

**A Comparative Study of Students Comprehension Scores When Taught Using Physical
Texts and Digital Texts in a 4th Grade ELA Classroom**

By

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Abstract

The purpose of this study was to compare the outcomes of reading comprehension scores across two mediums, print and digital books in a fourth grade English Language Arts (ELA) class. The sample for this study consisted of fifteen students between the ages of nine and ten. Data were collected using two ELA practice checkpoint tests after two equal units in comprehension and difficulty were taught. One unit was taught using digital books and the other unit using print medium. Each test consisted of two texts and comprehension questions. Students took one test on paper with pencil, and another digitally using a Chromebook. The results indicated a significant difference between physical and digital texts, with digital texts outperforming physical texts. The results also indicated that females scored higher than males using the digital text, and males scored higher than females using the physical text. The results suggest that classroom teachers should teach reading comprehension strategies using methods for both physical and digital texts.

Key words: Comprehension, Digital Text, Physical Text, ELA.

Chapter 1 Introduction

There are countless studies out there where the effect of print versus digital books has been discussed and observed. As far as what is currently known about this problem of practice many factors continue to change, making some aspects difficult to determine. Many research studies found that because of the ever-changing world of technology, new digital mediums that allow students to access books continue to change. As well as how students are able to annotate and use comprehension skills, they have originally been taught using print books. Of the four research studies one found little to no relationship difference between physical or digital books and comprehension. The other three found slight differences, favoring print mediums. According to the study *A Comparison of Children's Reading on Paper Versus Screen: A Meta-Analysis*, it was, “found that when the paper and digital versions of the story are practically the same and only differ by the voiceover or highlighted print as additional features in the digital book, then paper outperforms digital” (Furenes et.al 2021). This evidence shows that this group of students comprehend the text more when it was read aloud using a physical book. The study, *Digital or Print? A Comparison of Preschooler's Comprehension, Vocabulary, and Engagement From a Print Book and an e-Book* by a group at the University of California, Irvine found that there were slightly higher comprehension scores using print, but the level of engagement was higher for digital books, making the reading process more enjoyable for some students. Jan Eyre's research study found that, “in our modern world, there is a place for both reading on paper and reading online” (Eyre 2017). Eyre determined that though there is more of an attraction to reading digitally, reading comprehension often comes out higher when using print mediums. In Ayşegül Kaban and Sirin Karadeniz's research study on screen versus paper reading, similar findings arose regarding reading comprehension and motivation/engagement. More students were

motivated and engaged with digital mediums of books. However, this study found that there was no significant difference in reading comprehension of the two mediums.

Most of these research studies pointed to the fact that there is a slight positive relationship between reading comprehension and physical books when compared to reading comprehension and digital books. Many of the studies also found that reading motivation is positively influenced when students read using digital books. Right now, what is currently known about this problem of practice is that physical books support reading comprehension more than digital books because students are accustomed to using reading comprehension strategies they have been taught while using print books rather than digital books.

Though each of these four studies gathered information on reading comprehension of physical and digital books similarly, each one also had some unique qualities that contributed to their information on the topic. Many of them selected groups of students to observe while one drew information across over one-hundred different studies. All of these studies used methodologies that compared reading comprehension between print (physical) books and digital books.

Jan Eyre's article *On or Off Screen: Reading in a Digital World* took place in New Zealand and collected data by using results from both online and print versions of the PAT: Reading Comprehension. This exam is designed for children aged four to ten and is used as a standardized assessment in New Zealand. Eyre compared over 200,000 exams, both print and digital. After careful comparison Eyre found that student's comprehension scores tended to be lower when they had taken the online version of the PAT. Eyre also compiled research concerning how reading comprehension strategies that are taught using print books and texts need to be practiced using digital books as well.

The study *A Comparison of Children's Reading on Paper Versus Screen: A Meta-Analysis* studied inconsistent findings regarding reading comprehension between print and digital books. The researchers quantitatively reviewed 39 studies across 30 articles totalling 1,812 children between the ages of one to eight years old. Components the researchers considered was access to a dictionary or on-screen vocabulary words, story enhancing elements, and adult support. Taking all these elements into account the study found that overall students performed better with print books and adult support versus digital book mediums.

Ayşegül Kaban and Sirin Karadeniz's study *Children's Reading Comprehension and Motivation on Screen Versus on Paper* takes place in Turkey and collects data from 96 sixth grade students during a five-week period. The study sought to examine students' behaviors and reading comprehension when reading print and digital books. There were four treatment groups included within the study as well as one control group. The tested student groups read in the following order, personalized/gamified/PDF digital reading. Whereas the control group strictly read print books throughout the duration of the study. The study observed English as a foreign language learners (EFL) to see how the two mediums affect motivation and reading comprehension. The study found similar findings to the previously mentioned studies in that digital books motivated students to read more than print, however, there was no real significant difference in reading comprehension across the two mediums.

