook group mean rank (*MR*=460.76) and the non-Limited English Proficient pBook group mean rank (*MR*=539.71. Student success is consistent with the research of Greenlee-Moore and Smith (1996), who suggested that the privacy of failure and immediate scaffolding support provided by the electronic conditions can benefit students. Barger and Notwell (2013) found that several features of eBooks appealed to students, and the read-aloud feature was the most popular. One of the perks of the read-aloud feature is that it makes academic content accessible for struggling readers. The individual manipulation of the eBook features affords students autonomy or self-regulation in the learning process, factors that can motivate and strongly influence a student's reading success (Schunk, 2001).

Based on the moderate findings of this research study and the benefits other studies have reported (Barger & Notwell, 2013; Picton, 2014), educators should take an optimistic stance and continue endorsing the eBook format in support of Limited English Proficient students. They offer features such as instant translation, text-to-speech, and hyperlinks to expanded informational resources, which can provide many benefits. These features can enhance students' reading comprehension and build their confidence, promoting risk-taking and growth in reading ability. Future studies could focus on examining the long-term effects of eBook usage on Limited English Proficient students' reading comprehension and other literacy skills.

Conclusions and Interpretations for Research Question 3

What is the effect of reading books in paper versus electronic format on non-Limited English Proficient reading comprehension compared to Limited English Proficient middle school students in a South Texas school district?

To address the third research question, a Pairwise Comparison of Groups was used to compare the four sample groups' reading comprehension quiz scores means. The grouping was based on a cross-composition of two book formats (print and electronic) and two student population groups (non-Limited English Proficient and Limited English Proficient). The results showed an expected outcome of a statistically significant difference between the groups. The null hypothesis was not supported. However, the importance of this research question focuses on the difference within the groups as they are paired for comparison. To that end, the Pairwise Comparison of Groups section was reviewed. The pairing of interest for this research question was between the two print books sample groups and the two electronic books groups, which only differed in the categorical group based on their Limited English Proficient status.

It revealed that Group 1 - non-Limited English Proficient students reading in print books and Group 3 - Limited English Proficient students reading in print books were statistically significantly different. The null hypothesis was not supported. Conversely, the comparison of Group 2 - non-Limited English Proficient students reading in electronic books and Group 4 - Limited English Proficient students reading in electronic books was not statistically significantly different, and the null hypothesis was accepted.

This research question provides a broader perspective on the interrelation of the effect on the four groups observed because of the intervention, the electronic book format that was

introduced as an alternative to the paper book format (see Figure 5.1). Even though the participants randomly selected these books throughout the academic year, the difference in quiz score means for each format suggests a cause-and-effect relationship. Considering the score means of the printed book non-LEP and LEP sub-group who did not receive the treatment (eBook format), compared to the electronic book LEP sub-group score means, growth has occurred, just not statistically significant. That distinction provides the most insight into how the LEP eBook group relates to the pBook group's level of improvement in reading comprehension.

To explore if the electronic format positively affected the reading comprehension of the Limited English Proficient students to compensate for lack of background knowledge to comprehend what they read successfully. The results display a moderate trend in that direction but have yet to reach the statistical significance level of improvement.

