THE EFFECT OF EBOOK READING ON OVERALL LITERACY DEVELOPMENT

by

Beth Bosman Acosta

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

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ABSTRACT

This study examined the effect of eBook reading, in contrast to traditional print reading, on developing overall literacy in lower elementary school students. It focused on student motivation, phoneme awareness, word recognition, and comprehension as they pertain to student achievement. This research study is important since it investigated a unique way to implement technology to assist both early and struggling readers. The study was designed to examine the effect of using an eBook application (Raz-Kids) instead of the traditional reading curriculum to engage the students through the interactive activities. The study involved 106 lower elementary school students in a private, Christian school with 96 students completing all assessments required for the quasi-experimental static-group comparison research design. This research study used the Elementary Reading Attitude Survey and the STAR Reading Enterprise assessment to evaluate student progress after incorporating the Raz-Kids application into their current reading program for a six-week period. A MANOVA was used to analyze all of the research data pertaining to motivation to read as it pertained to academic and recreational reading, phoneme awareness, word recognition, and student comprehension. The analysis indicated that there was not a statistically significant difference between the scores of students who participated in the treatment group and those in the control group. Data was collected through these assessments and analyzed using SPSS statistical software.

Keywords: eBook, lower elementary school students, technology, literacy, motivation, interactive, Raz-Kids

Dedication

This dissertation is dedicated to my husband Rafi who God brought into my life at the perfect time and to my mom who instilled the joy of learning in me at an early age and has stood by and supported me in every step of my educational journey.

Acknowledgements

But those who wait on the LORD shall renew their strength; they shall mount up with wings like eagles, they shall run and not be weary, they shall walk and not faint (Isaiah 40:31 NKJV). God, I thank you for walking beside me every step of this journey. Thank you for patiently carrying me when I was discouraged and for giving me a nudge when I needed to be reminded that through you ALL things are possible as I am a child of God. Soli Deo Gloria!

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Finally, to all of my family, thank you for believing in me throughout this process and for understanding when I "had to work on my dissertation." It is finished.

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List of Abbreviations

Academic Reading (AcadRead)

Applications (Apps)

Computer-Assisted Instruction (CAI)

Computerized Adaptive Test (CAT)

Electronic Books (eBooks)

Electronic Reader (eReader)

Elementary Reading Attitude Survey (ERAS)

Electronic Quiz (eQuiz)

English Language Learner (ELL)

Institutional Review Board (IRB)

Information Technology (IT)

Phoneme Awareness (PA)

Phoneme Awareness after Research (PA2)

Reading Comprehension (RC)

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Recreational Reading (RecRead)

Substitution, Augmentation, Modification, Redefinition (SAMR)

Socioeconomic Status (SES)

Severe Learning Impairment (SLI)

Word Recognition (WR)

Word Recognition after Research (WR2)

Zone of Proximal Development (ZPD)

CHAPTER ONE: INTRODUCTION

Overview

The approach to literacy development has been impacted due to the increased use of technology. In the past, the use of print materials was the exclusive way to approach literacy development. Literacy skills can predict academic achievement, but when young children have poor literacy skills, they may develop achievement gaps that are difficult to eliminate later on (Zhou & Yadov, 2017). Because children today are tuned into the electronic world, transitioning from paper-based reading to eBooks may stimulate an interest in reading that promotes literacy activities, and, consequently, eBook reading could be an effective way to improve children's literacy skills (Wright, et al., 2013). The goal of this research is to determine whether or not eBooks are effective in accomplishing literacy goals that include phoneme awareness, word recognition, and comprehension as well as investigating their effectiveness in stimulating student motivation to read.

Background

Because the interest in using eBooks has increased in educational settings, research on their effectiveness has been an ongoing process. The behavior involved in screen-based reading can result in less immersive reading (Clowes, 2018). However, children who acquire digital literacy skills at an early age develop sophistication in the use of technology (Reynolds, 2016). Another focus has been on investigating how the interactive capacity of eBooks results in developing literacy skills (Ciampa, 2012; de Jong & Bus, 2002). Researchers have discovered that the quality of eBooks varies widely. In order for them to be effective learning tools, they must be well constructed. A well-constructed eBook has integration of text, animation, and hot spots. If this integration does not exist, hot spots and animation can distract from

comprehension. Therefore, the ways books are used in literacy development has a significant impact on their effectiveness. Educators also need to consider context when selecting material. Contextualism is an important factor in literacy development. Children are more familiar with the print format and still have more capabilities in that traditional format (Kozminsky & Asher-Sidon, 2013). Book and language experiences vary among socioeconomic groups, and some children many not have any digital experience before entering school (Christ et al., 2016).

The literature focuses on examining the effectiveness of eBooks to both motivate children to read and to assist them in developing literacy. Motivation to read engages young children in the reading process and is a predictor of later skill in learning (Boudo et al., 2014; Ciampa, 2012). Motivation can mediate the Matthew Effect where good readers become better readers and poor readers remain poor readers (Ciampa, 2012). Students show a preference for eBooks over print when they have the freedom to choose the book, giving them a perceived control over the reading task (Ciampa, 2012). Such control is referred to as constructivism (Ciampa, 2012).

Ebooks provide an active orientation to reading and encourage sustained levels of attention, competence, and engagement (Ciampa, 2012; McClanahan et al., 2012). Active involvement results in more learning than passive listening to a story (Smeets & Bus, 2012; Kozminsky & Asher-Sidon, 2013). The methods through which students learn lead to their construction of knowledge. Current research is studying how eBooks contribute to this cognitive acquisition (Kroll, 2004).

The theories of constructivism and cognitive load apply to the study of the effectiveness of eBooks (Leahy & Sweller, 2011). In constructivism, the learner constructs meaning through interaction with others and the environment. The child's learning needs to correspond with his/her level of development but not be limited to this level. The practice of buddy or peer

reading to gain knowledge through social context is supported by constructivism (Christ et al., 2016). When the student works with an adult or peer who is more knowledgeable, that student is able to experience a positive reading outcome. With this assistance, the learner can tackle more challenging material. The constructivist theory posits that the learner actively creates knowledge and that learning, therefore, is significantly dependent on the internal drive (desire) the learner has to advance the learning process. Initially students have to be motivated to engage in the learning until they have gained the knowledge goal (Ciampa, 2012).

Constructivism incorporates the conceptual approach involved in the use of eBooks in primary grades to promote emergent literacy. When promoting the reading of eBooks, educators and researchers focus on the aspects that will motivate a child to read. The students' ability to choose books that interest them stimulates their internal drive. When children are effectively motivated, they are able to gain knowledge (Ciampa, 2012). Reading eBooks allows learners to build their knowledge independently or through interacting with others as they are active participants in the learning process. The eBook and other digital devices can lead to new cognition and new neural circuitry (Clowes, 2018).

Cognitive load theory is based on the capacity of individuals' both working and long-term memory. Some concern exists regarding cognitive load when the student has to decide whether to click on a link (Clowes, 2018). Also, when the interactive features in eBooks require the learner to go back and forth between text features, cognitive overload may occur. Therefore, the instructional design should focus on interactive features that enhance the text without unnecessary distraction. While some studies suggest that interactive features are not beneficial to reading comprehension as they distract from the text, a number of empirical studies indicated

that the interactive features and the story context together will facilitate simultaneous processing of both and, therefore, positively impact the learning process (Korat, 2010; Smeets et al., 2014).

When both visual and auditory features are involved in the reading process, the learner's working memory is increased (Leahy & Sweller, 2011). The dual coding theory posits that the recall of letter-sound association is more effective when the connection is concrete. For example, superimposing the letter "s" on an illustration of a snake formed in the shape of the letter "s," also reinforces recall (McKenzie, Spence, & Nicholas, 2018). Good design that allows a learner to read and view a picture that also shows the meaning of what is read can reduce cognitive overload in working memory (Rummer et al., 2010).

The zone of proximal development (ZPD) delineates the theory of human development set forth by Vygotsky. In this theory, when a less competent person internalizes what has been learned with the help of a more competent person, the basis for the next level of development is established. Only the knowledge and skills that are within the next developmental zone can be internalized through the help of another. After the individual has internalized the function, he/she can perform independently (Eun, 2019).

The ZPD has been described as the distance existing between understood knowledge and active knowledge. Active knowledge is acquired as the individual interacts informally with the world. The ZPD is also the area in which individual activity leads to social transformation. This development of knowledge and skills is continuous across the lifespan as active knowledge serves as the beginning of a new process of learning so that the zone keeps shifting from what has been learned toward the goal of new knowledge (Eun, 2019).

Although all researchers did not find that eBooks were more effective than print books (Neuman, 2016; Merga & Roni, 2017), the literature records many advantages to the use of

eBooks. Reading comprehension is improved when the design goals and interactive features are congruent with the story (Kao et al., 2016). High interactive features support instructional concepts to enhance learning that supports the instructional goals. In addition to cognitive ability, motivation is essential to reading competence. Kao et al. (2016) designed their electronic storybook content to increase motivation by interactivity that grabs children's attention, is relevant, helps build confidence, and provides satisfaction. Ebooks with their multimedia effects provide nonverbal cues to support understanding of the verbal information (Korat, 2010).

Since inattentive behaviors affect the development of early literacy skills (Hume et al., 2016), the ability of eBooks to stimulate interest and engagement through animation and other multimedia features is an important advantage (Christ et al., 2016, Hess, 2014; Ciampa, 2012). When they are properly integrated, the animation and interactive aspects provided by eBooks make them particularly beneficial for struggling readers, particularly those from a low socioeconomic status (SES) (D'Agostino et al., 2016; Boudo et al., 2014, Phadung et al., 2016). They provide opportunity for more one-on-one time, address the gap between poor and good readers (Ciampa, 2012), and allow for independent use (Kozminsky & Asher-Sidon, 2013; Hess, 2014). In addition, buddy reading can extend and transform knowledge since it provides scaffolding.

However, the most important consideration is to find out if students improve their literacy while using eBooks. Some researchers found that vocabulary increased with those having limited vocabulary, particularly their acquisition of receptive word learning (Smeets & Bus, 2015; Christ et al., 2016). The sensory stimulation held interest longer and helped focus attention. Additionally, literacy acquisition was slightly higher with print books than with eBooks, primarily in plot understanding (Kozminsky & Asher-Sidon, 2013).

Well-constructed eBooks that integrate interactive features with the text are essential because otherwise multimodal features can be a distraction. For example, an eBook that provides pronunciation assistance or reads the text to the learner as they follow along enhances the reading experience and increases understanding. If hotspots are not integrated, they can be disruptive to literacy acquisition (Smeets & Bus, 2015; Kozminsky & Asher-Sidon, 2013, Christ et al., 2016). Interactive features must be important to the story. Highlighting text coincides with reading by the narrator and hotspots that help in information processing can further the understanding of the story (Shamir & Korat, 2015).   However, research has shown that 90% of hotspots are not congruent with the storyline (Christ et al., 2016, p. 4), and neither affect learning of novel words nor require distinguishing between target and neighboring words (Smeets & Bus, 2012). The use of extra-textual multiple choice questions along with eBook reading increased expressive word learning and stimulated more mental activity (Smeets & Bus, 2015). Because literacy today includes digital knowledge, the role of eBooks in the educational process should continue to be the focus of research to study what is effective protocol.

Raz-Kids is a popular internet-based reading program that enables students to read stories on their individual reading level and provides a way to increase their reading time during the school day. This program is focused on making reading easier and more enjoyable for children as they increase their literacy skills in decoding and comprehension (Meyers et al., 2021). Children listen to fluent reading of a story, can record their own reading, and take a quiz. Teachers are able to ensure that students are reading at their appropriate reading level. As students successfully complete books at one level, they can advance to a new level (Marchand, 2015). In the study by Raynor et al. (2020), second grade students using Raz-Kids had increased comprehension and motivation as well as increased fluency. Because students are preparing for

a world where technical knowledge is a necessity, ability to use mobile devices can help them develop critical technology skills in addition to improving literacy (Israelson, 2015).

As schools are converting to digital formats for instruction, technology must enable both teaching and learning for this approach to be successful. At present, there is no consensus that digital classrooms provide a significant advantage or that they outperform traditional classrooms. For the medium to influence learning in a positive way, instructional methods have to change (McKnight et al., 2016) so that children learn to think differently. Surface learning requires only a recalling of facts while deep learning requires students to think conceptually and form judgments (Keane et al., 2016). The SAMR model (substitution, augmentation, modification, and redefinition) has been developed to address this need. SAMR describes the level of technology of implementation that can provide a framework for transforming learning as well as evaluating it (Webb & Gibson, 2015).

In the SAMR model, substitution is a replacement of handwriting with a word processor; augmentation adds features such as editing, spelling checks, and insertion of graphics to enhance the product; modification provides for collaborative tasks in addition to individual tasks; and redefinition allows students to engage in ways impossible without technology. Deeper learning occurs in the last two transformational stages (Keene et al., 2016). Although mobile devices can create optimal learning experiences by providing for personalized learning, some users may encounter difficulties in implementing this type of learning (Romrell et al., 2014).

Students can personalize their mobile devices through choice of backgrounds, software, and accessories and can develop familiarity with their particular device. The level of familiarity impacts their usage (Romrell et al., 2014). This technology of integration should facilitate accomplishing more complex goals as well as making it possible to do more in less time (Liu,

2016). The SAMR model emphasizes that students take ownership of their own learning with teachers being facilitators who supply detailed task information and the rubrics used to assess learning. Taking more responsibility for their learning helps students mature. Therefore, the focus is more on student learning than on teacher teaching (Drennan & Moll, 2016).

Problem Statement

With the emergence of technology into the field of education, it has become increasingly evident through research that the use of technology can assist with literacy development in elementary school-aged children. Phonological processing skill and decoding of words are essential for a child to read and comprehend written material with technology involving eBooks. Ebooks help meet these literacy goals in a way that appeals to the new generation. Because developing technology skills is so important, educators must learn how to take advantage of the options offered by eBooks (Wright et al., 2013). Research suggests the incorporation of online eBooks can support those struggling with difficulty in reading (Ciampa, 2102) by improving the reading comprehension of struggling readers. However, research has also cited limitations to the implementation of technology for literacy development. Teachers must be adequately trained on the implementation of technology, specifically eBooks, or they will not be able to effectively implement their use the classroom (D'Agostino et al., 2016). Additionally, Hess (2014) could not definitively tie an increase in achievement to the implementation of an eReader. In recent years, eBook designers have made important improvements to create the software that enhances literacy development (Korat & Falk, 2019).

Because the use of iPads, one kind of eReader, supports children who have reading difficulty but also those who are at or above grade level, they can be effective as a reading tool with students who have varying reading ability, but the technology applications must be carefully

reviewed for educational value (Husband & Schendel, 2017). In many areas, iPads can be used effectively to increase skills but there must be more empirical evidence before the iPad is adopted for educational purposes (Chai, 2017). In addition, teachers in Chai's (2017) study questioned whether or not student engagement with the material had any influence on positive learning and, therefore, were uncertain if the iPad was an effective tool. The problem is that not enough research has been conducted which specifically focuses on the implementation of an eBook program to improve student motivation and literacy development.

Purpose Statement

The purpose of this quantitative, quasi-experimental static-group comparison design study is to examine the significance of eBook implementation on lower elementary school students regarding emergent literacy. The study aims to further investigate the effect of an eBook addition to a traditional reading curriculum to assist in engaging early readers and developing literacy skills through a more active interaction with the material. The addition of the Raz-Kids application (app) will allow students to have a more interactive experience with their reading material and will help this researcher determine the level of effect that the integration of an eBook has on overall literacy development and student motivation. The program will be used each day instead of the traditional reading program already in place. The independent variable, "eBook", will be generally defined as a book that is either entirely composed in or has been transformed to a digital configuration for viewing on a handheld device. The independent variable eBook will consist of books in the Raz-Kids program. The dependent variable, overall literacy development, will be generally defined as phoneme awareness, word recognition, and comprehension. The covariate, motivation, will generally be defined as the process of giving someone a reason to do something.

The target population for this research study was lower elementary school students selected through convenience sampling from a private Christian school located in southeastern Florida. The participating school has the following demographics: 55% Caucasian, 20% African-American, 17% Hispanic, 8% Other.

Significance of the Study

This research study is important because it involves investigating an increasingly used way to help both early readers and struggling readers by implementing technology into the school reading curriculum. Students at this time are becoming very well accustomed to digital learning, and the implementation of eBooks may increase engagement in reading curriculum. For example, Kelley and Kinney (2017) used a commercial eBook in their study of whether interactivity resulted in story comprehension and word learning. Interactive versions and non-interactive versions produced similar gains in word knowledge, story comprehension, and language learning. Neither version was designed to achieve educational goals and provided opportunity only for incidental learning. To achieve educational goals, designers must use information regarding effective interactive features (Zhou & Yadov, 2017). They should ensure that the features are straightforward and based on the background knowledge, literacy skill, and concentration level of the students.

Some empirical studies indicate that interactive features correlating with story content can facilitate cognitive processing and, subsequently, have a positive impact on learning (Korat, 2010; Smeets et al., 2015). A focus on phonological awareness, vocabulary acquisition and story comprehension was effective for kindergartners who exhibited emergent literacy language developmental difficulty, children at risk for having learning disabilities, and children whose low socioeconomic background contributed to their delayed verbal development. Because children

process written language cognitively before they reach school age, digital technologies should be introduced to them in kindergarten (Shamir & Korat, 2015).