In the study, *Digital or Print? A Comparison of Preschoolers' Comprehension, Vocabulary, and Engagement From a Print Book and an e-Book*, conducted by a team of researchers at the University of California, Irvine two-hundred students were included in a study of reading comprehension using print and digital books. The students were ages three to five years and had the texts on both mediums read aloud to them. The digital books included a

recorded reading, and the print books were read aloud by an adult. The students were randomly assigned either a print or digital book. The study found that those who had the print book read aloud to them scored higher on a reading comprehension exam where comprehension, vocabulary, and engagement were measured. The study also found that females scored higher than males in both mediums.

The research articles that I compiled for my evidence all show comparative studies of reading comprehension using print books and digital books. The problem of practice in this study is to compare my own students' reading comprehension scores when taught using physical (print) books versus lessons being taught using digital books. The data I collect will reflect fourth grade ELA students' reading comprehension, I will also observe student motivation between the two platforms. Each of the four research studies observed student reading motivation as well. By using information from these studies, I was able to develop a plan of research action that will best show results between the two mediums. Collecting data in this area will help educators determine what classroom libraries should look like, what digital reading platforms should be used, and what student comprehension strategies should be practiced using both print and digital books.

One study conducted by a team at the University of California, Irvine determined that though there is more of an attraction to reading digitally, reading comprehension often comes out higher when using print mediums (Eyre 2017). More in-depth research on various studies will be discussed later in Chapter Two. Because I observed these differences myself between the two mediums it led me to look into teaching two lessons using two similar books, one lesson taught with a physical book and the other with a digital book, in order to compare comprehension scores of the two mediums. At the beginning of my research process, I researched four articles

on studies that all compared the effects of print versus digital on reading comprehension across multiple age groups and countries. The findings of the articles were helpful in mapping out my own study of the problem of practice. For this study twenty-five current fourth grade students will be taught lessons with both physical and digital books. The hope for the results of this study is to show if there is a difference in comprehension scores between physical and digital reading. The results of this study could help educators know what online platforms to use or how to build a successful classroom library, each to encourage students to read using a medium that best supports reading comprehension.

Statement of the Problem

Over the past several decades the world of technology has been developing at a rapid rate. Today's younger generations were born into a world where almost everyone has their own personal device that can take the place of multiple items all at once. Because of this more and more students across the world have access to a wide range of digital books and textbooks. Studies have looked at the comparison between physical (print) books and digital in relation to students' reading comprehension (Furenes et al. 2021). Since the world of technology continues to develop with every passing school year, it only makes sense that we understand the effects that reading books digitally rather than physically has on reading comprehension in today's student population.

Purpose of the Study

The purpose of this study is to compare students' comprehension scores when taught using digital texts and when taught using physical texts in a fourth grade English Language Arts classroom.

Significance for the Study

In general, students who have access to a personal tablet or computer during class time are more motivated to read using that device. Studies have shown that in the comparison of physical books versus digital books, students are more motivated to read by digital books (Kaban 2021). Because of this, the question of reading comprehension arises. Since students are more generally motivated to read when using digital books, incorporating these books into lessons could mean more student engagement. However, it is important that we look at the issue of comprehension and whether there is a difference between physical and digital book comprehension scores. If not, then more educators can consider the content of both their classroom libraries and what platforms they have for digital books.

Definitions

Accelerated Reader: A website created by Renaissance that provides reading comprehension quizzes across various reading levels.

Physical texts: Texts read from physical, print paper and includes test questions read and answered on physical, print paper.

Digital Texts: Texts read digitally on a Chromebook computer and includes test questions read and answered digitally on the same device.

Comprehension Scores: Test scores derived from the two tests, physical and digital. Questions asked are based off texts within the test and scores show how well students comprehended the texts.

4th Grade ELA class: This class is a Fourth Grade English Language Arts class consisting of twenty-six students, fifteen of which make the sample for this study.

Limitations

Some limitations and delimitations present themselves through this study. Some limitations include student/participant attendance. This aspect is beyond researcher control and could potentially skew results. Some limitations include the number of lessons taught and length of the lessons. As the researcher and teacher of the lessons are limited to a time frame.

