Teacher Perceptions of Technology-Based Reading Interventions with Kindergarten Students and the Differences Between Technology-Based Interventions on Student Reading Growth

by

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A dissertation submitted to the faculty of

Wilmington University in fulfillment

of the requirements for the degree of

Doctor of Education

in

Innovation and Leadership

Wilmington University

November 2018

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I certify that I have read this dissertation and that in my opinion it meets the academic and professional standards required by Wilmington University as a dissertation for the degree of Doctor of Education in Innovation and Leadership.

Joseph A. Massare, Ed.D., Chairperson of Dissertation Committee

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John C. Gray, Ed.D., Professor and Dean, College of Education

Dedication

I dedicate this dissertation to my family, who have all contributed to making the pursuit and earning of my doctoral degree a reality. To my parents, Dr. John Curtis Agner and Sheila Agner, thank you for setting an outstanding example of hard work and perseverance for me. You paved the way for me as an educator and as a passionate human services provider. Thank you for helping me to realize my potential and for guiding me throughout the years.

To my sister, Dr. Shannon Agner, and family, for your endless encouragement, support, and helping me to keep balance. To my beloved brother, Royce Agner, you are with me always, and you will continue to make an impact on my work as an educator. My grandparents, Nell Agner, Emma Zisa, and Virginia McNally, thank you for believing in me, and for being some of my greatest cheerleaders. I am grateful for my family's understanding and support of the time I committed to this program. Because of you, I am reaching an achievement that I never could have dreamed!

Acknowledgements

I would like to thank my family for their unwavering support provided throughout this endeavor. Thank you to my dear friends who have walked alongside of me throughout this immense journey! I am grateful to my doctoral family for the wonderful fellowship and encouragement over the past three and a half years. God made no mistake in bringing each of us together!

Thank you to my co-workers who supported me throughout the pursuit of this research and degree. I am appreciative of the teacher participants from this study who gave up their personal time to contribute to the research.

I would like to acknowledge the tremendous guidance that Dr. Joseph Massare and Dr. Thomas J. Vari have given me throughout this program, and especially within the process of this dissertation project. Thank you for your commitment, expertise, and encouragement each step of the way. I am fortunate to have had you as outstanding examples of educational leaders.

Abstract

The purpose of the study was to explore Kindergarten public school teachers' perceptions of the effects of technology use in the classroom on reading achievement and barriers to technology use in the classroom. This study also examined the differences between technology-based learning interventions on Kindergarten students' reading growth. Literature reviewed includes a definition of Response to Intervention (RTI), an overview of research focused on technology-based interventions in the elementary classroom, and research findings of the academic differences between technology-based interventions. This study was designed with a mixed-method approach that involved eight kindergarten teachers and their students' pre-existing reading data from a suburban school district in New Jersey. A number of themes emerged from the teachers' interviews and the students' reading growth data analysis. All teacher participants identified benefits to using technology in the classroom, including those who did not incorporate technology-based reading centers into their daily learning activities. Teacher perceptions of barriers to technology use in the kindergarten classroom were also explored and two major themes emerged: technology does not always work, and kindergarten students do not always know how to use technology. Overall, findings indicated that kindergarten students using iPads throughout the school year within reading centers made more progress on average than those using computers, multiple platforms, or no technology in reading centers.

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Chapter I

Introduction

Background

"Little is currently known about what the most popular forms [of technology] are today for elementary schools and how teachers implement them within their classrooms and individualized curriculums" (Kenney, 2011, p. 69). The goal of Kenney's research and many others (Larabee, Burns, & McComas, 2014; Musti-Rao & Plati, 2015; Whitcomb, Bass, & Luiselli, 2011) was to expand on the understanding of how technology improves education, as well as to identify the influence of educational technologies on elementary learners. McManis and Gunnewig (2012) noted in "Finding the Education in Educational Technology with Early Learners" the importance of developmental appropriateness of technology selected, tools for teachers to successfully implement technology, and integration of technology into the general curriculum of the classroom. Additionally, they discussed the importance of "establishing learning goals for the children…identifying the hardware on hand or that you'd like for your classroom, and considering the content of software programs" (McManis & Gunnewig, 2012, p. 17).

The researcher is a Learning Disabilities Teacher-Consultant (LDT-C) in the suburban Kindergarten through Twelfth grade school district where this study was carried out. Along with the increasing use of technology in the world in the 21st century, the researcher has seen an increase in iPad, Chromebook, and other technology use in the classrooms at the lower elementary school. Working with parents, educators, and students, the researcher set out to explore the differences between technology-based reading interventions on Kindergarten

students' reading growth. The intention was to better understand whether technology-based reading interventions have a positive or negative influence on student learning.

Statement of the Problem

It is unknown what Kindergarten public school teachers' perceptions are of the effects of technology use in the classroom on reading achievement. It is also unknown what barriers there are to technology use in the classroom. It is unknown what the differences between technology-based learning interventions are on Kindergarten student reading growth.

Purpose of the Study

The purpose of the study was to explore Kindergarten public school teachers' perceptions of the effects of technology use in the classroom on reading achievement. Teachers' perceptions of barriers to technology use in the classroom were also examined. Additionally, the differences between technology-based learning interventions on Kindergarten students' reading growth were explored.

This study addressed several ELCC Educational Leadership Standards (NPBEA, 2011), including Standards 2.1, 2.2, 2.4, 3.2, and 3.5. First, Standard 2.1 calls for candidates to "understand, advocate, nurture, and sustain a district culture and instructional program conducive to student learning through collaboration, trust, and a personalized learning environment with high expectations for all students" (p. 10). By exploring student learning through technological avenues, school leaders are considering the personalized learning needs of students. Implementing technology-based learning in classrooms as early as Kindergarten sets a high standard for all students by fostering independence, as well as providing alternative learning modes that coincide with 21st Century practices.

ELCC Standard 2.2 states that "candidates understand and can create and evaluate a comprehensive, rigorous, and coherent curricular and instructional district program" (NPBEA, 2011, p.10). District leaders need to be able to collaboratively establish and evaluate instructional and curricular programs. This study will help evaluate the effectiveness of the technology-based learning centers on Kindergarten student reading growth.

ELCC Standard 2.4 states that "candidates understand and can promote the most effective and appropriate district technologies to support teaching and learning within the district" (NPBEA, 2011, p. 10). Technologies have been incorporated into daily teaching and learning practices in Kindergarten through Twelfth grade classrooms. However, additional research is needed to help identify the effectiveness of approaches and technologies used.

ELCC Standards 3.2 and 3.5 focus on the efficient use of technological resources to "support high-quality school instruction and student learning" (NPBEA, 2011, p. 14). Educational leaders must demonstrate management skills conducive to effective instructional and learning approaches. Additionally, understanding the technological resources available to enact within the classroom for student learning and success is essential to school leadership capabilities.

Need for the Study

Rothschuh and Larazus (2010) stated that, "There is an urgent need to invest not only in classroom technology, but also in technology that links the school and home learning environments to better enable parents to support their children's learning" (p. 2). More information is needed to understand how technology is used in the Kindergarten classroom for instructional purposes. Further research is necessary on teachers' perceptions of barriers to technology use in the classroom. Additionally, there is a need for further research to provide

educators and parents with an understanding of the differences between technology-based learning on student achievement.

Research Questions

The research questions developed for this study are as follows:

1. What are Kindergarten public school teachers' perceptions of the effects of technology use in the classroom on reading achievement?
2. What are Kindergarten teachers' perceptions of barriers to technology use in the classroom?
3. What are the differences between technology-based reading interventions on Kindergarten student reading performance as determined by aggregate student reading growth on the DIBELS benchmark assessment?