The process of learning to read opens the student to a world of cultural and educational gain and has been proven to significantly impact both the mind and overall brain function (Fernandes et al., 2016). Research has been conducted on overall literacy development as associated with eBook integration with both pre-school and elementary age children, but there is a lack of research that specifically addresses first, second, and third grade students. This study will investigate the overall literacy development among first, second grade and third students through the implementation of an eBook program. While animation is an important function in eBooks, de Jong and Bus (2004) found little empirical evidence to support any instructional benefit found in use of animation in instructional materials, they also found no evidence of animation interfering with comprehension. In addition, findings regarding how animation affects learning are inconclusive and inconsistent, but multimedia reading approaches have proven to be beneficial for children who are at-risk for having reading difficulties (Shamir & Korat, 2015). The animation enhances the story content and provides motivation that keeps them engaged. Therefore, the significance of this study is evident as it seeks to provide additional insight into the overall literacy development of lower elementary school students through research that included a diverse ethnic population and varying levels of academic ability, thus allowing the findings to be generalized to other locations.

Research Question

RQ1: Is there a difference among lower elementary school students' motivation, phoneme awareness, word recognition, comprehension, and overall literacy when implementing the eBook application Raz-Kids to develop literacy.

Definitions

1. *Buddy reading*—"reading in social context" (Christ et al., 2016, p.2) where readers in pairs help each other.

2. *Cognitive load theory*—the capacity of an individual's working and long-term memory (Leahy & Sweller, 2011).

3. *Computer-adaptive testing (CAT)*—computer testing where the level of difficulty is adapted to the student's ability (Shapiro & Gebhardt, 2012, p. 296).

4. *Contextualism*—learning in a familiar context (Kozminsky & Asher-Sidon, 2013).

5. *Deep reading*—immersion in text that involves deliberate and thoughtful reading (Clowes, 2018).

6. *Digital literacy*—mastery of technology tools and digital practices (Reynolds, 2016).

7. *Dual coding*—use of both image and language in aiding recall of letter-sound association (Mackenzie et al., 2018).

8. *eBook*—electronic format of a book (de Jong & Bus, 2004).

9. *Expressive word learning*—learning how to use the word in context (Smeets & Bus, 2012).

10. *Hot spots*—"places in the eBook (app book) that activates sounds or actions when touched" (Christ et al., 2016, p.2).

11. *Matthew Effect*—In this cycle, good readers get better and poor readers remain weak and this process can begin as early as first grade (Christ et al., 2016).

12. *Multimodal literacy*—This approach uses visual and action modes (audio, hotspots, animation) (Christ et al., 2016).

13. *Receptive word learning*—learning and language occurs through listening and

reading (Smeets & Bus, 2012).

14. *Scaffolding*—"supporting one another in learning processes" (Christ et al., 2016, p.2).

15. *Vygotsky's theory of constructivism*—when children are effectively motivated, they are able to gain knowledge (Ciampa, 2012). The learner controls the reading process and meets real-life experience (Christ et al., 2016).

16. *Working-memory*—memory that is utilized in the processing of new information (Margolin et al., 2018).

17. *Zone of proximal development (ZPD)*—"distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under the guidance or in collaboration with more capable peers" (Eun, 2019, p. 19-20).

CHAPTER TWO: LITERATURE REVIEW

Overview

Literacy skills can predict academic achievement. When young children have poor literacy skills, they may develop achievement gaps that are difficult to eliminate later (Zhou & Yadov, 2017). In the United States, nearly 100% of the classrooms incorporate technology tools with eBooks widely used (Skibbe et al., 2017, p.419). Students generally read these eBooks independently as a supplement to teacher-led instruction (Shamir & Korat, 2015). Because children today are tuned into the electronic world, transitioning from paper-based reading to eBooks may initially stimulate an interest in reading that promotes literacy activities, and, consequently, eBook reading can be an effective way to improve children's literacy skills (Wright et al., 2013).

Theoretical Framework

Constructivism

The theoretical framework addressed in this research includes Vygotsky's constructivism and the cognitive load theory. While Piaget is recognized as the father of constructivism, Vygotsky promoted this student-centered active learning theory. This theory states that knowledge construction occurs when students are active participants, not passive, in the learning process. The teacher must be an active listener and let the children be autonomous in their literacy learning. Through their interactions with symbols and their meaning, children develop strategies to increase their knowledge. When solving a problem is relevant to students, their motivation is increased. Literacy skill involves one's ability to take an abstract concept and apply it to a problem in real-life. Understanding relevance prepares students to transfer their knowledge to new contexts (Cook & Klipfel, 2015). Mental strategies strengthen their thought

processes, enabling them to develop their literacy skills. They can acquire these strategies as they work with an adult or even with a competent peer (Tolentino & Lawson, 2017).

The methods through which students learn lead to their construction of knowledge. When children interact with those in their cultural community who have more experience, they learn how to construct knowledge. Immersion in the literacy practices of their culture follows the sociocultural perspective regarding literacy learning as children are learning what is valued in their environment. When literacy is valued in the culture, acquiring sociocultural knowledge is meaningful. It is a natural process for children to desire to understand how they fit in the world (Tolentino & Lawson, 2017). Researchers continue to study how eBooks contribute to this cognitive acquisition (Kroll, 2004).

Because the learner constructs meaning through interaction with others and the environment, experience is essential. "We cannot transcend the horizon of our experiences. Experiences are all we can work with; out of experiences we construct the world" (Reigler, 2001, p.1). The child's learning needs to correspond with his/her level of development but not be limited to this level. The practice of buddy or peer reading to gain knowledge through social context is supported by constructivism (Christ et al., 2016). When the student works with an adult or peer who is more knowledgeable, that student is able to experience a positive reading outcome. Tolentino and Lawson (2017) refer to the global quality in the learning environment as it relates to children learning how to participate in developmentally appropriate activities and interactions. Global quality is enhanced by positive supportive relationships. With this assistance, the learner can tackle more challenging material.

Constructivism incorporates the conceptual approach involved in the use of eBooks in primary grades to promote emergent literacy. When promoting the reading of eBooks, educators

and researchers focus on the aspects that will motivate a child to read. The students' ability to choose books that interest them stimulates their internal drive. When children are effectively motivated, they are able to gain knowledge (Ciampa, 2012). Reading eBooks allows learners to build their knowledge independently or through interacting with others as they are active participants in the learning process. Computer devices such as iPads are adaptive to individual differences existing in student's learning. After a skill is mastered, the student can progress to learning the next skill. Additionally, the application can provide remedial information if necessary (Putnam, 2017).

Vygotsky's sociocultural theory posits that learning is a social activity that occurs in a sociocultural context where children learn through using cultural tools. Learning occurring at work and home allows one to gain knowledge and thinking patterns from family, friends, and other knowledgeable people. Because mobile devices provide portability, they are useful in student learning outside the traditional school learning environment. In line with Vygotsky's sociocultural theory, when adults share the reading of eBooks with children, their verbal language exchange constitutes social interaction. Children receive emotional support as the adult assists them in managing the eBook functions, giving them increased independence so that they can develop initiative and autonomy (Pacigo & Quest, 2017).

In the social-constructivist learning theory, social engagement occurs among peers, but students are autonomous in the learning process. Social constructivism and constructivism posit that students learn best when they are fully engaged in that which is personally meaningful for them. Need-to-know activities encourage more engagement than skills-based lessons that are not connected to a meaningful purpose for learning. Task-driven learning that involves hands-on activities provides real life environments (Reynolds, 2016).

The constructivist view holds that the conception of reality exists in the human mind while social constructivism involves an interaction between individuals (Eybers, 2018). Constructivism involves individuals creating their understandings through interaction of what they know and the ideas to which they are exposed (Kosnick et al., 2018). Such interaction allows the individual to understand the social environment and create meaning through cultural participation (Eybers, 2018). Therefore, a sociocultural view does not minimize the importance of the individual (Chapman, 1995).

The social constructivist theory posits that the learner actively creates knowledge and that learning, therefore, is significantly dependent on the internal drive (desire) the learner has to advance the learning process. Children develop practices that their community values and supports as they are given the opportunity to become active citizens. The teacher's role is to be an informed listener as the children are engaged in learning through their individual thinking. When children have exposure to many different texts and have the opportunity to use them, they increase their ability to understand the printed word and, consequently, increase their writing ability (Tolentino & Lawson, 2017) although initially students have to be motivated to engage in the learning until they have gained the knowledge goal (Ciampa, 2012). Careful listening is required of teachers so that they can take advantage of authentic and valuable opportunities to teach as they follow the child's lead. The experiences children have in school must be relevant for them to progress. The constructivist approach posits that when the material appeals to students, they achieve valuable learning because when the material creates interest for learning, they understand it better. When students are motivated, they are able to regulate their behaviors to get better results (Dincer & Doganay, 2017).

Learning with a computer aligns with the social learning theory of Vygotsky that posits that teaching and learning are interactive activities that help children develop understanding of literacy components. Many of the educational technology programs focus on "repetition, immediate feedback, and reinforcement, rather than social learning" (Putnam, 2017, p. 1156). However, educational technology can function in much the same way as teacher/student interactions, and many of the programs are designed to copy teachers' instructional methods. Before technological innovations are implemented in an educational program, careful evaluation of their effectiveness in promoting learning should be conducted (Falloon, 2013).

Cognitive Load

Many people have difficulty processing too much new information at one time. The cognitive load theory "considers the balance between acquisition of new information, building connection to previously learned information and problem solving (Cook & Klipfel, 2015, p. 36). When information becomes part of working memory, learning begins, but it must progress to long-term memory to be stored for later recall, limiting the extent of new information that can be retained. Therefore, it must fit into the capacity of the brain. Because stories are remembered differently than other information (Cook & Klipfel, 2015), the use of eBook storytelling may be an effective way for children to learn.

When one must divide attention between sources, in this case on-screen text and animation, both requiring visual resources of the learner, cognitive load increases. Even if the on-screen text is also spoken, learners have to mentally connect the visual information with the aural information (Dincer & Doganay, 2017). The cognitive load theory is based on the capacity of individuals' working and long-term memory. When the interactive features in eBooks require the learner to go back and forth between text features, cognitive overload may occur. Therefore,

the instruction design should focus on interactive features that enhance the text without unnecessary distraction (Korat, 2010; Smeets et al., 2014)

However, when both visual and auditory features are involved in the reading process, the learner's working memory is increased (Leahy & Sweller, 2011). In connecting meaning to symbols, children will resort to using both written language and visual arts. They may also invent their own ways of expressing their ideas. Being literate involves the ability to use the printed word to convey one's ideas, and to do so, a child needs to learn to read and write (Tolentino & Lawson, 2017). The dual coding theory posits that the recall of letter-sound association is more effective when the connection is concrete. For example superimposing the letter "s" on an illustration of a snake formed in the shape of the letter "s," also reinforces recall (McKenzie et al., 2018). The use of good design, such as in dual coding, allows a student to view a picture while reading and, in this way, reduce cognitive overload (Rummer et al., 2010). Presently, studies are scarce on cognitive load in relationship to pedagogical method (Dincer & Doganay, 2017).

Related Literature

Use of eBooks in the Classroom

The literature uses various terms to describe multimedia technology (CD-ROM, iPad, eBook, electronic book), and they appear to be used interchangeably (Zhou & Yadov, 2017). This technology supports children who have reading difficulty but also those who are at or above grade level. These electronic devices can be useful as a reading tool with students who have varying reading ability, but the technology applications must be carefully reviewed for educational value (Husband & Schendel, 2017). After implementing two web-based approaches, Lysenko and Abrami (2014) found that reading comprehension scores of lower elementary

students were statistically much higher than the scores following traditional standardized testing. Understanding how children learn is essential when selecting instructional tools. Learning involves both retention and transfer of information. Children must not only remember what has been taught but also need to be able to apply it to new contexts (Cook & Klipfel, 2015).

The greatest impact of an eReader is that it facilitates student access to information and actively engages them in learning (Domingo & Gargante, 2016). An advantage of using the apps is that the student can use them independently, at their educational level, providing immediate feedback and assessment results. Additionally, research has found that using the apps that pertain to learning skills results in significantly higher levels of student engagement. However, teachers often appeared to be more focused on students learning content when reading. Therefore, eBook technology must implement a variety of apps to meet these different educational goals (Domingo & Gargante, 2016).

To develop skill in reading comprehension, students in their early education must become proficient in decoding that allows them to segment and blend letter sounds and to develop automatic word recognition. Systematic and explicit phonics instruction involves following a sequence beginning with the basic word patterns and continuing to the most advanced (Larabee et al., 2014). The use of iPads can be effective in increasing these skills but further study regarding use for educational purposes is recommended (Chai, 2017) since effectiveness may be compromised as often the use of mobile devices in school is fragmented, reducing the potential of this technology (Larabee et al., 2014). Questions arise as to whether the initial enthusiasm toward reading eBooks will diminish over the long-term when the novelty wears off (Abdus, 2014; Hashim & Vongkulluksn, 2018).

In contrast to working with a computer program, students engaging in instruction with teachers interacted socially and responded to the text in different ways, including writing. In addition, the development of emotional bonds due to this interaction was seen as leading to increased learning. Putnam (2017) concluded that computer programs were most effective when used in early literacy instruction that required repetitive drills and practices. On the other hand, the integration of various literacy skills such as comprehension and understanding concepts was more successful with a teacher who was able to interact socially with the students. Hashim and Vongkulluksn (2018) found that eBooks do not benefit classroom learning more than do traditional print books. A blended approach of traditional print based instruction, along with digital technologies, leads to greater academic success (Tkach & Gallager, 2020). The teacher influences how effective the eBook is. Research shows how a teacher's understanding of the process of acquiring language skills and how expectation for student learning using the technology influence reading engagement. Therefore, technology can supplement but not replace the teacher in the classroom (Salmon, 2014). At this time, the impact of the pedagogical approach chosen by the teacher when incorporating eReaders has not been thoroughly researched (Hashim & Vongkulluksn, 2018).

Compared to print storybooks or static illustrations, animated eBooks help children achieve higher retelling scores, and their retelling is more creative and longer (Phadung et al., 2014). The interactive eBooks with animation also support word meanings. Based on pre- and post-interventions, ethnic minority children showed significant improvement both in word recognition and in story comprehension when an interactive e-story was used. Because the interest in using eBooks has increased, research on their effectiveness has been an ongoing process. Another focus has been on investigating how the interactive capacity of eBooks results

in developing literacy skills. However, to be effective, eBooks must be well constructed having animation and hotspots integrated with the text so that animation and hotspots do not distract from comprehension (deJong & Bus, 2002).

Learning to read has a significant impact on one's overall brain function (Fernandes et al., 2016) with phonological processing skill and decoding of words essential for a child to read and comprehend written material (Horne, 2017). Technology involving eBooks can be the means to meet these literacy goals in a way that appeals to the new generation. Because developing technology skills is so important, educators must learn how to take advantage of the options offered by eBooks (Wright et al., 2013). Although concern exists regarding distraction from interactive features that may occur with use of eBooks, many studies show the value of eBooks to improve literacy (de Jong & Bus, 2002; Korat, 2009) for both typically developing children and those with learning disabilities related to communication disorders (de Jong & Bus, 2004; Korat, 2009).

The Importance of eBook Design

Congruent with text

To improve reading comprehension the design goals and interactive features must be congruent with the story (Kao et al., 2016). High interactive features support instructional concepts to enhance learning that supports the instructional goals. In addition to cognitive ability, motivation is essential to reading competence. Kao et al. (2016) designed their electronic storybook content to increase motivation by interactivity that grabs children's attention, is relevant, helps build confidence, and provides satisfaction. Ebooks with their multimedia effects provide nonverbal cues to support understanding of the verbal information (Korat, 2010).

Applications chosen for eBooks should have effective design. For example, the instructions for the student must be understandable and easily accessible. They should include learning and practice exercises as well as appropriate use of games and should be matched to the educational level of the student (Falloon, 2013). Poor design negatively affects reading comprehension (Bus et al., 2015; de Jong & Bus, 2002; Korat, 2010). When special effects were unrelated to the story, the children had difficulty understanding what was happening in the story (Beck & McKeown, 2017). Ebooks that offer many opportunities for interaction with the content and are based on instructional principles have a great potential to motivate reading and improve performance. The assessment tools researchers have developed help educators evaluate how effective an eBook may be in nurturing cognitive growth (Salmon, 2014). Technology can encourage better understanding of educational concepts because children who are actively involved are more successful (Chauhan, 2016). Factors that schools should consider when implementing eBooks include their design, their ease of use, and their availability (Abdus, 2014).

Developed for educational purposes

The design of the eBook is critical in its educational value. An emphasis is placed on the importance of high-quality eBooks in order to enhance instruction by aligning the eBook with the development of specific literacy skills (de Jong & Bus, 2002). Because the study by de Jong and Bus (2002) found that the commercial eBooks were often ineffective in supporting literacy skills, they emphasized the need for researcher-developed or modified eBooks designed to support literacy skill acquisition. Care must be taken to ensure that the design will enhance student interest but not adversely impact learning through irrelevance. Therefore, evaluation of specific components must include how they affect language learning (Kelley & Kinney, 2017).