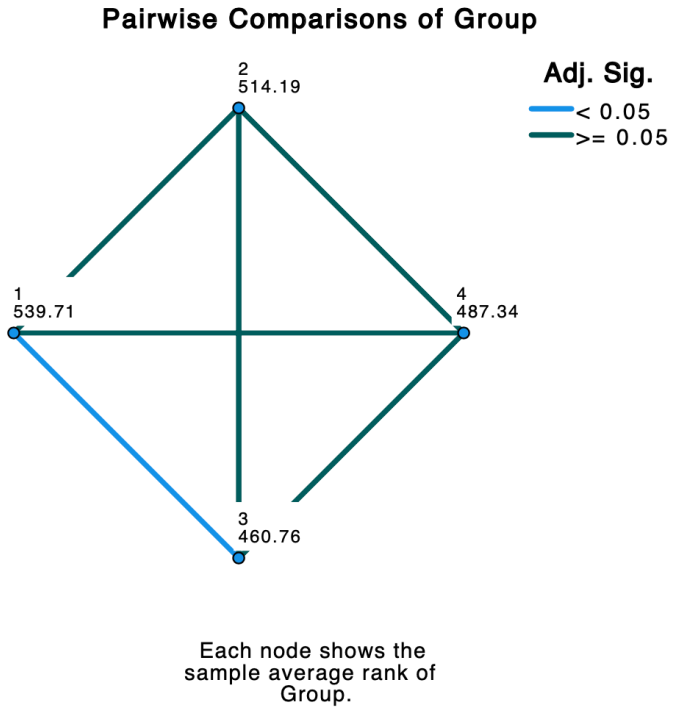

Figure 5.1

Pairwise Comparison of the Group

Implications for Practice

Implications for Practice Research Question 1

Considering the research outcomes, several implications for educational practice can be identified. First, it is incumbent upon administrators to anticipate any unintended consequences

of new technology implementation. The electronic book adoption is no different, recognizing that this technology's full potential and associated issues may only become apparent after an extended period. Secondly, given that the results do not demonstrate a significant difference in reading comprehension between print and electronic formats, decision-makers must also closely monitor and assess the benefits to ensure that continued financial investments in eBook technology are warranted. Thirdly, administrators must avoid overcorrection, as teachers and students may need more time to feel comfortable with the new technology before results are well pronounced.

This study may have been ahead of its time. However, change is coming so quickly that educational leaders must keep a pulse on issues of importance, such as reading comprehension and leveraging technology to maximize learning outcomes. It may have been more revealing to have selected only three out of the ten middle schools that self-reported the highest score for technology integration during their yearly justification for continued funding instead of including those who were trailing behind in adopting the electronic initiative.

Implications for Practice Research Question 2

The conclusions from this research question suggest that educational practitioners and administrators should hold the course on investment in the electronic book format to support the Limited English Proficient student population. There are signs of improvement regarding the Limited English Proficient student's outcomes in reading comprehension in the electronic medium. The availability of features such as instantaneous translation, text-to-speech functionality, and hyperlinks offering access to comprehensive informational resources through electronic books can boost reading comprehension even more and instill confidence (Wright, 2013). Student confidence fosters an environment conducive to risk-taking and further growth

in reading gains. Compared to other Limited English Proficient students reading in the paper book format, their gains to date are admirable and should be rewarded by continued funding. Subsequent studies could concentrate on examining the enduring consequences of electronic book use by Limited English Proficient students on reading comprehension and the improvement of additional literacy skills. In hindsight, including a survey of what electronic book features were most beneficial to the participant could have provided more insight into the effects of book formats on reading comprehension. By adopting these innovative approaches, researchers can contribute to developing more effective and evidence-based educational practices that cater to the diverse needs of Limited English Proficient students.

Future researchers should also consider exploring the impact of book formats on specific aspects of reading, such as vocabulary acquisition, fluency, or motivation. Adaptive learning algorithms and personalized feedback mechanisms can also better support Limited English Proficient students' academic development overall. Reflecting upon the methodology employed in this study, retrospectively selecting a control group with no intervention could have been possible. It might have furnished more valuable insights into the effects of book formats on reading comprehension.

Implications for Practice Research Question 3

The practical implications derived from the present study underscore the necessity for educators and researchers to contemplate the influence of book format on reading comprehension, particularly for Limited English Proficient students. Based on the outcomes of the current investigation, it may be advantageous for educational practitioners to supply print books for all students while continuing to offer eBooks as a viable option. To further illuminate this topic, future research endeavors could incorporate additional reading comprehension metrics

or examine the impact of book format on reading motivation and engagement. Explicit recommendations for future researchers encompass replicating the present study with augmented sample size, a more heterogeneous student population, or alternative age cohorts.

Some students performed as well or better in the electronic as in the paper format, suggesting that students at the research schools are on a path to transition to the electronic format. Considering the massive growth of the Limited English Proficiency population across the United States, targeting research-based efforts to support struggling readers makes sense.

Acknowledging the study's limitations, which may have contributed to the lack of significant results, is essential. This section notes those limitations and acknowledges that every attempt was made to minimize the effects of extraneous variables on the results of this study. As with all studies, there are aspects of this study that may limit the validity and generalizability of the results obtained. For example, the sample size was relatively large, and the study was conducted across the whole school district. Still, the convenience sampling of participants' data from a local school district with a primarily Hispanic, low socioeconomic status student population, with a Limited English Proficient population nearly twice the size of the state totals, may limit the generalizability of the findings.