Definition of Terms

Key terms are defined here for the purposes of this study:

Apps. "Applications created for digital devices, such as tablets and smart phones, to serve a single, specific function and can be downloaded wirelessly or by connecting to a computer" (Hutchison, Beschorner, & Schmidt-Crawford, 2012, p. 17).

DIBELS assessment. The benchmark assessment used to measure student reading progress. "The Dynamic Indicators of Basic Early Literacy Skills (DIBELS) are a set of procedures and measures for assessing the acquisition of early literacy skills from kindergarten through sixth grade" (University of Oregon CTL, 2018, para. 1).

Promethean Board or Smart Board. An interactive whiteboard which projects images from a computer, which can be used by touch or via a specialized pen (WCHS Educational Foundation, 2018).

Kindergarten student. Any general education student in a kindergarten class.

Technology-based reading interventions. iPad Apps, websites, or computer software used for reading interventions and/or instruction.

Chapter II

Literature Review

Introduction

This literature review focuses on elementary educational technology interventions. The goal of this review is to set the stage for this study's research on application-based elementary education interventions that can be applied both in the school and home settings for increasing student achievement in reading.

Inclusion criteria. The search criteria for research on Application-Based Learning Interventions in the Elementary Classroom included combinations of the following keywords and phrases: *Response to Intervention (RTI), computer-based reading and math interventions, elementary education computer programs, elementary reading apps, elementary learning apps, elementary literacy, first grade reading apps, first grade reading games, phonics apps, early literacy apps, and elementary technology-based interventions*. All EBSCOhost databases were searched, and the following produced the articles included within this literature review: WorldCat, SAGE, SpringerLink, ERIC, British Library Serials, Wiley, and Wilmington University Institutional Repository. Articles were mainly limited to 2010 and later, but a few articles from prior to 2010 were included due to exceptional relevancy or they offered a unique contribution to this literature review. Most references were peer-reviewed dissertations, but others included informative review articles published in educational journals. References included within these sources were explored for further content. The keywords *elementary technology-based interventions* yielded the greatest number of peer-reviewed dissertations; whereas, keyword combinations which included the term *apps* resulted in the most informative

review articles. Informative review articles were completed by teachers, educators, and individuals with professional technology backgrounds.

Organization of the literature review. The review first reflects upon research found related to Response to Intervention (RTI), including definitions, to help the reader understand this increasingly important concept in elementary education. Next, the review concentrates on an overview of literature focused on technology-based interventions used in the elementary classroom setting. A broad picture of the range of technological supports helps capture the progression of interventions or a continuum of available technology-based interventions for elementary students. The literature is further outlined in the following sections of this review, including a snapshot of studies which focused on application-based reading interventions for elementary education. It was also important to ensure that the reader understands what implementing technology-based interventions in the classroom looks like and any barriers involved. Additionally, the overall findings of the academic differences between technology-based interventions are reviewed.

Need for Technology-Based Interventions

Some of the literature (Pindiprolu & Forbush, 2009) would agree that, "one way to overcome some of the existing barriers in meeting students' needs is to supplement classroom instruction with parent implemented reading programs that provide systematic, comprehensive, and explicit instruction in the five evidence-based reading components": phonemic awareness, fluency, phonics, vocabulary, and comprehension (pp. 71-72). For example, Pindiprolu and Forbush (2009) used the *Funnix* and *Headsprout* programs to study computer-based reading interventions within the home.

McClanahan, Williams, Kennedy, and Tate (2012) studied "How Use of an iPad Facilitated Reading Improvement" for a student with ADHD. They described the visual and hands-on modalities of the intervention as beneficial components. The student had the ability to record "his own reading and…play it back and hear his own mistakes" (p. 26). They surmised that using the iPad permitted the student to engage in learning activities differently than with typical classroom instruction. McClanahan et al. (2012) suggested that research should continue in the area of iPad use as an intervention for academics.

Northrop and Killeen (2013) described the importance of appropriate use of iPad interventions and supports in the classroom.

1. Teach the literacy concept using explicit instruction before using the app.;
2. Introduce the app as a way for students to practice what they have learned in their word-study instruction…explain and model;
3. Check to ensure that students understand not only how to use the app, but also that they understand the literacy content the app is using; and
4. Using the app during independent work time or literacy center work. (pp. 533-535)

The Response to Intervention framework and technology was explored to consider the existing use of technology for student interventions.

Response to Intervention

Response to Intervention (RTI) is defined by Getting and Swainey (2012) as "a homogeneous system of grouping students by ability in specific areas based on their needs" (p. 25). Smith and Okolo (2010) identified RTI as "the primary identification and instructional model for states and school districts" (p. 258). The goal of their research was to review and analyze how to advance the use of educational technology within RTI. "RTI features four

primary components: (a) evidence-based classroom instruction, (b) student assessment with a classroom focus, (c) universal screening of academics and behavior, and (d) continuous progress monitoring of students" (Smith & Okolo, 2010, p. 258).

Basham, Israel, Graden, Poth, and Winston (2010) sought to introduce a "framework of RTI that incorporates UDL [universal design for learning] and purposeful technology use with evidence-based strategies to support the needs of students" (p. 244). They emphasized that future RTI implementation would benefit from further clear instruction of UDL purposes and procedures, including "focused technology use" (p. 254). Additionally, Allsopp, Alvarez McHatton, and Farmer (2010) presented a specific framework for instructional practices using technology within math RTI programs. They walk the reader through a guide to instructional practices specific to technology within math RTI instruction. This was an exploratory study that did not present any formal experimental findings. It is important to note that the literature review returned more reading-based studies overall than math-based studies.

Bursuck and Blanks (2010) specifically looked at "early reading instruction within a multitier RTI system" in their research (p. 421). They noted that serious consequences can be the result of not providing instruction based upon evidence. Ultimately, Bursuck and Blanks (2010) identified RTI as a "promising approach to both solving the achievement gap in reading, as well as helping to assure that only students most in need are provided with special education services" (p. 428). They discussed the pervasiveness of reading problems at the primary level, described traits of evidence-based reading practices, and discussed how to strengthen reading instruction in the multi-tiered model.

The National Reading Panel and the National Early Literacy Panel were cited as identifying five essential key skill areas needed for successful reading instruction. The areas

include: phonemic awareness, fluency, phonics, reading comprehension, and vocabulary. Through this citation, the authors identify critical focuses for reading instruction to be included within a strong RTI system. They also make an informative review of the components of well-designed reading instruction, research-based instructional enhancements, and describe the differences between tiers within the system. These sources provide a basic yet informative review of the RTI framework (AIR & Center on RTI, 2018;RTI Action Network, 2018). In response to the above mentioned "research-based instructional enhancements" as part of RTI, this study is investigating the differences between technology-based reading interventions to contribute to the knowledge base.

Technology-Based Interventions: Hardware

Technology-based learning interventions are growing at increasing rates. Prior to the 21st century, technology in the classroom may have been limited to a television, VCR, projector, or computer accessed primarily within a computer lab or library. Additionally, computer and technology access often depended upon parent provision of these educational enhancements within the home. The growth in types of technological learning interventions and their increasing accessibility supports opportunities for more readily available and motivating interventions for elementary students in the 21st century. "There is significantly more information available to be consumed today than in past generations, and Millennials have more ways to consume it than ever before" (Devlin, Feldhaus, & Bentrem, 2013).