For eBooks to support emergent literacy they have to be designed for educational purposes (Shamir & Korat, 2015). Often applications did not allow repeating segments, did not synchronize highlighting of text with the narrations or provide activities to develop phonological awareness. Since interactivity is an important element of digital storybooks, it must involve active participation in order to affect language learning positively. Tablets, which allow taps or swipes for interaction, might increase a child's engagement with the content of the story by drawing attention to key components, giving opportunities for response to the story content and providing feedback in the response (Kelly & Kinney, 2017). Students who used eBooks with multiple interaction options evidenced significantly higher achievement in both reading motivation and comprehension (Kao et al., 2016).

Kelley and Kinney (2017) used a commercial eBook in their study of whether interactivity resulted in story comprehension and word learning. Interactive versions and non-interactive versions produced similar gains in word knowledge, story comprehension, and language learning. However, neither version was designed to achieve educational goals and provided opportunity only for incidental learning. Designers can use information regarding effective interactive features to ensure that the features are straightforward and based on the background knowledge, literacy skill, and concentration level of the students (Zhou & Yadov, 2017). Many educational apps specially aimed at developing literacy skills often do not effectively support learning goals and some have no effect at all (Roskos et al., 2017).

Using eBooks specifically designed for explicit instruction resulted in greater gains in word knowledge and in language learning. For example, interactive features promote significant language learning when the features have been intentionally designed for instructional purposes (Smeets & Bus, 2012). Even though hotspots kept children engaged, multiple-choice questions

were more effective in word learning than were hotspots. Digital eBooks may be more appropriate as a supplement, not a replacement, for child-adult interactions using storybooks (Kelley & Kinney, 2017). Apps are more effective when they are integrated into the learning curriculum, not used as an extraneous activity (Falloon, 2013; Lysenko & Abrami, 2014).

Interactivity

Supplemental features

Multimedia approaches must include "reflection, guidance, feedback and interactivity" (Kao et al., 2016, p. 57) to result in improved reading performance. The use of eBooks provides for learning at one's own pace, as do traditional books, but the multi-visuals and sound effects can increase motivation and improve reading comprehension by lessening the need for decoding both words and grammar. Combining interactive features that have intrinsic value with story context may facilitate processing of both to have a positive impact on learning. However, too many supplemental features might result in children not focusing on their learning goals, resulting in decreased reading comprehension (Kao et al., 2016).

Format

Shamir and Korat (2015) used four eBooks modes to explore their effectiveness: "(a) read story only, (b) read story and play, (c) read story with dictionary, (d) and regular classroom curriculum only (the control group)" (p. 114). In all three modes, children showed improvement in emergent literacy involving word recognition, word meaning, and phonological awareness with low socioeconomic status (SES) children showing greater improvement than did mid-SES children. Multimedia technologies make educational content easier to follow, keeping children on task and motivated. Cognition is promoted because the multimedia format combines text

with valid interactive features and multi-sensory events. Students will learn better if irrelevant features are excluded (Clark & Mayer, 2011).

Highlighting text and hotspots that help in information processing may further the understanding of the story (Shamir & Korat, 2015).   Multimedia also offers flexibility as the reader explores and learns through interactive features. Because multimedia features add more processing tools to help children interpret events in a story, they can increase their knowledge, providing a better way for children to remember linguistic information in the stories they read (Lewalter, 2003). Visual effects that are unrelated to the story might not only distract from the text but also interfere with the child's comprehension (de Jong & Bus, 2004). Some programs, such as Raz-Kids, have been designed with hotspots that enhance the story without such distraction.

Adult support

Adult support is an important aspect in children's reading of eBooks. Evidence exists that young children recall more of the story structure and language when the story is read by an adult rather than by the computer. In the latter case, children may be more interested in the animation than in the story and have selected the screens that had the most appealing interactive effects (de Jong & Bus, 2004). When children read with an adult, learning was more effective regarding emergent literacy and children's engagement (de Jong & Bus, 2004). Parent support for their children's reading engagement in both digital and non-digital format contributes to their attitude toward reading, indicating the importance of adult involvement in the learning process (Ozturk & Ohi, 2018). Word accuracy advanced the most with teacher support as children read because the teacher can scaffold the children's vocabulary when they are interacting with eBooks (Barnyak & McNelly, 2016).

Current literature provides some evidence that adult support offers benefits in addition to interactive features. Less able readers engaged more with adult support, possibly because of lower proficiency in these readers (Wood et al., 2010). Children who have specific language impairment (SLI) take longer to learn new words, leading to deficits in breadth and depth of vocabulary during the rest of their school-age years (Horne, 2017). Because of these deficits, they have difficulty in reading coding and story comprehension, falling further behind their peers (Storkel et al., 2017). These skills are important since as children advance in their learning, they need to engage in complex thought processes that require strong reading comprehension (Horne, 2017).

Additionally, an increase in sight-word fluency occurs when the teacher directs the use of the e-reader (iPad). Use of animated video results in more learning of new words with or without vocabulary activities, particularly if the eBooks are interactive (Musti-Rao et al., 2015). Consequently, animation should be focused on implementing the learning objectives that involve knowledge acquisition (Dwyer & Dwyer, 2006). Repetition of static visuals has been shown to significantly increase achievement. Students have to already understand content area facts and concepts in order to have the competency to profit from the animation. Also, to be effective, the animation should correlate with the story (Lee, 2017).

Varying ability levels

An eBook also provides an opportunity to instruct students at different reading levels (Lewin, 2000). Vygotsky referred to the "difference between what a learner can do with and without assistance" (Barnyak & McNelly, 2016, p. 529) as the zone of proximal development. In this zone, children learn when their scaffolding experiences with either adults or other competent individuals are meaningful. The adult can permit the learner to concentrate first on the aspects of

the task that fall in the range of competence. The adult can also focus on specific strategies for an individual student. High-quality eBooks that focus on emergent literacy rather than on multimedia features can provide for scaffolding experiences (Barnyak & McNelly, 2016).

Electronic books are more effective than a read-only instructional approach, specifically in both low and middle socioeconomic status. An interactive dictionary in eBooks is a factor in strengthening the ability to read and understand words. Significant correlations exist between eBook dictionary interaction and scores on word meaning after the instruction (Korat & Shamir, 2008). Children whose literacy skills are delayed may benefit from the nonverbal information presented in eBooks and from relevant interactive features aimed at increasing literacy skills that enhanced children's listening (Smeets & Bus, 2012).

However, when questions regarding new vocabulary are embedded in the text, greater progress in understanding vocabulary is found than in the use of the eBook dictionary feature. This result is attributed to a higher cognitive requirement needed to answer the questions while the dictionary feature involved a passive interaction (Smeets & Bus, 2012). The possibility exists that the ability level of the children and the quality of the researcher-designed eBook affected these results. In addition, de Jong and Bus (2004) questioned whether irrelevant features of the eBook could act as a distraction rather than an advantage to literacy development since irrelevant features can interrupt the text.

Comprehension

When comparing the equivalency of comprehension between print and electronic formats, the type of text is determinant in the effectiveness of the format (Margolin et al., 2018). Specifically, a tablet is an effective format for reading narrative text that focuses on thematic information, but for reading expository text, the print format provides for more effective detailed

processing, and the goal of reading, whether of print or electronic text, is comprehension. Research has drawn contradictory conclusions regarding reading speed on the two formats and its influence on comprehension with recent research finding little difference (Margolin et al., 2018).

However, students reading in an electronic format required more time to complete the reading. Wright et al. (2013) suggested that the time involved in loading the device as well as the distractions the device provided may account for this difference. Comprehension could also be hindered because the active reading processes of underlining and highlighting are not used (Margolin et al., 2018). Working memory is an integral component of reading comprehension because reading involves a cycle of recognizing words, incorporating meaning, and drawing conclusion or inferences. Reading comprehension also depends on the reader's ability, the text representation, and the reading environment. Readers must incorporate what exists in memory with the new information. If working memory resources are hindered by distractions, reading comprehension is negatively affected (Margolin, 2018).

Comprehension skills are developed through the use of definitions, questions, and animations relevant to the text and through the opportunity for children to read the story many times on their own (Smeets & Bus, 2012). The use of hotspots, places where touch activates sounds or actions, can increase interest in reading, but the quality and relevance of these interactive features in eBooks are integral in influencing literacy outcomes (Salmon, 2014). These features determine the potential for the child to engage in independent reading.

Roskos et al. (2017) found that eBooks were more effective in word learning than in text comprehension. They emphasized the need for more critical appraisal of learning platforms to evaluate the effectiveness of this type of technology. Children who used interactive versions of

eBooks with hotspots that defined the target vocabulary and included multiple-choice questions learned more words than those who used animated versions (Smeets et al., 2014). However, no difference was found in story comprehension. Smeets et al. (2014) emphasized the interactive components had to be designed specifically to teach vocabulary. When the hotspots were designed to entertain rather than instruct, they were ineffective in language learning but they did not detract from story comprehension (Kelly & Kinney, 2017).

Use of hotspots

The Joan Ganz Cooney Center, which has evaluated 137 popular eBooks, found 75% of them included hotspots and 65% had game-like activities with only about 20% of them related to the story (Takas, Swart, & Bus, 2015, p. 699). However, cognitive theory related to multimedia learning posits that for deeper learning to occur, information presented both verbally and nonverbally must connect the visual to the narration (Richter & Courage, 2017). When multimedia stories combine the verbal and nonverbal channels, using both auditory and visual learning in contextual processing, vocabulary learning and reading comprehension are enhanced (Zhou & Yadov, 2017).

Conversely, the availability of many sound and visual effects may result in children playing with these effects and spending little time listening to the oral narration (de Jong & Bus, 2002). Additionally, interactive elements that do support story comprehension may decrease performance because the continual switching between verbal and nonverbal tasks may put too much stress on young children's working memory. Even with related content, story comprehension is a more fundamental task than playing with games (Takas et al., 2015). However, interactive features can increase interest in reading, and the repeated exposure improves recall of material (Richter & Courage, 2017).

Multimedia and questioning

The multimedia interactive features in eBooks may allow children to obtain contextual information and understand word meanings and story contents. Zhou and Yadav (2017) explored if effects of multimedia and questioning with preschoolers impacted story comprehension, vocabulary, and engagement in comparison to their using paper-based storybooks. The multimodal approach that uses the written word, voice output, and pictures helped reinforce the concepts taught (Stone-MacDonald, 2015). Open-ended questions that involve scaffolding, beginning with low cognitive demand in the beginning sessions and progressing to high demand, resulted in the greatest vocabulary gains and helped children connect new knowledge with earlier knowledge. This questioning benefits reading engagement as it encourages a deeper level of information processing (Zhou & Yadav, 2017). While open-ended questions are beneficial for comprehension, it is not clear whether the same scaffolding functions similarly with vocabulary learning. However, vocabulary was improved through scaffolding that supported reading through the use of nonverbal interactive features (Barnyak & McNelly, 2016).

While reading engagement is improved because of the use of interactive features and the ability to manipulate the images and story text, questioning with multimedia reading is not significantly beneficial for either vocabulary learning or story comprehension in younger children (Zhou & Yadav, 2017). The lack of significance could be attributed to the young age of the participants who may have experienced difficulty in understanding the questions or who may have had limited expressive language skills.

Print Storybooks Compared with eBooks

Concerns

Longer expository texts may be comprehended more effectively through the use of print text because expository material that involves processing detail makes more demands on working memory (Margolin et al., 2018). However, the study by Margolin et al. (2018) does not support the suggestion that eBooks are inappropriate for academic reading and that readers that need detailed information may be at a disadvantage when using eBooks for this purpose. The use of eBooks can be conducive to deep reading and trends have shown concentrated reading still exists (Clowes, 2018). Additionally, cognitive faculties and the involved neural processes are not threatened by digital technology.

Importance of digital literacy

It is important for early learners to acquire digital literacy to accrue cultural capital and to assure social mobility in what Reynolds (2016) refers to as "social constructivist digital literacy" (p. 736) where the learner has a productive purpose that drives the use of technology in the context of the student's everyday life. This technology learning takes place in school settings and also in the naturalistic interactions in homes and community centers (Reynolds, 2016).

Repeated reading

Story understanding by children is similar whether stories are read electronically or listened to repeated adult readings (de Jong and Bus, 2004). Children read electronic books in the same manner as they read print books, following the story's sequence of events. Although children may explore more of the multimedia options in later reading, this shift does not suggest lack of comprehension. Children reread the eBook about the same number of times as they listened to an adult reading. Engagement in reading may encourage children to read more by

affecting their attitudes toward reading. These attitudes involve many reasons for reading such as reading for enjoyment, escape, utility or development (Abdus, 2014). Most children in the study by de Jong and Bus (2004) appeared to be engaged with the text in the eBook. Although their findings did not agree with those of other researchers in regard to animation being distracting, they did acknowledge that eBook reading could result in passive viewing.

Even if electronic books are not as effective as books read aloud to children by adults, they can be beneficial supplements when children are beginning to understand the concept of stories. As children understand the structure of the stories more, they are less distracted by the visuals and have increased memory of the text. As children get older, they are able to understand the book as a whole and not see the individual pages as separate entities. Repeated readings of a story may lead to literacy improvement. Adults reading with children contribute to their learning, but the importance of adult interaction in the reading process varies by stage of development (de Jong & Bus, 2004). Neither print text nor eBook is as important to children's motivation and comprehension as is the storyline (Jones & Brown, 2011). Learning is most effective when students are actively involved in the process and are able to relate the learned concepts to their own lives (Chauhan, 2017).

Alternate approaches to reading

Shared book reading between child and parent has traditionally been the way children developed literacy skills. Parents reading storybooks to their children also provides opportunity for children to increase their vocabulary. While in line with Vygotsky's theory, children's phonological awareness and vocabulary benefitted from parent-child reading, but no difference appeared in language development between use of print storybooks and eBooks (Korat et al.,

2013). However, now the multimedia features available in eBooks can transform the reading experience for children whether they read with an adult or independently (de Jong & Bus, 2004).

It can be difficult to make a fair comparison between digital and print text (Clowes, 2018). While some children prefer reading an eBook instead of reading a print book, Abdus (2014) points out that comprehension does not differ. However, the children may be more engaged when reading eBooks because the multimedia factors enhance the reading of text by helping them visualize meaning. Using eBooks gives the students the opportunity to personally select texts that appeal to them, similar to print texts, and to develop a mobile library of the books they choose. With eBooks the child has increased opportunity for multiple independent reading and exposure to more challenging reading through digital libraries (de Jong & Bus, 2002). Having these advantages is very important since children who are deficient in literacy skills when they enter school are likely to experience continued reading difficulty. Multimedia eBooks appear to be effective because of the technology-based interactivity which encourages children to relate to stories in ways not provided by print books. The eBook enhances cognitive faculties by presenting information through combinations of functions (Dehaene & Cohen, 2007).

Effect on literacy skills

If children are to become proficient in reading, they must develop emergent literacy skills that include language ability, comprehension, vocabulary, and word reading. Therefore, it is important to establish the connection between use of electronic books and the development of literacy (Salmon, 2014). While eBooks should not replace traditional print storybooks, increased exposure to storybooks and the interest created by animation and other interactive features can be beneficial for children (de Jong and Bus, 2004) since some research indicates that reading

engagement, comprehension, vocabulary, and communication initiations are increased through the use of eBooks (Moody et al., 2010). This research in the efficacy of eBooks in improving literacy has shown that engagement is increased, and improvements are made in both comprehension and vocabulary because of the digital features of eBooks (Bus et al., 2006). Even so, comprehension is not an automatic result of eBook use (Kao et al., 2016). Furthermore, teaching key literary components using technology positively affects reading achievement (Lysenko & Abrami, 2013). Reading improvement also occurs when proper scaffolding is interpreted in the design. When the eBook requires high interaction, motivation and comprehension are increased (Kao et al., 2016).

A study by Lysenko and Abrami (2013) replicated previous research studies regarding integration of technology. They found that teaching key literary components using technology positively affects reading achievement and helps develop self-regulation skills. They also found that teaching these skills has been difficult for some teachers (Lysenko & Abrami, 2013). When the eBook required high interaction by the student, motivation and comprehension were higher than when low interaction was required. If proper scaffolding is included in the design, reading performance is improved.

Research has produced conflicting results in regard to use of digital storybooks improving language learning (Zucker et al., 2009), vocabulary (Korat et al., 2013), and comprehension (de Jong & Bus, 2004) in comparison to traditional storybooks. While digital storybooks with video versions resulted in more vocabulary learning, these versions were less effective with students who had language impairment. Multimedia components that are relevant to an institutional goal improve learning, but if they are not consistent they may be a distraction (Kelly & Kinney, 2017).

In a meta-analysis, technology-enhanced stories had a small but significant impact on either vocabulary or engagement outcomes. In contrast to traditional print storybooks that are research supported to be effective in developing literacy skills, research on the effectiveness of electronic books has not been as extensive, but eBooks have the potential advantage of incorporating multimedia components (Kelley & Kinney, 2017). Because multiple formats existing in eBooks provide an opportunity to gain information in more ways than exist in a single format, it is argued that they may prove to be more effective. For example, animation can highlight key events or clarify a word's meaning, and, in this way, these interactive features may have an influence on a child's literacy level (Salmon, 2014).