Organization of the Study

This study will take place in a fourth grade English Language Arts classroom. There are twenty-six students total in the class, fifteen will be used as the sample. The first step in this study is obtaining permission from the Milligan IRB, followed by the school district and parents of participants. After all permission is obtained the data collection will begin. The study will be set up in a way where two weekly lessons will be taught. At the end of each weekly lesson students will take a comprehension test based on the content they just learned. One test will be taken digitally, and the other physically. The results of these two tests will be used to compare students' comprehension between the two mediums. Data collected for this study will be analyzed quantitatively using SPSS version 28. All research questions addressed in this study will be analyzed using dependent and independent samples t-tests. Data will be analyzed at .05 level of significance. The first chapter of this study gives an overall introduction to the study. The second chapter includes a review of related literature on physical and digital book comprehension. The third chapter discusses methodology and procedures, along with the population, sample, data collection instruments, and research questions and related hypotheses. The fourth chapter includes the data analysis and the collection of data. The fifth chapter includes a summary of findings and recommendations.

Chapter 2

Introduction

Across the globe school districts have been integrating technology and one to one access to personal devices in classrooms of all grade levels. Student access to these devices not only enhances student engagement, but provides opportunities for online, digital reading. However, the effectiveness of digital reading compared to physical book reading when it comes to comprehension has been questioned and studied numerous times spanning from Pre-K, all the way to the university level (e.g. Reich et al., 2019. KAZAZOĞLU, 2020). The medium or device that a text is delivered to students affects the transaction, or comprehension (Çetin & Kılıçkaya, 2019). Which is why understanding the relationship between comprehension and physical versus digital reading is important. To measure the effectiveness of digital versus physical print books and text, researchers have used forms of comprehension exams to identify any differences. An understanding of student's reading comprehension skills are needed at all educational levels (Çetinkaya Özdemir & Akyol, 2019). In their process of creating a successful reading comprehension exam Özdemir and Akyol (2019) stated that testing is an important way to measure the success of the students' education. By using comprehension exams educators and researchers can better understand the relationship between comprehension and physical versus digital books and texts. When educators gain an understanding of the relationship, they will be better equipped to plan reading strategies for their students based on both physical and digital books. These comprehension exams have been observed through studies in elementary settings (e.g. Reich et al., 2019. Wang et al., 2019. Neuman et al., 2017) where the differences in comprehension between the two mediums were, for the most part, mixed in results. These exams have also been used in middle, high school, and university settings (e.g. Goodwin et al., 2019.

Haymon & Wilson, 2020. Sackstein et al., 2015), where the differences in comprehension between physical and print books was also mixed and did not consistently show evidence that one medium showed higher levels of reading comprehension than the other.

Physical and Digital Books in Lower Elementary Settings

Properly understanding the effectiveness of digital reading in early learning years and lower elementary grades is important because children in today's society are exposed to digital screens so early in their cognitive development. Tablets and computers are a part of children's everyday activities (Rideout, 2017), both in school and at home. A 2015 (Blackwell et al. 2015) study reported that over half of the preschool teachers surveyed, used digital tablets for instructional purposes in their classrooms (Blackwell et al. 2015). However, with digital reading children are lacking the movements of holding a book and flipping through the pages. Instead, many digital books flip automatically and offer Read-to-Me voice overs. Researchers have asked if these differences play a role in both plot and vocabulary comprehension.

One study conducted in 2019 observed two hundred students aged three to eight and tested them on both plot and vocabulary comprehension using a digital e-book and a physical print book (Reich et al., 2019). The findings of this study showed that though students expressed more engagement with the digital e-book, comprehension was higher when students were read to using a physical print book. Another study found that reading speed and accuracy were negatively affected when students are required to fulfil cognitively demanding tasks when reading books in a digital form (Çetin & Kılıçkaya, 2019). A 2021 study (Furenes et al., 2021) found also observed students on digital and print reading comprehension and found that students performed higher when reading physical print books (Furenes et al., 2021). The importance of this information is that it shows how young, developing students comprehend more when a

physical book is in front of them. This information, among other studies regarding comprehension in lower elementary students, enable educators to formulate a classroom reading strategy for their students. The educator will know that having an expansive classroom library with a variety of physical books for students will enhance student reading comprehension in comparison to relying on digital e-book reading platforms. However, it is still important to note that digital e-books may carry more engagement solely because of their digital form.

A similar study was conducted in 2017 (Neuman et al., 2017) where researchers observed pre-school student's comprehension of oral language when read to using a physical print book and when read to using a digital book. The study arose because of the rise in technology put into the hands of young children. Because of this, it is important to critically understand the role of media exposure and digital screens in children's vocabulary and comprehension (Neuman et al., 2017). In comparison to the previous study mentioned above (Reich et al., 2019), this study found no significant difference between physical print books and digital books when it came to children's comprehension of the story. This shows that the content of the book, rather than the medium, plays a role in predicting comprehension exam results (Neuman et al., 2017). Though this study found no significant difference educators must remember to consider the developmental age of lower elementary students and the expectations they will encounter throughout their educational career. These expectations could include reading material from one medium over the other. Educators need to remember that even if students comprehend content similarly across physical and digital books, they should be equipped with reading strategies that allow them to be successful readers across both mediums.