In addition, the researcher could not control for potentially confounding variables, such as prior access to electronic book materials. Over 95% of the district's student population is classified as having low socioeconomic status, and varying levels of access to technology at school and home make an impact. Students from more affluent backgrounds could have more developed technology adaptation skills, resulting in higher ease of eBook use, which may have skewed the study results. A causal-comparative research design was used to achieve the purpose of the study while minimizing disruption to the educational environment. Gall, Borg, and Gall

(1996) noted that in studies employing a causal-comparative research design, determining causal patterns with any degree of certainty is difficult.

Educators may need an encouraging push from studies like this which may fall short of statistically significant results but at least provide a glimpse into the future success of the electronic format. Providing a clear indication of progress and potential can help stakeholders embrace the initiative and push it to the point of realizing it is an educational enhancement.

Recommendations for Future Research

Emerging research suggests a generational shift is occurring, hinting that digital reading might be more suited to the generation of children who have grown up using screened devices. Research should investigate which electronic book features contribute the most to supporting a student's reading comprehension development and recommend a protocol for prescribing the features in response to specific deficits the student needs to overcome. Future research endeavors could delve into diverse facets of eBook utilization and the effects on student's academic performance.

For instance, a prospective study could examine the growth in reading comprehension by comparing the Fall and Spring semester Accelerated Reader quiz scores, contrasting electronic book users with print book users. A longitudinal study that measures the growth in reading comprehension for students using print or electronic formats over an academic 3-year period provides a more comprehensive understanding of how book formats impact reading comprehension development over time.

Another possible investigation could implement a more structured reading program in which all participants read from a single listing of books as they registered for the study and

selected which book format (printed or electronic) they were willing to participate. This approach could help control for potential confounding factors related to book content and difficulty. The methodology would empower researchers to contrast the two groups' reading comprehension and engagement levels in a more controlled environment.

A subsequent study that explores the factors affecting struggling readers from taking advantage of the benefits of the electronic format would be valuable. With events such as the recent pandemic likely to reoccur, electronic books can mitigate the impact of remote learning. The new wave of Artificial Intelligence could help propel electronic book adoption as a means of monitoring and integrating adapted learning through its features to maximize comprehension. Collectively, these recommendations endeavor to foster further exploration of the intricate relationship between book format and reading comprehension to better support all students in their academic pursuits.

Summary

In conclusion, this study sought to examine the extent to which reading books in electronic format affects students' reading comprehension at the middle school level within a school district in South Texas; and if Limited English Proficient students receive any additional benefit. The analysis of the study results found no statistically significant effect on reading comprehension within the non-Limited English Proficient and Limited English Proficient students between the printed and electronic book formats. However, the Limited English Proficient electronic format group attained a higher quiz score mean rank than the paper format group, suggesting a positive effect. The electronic format intervention provided substantial gains in closing the gap in reading comprehension with the non-Limited English Proficient paper format group. The study school district was in its second year of implementation, and its

students and teachers justly required time to adapt to the new technology. They were only beginning to grasp its full capabilities. The importance of the study was the major implications on students' success across all subjects, given that reading comprehension is fundamental to learning across the curriculum, and that is still unchanged.

Additionally, the low reading comprehension in Hispanic, Limited English Proficient students negatively affects academic achievement. These outcomes show promise in addressing the challenges Limited English Proficient students face in overcoming a lack of background knowledge which can bring what they read in focus and allow comprehension. Success in reading comprehension also translates into success across all subjects, given that reading is fundamental to learning across the curriculum. As researchers look for areas needing further study, which will make the most significant contribution to student success, the electronic format should be at the top of the list. There is no time to wait and see if eBooks are an educational enhancement or novelty before we choose to study the phenomena.

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APPENDIX A

APPENDIX A

DISTRICT APPROVAL LETTER

January 23, 2019

To Whom It May Concern:

In accordance with Board Policy GBAA (LEGAL), Information Access Requests for Information, I have reviewed Mr. Felipe Reyes' request for District records for use in his proposed retrospective quantitative study examining the effect of electronic books on reading comprehension. Approval is granted with the condition that all personally identifiable information will be removed and an anonymized identification code assigned before the records are released from the District. The information may be used for research purposes only.