Multimedia stories combine the verbal and nonverbal channels, using auditory and visual learning in contextual processing to promote enhanced vocabulary learning and reading comprehension. Children's vocabulary knowledge can be increased in various ways. Multimedia features of eBooks help children develop phonological awareness skills and word comprehension. Built-in dictionaries also facilitate word learning in young children, especially when an animated image of the target word accompanies the oral explanation of the word. Children using eBooks are more apt to look up words they do not know because electronic dictionaries are quicker and easier to use than are print dictionaries, and they offer privacy to students who may not want others to know they have to look up a word. As a result, these children can acquire more word meaning and recognition and also increase phonological awareness (Abdus, 2014). However, alphabet eBooks, even with their interactive features, had no advantage over paper alphabet books in kindergarten classes because saying the letter and objects' names led to increased engagement in both formats (Willoughby et al., 2015). No statistically significant differences were seen when the emergent literacy benefits were

compared. Home literacy activity may have influenced the results, since 50% of the parents stated they read alphabet books to their children at home (Willoughby et al., 2015).

Attentiveness

All of the children in the study by Richter and Courage (2017), regardless of age, were very attentive during reading sessions of both print and eBooks, focusing nearly 90% of the allotted time (p. 99). The ability of children to consistently focus on eBooks varied by the age, with preschoolers being the least attentive during the reading of print storybooks. However, a consistently elevated level of attention and academic engagement occurred when an iPad was implemented for reading instruction (Musti-Rao et al., 2015). Executive function was more predictive of attentiveness than age, which can exhibit notable individual differences. Level of executive function also affects total story recall in both formats. Children who have strong executive function can process more information simultaneously and are less distracted. Therefore, children's maturity regarding executive function is a better guide than age in selection of eBooks (Richter & Courage, 2017).

Additionally, children were more attentive to print when listening to the story being read to them and with words highlighted when they were listening to an eBook. While adult support is beneficial in reading both print storybooks and eBooks, when highlighting occurred on eBooks, children's attention was increased without adult support (Skibbe et al., 2017). This research suggests that the interactive design features can augment interactions with text. Labeling or pointing to pictures also helps children learn more new words. Children using eBooks initiated more communications and explored illustrations more frequently than when using traditional print books. However, not all researchers were in agreement that print books were less effective than eBooks (Neuman, 2016; Merga & Roni, 2017).

Recall

Students using eBooks were more effective in story retelling and in comprehension as indicated through comprehensive questions than were students listening to adults reading the storybook (Doty et al., 2001). However, when adults reading with children engage in interaction using the strategies of "prompt, evaluate, expand, repeat" (Moody et al., 2010, p. 298), the language skills of students are accelerated. Additionally, adults using interactive behaviors such as repetition and open questions are able to promote a child's active experience with both eBook and print texts (Moody et al., 2010). The attention to the multimedia and interactive features may not indicate level of attention to the story since studies have shown equivalent story recall for both print books and eBooks. Even though the children were more engaged in the eBooks, this greater engagement did not provide any advantage with recall (Richter & Courage, 2017). Therefore, research has not provided definitive conclusions.

Little empirical evidence supports any instructional benefit found with the use of animation in instructional materials. Findings regarding how animation affects learning are inconclusive and inconsistent although de Jong and Bus (2004) found no evidence of animation interfering with comprehension. Shamir and Korat (2015) determined that multimedia reading approaches are beneficial for children who are at-risk for having reading difficulties because the animation enhances the story content and provides motivation that keeps them engaged. In a meta-analysis, animation did not produce better learning outcomes than outcomes found in static conditions (Berney & Betrancourt, 2016).

Those who experienced the multimedia content of eBooks were able to give more complete retellings of a story. Research supports the hypothesis that young children are best able to recall events in a story when visuals are used. The visuals help young, less active readers in

the same way that good readers create a mental picture when reading print (Verhallen & Bus, 2010). Story understanding assists in acquiring new vocabulary and learning new sentence structures and increases children's ability to recall this information. Repeated encounters with the material revealed increased differences between verbal and nonverbal representations. If children better understand the nonverbal events, they may be enabled to interpret story language in subsequent sessions. While children who have good quality language skills may get bored during repeated reading, it does not appear that children with lower proficiency do (Verhallen & Bus, 2010).

Independent Reading

Using eBooks enables young children to read or listen to stories by using multimedia features (Korat et al., 2013). After they have learned how to use the features, students have the ability to proceed through the curriculum without much teacher assistance (Jones & Brown, 2011). Children reading eBooks independently have the potential for literacy development in a short period of time (Hsaio & Chen, 2015; Wood, 2005) as eBooks can help children gain significant benefits through independent reading to improve reading comprehension (Hsaio & Chen, 2015). Reading eBooks does not reduce learning the story language since children's engagement is as focused as it is when an adult reads to them (de Jong & Bus, 2004). However, the use of eBooks provides more reading experiences, resulting in improved literacy and language skills (de Jong & Bus, 2002). Zhou and Yadov (2017) also concluded that multimedia story reading supports both reading engagement and vocabulary learning more effectively than print reading. These findings can help educators enhance literary instruction by using multimedia stories that have touch-activated features in both in-group shared reading and in

individual support. Parents can use the same approach for supporting children's independent reading at home.

While emergent readers do not benefit as much from eBooks when adult support is not available, eBooks may increase reading enjoyment. The comprehension scores of students who read the same story, some on eBooks and some with paper-based books, showed no significant difference in reading comprehension, but when oral-narration of an eBook was added, both comprehension skills and enjoyment increased when students read either eBooks or paper-based books (Wright et al., 2013). Use of pictures also contributes to comprehension (Smeets et al., 2014). When children read eBooks with games, they were distracted from the text, but they were able to recall the story as well as when an adult read to them or they read eBooks without games (de Jong & Bus, 2002). Ebooks read independently or with an adult give children the ability to control their reading activity relating to actions in the book (Barnyak & McNelly, 2016).

Prior adult reading to children may have affected the children's experience with eBooks, and in their study they found children reading eBooks were able to achieve significant comprehension and linguistic expression (de Jong & Bus, 2004). Reading eBooks effectively provides children with more opportunity to read and also to help children who are not yet ready to read printed texts on their own. When children read with an adult, learning was more effective in regarding emergent literacy and with children's engagement (de Jong & Bus, 2004; Shamir & Korat, 2015), but eBooks can also be an effective supplement because they can focus on individual learning needs. However, deJong and Bus (2004) and Shamir and Korat (2015) did not conclude that eBooks can take the place of adult-led book reading. While eBooks have shown effectiveness in promoting early literacy when used with adult support (Korat et al.,

2009), it is difficult to know if appropriate adult support is being provided when children use

eBooks; therefore, the educational value is uncertain (Skibbe et al.,2018).

Developmental Disabilities

Physical disability

Children with spinal cord injuries, dyslexia, attention deficit disorder, and inability to

focus, as well as those who lack the physical capacity to hold books, find eBooks provide a

better way to read (Mune & Agee, 2016). Digital programs can be customized to target the

specific need of the individual child regardless of skill level. Some of the apps require fine

motor control which could be a barrier for a child with a physical disability such as cerebral

palsy. Therefore, such a child might need help from a peer or adult (Stone-MacDonald, 2015).

Technology can provide the adaptions these children need to support them in the classroom. The

multimodal features of an iPad are particularly helpful for children who have loss of vision or

hearing (Mune & Agee, 2017; Stone-MacDonald, 2015).

Intellectual disability

Apps are available to help developmentally disabled children learn to communicate

better. Some of these target children who do not speak in sentences expand their ability by

organizing their communication around specific topics (Stone-MacDonald, 2015). Reading-

disabled children need much practice to be able to phonologically decode and to recognize

words. Ebooks can provide extensive repeated practice for them as they work independently

with immediate feedback as well as instructive corrections (Horne, 2017). This feedback

promotes comprehension (Barnyak & McNeely, 2016). The interactive features of this

technology make it possible for children with these disabilities to participate in literacy activity

with their peers. They can independently access apps that support the areas of literacy where

they need practice (Stone-MacDonald, 2015). Children on the autism spectrum or who have

cognitive difficulties following injury also benefit (Stephenson & Limbuck, 2015).

Students who have reading disabilities usually have difficulty decoding written text. This

difficulty affects accuracy and speed when they are reading, resulting in poor comprehension.

While oral presentation eliminates the need to decode written material, there are contradictory

studies on whether or not improved comprehension occurs (Wood et al., 2018). Children who

have difficulty reading or have learning disabilities benefit when eBooks are added to a print-

based curriculum (Barnyak & McNelly, 2016). Because touch-screen devices are now

mainstream, intellectually disabled children can use them without being stigmatized (Stephenson

& Limbuck, 2015).

The use of eBooks also helps children who have had negative experiences reading which

have adversely affected their motivation (Barnyak & McNelly, 2016). It is important for

children to be able to decode phonologically since that is an essential skill for developing reading

fluency which is necessary for one to achieve comprehension, and opportunity to read most often

leads to reading achievement. However, children who are poor readers will struggle when they

read text to acquire knowledge (Horne, 2017). Ebooks can help these young readers who are

struggling or are disinterested in reading (Clowes, 2018).

Developing vocabulary skill is also essential to reading comprehension, and when

children lack knowledge of vocabulary, they will have impaired reading comprehension (Horne,

2017). However, when children understand text language, their vocabulary acquisition is

enhanced (Barnyak & McNelly, 2016). Furthermore, mastery of initial decoding skills is

necessary before a child can advance to a higher level of language skill (Wood et al., 2018).

Through the use of computers, the text can increase in difficulty as the student progresses

(Horne, 2017). As directions become increasingly complex, children also can develop their executive function (Stone-MacDonald, 2015).

Severe language impairment

Students who have learning disabilities especially benefit from phonological awareness (PA) training. Research has shown that when this training is computer-assisted, the students significantly outperformed those whose training was teacher- directed (Chai et al., 2015). However, few studies have been directed using this comparison. Children with severe learning impairment (SLI) learn new words slowly which results in deficits in the number of words they know and their detailed knowledge of these words. With a limited vocabulary, they fall behind their peers in comprehension and academic achievement. While interactive book reading has been effective in helping them, the results fall short of what is needed.

Although independent book reading facilitated by eBooks benefits children with severe language impairment (SLI), their progress is lower than that of typically developing students (Smeets et al., 2014). Background noise, music, and sounds may interfere with story comprehension when the story is also orally presented. Since SLI children have different language profiles, the results may reflect the severity of the impairment rather than the nature of it (Smeets et al., 2014). These findings are beneficial for evaluating and then designing interventions to help SLI students develop literary skills since for these children, avoiding all audio features would be in the children's best interest.

Educator Discernment

Discernment is necessary when educators are selecting apps for children with disabilities. A good educational practice when integrating technology is to determine any necessary accommodations or modifications that are necessary to meet diverse learning needs before the

lessons are planned (More & Travers, 2015). Educational apps need to be evaluated according to

the existing guidelines for the curriculum (More & Travers, 2015; Chera & Wood, 2003). The

design must be developmentally appropriate so that it can be used with little adult help.

Additionally, apps that require fine motor manipulation are unsuitable for children whose

physical disability makes this requirement difficult (More & Travers, 2015).

Additionally, educators should also consider the cultural and social context of the

program. They should select interactive media that is developmentally appropriate to support

specific learning goals. These apps should take into consideration a child's interest and learning

needs as well as allow the child to make choices so that they challenge the child to grow without

causing frustration. Apps that are interactive can present opportunity for problem solving in

contrast to those that involve only rote memorization (More & Travers, 2015). Educators must

realize that an eBook that is poorly designed may interfere with reading comprehension rather

than enhance it (Barnyak & McNelly, 2016).

At-Risk Children

At-risk children present significant challenges. Children are at risk when they have an

environmental disadvantage (Moody et al., 2010). Also, children are considered to be

disadvantaged if their socioeconomic status (SES) is low, if they are in immigrant families or if

they lag in literacy or language development. (Takas et al., 2015). The number of students who

are English language learners (ELLs) is growing in the United States schools. These students

have significantly lower test scores and graduation rates. Consequently, it is important to

implement more effective teaching strategies to help these students improve academic

achievement. Use of technology has become a viable way to meet the needs of ELL students.

The interactive features and the many built-in characteristics such as dictionaries, sound effects,

and other supplementary material enhance the reading experience and motivate children to read. This technology also gives children control over their learning (Ok & Ratliffe, 2018). In addition, Chai (2017) found that using a researcher-developed iPad program helps students with developmental delays, who are also at-risk, experience immediate changes in identifying target phonemes.

The use of eBooks provides other advantages for children at risk. They allow independent multiple readings of the same story, incorporating traditional shared reading of printed text that has been proven beneficial. Interactive e-stories are useful instructional tools to improve language learning and literacy among minority children. Those for whom English is a secondary language characteristically have lack of proficiency in English that inhibits their learning. Storytelling helps these minority groups develop their social and emotional skills. Using eBooks for storytelling is an effective way to meet all of these needs. Story application skills have been found to be an accurate indicator of literary achievement (Phadung et al., 2014). Ebooks can provide more opportunity to read aloud because they are easily accessible in schools and in the majority of homes. These increased opportunities to read resulted in improved literacy and language skills.

Possession of phonological awareness skills is especially important for disabled ELLs if they are to become independent readers. When they do not acquire these skills, they will fall behind in literacy achievement. However, few empirical studies have addressed the challenge facing dual language learners. Computer-assisted instruction (CAI) allows for individualized instruction while providing more opportunity to practice, allowing for immediate feedback, and reinforcing the skills learned. Technology can assist students with disabilities in literacy skills to improve their reading fluency and their comprehension, and students who had computer-assisted

phonological awareness training scored higher than students who did not have the training. In addition, when children who were developmentally disabled used iPods, they achieved positive results (Chai et al., 2015). Students receiving CAI developed significantly higher phonological skills and made progress in incidental learning such as vocabulary skills (Macaruso & Rodman, 2011).

When at-risk students used the computer to practice targeting letter sounds, they showed improvement in their knowledge of letter sounds and also became more fluent (Larabee et al., 2014). Use of a mobile device to play educational reading applications can lead to literacy and vocabulary gains as well as to increased on-task time (Larabee et al., 2014). Also, eBooks used in interventions have had positive literacy benefits (Verhallen et al., 2006). However, the connection between the number of repetitions and subsequent literacy outcomes has not undergone significant research.

Korat (2009) found that preschool and kindergarten students using repetitive reading of eBooks made greater literacy gains than children receiving instruction in regular classrooms. This finding offers a promising intervention for preschool children who are at risk of having difficulties (Salmon, 2014). Furthermore, educational eBooks help young children who have learning disabilities and children from low SES environments overcome existing barriers that hinder reading development (Shamir & Korat, 2015). When they overcome these barriers, it is expected that these children will show more motivation to become engaged in reading related activities. Students are more engaged when using iPad instruction when they read independently. Students from diverse groups, both cultural and linguistic, are at risk for poor academic achievement because they often fail to acquire the basic reading skills that are essential for academic success (Musti-Rao et al., 2015).

Educators should use a variety of eBooks since different features yield different outcomes. The use of eBooks in schools may be particularly helpful for children whose home setting provides few opportunities for interactions with books. Research is evidencing that eBooks are especially important when parents have limited literacy skills or have difficulty in scheduling time and in homes where English is a second language. The use of multimedia is beneficial for special needs children as it can accommodate students with learning disabilities since students can manipulate text size to adapt to specific needs (Zhou & Yadov, 2017). Half of minority students read below basic skill level in middle elementary grades when they have failed to achieve reading proficiency during early elementary years.   (Musti-Rao et al., 2015, p. 154). High quality support for children reading eBooks is critical to foster early literacy achievement (Skibbe et al., 2017).

The positive effect of technology use indicates that use of mobile devices can enhance learning. Educational technology is best used to facilitate reading instruction toward learning goals but should not replace traditional teaching. In this way, the technology can focus on specific learning needs of individual students. Research has concluded that mobile technology increases engagement and improved academic achievement. The results of this study by Larabee et al. (2014) indicate the benefit of using mobile applications in reading interventions. They suggest, however, that future studies should focus on the effectiveness of mobile technology when teacher guidance is limited.

Positive growth can also occur through paired-peer reading and through an adult prompting discussion and engaging thinking (Korat et al., 2009). Therefore, while eBooks do enhance reading development, both adult involvement and reading instruction are also important factors in literacy development and should not be eliminated (Salmon, 2014). They are effective

tools to reinforce literacy skills both in the classroom and at home. Shared storybook reading has had positive impact on children acquiring skills in language and literacy for both those who are typically developing and for those who have developmental risk (Van Kleeck & Vander Woude, 2006), and disability (Davie & Kemp, 2002). Design features in a storybook affect the reading interaction between the child and the adult. Child involvement may vary depending on whether the child is reading traditional paperbacks or eBooks. In addition, greater engagement and communication may occur when children read with an adult (Moody et al., 2010).