Because reading is such a large focus in lower elementary, educators spend time crafting exactly what reading time will look like in their classrooms. This comes in forms of interactive

read alouds done by the teacher, independent reading, and buddy reading. Buddy reading is a reading strategy where students are expected to ask questions about the text, draw attention to the content, debate, and negotiate with a peer (Wang et al., 2019). With beginning readers buddy reading can help students comprehend more about the story because they have a peer to interact with about the text. In a 2019 study on buddy reading in a Kindergarten classroom (Wang et al., 2019), researchers looked at the relationship between buddy reading, digital books, and comprehension. The study found that students working in pairs did show higher signs of comprehension than those working in triads (Wang et al., 2019). Research also shows that students working in peer tutoring groups positively influence reflective knowledge building, comprehension monitoring, and the elaboration of explanations (Tsuei et al., 2020). Evidence that students work well in peer groups led Wang et al. (2019) to challenge students in buddy reading by providing students with engaging e-books that offered more than a Read-To-Me feature. The e-books included animations and hotspots. These extra effects, though they did not affect reading comprehension of the story itself, did provide room for distractions, especially when students were paired up. Despite this form of digital book not affecting overall reading comprehension, the busyness of the elements included in the text should be considered when allowing students to engage in digital reading. It is also important to remember that though proximity and access to digital reading resources should not be minimized, these resources should not be detracting print resources (Ciampa, 2012). Students should understand both physical print and digital based books.

Studies that observed the relationship between digital reading and comprehension and found that there was no significant difference in results when compared to physical print reading (e.g. Neuman et al., 2017. Wang et al., 2019), argue that digital reading platforms can enhance

not only student comprehension, but engagement and literacy skills as well. However, digital technology use in classrooms does not have to be in competition with traditional literacy (Knapp, 2019). In 2019 Knapp observed how digital technology can be used in classrooms and school libraries to support and enhance more traditional literacy skills (Knapp, 2019). Sackstein, Spark, and Jenkins (2015), tested the reading comprehension of sixty-eight students across both physical book and digital e-book reading platforms. The study concluded that there was little to no difference in the reading comprehension scores between the two platforms. In relation to Knapp (2019), the researchers declared that digital e-books provide evidence that tablets and other digital reading platforms are suitable for learning and literacy skills (Sackstein et al., 2015). The two studies agree that digital reading sources can enhance student learning, even if there is no change in comprehension when compared to physical print reading.

Physical and Digital Books in Upper Elementary and Middle School Settings

In relation to lower elementary grades, upper elementary and middle school settings also carry a heavy importance of reading comprehension. In these grade levels students begin reading more advanced texts and expectations are raised. Numerous studies (e.g. Goodwin et al., 2019. Haymon & Wilson, 2020), observed the difference between physical print and digital books when testing for reading comprehension.

In 2019 Goodwin et al. compared middle school student's reading comprehension scores using both physical print and digital reading mediums. The researchers noted the rapid expansion of technology integration into curriculum and classrooms. At the time of the study, the digital reading transition had expanded without too much of an understanding of the differences between digital and physical mediums for reading (Goodwin et al., 2019). The study included three-hundred and seventy-one fifth to eighth graders who completed a reading task and

comprehension exam like that of a standardized test (Goodwin et al., 2019). Those who read on paper had a two page, front and back text with ten comprehension questions. Those who read digitally had to scroll through the text and answer ten comprehension questions on the side of the screen. A relationship was found between highlighting and annotating text and paper mediums. Through this study the researchers found that students who completed the reading and test taking on paper performed better than those who completed the reading and test taking digitally (Goodwin et al., 2019). These results show the importance of teaching annotation skills when both reading and test taking. If educators and school districts continue to advance into more digitally focused classrooms, then educators must begin putting emphasis on digital annotating as well. Doing so may increase reading comprehension scores when students are reading and test taking digitally, like in this study.

Observing the relationship between comprehension and reading in digital form versus physical form is not only important in the general education classroom, but in areas of giftedness as well. Haymon and Wilson (2020) conducted a study on gifted middle school students and how differentiated reading instruction using technology affects their reading achievement. The researchers stated that students who struggle with reading comprehension potentially struggle because of the lack of individualized reading instruction (Haymon & Wilson, 2020). With a more focused approach towards individualized reading instruction in all areas of education, overall reading comprehension may increase across both mediums of physical and digital books. This relates with Naumann and Salmerón (2016) who studied the relationship between digital reading comprehension and navigation of online reading materials. They found that it was strong comprehenders who also benefited from efficient navigation the most (Naumann & Salmerón, 2016). This relationship between digital reading comprehension, online navigation, and

individualized reading instruction shows that all three must be considered when designing reading strategies for students. It also shows how all three must be considered when measuring students' reading comprehension. These studies, though they each support digital reading, related to the statement made by Ciampa (2012), that it is essential to remember that though proximity and access to digital reading resources should not be minimized, the resources should not be detracting from print resources (Ciampa, 2012), especially when a print medium may benefit the student more due to poor online navigation skills or other factors.