According to Larabee et al. (2014), "mobile devices are a relatively new innovation, the research regarding their implementation in schools is limited. The existing literature examining mobile learning is small and peripheral in nature" (p. 451). Hutchison et al. (2012) contributed

to the research and defined the iPad as having many capabilities of a laptop or desktop computer, but further unique traits, including the touch screen and numerous applications.

In a qualitative interview-based study, Kenney (2011) found these to be the most frequently-used technology-based interventions and supports in the classroom setting: SMART board, Classroom Performance System (CPS) clickers, Internet-based software, games, and activities (i.e. Discovery Education and Study Island), Microsoft PowerPoint, audio/recording devices for reading, iPad applications, and ELMO technology (a "digital visual presenter for students" similar to an overhead transparency previously used in the classroom) (p. 71). Furthermore, Interactive Whiteboards (IWBs), tablets, and the iPod Touch have been proven to influence academic gains for elementary students (McManis & Gunnewig, 2012). Research focused on software-based interventions is explored to help identify effective technology that can be applied within the RTI model.

Technology-Based Interventions and their Effects: Software

Fairly recent studies have continued to look further at software-based computer reading interventions (Cheung & Slavin, 2013). For example, Whitcomb et al. (2011) utilized *Headsprout*, a computer-based early reading program, in their study of the effects of technology on "word list and text reading skills" (p. 491). *Headsprout* is a supplemental reading program designed to teach students to read and strengthen early reading skills. This web-based program is primarily student-directed and focuses on vocabulary, phonics, reading fluency, and comprehension (Pindiprolu & Forbush, 2009). The single-participant design of Whitcomb's study is a limitation. Additionally, the specific learning characteristics of this participant with Autism further limit the generalization of the results which indicated "improved reading accuracy across the word sets and stories" (Whitcomb et al., 2011, p. 491). The researchers

suggest replication of the study with more teachers and students in varying educational settings and using different forms of assessment (including DIBELS).

Prior to that, Watson and Hempenstall (2008) researched effects of the parent-delivered *Funnix* (CD-based) program on kindergarten and first grade students. This program delivers explicit instruction in phonological awareness including decoding and blending. Fluency, comprehension, and vocabulary are also emphasized with the goal being to build students' oral reading fluency. Skills are presented in a sequenced and cumulative manner, and adult participation is required.

> Statistically significant treatment effects were found for Kindergarten students in the intervention group on letter-sound fluency, oral reading fluency, non-word decoding, and phonemic awareness skills. Grade 1 students in the intervention group demonstrated significant improvement over time on letter-sound fluency, letter-name knowledge, non-word decoding and oral reading fluency. (Watson & Hempenstall, 2008, p. 258)

Overall, Watson and Hempenstall (2008) found the most improvement within the Kindergarten participant group who completed the *Funnix* program versus Kindergarten students who did not participate. They calculated Cohen's effect size *d* for dependent variables to identify the degree of observed changes. This effect size was calculated by the ratio of the difference between group means on a pre- and post-test. Overall, the Kindergarten group who completed the *Funnix* program scored with larger effect sizes. Results helped to identify the best potential target group for this particular intervention (Kindergarten). Subsequent research studied effects of more than one program on elementary students' reading performance.

Pindiprolu and Forbush (2009) looked at a sample of 25 students in kindergarten, first grade, and second grade using both the *Headsprout* and *Funnix* intervention programs at home and found the following:

> One-way analysis of co-variance was used to compare differences between groups, and a paired-samples *t*-test was used to measure the pre-post gains on the DIBELS measures for each group…The results for the *Headsprout* group indicated that there was a statistically significant difference between pre- and post-test scores on two of the six measures at the .05 significance level… the *FUNNIX* group indicated a statistically significant difference between pre- and post-test scores on the Word Use Fluency measure at the 0.5 significance level. (Pindiprolu & Forbush, 2009, p. 75)

Findings showed that computer-based reading programs effectively increase only *some* basic reading skills for elementary students who are considered at-risk. For *Headsprout,* the effects size *d* was large with Letter Naming Fluency and Phoneme Segmentation Fluency. Small effects size *d* was found for Word Use Fluency and negative with Nonsense Word Fluency and Oral Reading Fluency. In the *FUNNIX* group, the Word Use Fluency *d* score was medium. Small *d* scores were found with Nonsense Word Fluency, Initial Sound Fluency, and Phoneme Segmentation Fluency. A comparison of the data indicates inconsistent results between groups for all skill areas assessed. Broad statements were made in the conclusions of this study, saying that the eight-week computer-based reading program implementation "facilitated the phonemic awareness and word use fluency skills" of lower elementary students (p. 80). A more accurate statement made within the conclusions says that the results suggest these software-based reading programs can be used as a supplemental instructional tool.

Furthermore, Fälth, Gustafson, Tjus, Heimann, and Svensson (2013) offered some of the most recent research using software-based reading interventions. They used the "COMputerized PHOnological Training (COMPHOT)" and the "Omega-Interactive Sentences (Omega-IS)" programs to investigate the effects of the computer-based interventions on student reading skills for first and second grade students. Reading skills were improved for all participant groups. Multiple mixed ANOVAs were applied between subjects and test sessions and showed "statistically significant main effects of the test session" for all "tests ($p < .05$)" (p. 47). Ultimately, this study showed that computer-supported interventions which target a combination of reading comprehension and phonological training have potential to be effective as a reading intervention.

Ferrell (2015) found the opposite in a study of CBI (computer-based instruction) for middle school math students. Results indicated that there was no significant difference between the CBI group versus the traditional modes group. Beyond software-based interventions, reviews and research on app-based interventions for elementary students were explored.

Defining Technology-Based Learning Interventions: Apps

According to Cheung and Slavin, "Educational technology is defined as a variety of electronic tools and applications that help deliver learning content and support the learning process" (2013, p. 279). In their review, they looked extensively at "the effects of alternative types of educational technology applications for struggling readers" (p. 278). Apps are defined as "applications created for digital devices, such as tablets and smart phones, to serve a single, specific function and can be downloaded wirelessly or by connecting to a computer" (Hutchison et al., 2012, p. 17). Accessibility to applications varies, as apps can range in price from free to around five dollars.

In 2015, Israelson reviewed elementary teachers' reading App selection process in one school district. The rationale for her review was due to teachers often using Apps with their students that are simply available, previously purchased, or those their colleagues use, regardless of whether the Apps fall in line with best instructional practices for early literacy. In this article, "The App Map" was presented, a tool for teachers to use in selecting an appropriate App for instruction.

Israelson reported that teachers frequently resort to selecting Apps that are visually appealing in graphics or price. The App Map is referred to as a "research-based framework for selecting quality apps for early literacy instruction" (Israelson, 2015, p. 340). The researcher noted, that while many K-3 teachers devoted much time to comprehension strategy instruction, they use Apps for letter/sound identification, rhyming, and blending. Using the App Map framework, teachers are able to evaluate and identify apps that provide value in lessons, meet instructional reading objectives, and engage students in learning in a motivating way.

With a different focus, Smith and Okolo (2010) looked at "technology-based graphic organizing tools," "technology-based writing tools," and "Applications or Sources of Information for Explicit Instruction and Practice" in their effort to "connect RTI components with technology-based solutions" (pp. 260-268). They found two impactful items in their exploration of technology's role in instruction within the multi-tier model. First, few studies have been completed to investigate the level at which technology applications can be "considered an evidence-based practice" (p. 270). Second, they noted a "large-scale evaluation" conducted by the Institute of Education Sciences that looked at use of mathematics and reading software, citing that "results were not encouraging" (p. 270). A number of studies have

investigated what specific reading application-based interventions are available, and others have assessed the effectiveness of reading applications on elementary students' performance.