Because sight words constitute a large portion of text encountered in reading, students need to receive instruction both in phonics and in reading sight words. Acquiring both decoding skills and sight word recognition is necessary to develop reading fluency. Instruction must focus on embedded words in a meaningful context with many opportunities to practice. Computer-assisted instruction provides this opportunity. In addition, CAI produces higher levels of engagement (Musti-Rao et al., 2015). Knowledge of target words occurs from both teacher-facilitated and technology-facilitated instruction with at-risk children. Participants in the study by Dennis et al. (2016) had opportunity to engage independently with eBooks with little teacher help, but the features did not match completely with teacher-facilitated instruction. Their research indicated that at-risk children make greater gains when opportunity to use new words follows explicit instruction. Additionally, children using researcher-designed software in the eBooks experienced greater gains in vocabulary than did the children who experienced traditional classroom instruction (Chera & Wood, 2003). The use of the multimedia format was of particular value to second language students (Verhallen & Bus, 2010).

Computer-Adaptive Assessment/Learning

A number of computer-based tests on literacy exist. STAR Reading, developed by Renaissance (2013), is a computerized adaptive test (CAT) that assesses student reading comprehension, provides norms for measuring student reading performance, and generates data to indicate student growth in reading. The National Center on Response to Intervention found STAR Reading to have convincing evidence of reliability and validity. However, more empirical research should be conducted regarding progress monitoring to determine the ideal monitoring intervals, which are based on the grade level of the students (Bulet & Cormier, 2016). Their research data indicates "that STAR Reading is *most* useful when student's reading level is between grades 1 and 4, inclusively" (p. 10).

CAT assessment is valuable in identifying the academic progress of individual students (Shapiro & Gebhardt, 2012) and in promoting effective intervention among young students (Johnson, Perry, & Shamir, 2010). Computer-assisted learning has a "statistically significant positive impact on student reading gains when compared with traditional reading instruction alone" (Shannon, Styers, Wilkerson, & Peery, 2015, p. 20). The Accelerated Reader program supports independent reading with the use of books providing an appropriate challenge level that corresponds to a student's zone of proximal development in order to maximize student progress (Shannon et al., 2015).

Summary

Because most children are captivated with technology, the use of eBooks in early elementary may be effective in developing emergent literacy (Wright et al., 2013). Researchers focused their investigations on how eBooks may affect the development of comprehension, vocabulary, and language acquisition. They hypothesized that the interactive features would

motivate children to read more and consequently improve reading performance. They found that because commercial eBooks placed more emphasis on multimedia features, they usually did not support literacy acquisition. Therefore, they emphasized the need for eBooks to be specifically designed for educational purposes. Educators must exercise discernment when selecting apps to be integrated into the curriculum to make sure they are developmentally appropriate and that they address the established learning goals.

There are some roadblocks to the effective use of eBooks. While the interactive features of hotspots and animation can facilitate literacy development, they can also be a distraction and create cognitive overload. Therefore, the hotspots and animation must be congruent with the storyline if they are to support literacy development. Most literature emphasized that eBooks should not replace print storybooks, but rather act as a supplement. Children benefit from peer reading and adult support, but with eBooks they can also read independently which can improve the frequency of reading. Additionally, the use of eBooks provides an advantage for children who are at risk because of learning disabilities or disadvantaged environmental situations. Designers of eBooks are responding to the need to make them able to maintain the benefits of print text while developing new approaches. The results of research on the use of eBooks show how this technology can enhance the development of emergent literacy.

CHAPTER THREE: METHODS

Overview

The concept of literacy development has been changing with the increased focus on technology in education. Historically, print materials were the only way to approach literacy. However, as the use of educational technology has increased, interest in eBooks and eReader programs has also increased. This chapter will provide a detailed description of this research study through a thorough discussion of the following key elements: design, research questions, hypotheses, participants and setting, instrumentation, procedures, and data analysis.

Design

In order to evaluate the effect of eBook readers on overall literacy development, a quantitative, quasi-experimental static-group comparison design research study was conducted with lower elementary school students using the independent variable *use of eBook reader* and the dependent variable *overall literacy development* as it pertains to motivation, phoneme awareness, word recognition, and comprehension. A quasi-experimental static-group comparison design attempts to find a causal relationship between the independent and dependent variable. Key components to a quasi-experimental static-group comparison design are two designated groups that are not determined randomly with one group getting the treatment and one not receiving the treatment and a posttest is administered to each group to determine the difference, after treatment, between the two groups (Gall et al., 2007). This research design is appropriate for this study because it will compare class sections of lower elementary school students who were not randomly assigned to either the control group or the treatment group by section. Additionally, the quasi-experimental static-group comparison design is appropriate, as the variable will be manipulated in the study. This type of research design was used in similar

studies seeking to evaluate how the use of an eBook potentially influences elementary age students (Doty et al., 2001; Korat et al., 2009).

Research Question

RQ1: Is there a difference among lower elementary school students' motivation, phoneme awareness, word recognition, comprehension, and overall literacy when implementing the eBook application Raz-Kids to develop literacy.

Hypotheses

The null hypotheses for this study are:

H_o1: There is no difference in student motivation to read as it pertains to academic and recreational reading for lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the Elementary Reading Attitude Survey (ERAS).

H_o2: There is no difference in student phoneme awareness between lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the STAR Reading Enterprise assessment.

H_o3: There is no difference in student word recognition between lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the STAR Reading Enterprise assessment.

H_o4: There is no difference in student comprehension between lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the STAR Reading Enterprise assessment.

Participants and Setting

The target population for this research study was lower elementary school students selected through convenience sampling from a Christian school located in southeastern Florida

during the spring semester of the 2020-2021 school year. The participating school had the following demographics: 55% Caucasian, 20% African-American, 17% Hispanic, 8% Other. The school draws from a population that includes students from a low to high socioeconomic status.

This research study included the target sample size of approximately 107 (N=107) total lower elementary school students, which created a sufficient sample size according to Gall et al. (2007) for a medium effect size with a statistical power of .7 at the .05 alpha level. The school has two sections for each grade and all students in the treatment group used the eBook application (Raz-Kids) for the six-week duration of the research. This ensured that each lower elementary school student in the treatment group was exposed to the independent variable (eBook). The sample was selected through convenience sampling of enrolled lower elementary school students. The elementary school principal designated the treatment and control section for each of the participating grades from the naturally occurring class groups. The participants were invited to participate through an email invitation sent out by the elementary principal to the parents of the students. The email included the researcher prepared documents of parent/guardian consent. The study was introduced to the students by the researcher. The school had an iPad cart available for each grade level and the Raz-Kids application was loaded onto the devices before the start of the research study by the elementary information technology (IT) specialist IT. The Raz-Kids reading application remained with the school after completion of the research study.

Instrumentation

This research study incorporated the Elementary Reading Attitude Survey (ERAS) developed by Michael McKenna and Dennis Kear (1990) to assess if there is a difference in

student motivation to read (Ho1) when implementing Raz-Kids for lower elementary school students to develop literacy. The research study also incorporated the STAR Reading Enterprise Assessment to determine if there was a difference in phoneme awareness, word recognition/vocabulary development, comprehension, and overall literacy development (H_o2-H_o5) with lower elementary school students when implementing Raz-Kids to develop literacy.

Elementary Reading Attitude Survey

The Elementary Reading Attitude Survey (ERAS) is appropriate for this study as it has been found to be valid and reliable on a similar demographic as the population that will be studied in this research. The ERAS was also used in studies by Kazelskis, Thames, Reeves, Flynn, Taylor, Beard and Turnbo (2004) and Worrell, Roth, and Gabelko (2007). These previous studies focused on obtaining elementary student motivation toward reading based on assessments given at different intervals in the school year. The purpose of the assessment is to provide teachers with an efficient and reliable estimate of student attitude levels toward reading. One of the authors of the survey, Dr. Dennis Kear, was contacted for permission to use the survey in this research. This researcher was informed that the ERAS is published in the public domain so that teachers and researchers can use it with students free of charge.

The classroom teacher administered the instrument. The teacher read aloud each question and the student circled the picture that most accurately depicted the feelings associated with the question. The survey is designed to take approximately 10-15 minutes to complete. The questionnaire provides three scores for each student. The first score aligns with the first ten questions. The second score aligns with the second ten questions. The third score is a composite of all scores and provides an overall indication of the student attitude toward reading. Each subscale can range from 10 to 40 points and the composite can range from 20 to 40 points. A

score of 50 is considered the midway point and would represent indifference toward reading.

The first half of the questions on the survey are aligned with attitude toward recreational reading

and the second half of the questions are aligned with attitude toward academic aspects of

reading. The researcher scored the assessment after identifying information was deleted.

The instrument is a 20-item, four-point Likert scale questionnaire which uses the

character of Garfield in poses depicting attitudes from very happy to very upset. The four points

were chosen based on research that suggests that most young children can simultaneously

discriminate among five or fewer bits of information (McKenna & Kear, 1990). The instrument

is divided into two separate subscales with 10 questions; each designed to assess attitudes toward

recreational reading and academic reading (McKenna & Kear, 1990).

The development of the ERAS involved a merge of 39 items taken from an item pool

consisting of 15 items relating to attitude toward academic reading and 24 items relating to

recreational reading. The uniform "How do you feel..." is used as the beginning of each question

to establish consistency in student expectation. A model instrument was administered to 499

elementary students located in the Midwest after which the final 10 items for each subscale were

chosen based on correlation coefficients. The revised instrument incorporating the changes was

administered to 18,000 students in grades 1-6 (McKenna & Kear, 1990).

Reliability was tested with Cronbach's alpha on each subscale at each grade level with

coefficients ranging from .74 to .89. Evidence of validity was gathered several ways and divided

by subscale. For recreational reading, students were divided into groups based on whether they

had a public library close to them and whether they had a library card. Those students who

stated they had a library card scored significantly higher in recreational scores at $p < .001$ ($M = 30.0$) as compared to those who stated they were non-cardholders ($M = 28.9$), providing validity

is present with an outside criterion. A second test compared students who had checked out non-required books from the library with the means varying significantly ($p < .001$) at $M = 29.2$ for checked out books and $M = 27.3$ for those who reported no checked out books (McKenna & Kear, 1990).

A final test of the recreational subscale compared the difference in groups of students who watched more than two hours of television per evening with students who average less than one hour of television watching per evening. Results showed a significant increase ($p < .01$) in student attitude toward recreational reading with those in the low viewing group ($M = 31.5$) as compared to those in the high viewing group ($M = 28.6$), demonstrating the overall impact on student attitude toward recreational reading based on television viewing habits (McKenna & Kear, 1990).

Validity testing for the academic subscale looked to identify the relationship between reading ability and assessment scores. Students determined to have high overall reading ability had a mean score of $M = 27.7$ which was significantly higher than the mean ($M = 27.0$, $p < .01$) for students considered to be low ability readers, evidencing that scores were indicative of student opinion on academic reading. A factor analysis using the least squares method of extraction further determined that the two subscales, when used together, were able to identify certain aspects of student attitude toward reading (McKenna & Kear, 1990)

STAR Reading Enterprise Assessment

The research study incorporated the STAR Reading Enterprise Assessment to determine if there was a difference in phoneme awareness, word recognition, comprehension, and overall literacy development in lower elementary school students when implementing Raz-Kids to develop literacy. Renaissance Learning developed the STAR Reading Enterprise Assessment

instrument in 2011 as a computer-adaptive test (CAT), which assesses the student skill level and adjusts questions based on student responses. The research site already uses the STAR Reading Enterprise Assessment so archival data was available for previous school quarters. This instrumentation is appropriate for this research as it was used in similar research studies by Shannon et al. (2015), Bulut and Cormier (2016) and Johnson et al. (2009).

The test was developed and is designed to help educators identify student strengths and deficits in reading growth and to provide specific insight for methods of intervention. The instrument evaluates phonological awareness, phonics and word recognition, and comprehension and is designed for grades K through 12. The 25-item computer test takes approximately 10-15 minutes based on student progress. The STAR assessment provides additional scores that are designed to offer insight into overall student performance in comparison to other students. These include percentile rank, percentile rank range, zone of proximal development, and grade equivalent.

The normative sample of the STAR Reading Enterprise assessments consisted of a random national sample using more than 1.2 million STAR Reading Enterprise tests that were administered between 2012 and 2013. The internal consistency had a reliability coefficient of .95 for the 100,000 first-grade students examined, .94 for 100,000 second-grade students examined, and .94 for 100,000 third grade students examined. The retest reliability used 5,000 students for each grade and the reliability coefficient was .54 for first grade students, .66 for second grade students, and .75 for third grade students (McBride, 2013).

Validity for the STAR Reading Enterprise assessment was compared with other established measures of reading achievement including but not limited to various state accountability testing, diagnostic reading tests, and survey achievement tests. Predictive and

concurrent validity scores involved a total of one million students with correlations ranging from .60 to .87, which are considered to be strong correlations. The predictive validity of 7,477 first grade students was .68 and concurrent and external validity for 1,135 first grade students was .77. The predictive validity of 184,434 second-grade students was .78 and concurrent and external validity for 4,142 second-grade students was .72. The predictive validity of 200, 929 third-grade students was .80 and concurrent external validity for 4, 051 third-grade students was .75 (McBride, 2013).

Procedures

This study began after receiving Institutional Review Board (IRB) approval because human participants are involved in this research. The purpose of the IRB is to review the potential research study and ensure that the privacy and confidentiality of all participants will be maintained in addition to ensuring the safety of all the participants (Gall et al., 2007). After obtaining IRB approval, this researcher sent an invitation letter to the elementary principal and the superintendent of the private Christian elementary school located in Southeastern Florida. The communication included parent/guardian consent forms, a copy of the participant's rights, and a copy of each instrument: Elementary Reading Attitude Survey (1990) and the STAR Reading Enterprise assessment (2012).

After permission was granted by the elementary principal and the superintendent of the school and the parent/guardian consent forms were returned, the researcher arranged with the school to train the teachers assigned to the research study on how to incorporate the application Raz-Kids into their daily curriculum. The STAR Reading Enterprise Assessment is already utilized in the school so no further permission or training is required to use the instrument in this research study. The teachers were trained to administer the ERAS instrument, which was

utilized in the research study. The training occurred outside of the instructional day at a mutually agreed upon location and time.

The 44 lower elementary school students used the supplied iPad and the application Raz-Kids to read the designated books in addition to their traditional reading program for the duration of the research study. Before implementing the application Raz-Kids, the teacher provided initial instruction to the students to include, but not limited to, maneuvering through the program and interacting with the program to better facilitate student understanding. The program was incorporated into the daily school curriculum for approximately six weeks. The teachers administered the ERAS at the conclusion of the research study to assess student motivation with the eBook application (Raz-Kids).

Raz-Kids is a comprehensive reading resource that uses leveled reading to motivate and engage students. Students are able to access every eBook through online and mobile formats which allow the student to listen to the book, read at their own pace, and record themselves reading. Assessment is provided as an eQuiz that is completed when a student has completed a book. The eQuiz tests comprehension and directs further instructional needs. Students that read 10 or more of the leveled books and pass the comprehension quiz are able to advance to the next reading level, which provides them with longer and more difficult text. The leveled reading program allows the teacher to provide each student with the right content. The students in the treatment group used the Raz-Kids program in additional to their traditional reading program. The control group used only their traditional reading program.

The students took the STAR Reading Enterprise assessment at the conclusion of the research. After being stripped of any identifiers, the ERAS results were placed in a sealed manila envelope and returned to the school administrator and were picked up by the researcher

for analysis. The STAR Reading Enterprise assessment results were printed by the elementary school administrative assistant, stripped of any identifiers, placed in a sealed manila envelope and returned to the researcher.

Data Analysis

Data analysis for H_o1, H_o2, H_o3, and H_o4 was conducted using a Multivariate Analysis of Variance (MANOVA). The MANOVA allows the researcher to test hypotheses regarding the effect of the independent variable (eBook) on multiple dependent variables in research (Gall et al., 2007). It will determine if the use of an eReader program (independent variable) will have a statistically significant effect on motivation to read, phoneme awareness, word recognition, comprehension, and overall literacy (dependent variables). The MANOVA is appropriate for the statistical analysis of this research because it is used to compare the means on several Y (dependent variable) outcomes for naturally occurring groups. Additionally, the MANOVA will provide a better understanding of the group differences by taking into account the intercorrelations among the outcome variables thus providing the ability to show any significant differences that may be present in the data. This analysis may be more informative than results obtained from conducting individual univariate Analysis of Variance (ANOVA) tests (Warner, 2013).

The data was visually screened for both the control and treatment groups' dependent variable motivation to read using Box and Whisker plots to check for any potential inconsistencies. The Assumption of Normality was analyzed with a Kolmogorov-Smirnov test which is the appropriate test as the sample size is larger than 50 and is preferred when making comparisons within a normal distribution. The Shapiro-Wilk's test was conducted to account for the uneven group size and is considered appropriate for a sample size of less than 50. The

Assumption of Homogeneity of Variance was examined using the Levene's test. A test of between-subject effects was conducted for both recreational reading and academic reading and the model as a whole to account for any variation in the dependent variable.

To examine the combined use of an eBook reader on both recreational reading and academic reading as it pertained to student motivation to read, a Wilks-Lambda test was used to identify any differences in the means of identified groups of subjects on a combination of dependent variables. The Assumption of Homogeneity of Variance-Covariance was further checked using Box's M test of equality of covariance due to the sample size of the experimental group not meeting the requirement for the Kolmogorov-Smirnov test. To allow for the uneven group assignment, a test of Estimated Marginal Means was conducted to even out the variables. Absence of Multicollinearity was not assessed for this analysis given that there was only one predictor. The alpha level for each statistical analysis was $\alpha = .05$.