The studies mentioned above (e.g. Goodwin et al., 2019. Haymon & Wilson, 2020) show how reading comprehension, digital, and physical print books all relate to one another in upper elementary and middle school settings. In comparison to the lower elementary focused studies (e.g. Reich et al., 2019. Wang et al., 2019) these studies also found that literacy skills can be built by using digital books. However, the effects of comprehension when using digital or physical print books, was mixed. Growing developments in the digital world can greatly affect teachers, children, and reading education (Blanchard & Farstrup, 2011). Studies show that digital books, because of their engagement opportunities and their relationship to comprehension, could affect the way classroom teachers and students engage in literacy activities.

Physical and Digital Books in Special Education and English Language Learning Settings

Many research studies lay a heavy emphasis on the general education classroom. However, special education classrooms and English language learning settings must be accounted for when determining the relationship between student's reading comprehension and digital versus physical print books and texts. Both of these settings depend on read aloud accommodations for students to hear and comprehend the written material in front of them. Many times, these settings turn to providing students with digital Read-to-Me functions.

However, are these digital mediums the best for comprehension compared to being read to from a physical print book? Because of the complex nature of reading, an in-depth examination of digital reading is needed (Çeliktürk Sezgin, 2021). For students who have a learning disability or are learning to speak the English language, reading is truly complex. Because of this, educators must make sure they choose the best and most effective mediums and content for these learners that will best enhance their comprehension. A 2020 study (KAZAZOĞLU, 2020) observed how print versus digital print mediums fared against one another in a university setting. The study included a sample of English language learning students where the result showed that most English learners favored reading digital texts with links and pictures, over print materials (KAZAZOĞLU, 2020) Other researchers have conducted similar studies involving English learners, in order to determine which mediums, the students comprehend from the most. In comparison to the previous study (KAZAZOĞLU, 2020), a 2019 study also found that English learners who used an electronic reading program had not only higher engagement, but that the digital program supported their literacy development and comprehension (Yow & Priyashri, 2019).

A 2019 study (Pardede, 2019) focused on print versus digital reading comprehension involving English language learners. The study stated that one of the most vital skills every English as a foreign language learner must master is reading (Pardede, 2019). Having the skill set to read well and comprehend well, is a skill all readers must achieve. Pardede stated that, “due to the vital role of reading, imparting this skill has long been one of the priorities in EFL learning and teaching. To facilitate it, printed texts have long played a great role in EFL classrooms. However, the current influx of digital texts has caused a fundamental change in the ways today's students read” (Pardede, 2019). In comparison to other researchers Pardue also

understands the influx of technology in the world of education. These digital resources have been studied and compared to print resources time and time again in order to best understand their role in the classroom. Findings have shown mixed and inconsistent results on whether digital or physical print books have more of a positive effect on reading comprehension. These findings are probably attributed to the levels of technological advancement, a student's familiarity with computers, and the student's mastery of digital reading skills (Pardede, 2019). All of these elements, technological advancement, familiarity, and mastery all contribute to how well an English language learner will comprehend from a digital text, as well as a student in a general education classroom. These are elements that all lead into further study on the contributing factors of digital reading and comprehension.

Another study conducted in 2013 (Chen et al., 2013), observed the effects of comprehension, reading attitude, and vocabulary when English language learners read via e-books. The study observed eighty-nine students in total. Forty-six students made up the experimental group, where a ten-week e-book reading program was implemented. The control group consisted of forty-three students. The researchers chose this method in order to determine a relationship between English language learner's reading comprehension and digital versus physical print mediums. The study found that the experimental group exhibited more positive reading attitudes, comprehension, and vocabulary than the control group (Chen et al., 2013). This digital e-book reading program showed that English language learners improved on their literacy skills more so than when reading solely on physical print resources. This study and the former study (Pardede, 2019), relate to one another because each emphasizes the importance and overall positive effects of digital reading in an English language learning setting.