Möller (2015) wrote that, "Finding the most effective apps efficiently is time-consuming" (p. 55). A useful resource is cited for identifying the most recent educational apps: the American Library Association's "Best Apps for Teaching and Learning 2018" webpage (https://standards.aasl.org/project/ba18/) (p. 55). It will be important to carefully identify the best and most appropriate app or apps to use in research.

Elementary Reading App Interventions

Getting and Swainey (2012) researched the effects of iPad use on reading achievement with first grade students. The following iPad Apps were used for sight-word recognition: K-3 *Sight Words, ABC Pocket Phonics*, and *Smiley Sight Words*. Apps for reading fluency included: *Talking Tom, Voice Memos,* and *K-12 Timed Reading Practice*. *Reading A-Z* was used for comprehension intervention, and comprehension was the most difficult area to identify apps to use for intervention in the study. For word meaning and vocabulary recognition, *Kid Whiteboard*, *Doodle Neon Glow HD Free*, *Doodle Buddy* for iPad, and *Glow Draw* were used. Finally, literacy practice interventions included: *Clifford's Be Big with Words*, *Word Families*, *Magnetic Alphabet*, *Word Magic*, and *ABC Tracer*. It was found that "using iPads with at-risk learners creates an environment that meshes nicely with the learning styles of our youngest digital natives" (p. 27). According to Getting and Swainey (2012), "iPads truly make a difference in sight word recognition, fluency, comprehension, and vocabulary recognition and meaning" (p. 27).

In contrast, Larabee et al. (2014) found that iPad app (*Build A Word-Easy Spelling with Phonics)* use had "a small, positive effect on decoding performance when compared to the

standard materials" (p. 464) for first graders. However, this study's participant group was small (only three students), and this should be considered a limitation.

Looking at a different grade level, Hutchison et al. (2012) explored iPad use to enhance and support reading instruction in a fourth grade classroom. This study emphasized the importance of applying "curriculum-based technology integration" rather than using the iPads as a primarily technological integration. The article focused more on apps that were helpful in conjunction with standard reading instruction, and less on apps that serve well as independent reading interventions. Some of the iPad apps they used in this study included: *iBooks, Popplet, Doodle Buddy, Strip Designer,* and *Sundry Notes*. The teacher found that she "was able to meet her print-based literacy goals while simultaneously introducing some of the new literacy skills associated with 21st-century technologies…using the iPads for literacy instruction supported student learning" (p. 21). Unique components of the research included app descriptions, descriptions of literacy activities with each app, what was helpful in the iPad instruction, and special considerations to make when using the iPads for reading instruction. This information will be helpful for implementing future iPad-based interventions and research.

In a similar study, Northrop and Killeen (2013) recommended these apps in the article, "A Framework for Using iPads to Build Early Literacy Skills:" *Little Matchups ABC*, *iWrite Words*, *ABC Pocket Phonics*, *Word Connex*, *iCard Sort*, *Fry Sight Words*, *Popplet*, *Doodle Buddy*, and *Toontastic*. A helpful contribution they made is a framework including steps and guidelines for effectively teaching using apps. Their recommended literacy apps were also organized by literacy skills and provided a description of each app. Although Northrop and Killeen (2013) suggested that apps and tablets may offer extended student practice in early literacy skills, they also express concern that "at best, apps will waste precious classroom time,

and at worst, students will learn incorrect information and develop misconceptions" (p. 536). The greatest impact of the article is a recommendation of "using the gradual release of responsibility framework" where the teacher is explaining, modeling, guiding, and allowing independent practice when integrating app use into the classroom (p. 536).

Furthermore, Möller (2015) found success with *Audioboom*, *Kidblog*, and *Educreations* apps for first grade students in supporting "response-to-literature activities" (p. 55). The American Library Association's "Best Apps for Teaching and Learning" website is suggested by the author as a resource to help narrow down what apps to use. A detailed description is included in the article for each of the apps used, and there is an emphasis on how the apps are a *supplement* to traditional reading instruction. *Simon Sounds It Out*, by Don Johnston, is an additional phonics-based application offering practice of basic phonics skills via activities and games (Smith & Okolo, 2010). Again, the emphasis is on technology being a secondary tool to traditional reading instruction, whether in the school or in the home. When implemented within a framework in a systematic way, technology-based interventions can also result in having motivational effects on student performance.

Motivational Effects of Application-based Interventions

In a 2013 study, Cumming and Rodriguez (2013) used a "mixed method single subject and qualitative interview" approach to explore use of iPads in language arts instruction for four elementary students "with language-based disabilities" (p. 43). They found that "using the iPad increased the student's academic engagement" and teachers and students reported "high levels of satisfaction" (p. 43).

Cahill and McGill-Franzen (2013) focused their study on reviewing effects of using digital picture books with beginning readers and indicated that the interactive nature of e-books

spurs on traditional and new literacy skill development. "Reading e-books promotes traditional literacy skills and is particularly supportive in the area of vocabulary development" (Cahill & McGill-Franzen, 2013, p. 31). Book apps involving digital pictures were found to be "very motivating" and suggested that digital picture book apps "also provide ample opportunity for bridging the home-to-school literacy connection" (p. 37).

In contrast, Devlin et al. (2013) performed a mixed-methods study on traditional versus technology-based instruction in a STEM classroom and found that the technology-based group was only *slightly* more engaged than the traditional-methods group. Much of the research reviewed offers additional information about the motivational effects of app-based interventions and ample information to consider for future research (Getting & Swainey, 2012; Kenney, 2011).

Conclusion

The literature reviewed covered a considerable range of information on the effects that technology-based interventions has on elementary students. The sample sizes varied from one student to over 100 students. Technological interventions for elementary education range in cost, type, ease of use, and implementation style. The literature search returned significantly more research focused on reading interventions than on math interventions. It appears that the volume of technology-based reading intervention studies is greater than the amount of research completed on technology-based math interventions. A number of applications for reading support were drawn from the literature reviewed and can be further explored for future research. Overall, the research reviewed indicates both positive and negative effects of technology and application-based educational interventions at the elementary level.

Chapter III

Methodology

Introduction

The purpose of the study was to explore Kindergarten public school teachers' perceptions of the effects of technology use in the classroom on reading achievement. Teachers' perceptions of barriers to technology use in the classroom were also examined. Additionally, this study examined the differences between technology-based learning interventions on Kindergarten students' reading growth.

Research Design

This study was designed with a mixed-method approach that involved eight kindergarten teachers and their classes from a suburban public school district in New Jersey. A descriptive statistical analysis was used to interpret quantitative data of aggregate student reading growth by ex post facto data group matching. An interview was completed with each of the eight kindergarten teachers using the Teacher Questionnaire (see Appendix A).

Qualitative data from teacher interviews provided insight into teacher perceptions of the effectiveness and barriers of technology-based reading interventions in the Kindergarten general education setting. Using mixed methods, the data were triangulated to identify the significance of technology use in the classroom as it relates to student reading growth. As explained by deVaus (2001), an ex post facto matched-group study is used when creating groups from the participant pool after all data is collected. Student groups from classes using technology-based reading interventions across the school year and those not using technology-based reading interventions across the school year were compared for differences in reading achievement growth according to aggregate universal reading assessment (DIBELS) scores. By using this

approach, the study offered a quantitative analysis of differences between technology-based reading interventions in the natural Kindergarten classroom environment.