CHAPTER FOUR: FINDINGS

Overview

In order to evaluate the effect of eBook readers on overall literacy development, a quasi-experimental static-group comparison design research study was conducted over a period of six weeks with lower elementary school students. The independent variable, use of eBook reader and the dependent variable, overall literacy development was examined as it pertains to motivation, phoneme awareness, word recognition, and comprehension. At the conclusion of the study, data was analyzed based on the results of the STAR Reading Enterprise assessment and the Elementary Reading Attitude Survey. Chapter Four reviews the research question and the hypotheses and analyzes the findings of the assessment and survey.

Research Question

This study used a quantitative, quasi-experimental static-group comparison design to answer the question regarding eBook reading and overall literacy development.

RQ1: Is there a difference among lower elementary school students' motivation, phoneme awareness, word recognition, comprehension, and overall literacy when implementing the eBook application Raz-Kids to develop literacy.

Null Hypotheses

The researcher tested four hypotheses for the proposed research question to examine overall literacy development as it pertains to the use of eBook reading.

H_o1: There is no difference in student motivation to read as it pertains to academic and recreational reading for lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the Elementary Reading Attitude Survey (ERAS).

H_o2: There is no difference in student phoneme awareness between lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the STAR Reading Enterprise assessment.

H_o3: There is no difference in student word recognition between lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the STAR Reading Enterprise assessment.

H_o4: There is no difference in student comprehension between lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the STAR Reading Enterprise assessment.

Descriptive Statistics

Descriptive statistics were secured on the dependent variable, use of eBook reader, for the independent variable, overall literacy development, as it pertains to motivation to read, phoneme awareness, word recognition, and student comprehension. Descriptive information for the experimental group can be found in Table 1. At the conclusion of the research study mean scores for each individual component of overall literacy development range from 77.41 for comprehension to 97.02 for phoneme awareness with an overall mean score of 86.54 for phoneme awareness, word recognition, and comprehension. The standard deviation for post research scores was 27.61. The N value or frequency demonstrates the number of participants in the experimental group.

Table 1

Descriptives

Means and Standard Deviations for Study Variables by Treatment Groups

	Experimental (N=44)		Control (N = 51)	
	M	SD	M	SD
Phoneme Awareness	97.02	44.66	102.80	44.03
Word Recognition	85.21	16.50	88.20	12.31
Comprehension	77.41	21.66	80.82	17.96
Motivation to Read-Recreational	27.32	4.67	28.90	6.11
Motivation to Read-Academic	29.32	4.69	28.29	6.91

Descriptive information for the control group can be found in Table 1. As demonstrated

in the table, the mean pretest scores for each individual component of overall literacy

development range from 70.14 for comprehension to 86.00 for phoneme awareness with an

overall mean score of 78.35 for phoneme awareness, word recognition, and comprehension. At

the conclusion of the research study mean scores for each individual component of overall

literacy development range from 80.82 for comprehension to 102.80 for phoneme awareness

with an overall mean score of 90.61 for phoneme awareness, word recognition, and

comprehension. The standard deviation for post research scores was 24.77. The descriptive

statistics for both recreational reading and academic reading can be found in Table 1. As

indicated in the table, the experimental group had a mean score of 27.31 for recreational reading

with a standard deviation of 4.67 and a mean score of 29.32 for academic reading with a standard

deviation of 4.69. The control group had a mean score of 28.90 for recreational reading with a

standard deviation of 6.12 and a mean score for academic reading of 28.29 with a standard

deviation of 6.90. The *N* value or frequency demonstrates the number of participants in the control group.

Descriptive information for student motivation to read can be found in Table 1. As demonstrated in the table, recreational reading scores for the experimental group had a mean score of 27.32 with a standard deviation of 4.67 while the control group had a mean of 28.90 with a standard deviation of 6.11. For academic reading, the experimental group had a mean score of 29.32 with a standard deviation of 4.69 while the control group had a mean score of 28.29 with a standard deviation of 6.91. The *N* value or frequency demonstrates the number of participants in both groups.

<div align="center">**Results**</div>

Null Hypothesis One, Two, Three, and Four

A Multivariate Analysis of Variance (MANOVA) was used to test null hypothesis one. Data screening was conducted on the covariate motivation to read based on the independent variable, use of eBook reader. The researcher examined the data and scanned for any inconsistencies. Box and whisker plots were used to detect any possible outliers or inconsistencies. No extreme outliers or inconsistencies were detected. See Figure 1 for the Box and Whisker Plots for motivation to read.

Figure 1

Box and Whisker Plot—Motivation to Read
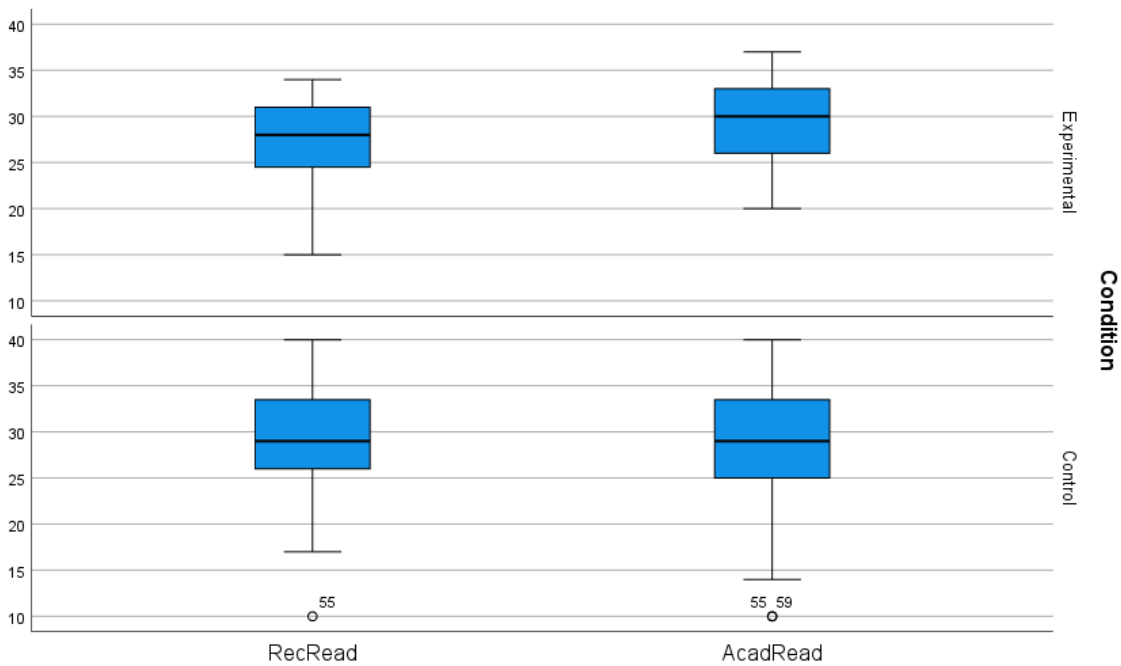
The researcher also conducted a scatterplot matrix on the dependent variables effect on motivation to read to include recreational and academic reading. The scatterplot evidences a linear relationship between recreational and academic reading as it pertains to motivation to read. See Figure 2 for the Scatterplot matrix.

Figure 2

Scatterplot Matrix—Motivation to Read
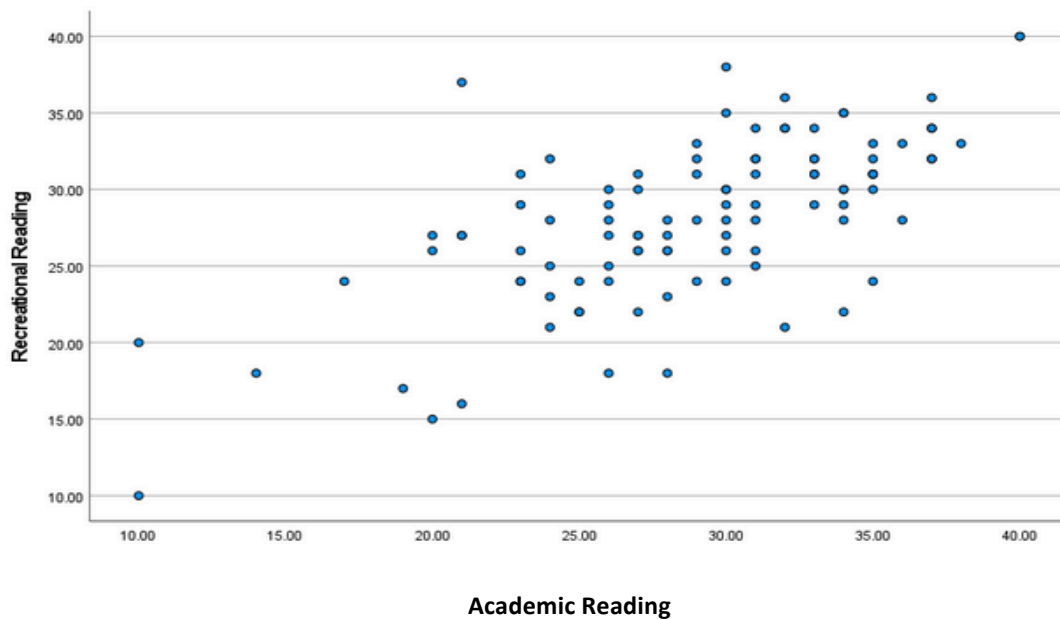
Assumptions

The MANOVA requires that each of the subgroup scores distribution is approximately normal and the scores group around their respective means similarly (i.e., homogeneity of variance), and that there is an additional assumption of absence of multicollinearity among the predictors (given that there was only one predictor multicollinearity was not assessed for this analysis). Subgroup univariate normality was assessed with the Shapiro-Wilk's and Kolmogorov-Smirnov tests. Shapiro-Wilk's test is generally used for sample sizes under 50. For the experimental group ($N = 44$) the Shapiro-Wilk's test indicated that the distribution for Recreational Reading violated the assumption of univariate normal ($p = .015$) while the univariate assumption of normal was met for Academic Reading ($p = .153$). In a follow up examination of the Recreation Reading distribution using Kolmogorov-Smirnov test to determine if the sample comes from a population with a specific distribution, the univariate criteria for

normal was met for the experimental group ($p = .076$). The Kolmogorov-Smirnov test is looking

for an even distribution as uneven groups can lead to a Type II error. Using Kolmogorov-

Smirnov test for the control group ($N =51$), no violation of univariate normality for Recreational

Reading ($p = .200$) or Academic Reading was indicated ($p = .200$). Although the uneven

distribution could have led to a Type II error, the data showed no significance so that is

considered better than a Type I error. The assumption of homogeneity of variance was examined

using the Levene's test. For assumptions to be met, p must be greater than .05. The assumption

was met for Recreational reading at $F(1, 93) = 1.83, p = .180$) and also for Academic Reading at

($F(1,93) = 3.76, p = .055$). See Table 2 for Tests of Normality and Table 3 for Test of

Homogeneity of Variances.

Table 2

Tests of Normality

		Kolmogorov-Smirnov			Shapiro-Wilk		
	Condition	Statistic	df	P	Statistic	df	P
RecRead	Treatment	.126	44	.076	.934	44	.015
	Control	.084	51	.200*	.972	51	.278
AcadRead	Treatment	.102	44	.200*	.962	44	.153
	Control	.095	51	.200*	.960	51	.081

The assumption of homogeneity of variance was examined using the Levene's test. For

assumptions to be met, p must be greater than .05. The assumption was met for recreational

reading at $p = .180$ and also for academic reading at $p = .055$. See Table 3 for the tests of

homogeneity of variance.

Table 3

Levene's Test of Equality of Error Variances

		Levene Statistic	df1	df2	P
RecRead	Based on Mean	1.825	1	93	.180
	Based on Median	1.847	1	93	.177
	Based on Median and with adjusted df	1.847	1	85.716	.178
	Based on trimmed mean	1.843	1	93	.178
AcadRead	Based on Mean	3.761	1	93	.055
	Based on Median	3.480	1	93	.065
	Based on Median and with adjusted df	3.480	1	77.674	.066
	Based on trimmed mean	3.622	1	93	.060

A test of between-subject effects was conducted for recreational reading and academic reading and the model as a whole to account for variation in the dependent variable. For recreational reading, the effect size was small (partial $\eta^2=.021$, $p=.164$). See Table 4 for Tests of Between-Subject Effects.

Table 4

Tests of Between-Subject Effects

Source	DV	SS	df	MS	F	p
Corrected	RecRead	59.250	1	59.250	1.965	.164
Model	AcadRead	24.772	1	24.772	.691	.408
Intercept	RecRead	74659.166	1	74659.166	2476.165	<.001
	AcadRead	78402.456	1	78402.456	2188.216	<.001
Condition	RecRead	59.250	1	59.250	1.965	.164
	AcadRead	24.772	1	24.772	.691	.408
Error	RecRead	2804.055	93	30.151		
	AcadRead	3332.134	93	35.829		
Total	RecRead	78242<.001	95			
	AcadRead	81981<.001	95			
Corrected	Recreational	2863.305	94			
Total	Academic	3356.905	94			

To test the combined effect of the use of an eBook reader on recreational reading and academic reading as it pertains to student motivation to read. The Wilks' Lambda test was used to determine whether there were differences between the means of identified groups of subjects on a combination of dependent variables. There was a statistically significant difference in student motivation to read based on the use of an eBook reader, approximate F (2, 92) = 3.900, p = .024; Wilk's Λ = .922, partial η^2 = .078. See Table 5 for Multivariate Tests.

Table 5

Wilks' Lambda Multivariate Test

Effect		Value	F	Hypo .df	Error df	p	Partial Eta Squared
Intercept	Wilks' Lambda	.032	1378.990	2	92	<.001	.968
Condition	Wilks' Lambda	.922	3.900[b]	2	92	.024	.078

To account for the uneven group assignment, a test of Estimated Marginal Means was conducted to even out the variables. The test was conducted with a 95% confidence level. For recreational reading, the experimental group had a mean of 27.32 and the control group had a mean of 28.90. For academic reading, the experimental group had a mean of 29.32 and the control group had a mean of 28.29. See Table 6 for Estimated Marginal Means and Figure 3 for Box and Whisker Plot for Estimated Marginal Means.

Table 6

Estimated Marginal Means

Dependent Variable	Condition	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
RecRead	Treatment	27.318	.828	25.674	28.962
	Control	28.902	.769	27.375	30.429
AcadRead	Treatment	29.318	.902	27.526	31.110
	Control	28.294	.838	26.630	29.959

Figure 3

Box and Whisker Plot—Estimated Marginal Means
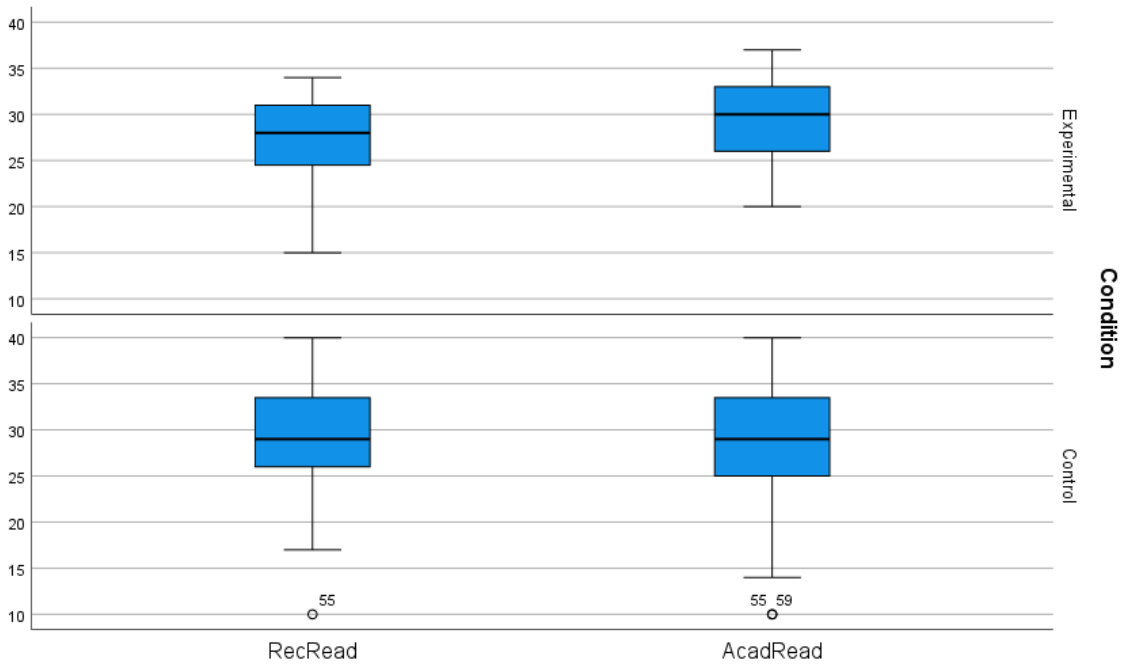
Result for Null Hypothesis H$_0$1

Although the assumptions of normality and homogeneity of variance were met, due to the sample size of the experimental group not meeting the requirement for the Kolmogorov-Smirnov test, the researcher conducted a Box's Test of Equality of Covariance Matrices. See Table 7 for the Box's Test of Equality of Covariance Matrices.