In regard to reading comprehension and English language learners, digital reading and comprehension showed positive results when compared to physical print reading comprehension. In a similar fashion a 2020 study (Grindle et al., 2020) that focused on the reading comprehension concerns surrounding students with Autism, showed similar results. The study included six students (three male, three female) ages six to eleven. The participants went through the internet-based reading comprehension program, Headsprout Reading Comprehension (Grindle et al., 2020). Findings demonstrated that students with Autism had increased reading comprehension when using this program. In comparison to studies based on lower elementary (e.g. Reich et al., 2019. Wang et al., 2019) and upper elementary and middle school (e.g. Goodwin et al., 2019. Haymon & Wilson, 2020) these three studies surrounding the settings of special education and English language learners (e.g. Pardede, 2019. Chen et al., 2013. Grindle et al., 2020) showed more consistent results in regard to the relationship between reading comprehension and digital versus physical print books. Lower elementary, upper elementary, and middle school-based studies all exhibited mixed results. However, special education and English language learners exhibited results where digital reading platforms were favored over physical print mediums. These online, digital resources are a way for special education and English language learning students to practice proficiency in their reading and literacy skills.

Conclusion

Because the world of technology continues to expand with every passing day, researchers and educators alike have observed the true relationship between reading comprehension and digital versus physical print mediums. Reading instructors often use their knowledge and understanding of reading comprehension skills to guide them in accelerating their students (Boudreaux, 2016). The level of experience that an instructor has with digital resources and

books also plays a part in how students will use either digital or physical print mediums in their classroom. Many studies have shown positive relationships between digital reading mediums and reading comprehension, especially in younger ages. Digital reading is an important part of information literacy, where students demonstrate the ability to think critically and make judgments (Lim 2020). Having those literacy skills and the ability to think critically help a student's comprehension. Despite studies in various areas such as elementary and middle school showing mixed results when it came to reading comprehension and digital versus physical print mediums, some areas, such as English language learners, showed more consistent results. These results found that comprehension was positively correlated with digital reading in these settings. Despite the mixed results on comprehension, findings have shown that students prefer digital reading over print reading because they feel more motivated and interested (Manalu, 2019). Studies have shown that many factors are at play when it comes to reading comprehension and digital versus physical print mediums. Factors such as the class setting, student learning needs, and engagement. All these factors play a role in the outcomes of reading comprehension though both digital and print mediums.

Chapter 3

Introduction

The purpose for this research is to compare the effects of reading comprehension across the two mediums, print and digital books in a fourth grade English Language Arts (ELA) class. In this chapter information about the study Population, Sample, Data Collection Procedures, overall study Procedure, and the Research Questions and Hypotheses. The Population includes information on the school where the study was conducted. The Sample reviews information on the study's sample. The Data Collection Procedures are described with detail and include information on data collection steps as well as data analysis. The Procedure reviews the procedures that occurred both before and during the study. Three research questions and three hypotheses are included, as well as three null hypotheses.

Population

Research participants for this study came from a suburban Title One elementary school consisting of approximately three-hundred and eighty PreK to fourth graders. The minority enrollment of the school at the time of study was 34%. Female enrollment was 51% and male enrollment was 49%.

Sample

The class involved in the study was one of the three fourth grade ELA classes at the school. The class consisted of twenty-six students total, fifteen students were used as the sample for this study. The minority population at the time of the study was 16%. Five students out of the twenty-six had Individualized Education Plans (IEPs). There were no English Language Learners (ELLs) or students with 504s included in the sample. There are thirteen females and thirteen males included in the sample of the study.

Data Collection Procedures

Data was collected at the end of two weekly reading lessons. One lesson ended with a paper district-made Reading Checkpoint exam where students read multiple passages and answered comprehension questions. The second lesson ended in a similar fashion; however, the students took a digital exam of the district-made Reading Checkpoint exam where they read multiple passages and answered comprehension questions. Scores were recorded by the instructor and Principal Investigator. Data collected for this study was analyzed quantitatively using SPSS version 28. All research questions addressed in this study were analyzed using dependent and independent samples t-tests. Data was analyzed at .05 level of significance.

Procedure

Before the study began, permission was granted from the Milligan University IRB, as well as the school principal. Forms were sent home informing parents and guardians of the study, allowing them to grant permission for their child to participate. The participants' everyday school routines were not affected by the study. The exams took place at the end of two separate units. There were twenty-six total student participants in the sample for this study.

Research Questions and Hypotheses

Research Question 1: Is there a difference between students reading comprehension scores when using digital versus physical texts?

Hypothesis 1: There is a difference between students reading comprehension scores when using digital versus physical texts.

Null Hypothesis 1: There is no difference between students reading comprehension scores when using digital versus physical texts.

Research Question 2: Is there a difference between gender on reading comprehension when using digital texts?

Hypothesis 2: There is a difference between gender on reading comprehension when using digital texts.

Null Hypothesis 2: There is no difference between gender on reading comprehension when using digital texts.

Research Question 3: Is there a difference between gender on reading comprehension when using physical texts?