Participants

With approval from the district superintendent and Board of Education, the participants for this research study included all Kindergarten teachers at a lower elementary school in a southern New Jersey school district. The criteria for Kindergarten teacher participants included all Kindergarten general education teachers ($N = 8$). Including all general education Kindergarten teachers helped to increase the sample size.

Instrumentation

Qualitative data was gathered using teacher interview questions modified from a previous study by Kenney (2011) as a guide. The researcher attempted to contact the original author of the questionnaire to ask permission to modify and use the questionnaire in this study, but all attempts were unsuccessful. Evidence of the requests are provided in Appendix E of this study. The final copy of the teacher interview questionnaire is also included in Appendix C. Questions were carefully considered for relevance to this study and modified as necessary. The teacher interview questionnaire addressed research questions one and two. Questionnaire results were qualitatively analyzed for major and minor themes as related to the effects of technology on student learning.

The suburban elementary school at which this research was conducted had a well-established RTI system in the lower elementary school (kindergarten through second grade). The system included procedures for assessing student achievement performance levels in reading three times per year (September, January, and May). DIBELS (Dynamic Indicators of Basic Early Literacy Skills), *Fountas and Pinnell* reading running records, and STAR Reading and

Math assessments were used to measure student performance within the kindergarten through second grade RTI program. Pre-existing student DIBELS assessment results were used in the quantitative analysis for this study.

Quantitative data were gathered using one measurement instrument, the Dynamic Indicators of Basic Early Literacy Skills (DIBELS). The DIBELS is "a set of procedures and measures to assess the acquisition of early literacy skills from kindergarten through sixth grade" (University of Oregon, 2018). DIBELS offers the study data produced from standardized, pre-existing procedures. The DIBELS assessment is administered by the teachers using standardized methods. This measurement was administered at the start of the school year and was considered a pre-test baseline of student performance levels in reading. DIBELS includes a measure of phonics, phonemic awareness, accuracy, and fluency. DIBELS was also administered as a post-test during RTI progress monitoring to identify differences, if any, between groups. Overall student DIBELS pre- and post-test quantitative scores were compared after one year of technology-based reading intervention use in six classrooms and no technology-based reading intervention use in two Kindergarten classrooms. Ex-post facto data was drawn from student progress-monitoring performance on the DIBELS assessment in September 2017 and May 2018. This section addressed research question number three.

Data Collection

Approval to carry out this study was received from Wilmington University for the HSRC, and the participants' school district. Following approval, teacher interviews were administered to the eight kindergarten teachers who taught during the 2017-2018 school year. Teacher participants were provided a letter explaining the purpose of this study, including assurance of

anonymity for participants, and their signed consent to participate in the study was obtained. Quantitative ex-post facto data was drawn from VPORT, the DIBELS database.

Data Analysis

Qualitative data. Individual interviews were completed in person with each of the eight kindergarten teacher participants in a mutually agreed upon location within the lower elementary school. Interviews were administered before or after school hours, at a time selected by each teacher participant. The interviews took no longer than fifteen minutes and were recorded and transcribed by the researcher. Participant responses were kept anonymous, and data were kept in a secured location. The qualitative data were collected and analyzed to identify minor themes related to the research questions. Minor themes of technology usage type were triangulated with quantitative data to identify major themes surrounding the differences between technology type-use on student reading growth.

Pre-test and post-test data. A quantitative data analysis was completed using SPSS statistical software. The independent variable in this study was students' independent usage of reading-based technology for the entire year. Additional variables of gender and race were considered; however, these demographics were not analyzed due to the limited *N* size (*N=8)*. The dependent variable in this study was student reading growth as measured by DIBELS composite scores. Student reading pre- and post-test DIBELS composite scores were converted into *z* scores using Microsoft® Excel software, so as to ensure an even scale of measurement because the scales from pre to post did not match. A factorial analysis of reading *z* score growth was used to generate mean growth differences within and between groups and statistical significance for students in each of the four distinct technology type groupings: iPad use, computer use, multiple-platform use, or no technology use in reading centers.

Reliability

Gathering the research data based on the naturally-occurring classroom environment (activities/interventions and assessments) offers reliability with results for effects on future classroom approaches, although the data from this study should not be considered generalizable due to the limited number of classrooms and the limited scope of the included data.

Threats to Validity

Internal validity. Internal validity considers any factors that may have influenced the outcomes of the study. In this study, qualitative interview data may have been influenced by teachers giving responses that they thought wanted to be heard rather than the factual information. Additional factors that may have influenced the outcomes include student technology-use frequency and student technology-use type. Some students may not have participated in technology-based reading interventions for the same frequency each week due to outside circumstances, such as absences, assemblies, testing, services, and other alternative classroom events or activities that may have arisen. Furthermore, a variety of Apps and websites were used potentially impacting validity of results.

External validity. Factors limiting the generalizability of the study are considered within external validity. Generalizability is limited due to the small sample size of this stud. Additionally, the study was limited to a suburban school in Southern New Jersey and cannot be easily generalized to different school settings with consideration of funding, programming, and classroom schedules.

Ethical Considerations

It was important to protect the confidentiality and well-being of the participants during this study. A Human Subject Review was completed prior to submitting for the research

proposal. The proposal was reviewed by the Wilmington University HSRC to identify any potential ethical concerns. Adjustments were made to the study as necessary. To protect participant confidentiality, subjects' names were eliminated and replaced with alternative identification numbers for the duration of the study, throughout data collection, and documents. DIBELS benchmark scores were used in pairing with an identification number for the study for purposes of identifying student growth in reading.

Summary

This chapter focused on outlining the study's methodology and research design. The chapter components included: methodology, study design, participants, instrumentation, data collection, data analysis, reliability, threats to validity, and ethical considerations. The study included eight kindergarten teachers and their students' DIBELS data (ex post facto) from a suburban school district in southern New Jersey. The teachers each participated in an interview, and student reading growth in relation to technology use was quantitatively analyzed by using ex-post facto data from benchmark DIBELS composite assessment scores. Ethical considerations have been made in the design of this study.

Chapter IV

Results

Introduction

This mixed method study examined teachers' perceptions of the impact of technology use in the classroom. The study explored teacher perceptions of the barriers to technology use in the classroom. This study also examined student reading growth as related to technology use within reading centers throughout the school year. Through a descriptive analysis of interview responses from kindergarten teachers at a suburban school district in Southern New Jersey and an inferential analysis of ex-post-facto kindergarten student DIBELS (reading) assessment data, the researcher triangulated results to identify themes. The following research questions were addressed:

1. What are Kindergarten public school teachers' perceptions of the effects of technology use in the classroom on reading achievement?
2. What are Kindergarten teachers' perceptions of barriers to technology use in the classroom?
3. What are the differences between technology-based reading interventions on Kindergarten student reading performance as determined by aggregate student reading growth on the DIBELS benchmark assessment?

Interviews were conducted with all eight general education kindergarten teachers from the 2017-2018 school year to address research questions one and two. The interview questions that were utilized (see Appendix A) provided information to assist with a descriptive data analysis, where minor themes were identified. A factorial analysis was then completed to address research question three. Using inferential statistics, based on a factorial analysis of

student reading z score growth, mean growth within and between technology use, groupings and statistical significances were generated. Major themes were identified from the inferential statistics.

Minor Themes

Minor themes were initially drawn from the teacher interview results to address research questions one and two. This information was then triangulated with student reading growth *z* score data to identify major themes and findings pertaining to research question three. The following six themes emerged from teacher interviews are displayed in Table 1: (1) years of teaching and technology use, (2) types of technology used, (3) student time on technology, (4) barriers, (5) benefits, and (6) resources and professional development.