Table 7

Box's Test of Equality of Covariance Matrices

Box's M	7.833
F	2.550
df1	3
df2	5497654.057
p	.054

The Box *M* test (using $\alpha = .05$ as the criterion for significance) did not indicate a significant violation of the assumption of homogeneity of variance/covariance matrices across conditions. The difference between the groups, as shown in Table 7, was not found to be statistically significant according to Box's M at $F(3, 2.550) = 7.883$, $p = .054$; therefore, this researcher failed to reject the null hypothesis H_o1 at a 95% confidence level.

Null Hypothesis Two, Three, and Four

A Multivariate Analysis of Variance (MANOVA) was also used to test null hypothesis two, three, and four. Data screening was conducted on the dependent variable, overall literacy development, for each covariate (phoneme awareness, word recognition, comprehension) based on the use of an eBook reader. The researcher examined the data and scanned for any inconsistencies. Given the utilization of standardized measures, univariate outliers were noted but not eliminated. Multivariate outliers were assessed via Mahalanobis distance, which is used to detect unusual combinations occurring with two or more variables. One case exceeded the cutoff for multivariate outliers identified at .001.

Assumptions

The MANOVA required an absence of multicollinearity, and that the assumptions of normality and homogeneity of variance were met. Normality was examined using both the Kolmogorov-Smirnov test and the Shapiro-Wilk test ($p > .05$) due to the difference in size between the experimental ($N = 44$) and the control ($N = 51$) group. The Kolmogorov-Smirnov test is not necessarily appropriate as the experimental group size is below 50 at $N = 44$. The Shapiro-Wilk Test would demonstrate post research violations in word recognition for the experimental group at $<.001$. Additionally, it would evidence post research violations for the control group in comprehension at $<.001$ and post research violations for the control group for phoneme awareness at $<.001$.

Table 8

Tests of Normality

| | Condition | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
		Statistic	df	Sig.	Statistic	df	Sig.
PA	Treatment	.095	44	.200[*]	.960	44	.133
	Control	.084	51	.200[*]	.957	51	.064
WR	Treatment	.231	44	<.001	.744	44	<.001
	Control	.159	51	.003	.847	51	<.001
RC	Treatment	.164	44	.005	.838	44	<.001
	Control	.154	51	.004	.879	51	<.001

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

A test of between-subject effects was conducted for phoneme awareness, word recognition, and comprehension, as it pertained to the independent variable (use of eBook reader). For phoneme awareness, the effect size was determined through partial eta squared to be

small at partial η2=.06 and a significance level of $p > .05$ at $p = .410$. The effect size for word

recognition was determined to be small with a partial η2 =.05 and a significance level of $p > .05$

at $p = .161$. The effect size for comprehension was determined to be small at partial η2 =.04 and

a significance level of $p > .05$ at $p = .253$. The test was completed at α =.05. See Table 9 for

Tests of Between-Subject Effects.

Table 9

Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Phoneme	1360.085[a]	1	1360.085	.684	.410
	Word Recognition	473.548[b]	1	473.548	1.999	.161
	Comprehension	566.500[c]	1	566.500	1.320	.253
Intercept	Phoneme	999426.752	1	999426.752	502.860	.000
	Word Recognition	753467.940	1	753467.940	3180.334	.000
	Comprehension	625322.265	1	625322.265	1457.194	.000
Condition	Phoneme	1360.085	1	1360.085	.684	.410
	Word Recognition	473.548	1	473.548	1.999	.161
	Comprehension	566.500	1	566.500	1.320	.253
Error	Phoneme	198748.591	100	1987.486		
	Word Recognition	23691.472	100	236.915		
	Comprehension	42912.755	100	429.128		
Total	Phoneme	1203973.000	102			
	Word Recognition	780278.000	102			
	Comprehension	671244.000	102			
Corrected Total	Phoneme	200108.676	101			
	Word Recognition	24165.020	101			
	Comprehension	43479.255	101			

a. R Squared = .007 (Adjusted R Squared = -.003)
b. R Squared = .020 (Adjusted R Squared = .010)
c. R Squared = .013 (Adjusted R Squared = .003)

_____

To test the combined effect (interaction effect) of the use of an eBook reader on phoneme

awareness, word recognition, and comprehension, multivariate tests were conducted. A

scatterplot matrix was plotted for each group of dependent variables (phoneme awareness, word

recognition, and reading comprehension). The scatterplots evidenced a curvilinear relationship

between phoneme awareness and word recognition and also between phoneme awareness and

reading comprehension which is indicated in the range of the higher scores. The scatterplots

evidenced a linear relationship between word recognition and reading comprehension. Although

the scatterplots indicated a curvilinear relationship, they violated the assumption of linearity.

This can lead to a false interpretation of a relationship so further analysis was conducted. See

Figure 6, Figure 7, and Figure 8 for scatterplots.

Figure 4

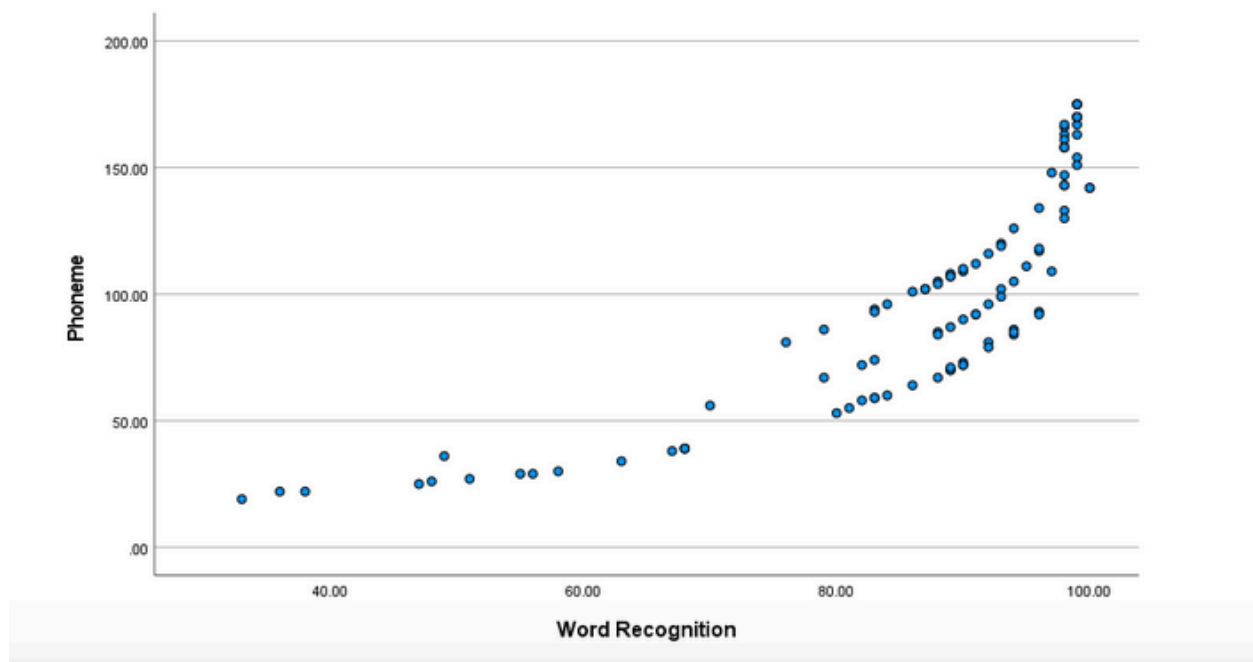*Scatterplot Matrix --Phoneme Awareness and Word Recognition*

Figure 5

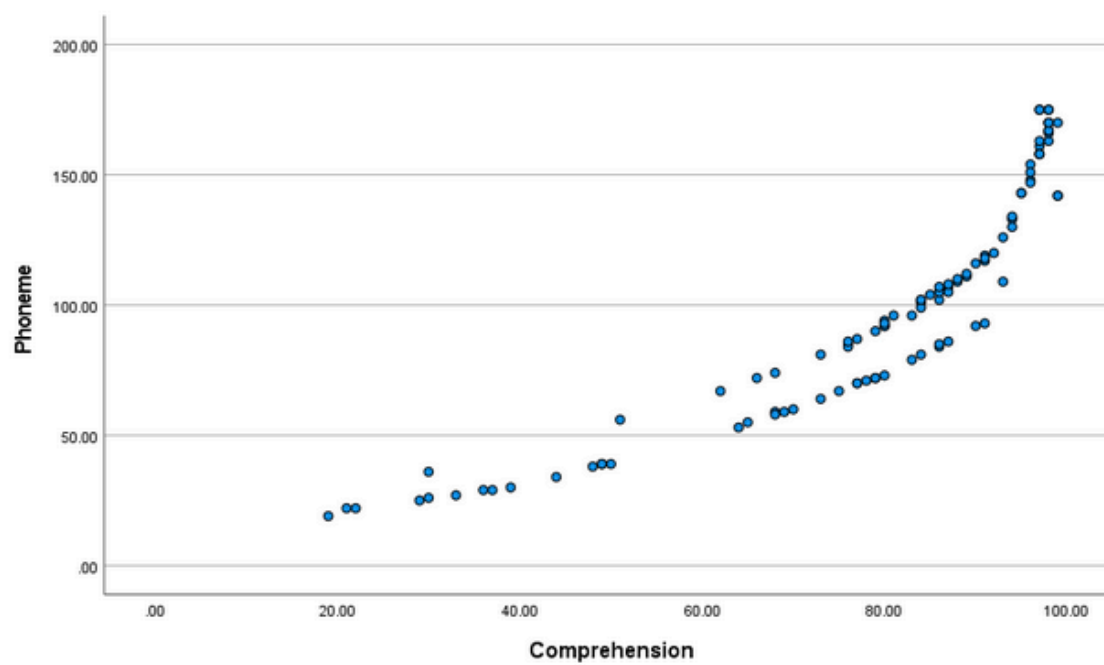*Scatterplot Matrix--Phoneme Awareness and Reading Comprehension*

Figure 6

Scatterplot Matrix--Reading Comprehension and Word Recognition
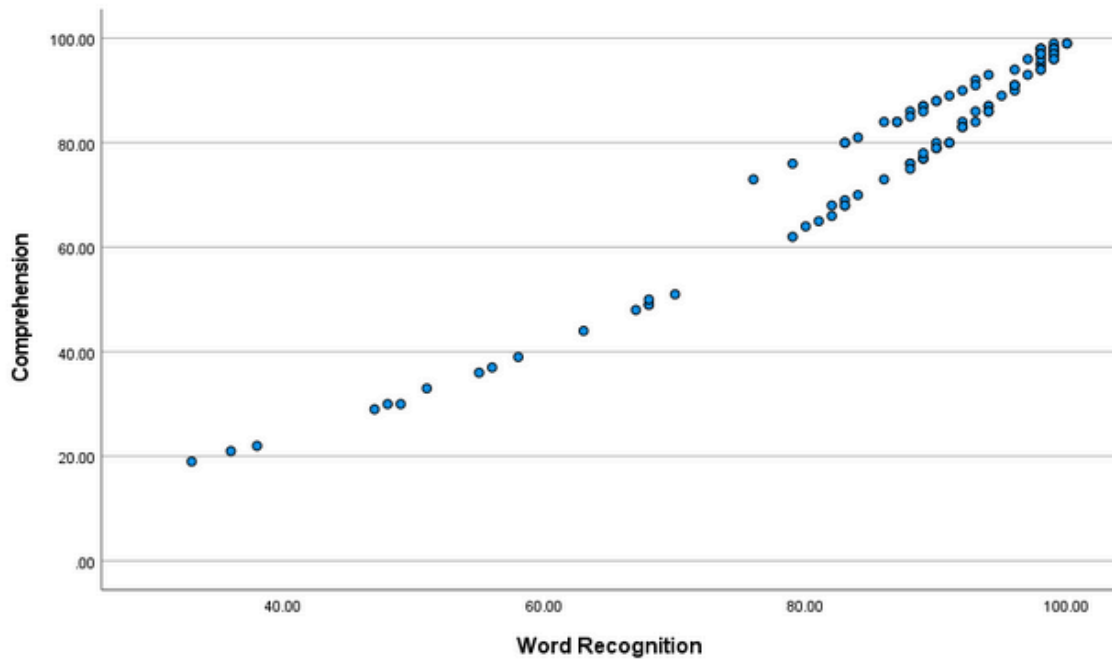
The Wilks' Lambda test was used to determine whether there were differences between the means of identified groups of subjects on a combination of dependent variables. There was no statistically significant difference in phoneme awareness, word recognition, and reading comprehension based on the use of an eBook reader, approximate $F(3, 98) = 1.12$, $p = .34$; Wilk's $\Lambda = .967$, partial $\eta^2 = .534$. See Table 10 for multivariate test.

Table 10

Multivariate Tests

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.991	3510.646[b]	3.000	98.000	.000
	Wilks' Lambda	.009	3510.646[b]	3.000	98.000	.000
	Hotelling's Trace	107.469	3510.646[b]	3.000	98.000	.000
	Roy's Largest Root	107.469	3510.646[b]	3.000	98.000	.000
Condition	Pillai's Trace	.033	1.120[b]	3.000	98.000	.345
	Wilks' Lambda	.967	1.120[b]	3.000	98.000	.345
	Hotelling's Trace	.034	1.120[b]	3.000	98.000	.345
	Roy's Largest Root	.034	1.120[b]	3.000	98.000	.345

a. Design: Intercept + Condition

b. Exact statistic

To account for the uneven group assignment, a test of Estimated Marginal Means was conducted to even out the variables. The test was conducted with a 95% confidence level. For phoneme awareness, the experimental group had a mean of 95.40 and the control group had a mean of 102.72. For word recognition, the experimental group had a mean of 83.86 and the control group had a mean of 88.20. For comprehension, the experimental group had a mean of 76.00 and the control group had a mean of 80.72. See Table 11 for Estimated Marginal Means.

Table 11

Estimated Marginal Means

Condition

Dependent Variable	Condition	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Phoneme	Experimental	95.408	6.369	82.773	108.044
	Control	102.717	6.124	90.568	114.866
Word Recognition	Experimental	83.857	2.199	79.495	88.220
	Control	88.170	2.114	83.975	92.364
Comprehension	Experimental	76.000	2.959	70.129	81.871
	Control	80.717	2.845	75.072	86.362

Results for Null Hypotheses H_o2, H_o3, H_o4

Although the assumptions of normality and homogeneity of variance were met, due to the sample size of the experimental group not meeting the requirement for the Kolmogorov-Smirnov test, the researcher conducted a Box's Test of Equality of Covariance Matrices. See Table 12 for the Box's Test of Equality of Covariance Matrices.

Table 12

Box's Test of Equality of Covariance Matrices

_____

Box's M	12.317
F	1.980
df1	6
df2	59045.339
p	.065

_____

The Box *M* test (using α = .05 as the criterion for significance) did not indicate a significant violation of the assumption of homogeneity of variance/covariance matrices across conditions. The difference between the groups, as shown in table 13, was not found to be statistically significant according to Box's M at $F(6, 1.980) = 12.317$, $p = .065$ therefore this researcher failed to reject the null hypotheses H_o2, H_o3, and H_o4 at a 95% confidence level.

CHAPTER FIVE: CONCLUSIONS

Overview

This chapter contains the discussion of this research study, including pertinent literature from other studies as it relates to the five hypotheses. In addition, this chapter presents the implications and limitations of this study and recommendations for future studies.

Discussion

The purpose of this research study was to examine the effect of eBook reading on overall literacy development in lower elementary students with a focus on motivation, phoneme awareness, word recognition, and comprehension. In this technological age, incorporating digital learning in schools is essential to provide students with the skills necessary to function effectively in a global economy. Essential to meeting this goal is understanding how this technology can enable both teaching and learning.

This research is important because development of literacy skills at an early age is a predictor of student achievement later on (Zhou & Yadov, 2017), and acquiring digital literacy results in technological sophistication (Reynolds, 2016). However, studies in digital learning, specifically use of eBooks, have produced inconsistent results. Some studies show eBooks are more effective in developing literacy skills than are print books while other studies have found insignificant differences. Furthermore, the techniques used by teachers may affect the learning outcomes. When the same instructional techniques are used, learning remains the same no matter which medium is used (McKnight et al., 2016). Therefore, the way a teacher approaches the use of eBooks impacts learning (Hashim & Vongkulluksn, 2018). Consequently, teacher education should focus on training in the implementation of eBooks to use them effectively (D'Agostino et al., 2016).

The research question for this study was as follows: Is there a difference among lower elementary school students motivation, phoneme awareness, word recognition, comprehension, and overall literacy when implementing the eBook application Raz-Kids to develop literacy as compared to the overall literacy, phoneme awareness, word recognition, comprehension, and motivation of lower elementary school students in the control group who are using a traditional reading program.