Sincerely,

Dr. Esperanza Zendejas
Superintendent of Schools

APPENDIX B

APPENDIX B

EXEMPT DETERMINATION FOR IRB-23-0017

The University of Texas Rio Grande Valley
Institutional Review Board

January 19, 2023

Felipe Reyes, Principal Investigator
Department: College of Education

Via Electronic Routing System

Dear Principal Investigator:

RE: EXEMPT DETERMINATION FOR IRB-23-0017 "Dissertation - eBooks:"

The study in reference has been determined 'Exempt' under the Basic HHS Policy for Protection of Human Research Subjects, 45 CFR 46.104(d). The determination is effective as of the date of this letter within the exempt category of:

> *"(1) Research, conducted in established or commonly accepted educational settings, that specifically involves normal educational practices that are not likely to adversely impact students' opportunity to learn required educational content or the assessment of educators who provide instruction. This includes most research on regular and special education instructional strategies, and research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods."*

Research that is determined to be 'Exempt' under the Basic HHS Policy for Protection of Human Research Subjects is not exempt from ensuring protection of human subjects. The Principal Investigator (PI) is responsible for the following through the conduct of the research study:

Assuring that all investigators and co-principal investigators are trained in the ethical principles, relevant federal regulations, and institutional policies governing human subjects' research.

1. Disclosing to the subjects that the activities involve research, and that participation is voluntary during the informed consent process.
2. Providing subjects with pertinent information (e.g., risks and benefits, contact information for investigators, and IRB/ORC) and ensuring that human subjects will voluntarily consent to participate in the research when appropriate (e.g., surveys, interviews).
3. Assuring the subjects will be selected equitably, so that the risks and benefits of the research are justly distributed.
4. Assuring that the privacy of subjects and confidentiality of the research data will be maintained appropriately to ensure minimal risk to subjects.

Exempt research is subject to the ethical principles articulated in The Belmont Report, found at the Office of Human Research Protections (OHRP) Website: www.hhs.gov/ohrp/humansubjects/guidance/belmont.html

Unanticipated Problems: Any unanticipated problems or complaints must be reported to the IRB promptly. Further information concerning unanticipated problems can be found in the IRB procedures manual.

Continuing Review: research deemed 'Exempt' is not subject to annual review by the IRB.
Modifications: Any change to your protocol requires a Modification Request (Amendment) for review and approval prior to implementation. The IRB may review the 'Exempt' status at that time and request an application for approval as non-Exempt research.

Closure: Please notify the IRB when your study is complete through submission of a final report. Upon notification, we will close our files pertaining to your study.

If you have any questions, please contact the Human Subjects Protection Program/IRB by phone at (956) 665-3598 or via email at irb@utrgv.edu.

Sincerely,

Institutional Review Board for the Protection of Human Subjects in Research

BIOGRAPHICAL SKETCH

Felipe Oscar Reyes is a graduate of the University of Texas Rio Grande Valley, earning a Doctorate of Education in August 2023 specializing in Educational Technology, a graduate of the Army War College earning a Master of Science in 2008 specializing in Strategic Studies, a graduate of Webster University earning a Master of Arts in 1991 specializing in Computer and Information Resource Management, and a graduate of Texas Arts and Industry University in 1982 specializing in Industrial Arts – Secondary Education.

As an educator he began his career as a teacher at the secondary level, progressed to Lead Teacher at the district level and then serve as Senior Specialist for Career and Technical Education at the Regional Service Center supporting the school districts in South Texas. He was then awarded both the Principal Certification, the Superintendent Certification and went on to serve as Principal and at various Administrator positions in Career and Technical Education, Library and Media Services, and Facility and Maintenance Operations. Dovetailed into his twenty-five year educational career, Colonel Felipe O. Reyes also served in the US Army as a Logistics Officer for thirty-two years ending his military career as the Group Commander for the Sub-area Petroleum Office in Southwest Asia on his third deployment into the war zone.

Dr. Reyes can be reached by email at felipereyes@me.com regarding this study.