Hypothesis 3: There is a difference between gender on reading comprehension when using physical texts.

Null Hypothesis 3: There is no difference between gender on reading comprehension when using physical texts.

Chapter 4

Introduction

The purpose of this study was to determine the relationship between reading comprehension and physical texts versus digital texts, as measured by English Language Arts Practice Checkpoint tests. A total of three research questions were used to guide this study. The software program SPSS Statistics was used to conduct a Paired Samples T-Test and two Pearson Simple Correlation Coefficient tests.

Data Collection

The data for this research was collected by administering two ELA practice checkpoint tests on two different test days (90 minutes each) to a sample of fifteen fourth grade students. The tests used were district made practice checkpoint tests. One test was given on physical paper with pencil, and the other was given digitally using a Chromebook computer on Illuminate Itembank. The tests included two passages and questions based on the passages. The students participated in two weekly lessons and tested at the end of each week's lesson. There was a total of nine males and six females in the sample size. The ages of the participants ranged from nine to ten years of age. The demographic profile for the participating students is displayed in Table 1.

Table 1

Demographic Profile of Participating Students

| Gender (%) | Frequency | Percent |
|------------|-----------|---------|
| Male | 9 | 60 |
| Female | 6 | 40 |
| Total | 15 | 100 |

Research Question 1 and Related Hypotheses

Research Question 1: Is there a difference between students reading comprehension scores when using digital versus physical texts? The Null Hypothesis was, there is no difference between students reading comprehension scores when using digital versus physical texts. Null hypothesis one was proven false due to a slight difference in the means of Physical Texts and Digital Texts. To answer research question one, the data from the two practice checkpoint tests were collected and compared using a Paired Samples T-Test. The mean score for the Digital Text was 89.66, whereas the mean score for the Physical Text was 89.33.

Research Hypothesis 1: There is a difference between students reading comprehension scores when using digital versus physical texts. The two mean scores of Digital Text and Physical Text were compared for a difference. In order to determine if there was a significant difference a Paired Samples T-Test was conducted. A significant difference between the means of Physical Text and Digital Text ($t(14) = .082, p < .05$) was found. The means for Digital Text was slightly higher ($M = 89.66, sd = 12.57$) than the mean for Physical Text ($M = 89.33, sd = 7.98$). The Calculated Effect Size was .02. The results are displayed in Table 2.

Table 2

Paired Samples T-test Scores of Physical and Digital Texts

| Variable <i>ES</i> | <i>M</i> | <i>SD</i> | <i>df</i> | <i>t</i> | <i>p</i> |
|-----------------------|----------|-----------|-----------|----------|----------|
| Digital Text .02 | 89.66 | 12.57 | 14 | .082 | .001 |

Physical Text 89.33 7.98

Note $p < .05$

Research Question 2 and Related Hypotheses

Research Question 2: Is there a difference between gender on reading comprehension when using digital texts? The Null Hypothesis was, there is no difference between gender on reading comprehension when using digital texts. To answer research question two, the data collected was compared using an Independent-samples T-test. The test found that males scored lower than females when it came to the digital test. Males scored a mean of 85.55 and females scored a mean of 95.83.

Research Hypothesis 2: There is a difference between gender on reading comprehension when using digital texts. An independent- samples t-test comparing the mean scores of males and females digital test comprehension scores was conducted. Levene's test for equality of variances indicated the variances were assumed equal ($p=.001$). A significant difference between the means of the two groups ($t(13)=1.624, p<.05$) was found. The mean for the males was significantly lower ($M= 85.55, sd=14.26$) than the mean for the females ($M=95.83, sd=6.4$). An effect size of .866 was realized. Hypothesis 2 was proven true, there is a difference between gender and reading comprehension while using digital texts. The results are displayed in Table 3.

Table 3

Independent - Samples t-test on Gender and Digital Texts Comprehension Scores

| Gender | <i>M</i> | <i>SD</i> | <i>df</i> | <i>t</i> | <i>p</i> | <i>ES</i> |
|--------|----------|-----------|-----------|----------|----------|-----------|
| Males | 85.55 | 14.26 | 13 | 1.624 | .001 | .866 |

Females 95.83 6.4

Note $p < .05$

Research Question 3 and Related Hypotheses

Research Question 3: Is there a difference between gender on reading comprehension when using physical texts? To answer research question three, the data collected was compared using an Independent T-test. The test found that males scored higher than females when it came to the physical test. Males scored a mean of 92.22 and females scored a mean of 85.0.