The first null hypothesis (H_o1) states there is no difference in student motivation to read between lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the Elementary Reading Attitude Survey (ERAS). Results of this research study validated the first null hypothesis because for recreational reading the experimental group had a mean of 27.32 and the control group had a mean of 28.90. For academic reading, the experimental group had a mean of 29.32 and the control group had a mean of 28.29. The difference between the groups, as shown in table 7, was not found to be statistically significant according to Box's M at $F(3, 2.55) = 7.883$, $p = .054$; therefore, this researcher failed to reject the null hypothesis H_o1 at a 95% confidence level.

Knowing whether or not a reading medium is effective in motivating students to read is important because motivation is essential to develop reading confidence. Gaining reading competence requires motivation to read. Many researchers report that eBooks are more effective in developing literacy skills since the interactive features of eBooks capture children's attention so they are able to overcome inattentive behavior that can negatively affect acquiring these early literacy skills (Hume et al., 2016). Additionally, engagement in reading also predicts later learning skills (Baudo et al., 2014; Ciampa, 2012).

The constructivist theory emphasizes that this engagement indicates an internal drive to gain knowledge (Ciampa, 2012). Access to a large number of eBooks allows children to select the books they want to read which in turn increases motivation. The availability of eBooks provides children the opportunity to become independent learners (Clowes, 2018). Furthermore, the multimedia features of eBooks may stimulate interest in reading (Christ et al., 2016; Hess, 2014; Ciampa, 2012; Kao et al., 2016) and make educational content easier to follow (Clark & Mayer, 2011). A focus of this research study was to determine if availability of many eBooks and the attraction of multimedia features do increase interest in reading.

However, some researchers question if it is the novelty of reading eBooks that motivates students to read, and they wonder if this initial enthusiasm will diminish over time (Abdus, 2014; Hashim & Vongkulluksn, 2018). When the use of animation and interactivity are no longer novel, will eBooks still continue to create enthusiasm for reading? This research showed that enthusiasm for reading did not vary in a statistically significant way between eBooks and print books.

The second null hypothesis (H_o2) states there is no difference in student phoneme awareness between lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the STAR Reading Enterprise assessment. In this research study, the effect size for phoneme awareness was determined through partial eta squared to be small at partial $\eta2=.06$ and a significance level of $p >.05$ at $p =.410$. The difference between the groups was not found to be statistically significant so this researcher failed to reject the second null hypothesis at a 95% confidence level.

To develop literacy skills, young students must develop phonological awareness (Korat & Shamir, 2008). The ability of students to highlight letters and words when reading and to access

speech feedback, such as found in Raz-Kids, leads to greater gains in phonological awareness than has been found in traditional classroom comparisons. This study did not reflect a statistically significant advantage of eBooks over print books. Although Salmon (2013) found multimedia formats led to greater gains in second language learners, this study did not include this demographic.

Students in the early grades need to develop proficiency in decoding so that they can segment and blend letter sounds to recognize words automatically (Larabee et al., 2014) as they are developing literacy skills. Some researchers have found greater gains when children use eBook applications such as Raz-Kids than when they use traditional print materials (Salmon, 2013). Although students in this study did not have noticeable disability in literacy skills, students who do have this disability were able to score higher in phonological awareness with a digital approach (Chai et al., 2015). This research study supports the finding so Zhou and Yadov (2017) who found similar gains occurred in both interactive and print formats.

The third null hypothesis (H_o3) states there is no difference in student word recognition between lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the STAR Reading Enterprise assessment. In this research study, the effect size for word recognition was determined to be small with a partial $\eta2$ = .05 and a significance level of $p > .05$ at $p = .161$. In this study, the difference between the groups was not found to be statistically significant so this researcher failed to reject the third null hypothesis at a 95% confidence level.

Some research found an increase in word recognition for students using eBooks whose present vocabulary was limited (Smeets & Bus, 2015; Christ et al., 2016) perhaps because the animation helped to hold their interest and focus their attention (Kominsky & Asher-Sidon,

2013). The multimedia effects provide nonverbal clues that support understanding of verbal communication (Korat, 2009). However, hotspots that do not support the storyline do not assist in the learning of new words. When multiple-choice questions accompany the eBook reading, expressive word learning increased. The eBooks intentionally designed for instruction also promote significant language learning (Smeets & Bus, 2015), and animation supports word recognition (Phadung et al., 2016). In spite of these findings, in this study word recognition increase did not significantly vary between the control and experimental groups.

When reading eBooks, children can access an interactive dictionary that can aid in both reading and understanding word meanings. However, when students are distracted by irrelevant interactive features they may not use decoding skills when encountering unfamiliar words. While some researchers found that eBooks promoted language learning, including acquisition of new words (de Jong & Bus, 2002, Korat, 2009, Lysenko & Abrami, 2014, Smeets & Bus, 2012), this research study with a diverse student population did not find that eBook use had any significant advantage over use of traditional print format.

The fourth null hypothesis (H_o4) states there is no difference in student comprehension between lower elementary school students who used the application Raz-Kids to develop literacy as evaluated by the STAR Reading Enterprise assessment. In this research, the effect size for comprehension was determined to be small at $\eta2 = .04$ and a significance level of $p > .05$ at $p = .253$. The test was completed at $\alpha = .05$. In this study, the difference between the groups was not found to be statistically significant so this researcher failed to reject the fourth null hypothesis at a 95% confidence level.

Because eBooks have not been as effective in comprehension as they are in word learning, researchers need to critically appraise learning platforms (Koskos et al., 2017).

Interactive features that require the students to switch back and forth can be a distraction (Korat, 2010; Smeets et al., 2014), but multimedia features that are congruent to the story do not appear to be a distraction from understanding the story. In fact, when visualizations are dynamic, story comprehension is enhanced (Takacs, 2015).

Technology-enhanced books allow verbal and nonverbal information to occur closer in time. Therefore, cognitive overload is reduced as the need for holding both in working memory to integrate them is eliminated (Takacs, 2015). This research study supports previous research by Singer and Alexander (2017) that shows neither digital nor print form should be regarded better for comprehension. Learner differences, type of text, and task demands all influence comprehension from either medium. When comprehension involved questions of larger grain size, such as identifying the main idea, the medium did not significantly affect the outcome. However, students had notably better performance in reading in print if the questions were more detailed. However, medium has little impact on comprehension for beginning readers who are reading simple text. Basic learner differences such as age, reading ability, and background knowledge affect comprehension using either print or digital devices (Singer & Alexander, 2017). It appears that educational settings determine which medium will be the most effective in promoting comprehension.

While little empirical evidence exists to support instructional benefit from animation, neither does animation interfere with comprehension (de Jong & Bus, 2004). An advantage in eBook reading is that students are able to read on their own reading level with Raz-Kids, making reading easier and resulting in greater comprehension (Meyers, 2021) yet they can increase complexity of reading materials as their skills improve. More success with comprehension

occurs when teachers interact socially with students (Bus et al., 2015) even when they are reading independently with eBooks.

Literacy is enhanced when the interactive features of eBooks increase the appeal. However, these interactive features must enhance the text, not distract from it (Korat, 2010; Smeets et al., 2014). While the students in this study are typically developing and did not present any predominant disabilities, de Jong and Bus (2002) and Korat (2009) found that eBooks improved literacy development for both groups. Print books were slightly more effective in helping children acquiring literacy, especially in understanding plot. Print may be more effective because the print format is more familiar to children (Kozminsky & Asher-Sidon, 2013). This research supports the study by Hashim and Vongkulluksn (2018) who found that eBooks are not more beneficial to comprehension than are traditional print books. Salmon (2014) agreed that eBooks should supplement classroom learning but not replace traditional learning.

Interactive features in eBooks allow students to scaffold literacy skills as they read independently without adult support (Salmon, 2013). However, no consensus exists presently that digital learning outperforms traditional classrooms or provides significant advantages to developing literacy (McKnight et al., 2016). This research study shows that both print and digital reading have importance in increasing literacy skills, and both mediums have a place in developing literacy skills. Also, reading printed books provides pleasure for many even though digital reading devices have become pervasive in the lives of both students and teachers. Although they cannot replace print books, eBooks definitely have a place in literacy development as they can result in an increase in the amount of time that children spend reading.

Implications

The use of eBooks can result in children reading more. Multimedia eBooks are effective because they provide encouragement for children to use educational features that are not available in print books, and these features enhance the cognitive faculties involved in developing literacy (Verhallen et al., 2006). Interviews conducted by Kaynor et al. (2020) in their study indicated that eBooks increased student interest in reading. On-task behavior, such as showing enthusiasm when children are successful in a learning activity, indicates engagement and enjoyment toward learning (Tkach & Gallagher, 2020) increasing the desire to read. Additionally, eBooks supplement traditional tools and can be targeted to specific individual learning requirements. Students using educational eBooks are able to work independently and progress from one level of knowledge to the next at their own pace. When they have gained knowledge, they are able to move to the next level. This ability supports Vygotsky's ZPD. As students work independently, teachers can also work more efficaciously.

However, before mobile devices are integrated into programming, educators must be aware of both the benefits and drawbacks of this educational technology. To accomplish the goal of developing literacy, educators need to possess strong understanding of the educational features in the apps. They should also be aware of potential distractions that could result in students paying little attention to reading content as they concentrate on the multimedia features.

Being able to read independently at home can help increase student reading time even if no adult is available to assist them. This capability can be especially valuable to various categories of at risk children such as those in lower socioeconomic situations where children are often on their own and with children for whom English is not the primary language. These children can further their literacy achievement by more frequent exposure to reading than may be

available in the classroom. The most important implication from this study is that eBooks, although they increase enthusiasm for reading, should not replace use of traditional print books but rather should be an additional resource to develop literacy in early elementary students.

Limitations

While the students in this research study came from diverse backgrounds, none were severely disadvantaged in regard to primary language or other severe language impairments. A study including a larger number of students from different schools in different environments, such as in a rural community or in an economically disadvantaged urban setting where children often lack access to books, could also result in different findings. A larger research study group could also lend itself to generalization.

In this study, because of the Covid pandemic, some students were learning remotely where the environment varied from that of the classroom. This situation may have produced results that did not present the most accurate effect of the Raz-Kids program. Additionally, this study lasted for six weeks with one testing at the end of the time period. A lengthier study with more testing might produce different results.

Recommendations for Further Research

Further study should be carried out with a larger number of participants from diverse environments to provide for generalization. Such a study should also involve students who are all in a classroom setting. Additionally, another study should involve all virtual learners so a comparison could be made between virtual and traditional classroom learning. The recent Covid pandemic identified the challenges that exist when a student is unable to be in a classroom setting.

Additional research should evaluate technology strategies to determine which strategies contribute most to developing literacy in early elementary grades. It should include how methods used by teachers affect the educational outcome and identify the training that is needed for teachers to implement effective use of this technology. Additionally, does teacher attitude towards the use of technology impact student scores when using eBooks? Teachers who are enthusiastic about technology use are more likely to create enthusiasm in the classroom.

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APPENDIX A

LIBERTY UNIVERSITY.
INSTITUTIONAL REVIEW BOARD

December 3, 2020

Beth Acosta
David Holder

Re: IRB Approval - IRB-FY20-21-248 THE EFFECT OF EBOOK READING ON OVERALL LITERACY
DEVELOPMENT

Dear Beth Acosta, David Holder:

We are pleased to inform you that your study has been approved by the Liberty University Institutional Review
Board (IRB). This approval is extended to you for one year from the date of the IRB meeting at which the protocol
was approved: December 3, 2020. If data collection proceeds past one year, or if you make modifications in the
methodology as it pertains to human subjects, you must submit an appropriate update submission to the IRB.
These submissions can be completed through your Cayuse IRB account.

Your study falls under the expedited review category (45 CFR 46.110), which is applicable to specific, minimal risk
studies and minor changes to approved studies for the following reason(s):

7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception,
cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or
research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or
quality assurance methodologies.

Your stamped consent form can be found under the Attachments tab within the Submission Details section of your
study on Cayuse IRB. This form should be copied and used to gain the consent of your research participants. If you
plan to provide your consent information electronically, the contents of the attached consent document should be
made available without alteration.

Thank you for your cooperation with the IRB, and we wish you well with your research project.

Sincerely,

Administrative Chair of Institutional Research
Research Ethics Office

APPENDIX B

June 30, 2020

███████████

~~Superintendent~~

███████████████

Dear Beth:

After careful review of your research proposal entitled The Effect of eBook Reading on Overall Literacy Development, I have decided to grant you permission to conduct your study at ███████████████ for your research study.

Check the following boxes, as applicable:

☑ The requested data WILL BE STRIPPED of all identifying information before it is provided to the researcher.

☑ I am requesting a copy of the results upon study completion and/or publication.

Sincerely,

███████████

Superintendent

███████████████

APPENDIX C

October 12, 2020

██████████

Principal

██████████████

Dear Beth Acosta:

After careful review of your research proposal entitled *The Effect of Ebook Reading on Overall Literacy Development,* I have decided to grant you permission to receive and utilize the STAR Literacy Assessment archival data for your research study.

Check the following boxes, as applicable:

The requested data WILL BE STRIPPED of all identifying information before it is provided to the researcher.

I am requesting a copy of the results upon study completion and/or publication.

Sincerely,

███████████

Principal

██████████████████

APPENDIX D

June 30, 2020

█████████

Elementary Principal

█████████

Dear Beth:

After careful review of your research proposal entitled The Effect of eBook Reading on Overall Literacy Development, I have decided to grant you permission to conduct your study at ████████████ school for your research study.

Check the following boxes, as applicable:

The requested data WILL BE STRIPPED of all identifying information before it is provided to the researcher.

I am requesting a copy of the results upon study completion and/or publication.

Sincerely,

█████████

Elementary Principal

█████████

APPENDIX E

Parental Consent

Title of the Project: The Effect of eBook Reading on Overall Literacy Development
Principal Investigator: Beth Acosta, Ed. S., Liberty University

Invitation to be Part of a Research Study

Your child is invited to participate in a research study. Participants must be in the 1st, 2nd or 3rd grade at ██████████████████████ Taking part in this research project is voluntary.

Please take time to read this entire form and ask questions before deciding whether to allow your child to take part in this research project.

What is the study about and why are we doing it?

The purpose of the study is to examine how the use of an electronic book impacts overall literacy development.

What will participants be asked to do in this study?

Each class section will be either a part of the experimental group who will use the eBook in instead of their traditional reading program for approximately 30 minutes each class day over the course of six weeks or the control group who will use only their traditional reading program. The groups will be determined by ████████████ and the researcher will have no input on which students are involved in the research. If you agree to allow your child be in this study, I would ask him or her to do the following things:
1. Complete the Elementary Reading Attitude Survey as the end of the six weeks. This will take approximately 15 minutes to complete.
2. Allow the researcher to obtain student results from their STAR Literacy assessment which were completed at the end of the previous quarter and which will be repeated at the end of the 6-week study.

How could participants or others benefit from this study?

The direct benefits participants in the experimental group should expect to receive from taking part in this study is the new skill of reading with an eBook.

Benefits to society include potential long-term societal benefits if overall literacy is improved. The value of technology as an educational tool continues to be debated. This research may provide insight into the further use of technology as a valuable educational tool. If the use of an eBook can be attributed to improved literacy skills, society as a whole could benefit.

What risks might participants experience from being in this study?

The risks involved in this study are minimal, which means they are equal to the risks your child would encounter in everyday life.

How will personal information be protected?

The records of this study will be kept private. Research records will be stored securely, and only the researcher, statistician, and the researcher's faculty sponsor will have access to the records.

All data provided to the researcher by the school will be stripped of all identifying information before the researcher receives the data.

Data will be stored on a password locked computer and in a locked filing cabinet and may be used in future presentations. After three years, all electronic records will be deleted, and all hard copy data will be shredded.

What conflicts of interest exist in this study?

The researcher serves as a teacher at ███████████████ To limit potential or perceived conflicts the elementary administrative assistant will ensure that all data is stripped of identifiers before the researcher receives it. This disclosure is made so that you can decide if this relationship will affect your willingness to allow your child to participate in this study. No action will be taken against an individual based on her or his decision to allow his or her child participate in this study.

Is study participation voluntary?

Participation in this study is voluntary. Your decision whether or not to allow your child to participate will not affect your or her or her current or future relations with Liberty University or ███████████████ If you decide to allow your child to participate, he or she is free to not answer any question or withdraw at any time without affecting those relationships.

What should be done if a participant wishes to withdraw from the study?

If you choose to withdraw your child from the study or your child chooses to withdraw from the study, please contact the researcher at the email address included in the next paragraph. Should you choose to withdraw her or him, data collected from your child will be destroyed immediately and will not be included in this study.

Whom do you contact if you have questions or concerns about the study?

The researcher conducting this study Beth Acosta. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at ███████████████ You may also contact the researcher's faculty sponsor, Dr. David Holder at ███████████████

Whom do you contact if you have questions about rights as a research participant?

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Institutional Review Board, 1971 University Blvd., Green Hall Ste. 2845, Lynchburg, VA 24515 or email at irb@liberty.edu.

Your Consent

By signing this document, you are agreeing to allow your child to be in this study. Make sure you understand what the study is about before you sign. You will be given a copy of this document for your records. The researcher will keep a copy with the study records. If you have any questions about the study after you sign this document, you can contact the researcher using the information provided above.

I have read and understood the above information. I have asked questions and have received answers. I consent to allow my child to participate in the study.

_____

Printed Child's/Student's Name

_____

Parent's Signature   Date