Table 1

An Overview of Teacher Interview Responses Corresponding to Six Themes Describing Teacher Perceptions of the Effects of Technology Use in the Kindergarten Classroom

N = 8	Years Teaching	Technology Types	Time on Technology	Barriers	Benefits	Resources & PD
Kindergarten Teachers	>10 years used fewer types of technology (average of 2 types)	All used Promethean or Smart Board	Most used for reading at least 20 minutes independently per day	Most said the biggest barrier is when technology "doesn't work"	50% said it "Keeps students' attention or interest"	The majority felt they have sufficient resources and professional development
	<10 years used more types of technology (average of 3 types)	Most used iPads, Chrome-books, desktop computers and/or Kindles	1. Two did not use: limited iPads available; 2. It was difficult to have kindergarteners using technology independently	Some teachers said Kindergarten students don't always know how to use technology or how to trouble-shoot technology	50% said "Students need to know how to use technology for life"	Two said they could use more resources and professional development.
		Some did not use technology-based reading centers		• Set-up • Promethean board is too high for Kindergarteners to reach • District setting limitations and getting locked out of the network	• Listening to a story • Varying levels available • Easier to plan • Reinforces concepts taught • Whole-class instruction • Tracking levels	One teacher said, "Yes and no"

Years teaching and technology use. Teachers were asked how many years of teaching experience they each had. They were also asked to share what types of technology they use for reading centers. Overall, teachers with fewer than ten years of teaching experience used more types of technology for reading-based centers (an average of three types of technology) than teachers with more than ten years of teaching experience. Teachers with more than ten years of experience used an average of two types of technology. The number of years of teaching experience among the participants is represented within Table 2 below. The types of technology used are further described under the second theme of "Types of Technology Used".

Table 2

Teacher Participants' Number of Years of Teaching Experience

# of Years Teaching	# Teachers
0 - 5 years	1
6 - 9 years	3
10 - 15 years	3
16+ years	1

Types of technology used. The second theme that emerged from the teacher interview data was the types of technology used in the classrooms. All eight kindergarten teacher participants reported that they used the Promethean/Smart board throughout the school year. The Promethean board projects computer images for students on an interactive touch board. Teachers noted that the math curriculum utilized technology-based materials that were projected during whole-class instruction on a daily basis. The Promethean boards were also used for Spanish curriculum videos, Science and Social Studies materials, "brain breaks", drawing

samples, and introducing new concepts. Additionally, Smart boards were used for students to listen to stories and music as a class.

Most teachers reported that they used any additional technology that was provided to the class, including iPads, Chromebooks, computers, and/or Kindles for reading and math centers. More specifically, some kindergarten students listened to stories and practiced reading on the iPads or Chromebooks using the RAZ Kids, Epic, and ABC Mouse Apps or websites during technology-based reading centers. Some students did not use technology-based reading centers throughout the school year by classroom design.

Time on technology. The third theme describes the time students spent using technology in reading centers. The majority of kindergarten teachers (n = 6) incorporated at least 20 minutes of technology-based reading centers in the daily classroom routines. The total number of minutes each student spent in a technology-based reading center varied per week. However, they had exposure to technology-based reading centers daily throughout the school year.

Other kindergarten teachers did not incorporate technology-based reading centers due to two main limitations. Participant three explained that only two iPads were available and it would be difficult to shape a reading center around two iPads. Student centers typically involve four to six children each. Participant six shared that it is difficult to expect kindergarten students to independently use technology for a reading center, especially during the first half of the school year.

Barriers. The fourth theme identified through teacher interview results was the barriers to technology use in the kindergarten classroom. The most common difficulty identified with technology use in the classroom by participants two, three, five, six, and seven was that technology "doesn't always work."

More specifically, participant 5 expressed:

> At such a young age, they don't know how to troubleshoot and problem solve, so then it's interrupting other small groups to figure it out. A lack of strong Wi-Fi, broken headphones, and broken speakers, I think that's the worst, but I think kids do learn to use it. (Participant 5)

Participant one said it is difficult "setting it set up for all the little kids, all at once. That's the hardest part."

Participant four said:

> Believe it or not, the height on the Promethean board is too high for the students in my class. And, the iPads are hard for Kindergarten students to log on and off. So I have to find two tech-savvy kids to be able to log other students on. (Participant four)

Participant six said it is difficult "getting 22 five year olds to use technology at the same time."

Participant seven said, "I think specifically a point of frustration for me is how they lock you out in such a short amount of time. So if I put in a password and get it ready, it is back to the screensaver."

Participant eight stated, "With the Chromebooks, they don't know how to use their finger and click at the same time. So it's a whole learning process."

Benefits. The fifth theme drawn from the teacher interview results most specifically aligns with research question one. Teacher perceptions of the benefits of technology use in the classroom most consistently revealed two responses: (1) technology keeps students' attention and interest, and (2) students need to know how to use technology for life.

Regarding student attention being a benefit, participant one stated, “It keeps their attention for a longer span of time.”

Participant two said, “It’s our future. That’s what kids know. In Kindergarten, they know more than us! The benefit of it is that we have to keep up with the times.”

Participant three stated, “It’s just their generation that they’re used to watching TV or iPads or videos, and they’re just drawn to watching.”

Participant five said, “I believe kids attend a lot better when they see the screen because it’s more enticing to children. And, that’s the way the world is going today; everything is going toward technology, so it needs to go that way.”

Participant six said, “This is the way the world is today. Students are sitting with a phone in their hand with their parents, so we need to help them know how to learn using technology.”

Participant eight shared, “They’re definitely more engaged when they’re using technology. The kids are going to be using technology for the rest of their lives, so the sooner they have it, the better.”

There were six additional benefits noted by individual teachers.

Participant one said, “You can modify it for their level.”

Participant two stated, “I think it is a little easier when it comes to planning your day.”

Participant three identified technology use as a benefit to reinforcing what was taught:

> I think it reinforces what I say. And if a student needs to hear it a second time, whether it is a different voice, whether it is in a song or a video, I think it helps them to hear it a second time. (Participant three)

Participant four specifically commented on the benefit of using the Promethean board, “It’s big enough for the entire class to see.”

Participant seven shared two benefits:

> Especially when I am not meeting with a reading group, it's great that they are being read to. You know, there are tons of studies that prove that being read to is great. The software that we use, I really like because it will highlight the words as it goes along. It tracks the kids' levels. (Participant seven)

Resources and Professional Development. The sixth theme that emerged from the teacher interview data was that resources and professional development provided by the district is generally sufficient. Just over one-half (n=5) of the teacher participants replied "yes" when asked if they had the resources (professional development and support) that were needed to implement learning-based technology in the classroom. Several of the teachers elaborated on their responses.

Participants three and four said, "Our district is wonderful with that (Professional Development)."

In contrast, participants five and six replied that they "could use more" professional development for the technology available for instructional purposes.

Participant eight explained that the teachers received a full training for the Internet-based math curriculum.

Participant two had a different response:

> Yes and no. I think a lot of it comes just with experience of trial and error. In the classroom it may depend on the students. Something might work for one group that might not work for another. If we are talking specifically about the math curriculum, I would love more training in how to navigate the curriculum online. And maybe where to pull to supplement and things like that. (Participant two)

Research Questions

Research Question #1: What are Kindergarten public school teachers' perceptions of the effects of technology use in the classroom on reading achievement?