Hypothesis 3: There is a difference between gender on reading comprehension when using physical texts. An independent- samples t-test comparing the mean scores of males and females physical test comprehension scores was conducted. Levene's test for equality of variances indicated the variances were assumed equal ($p = .001$). A significant difference between the means of the two groups ($t(13) = 1.860, p < .05$) was found. The mean for the males was significantly higher ($M = 92.22, sd = 6.66$) than the mean for the females ($M = 85.0, sd = 8.36$). An effect size of .980 was realized. Hypothesis 3 was proven true, there is a difference between gender and reading comprehension while using physical texts. The results are displayed in Table 4.

Table 4

Independent- Samples t-test on Gender and Physical Texts Comprehension Scores

| Gender | <i>M</i> | <i>SD</i> | <i>df</i> | <i>t</i> | <i>p</i> | <i>ES</i> |
|--------|----------|-----------|-----------|----------|----------|-----------|
| Males | 92.22 | 6.66 | 13 | 1.860 | .001 | .980 |

| | | |
|---------|------|------|
| Females | 85.0 | 8.36 |
|---------|------|------|

Note $p < .05$

Chapter 5

Summary of Findings, Recommendations, and Conclusion

This chapter includes a summary of findings, conclusions, recommendations for future study, and recommendations for practice based on research conducted on the difference between physical and digital texts and comprehension scores in fourth grade ELA.

Summary of Findings

In response to research question 1: Is there a difference between students reading comprehension scores when using digital versus physical texts? A Paired-Samples T-test was run showing that there was a difference between comprehension scores. The mean score for digital text comprehension was 89.66 and the mean score for physical text comprehension was 89.33. A significant difference between the means of Physical Text and Digital Text ($t(14) = .082, p < .05$) was found. Thus, the null hypothesis was rejected. This could be because students were more engaged with the digital platform of the digital text. The students in the class do not take digital tests often and may have been more excited about taking a digital test and therefore, more inclined to focus. This is inconsistent with findings from the literature review, which stated that reading comprehension scores were higher with the use of physical books than digital books (Reich et al., 2019). It is also inconsistent with other findings in the literature review that show there was no significant difference between the two sets of comprehension scores (Neuman et al., 2017).

In response to research question 2: Is there a difference between gender on reading comprehension when using digital texts? An Independent-samples T-test was run showing the comparison between males and females digital text reading comprehension scores. The mean for the males was significantly lower ($M = 85.55$) than the mean for the females ($M = 95.83$). A significant difference between the means of the two groups ($t(13) = 1.624, p < .05$) was found.

This shows that females may have been more engaged when taking the digital test than boys. Which is consistent with the literature review when it comes to engagement, However, it is not consistent when looking at comprehension. The literature review states that physical texts digital texts were found to be more engaging (Reich et al., 2019), but did not deliver a higher comprehension score. The findings of this study that girls performed better on digital than physical is not consistent with the literature review because there were no signs of a difference in comprehension. The null hypothesis was rejected.

In response to research question 3: Is there a difference between gender on reading comprehension when using physical texts? An Independent-samples T-test was run showing the comparison between males and females physical text reading comprehension scores. The mean for the males was significantly higher ($M= 92.22$) than the mean for the females ($M=85.0$). A significant difference between the means of the two groups ($t(13) = 1.860, p < .05$) was found. This could be because the boys showed more traits of engagement and test taking skills when taking the paper test. The findings that girls did not perform as well as boys is not consistent with studies in the literature review. The consensus in the literature review was that students typically performed better on reading comprehension tests when using a physical text (Reich et al., 2019, Furenes et al., 2021). The researcher believes that in regard to this study a closer look at the tests and texts used must be made in order to determine if there were any questions that threw students off. They also believe that more emphasis should be placed on proper reading comprehension techniques, such as using text evidence methods and in text note taking skills, for both physical and digital platforms. Having these skills at hand will help students achieve in both platforms. The null hypothesis was rejected.

Conclusion

Now that we have these results, we can infer that the medium of a text can affect student comprehension scores. Based on the results digital texts could prove to be rising in their ability to engage students and produce high comprehension scores. Because we now have these results, we can infer that boys may be more focused and engaged when reading texts digitally and girls when reading text physically.

Recommendations For Further Study

1. Further research on reading comprehension scores between digital and physical texts needs to examine the use of test taking/reading strategies such as the use of text evidence and note taking.
2. Further research on the topic needs to examine the devices used for the digital text to see if one device better performs another.
3. Further research on the topic needs to examine a larger sample size to see how a larger group comprehends between the two mediums.

Recommendations For Practice

1. Teachers should continue to teach reading comprehension strategies and text note taking; however, they should also teach those strategies using digital reading devices.
2. All those involved in a student's education should encourage them to read and practice skills that will help them retain what they read.
3. Teachers should find the balance between digital and physical reading platforms to better student's ability to comprehend and perform well with both.

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