Based upon a descriptive interpretive analysis of Kindergarten teacher interviews, this research question was addressed. Themes drawn from the interpretation to answer research question one are displayed in Table 3.

Table 3

Kindergarten Public School Teachers' Perceptions of the Effects of Technology Use on Student Reading Performance.

	Type(s) used	Why used	Apps/Software	Benefits/Effects
Kindergarten teachers	Promethean/Smart Board (8 teachers use) iPads (5 teachers) Kindles (1 teacher) Chromebooks (3 teachers) Desktop computers (2 teachers) CD Players (1 teacher)	Projecting learning activities • Whole-group lessons • Stories read aloud • Playing videos • Interactive Reading Centers • Listening to and viewing stories	RAZ Kids/ Reading A-Z (5 teachers) Epic (2 teachers) ABC Mouse (1 teacher)	Keeps students' attention (4 teachers) Students need to know how to use technology for life (4 teachers) Students can listen to a story and practice reading (1 teacher) Reinforces concepts taught (1 teacher) Used for whole-class instruction (1 teacher) Tracks students' levels (1 teacher)

As shown in the Benefits/Effects section in Table 3, the kindergarten teachers most frequently agreed that using technology-based reading centers is effective because technology keeps students' attention. Four out of the eight participants interviewed identified technology-

based reading centers as effective with relation to keeping students' attention. Teachers reported that students are more engaged for longer periods of time when reading on a tablet or computer. Students show an increased interest in using tablets and computers as opposed to reading from a book. Teachers reported that students are more interested with technology because technology use is so prevalent in today's world.

Four out of eight teacher participants also agreed that technology is necessary for life, and, therefore, is considered a benefit to student reading growth.

Participant five said, "It's our future. That's what kids know. In kindergarten, they know more than us! The benefit is that we have to keep up with the times."

Because 21st century students are surrounded by technology, the teachers reported on the importance of technology use for learning from an early age.

All eight teacher participants used technology for projecting learning activities in whole-group lessons, having stories read aloud, playing videos, and facilitating interactive learning activities. This suggests that they all found some value to using technology for learning effects. Six of the eight teachers had technology-based reading centers for students to independently engage in reading activities on a daily basis. In these centers, students participated in reading activities using iPads, Kindles, Chromebooks, and/or desktop computers to access applications or software including RAZ Kids (Reading A-Z), Epic, and/or ABC Mouse (see Table 3). In sum, all teachers found a level of significance to using technology for reading with their students based upon the reports of types and reasons used.

Research Question #2: What are Kindergarten teachers' perceptions of barriers to technology use in the classroom?

A descriptive interpretive analysis was completed using Kindergarten teacher interview responses to identify teacher perceptions of barriers to technology use in the classroom. Table 4 outlines the barriers of technology use to answer research question two.

Table 4

Kindergarten Public School Teachers' Perceptions of the Barriers to Technology Use in the Classroom

Number of Kindergarten Teachers	Barriers to Technology Use in the Classroom
5	When it doesn't work
4	Young students don't always know how to use technology
2	Students don't know how to troubleshoot with technology
2	District user settings limit access and updates
1	Set-up
1	Promethean/Smart Board is too high for students to reach

When asked, "What do you find difficult about using technology in the classroom?", Kindergarten teachers most commonly responded, "when it doesn't work." Just over half of the teacher participants (n = 5) noted the most difficulties with technology not working for classroom-based activities.

Specifically, participant three identified a barrier of "when the system goes down."

Participant five explained, "It doesn't always work. A lack of strong Wi-Fi access and Wi-Fi would go out, broken headphones, broken speakers, so I think that's worse."

Four out of eight (n = 4) Kindergarten teacher participants responded that using technology in the classroom is difficult because kindergarten students don't always know how to use technology.

For example, participant four remarked, "The iPads are hard for kindergarten students to log on and off, so I have to find two tech-savvy kids to be able to log other students on."

Participant five, who used technology-based reading centers throughout the school year responded,

> At such a young age, they don't know how to troubleshoot and problem solve; so then it's interrupting other small groups to figure it out. I did try a buddy system and had a leader in each group that seemed to know technology better than others. So, I would say, "Ask so-and-so first, and if they can't figure it out, come to me." (Participant five)

Similarly, participant eight, who used technology-based reading centers shared,

> When dealing with kindergarten, a lot of times they don't know how to use the technology so you have to teach them. And, with the Chromebooks, you have to request a mouse. They don't know how to use their finger and click at the same time (with Chromebooks), so it's a whole learning process. (Participant eight)

In contrast, a teacher who did not use technology-based reading centers also expressed common concerns. Participant six identified, "Getting 22 five-year olds to use technology at the same time" to be a difficulty with technology use in the classroom.

Other difficulties of classroom-based technology use from kindergarten individual teacher participants included: district user settings limiting access and limiting updates, set-up of technology, and the Promethean board being physically too high for kindergarten students to reach and interact with.

Two out of eight teacher participants ($n = 2$) reported difficulties with using technology due to the school system settings and access. For example, participant one said, "Keeping it updated, it's hard to update yourself because it goes through the school system."

Participant seven said, "A point of frustration for me is how they lock you out in such a short amount of time. So if I put in a password and get it ready, it's back to the screensaver." Furthermore, participant one stated, "Getting it set up for all the little kids all at once, that's the hardest part."

Research Question #3: What are the differences between technology-based reading interventions on Kindergarten student reading as determined by aggregate student reading growth on the DIBELS benchmark assessment?

Student growth was measured using Microsoft® Excel using ex-post-facto data from students beginning of the year DIBELS reading assessment performance and end of the year DIBELS reading assessment performance for school year 2017-2018. Raw DIBELS scores were translated into z scores in Excel, and *z* score growth was measured using the difference between end of year performance and beginning of year performance. Student reading growth *z* scores were grouped by technology-type(s) used for reading centers and then entered into SPSS to complete a factorial analysis. The dependent variable in this analysis was student *z* score growth. The independent variable was Independent Usage (of technology) (for the) Entire Year. Gender and Race demographics were considered for independent variables but not reported due to small *N* sizes. Mean growth scores, as shown in Table 5, revealed some differences between kindergarten students' technology use on reading growth, described in the "Major Themes" section.

Table 5

Mean Reading Growth by Technology Used

	N	Mean
iPad	21	.269
Computer	32	-.080
Multiple	53	-.045
None	38	-.147
Total	144	-.034

Major Themes

Using student DIBELS pre- and post-test data to measure reading growth, a factorial analysis was completed to investigate research question three. The following themes on the differences between technology-based reading interventions on Kindergarten student reading growth were drawn from data completed through the SPSS system (see Table 5).

iPad use. Overall, students made more gains using iPads than other student groups. To further explain, the analysis revealed that students ($N = 21$) who used iPads in technology-based reading centers across the school year made the most growth among the technology types used ($M = .269$).

Computer use. Some teachers provided desktop or Chromebook-based reading centers in the classroom. An analysis of students ($N = 32$) using primarily computers in technology-based reading centers showed that overall, computers did not support kindergarten student reading growth ($M = -.080$).

Multiple platforms. Students ($N = 53$) using multiple platforms of technology (any combination of iPads, Chromebooks, desktop computers, and Kindles) for reading similarly did show reading growth on average ($M = -.045$).

No independent technology use in reading centers. Students ($N = 38$) who *did not* use technology in reading centers showed the least growth on average ($M = -.147$) in reading according to DIBELS composite scores.

Conclusion

Overall, students using iPads for reading centers made the most growth (see Table 6). A mean z score growth of $M = .269$ for kindergarten students using iPads shows greater growth than groupings of students using computers, multiple platforms, or no technology. Students

using “None” (no technology), made the least gains of the groupings (M = -.147). While these results can be drawn from the test data, overall results were not statistically significant (p = .321), see Table 6 below. Furthermore, all groupings returned significance levels greater than .05 (not statistically significant) for a comparison between groups, as shown in Table 7. The analyses were based on a level of significance $p < .05$.

Table 6

ANOVA – Significance of Technology Usage on Kindergarten Student Reading Performance Between Technology Types

ANOVA	Significance *p*
Between Groups	.321

Note. Level of significance is $p < .05$.

Table 7

Multiple Comparisons Between Technology Usage and Significance

Technology Type	Technology Usage	Significance
iPad	Computer	.846
	Multiple	.896
	None	.424
Computer	iPad	.846
	Multiple	1.000
	None	1.000
Multiple	iPad	.896
	Computer	1.000
	None	1.000
None	iPad	.424
	Computer	1.000
	Multiple	1.000

Chapter V

Conclusions and Recommendations

Introduction

The purpose of this study was to examine teacher perceptions of the effects of technology use with Kindergarten students. The study also investigated teacher perceptions of the barriers of kindergarten students using technology in the classroom. Interviews were completed with each of the eight kindergarten teachers to help answer these questions and themes were identified. The interview results were then triangulated with kindergarten student reading growth to explore the differences between technology use.

Summary of Research Findings

Overall, teachers with fewer than ten years of teaching experience used more types of technology for reading-based centers (an average of three types of technology) than teachers with more than ten years of teaching experience. Teachers with more than ten years of experience used an average of two types of technology. With regard to types of technology used, six out of the eight kindergarten teacher participants provided iPads, Chromebooks, desktop computers, and/or Kindles in technology-based reading centers on a daily basis.

The two most common barriers to technology use in the kindergarten classroom reported by teacher participants were: technology doesn't always work, and kindergarten students do not always know how to use technology. Teacher perceptions of the benefits of technology use in the classroom most consistently revealed two responses: (1) technology keeps students' attention and interest, and (2) students need to know how to use technology for life. An additional finding from teacher interview data was that resources and professional development provided by the district is generally sufficient. Just over one-half of the teacher participants replied "yes" when

asked if they had the resources (professional development and support) that were needed to implement learning-based technology in the classroom. When using kindergarten teacher interview results and kindergarten student DIBELS assessment growth z scores, effects were identified.

Ultimately, students using iPads for reading centers made the most growth while students using "Multiple Platforms," "Computers," or "None" (no technology) in reading centers showed less growth on average. The difference in growth scores between platforms cannot be attributed to its usage due to the lack of statistical significance found using a factorial analysis of the variables.

Conclusions

The findings of this study revealed that overall, teachers perceive positive effects of technology use in the kindergarten classroom. Six out of eight kindergarten teacher participants reported daily technology use within reading centers in their classrooms for the duration of the school year. The most commonly identified benefits to technology use included keeping the students' attention and interest and students needing to know how to use technology for life. Teachers also liked that students are read to by technology-based activities when the teacher is working with other children. Additional benefits of technology use in the classroom contributing to perceptions of positive effects included: activities at the students' levels, making the day's plans easier, reinforcing lessons taught, tracking student levels, and whole-class interactive instruction.

Based upon the findings, kindergarten teachers identified technology not working as the greatest barrier to technology use in the classroom. This included lack of Wi-Fi and/or broken headphones or speakers. Teachers also reported that it is difficult that not all kindergarten

students know how to independently use or troubleshoot technology. Student difficulties with logging in or out of devices, apps or software, using the Chromebook touch pad (mouse), and keyboarding were reported to interfere with learning productivity. Furthermore, findings indicated that set-up of technology, district technology settings, and the physical height of the Promethean board being too high for kindergarteners were barriers to technology use in the classroom.

Overall, findings of the study suggest that kindergarten students who used iPads in technology-based reading centers made the most growth according the DIBELS- pre and post-test data. Findings showed that students using computers, multiple platforms or no technology in reading centers did not show growth on average. Results, however, were not statistically significant ($p > .05$) for all groupings.

Limitations and Generalizability

There were several aspects to this study that may have impacted the results. The participant group was limited to eight general education kindergarten teachers and, therefore, the study is considered small in size and scope. Special education teachers and teachers of other grade levels were not included in this study. The data reviewed in this study was limited to kindergarten general education students' reading data. Additionally, data from other subject areas, such as math, for example, were not included in this study. The variation of student technology usage, including specific time spent on devices and specific programs used, among groupings should also be considered a limitation to this study.

Interviews were completed with kindergarten teachers, and student data was used, from within one suburban Southern New Jersey school district, which limits generalizability across other school settings. With regard to generalizability, the technology available to the classroom

teachers interviewed for this study is limited to the provisions for the general education kindergarten classrooms in this specific single school district. Furthermore, the technology implementation practices reported by the teacher participants are limited to this particular single school district. Technology materials and practices vary from classroom-to-classroom, school–to-school and district-to-district, making the generalizability of this study limited.

Implications

The findings of this study should be shared with educators, parents, and students. The sharing of this information would contribute to careful consideration of student learning modes, and instructional methods and practices for reading. The study has implications for school district administrators when planning and budgeting for the types of technology provided to the classrooms. Additional implications include the impact of iPad use on student learning and the prevalence of touch-screen devices in the 21st century (as opposed to computers). Further consideration can be made with respect to the effects of kinesthetic activity (motor movements and touch) on learning, specifically with iPads and technology. The findings of this study suggest that students make the most progress in reading when using the iPad in reading centers on a regular basis.

Students who used computers in technology-based reading centers may not have had the background knowledge of how to use and navigate a computer prior to entering kindergarten. This potential lack of knowledge could hinder productivity with learning on a computer. However, the likelihood of students having prior knowledge of smart phone use or other touch-screen device use prior to entering kindergarten may be higher. Thus, perhaps iPad use for reading reinforcement and practice could have a greater impact on reading growth than using a computer, a variation of technology or no technology. Teachers' perceptions of student

engagement with technology for reading also suggested that the students' high interest with technology use would have a positive influence on their learning. The results of this study suggest that teachers who incorporate iPad-based reading centers may see more reading growth from their students than those using no technology-based centers, computer-based centers, or using multiple platforms of technology in reading centers. This provides implications to classroom teachers for the instructional design and routines of their classrooms.

Finally, this study's results imply that parents can benefit from knowing that some use of reading-based iPad or touch-screen technology practice can contribute to student growth in reading. Additionally, parents would benefit from knowing the impact of kinesthetic (hands-on) learning experiences for their children.

Recommendations for Future Study

The work of this study contributes to the existing research on the differences between learning-based technology use on student reading growth. More research is needed to understand teachers' practices of technology use in the classroom, including the effects of specific practices and the barriers to technology use in the classroom. Specifically, further investigation of the effects of particular app and/or software use should be considered. Additional research is needed for the effects of learning-based technology use on both reading and math performance of students. More information is also needed in the effects of the influences of school administrators' practices and beliefs regarding technology use in the classroom.

Future research may examine the effects of learning-based technologies among various grade levels and subject areas. Additional information is needed on student perceptions and attitudes towards using learning-based technologies versus traditional instruction. Future studies

may want to replicate this study in other school districts' kindergarten classrooms to examine effects and teacher perceptions. Likewise, the differences between learning-based technology use and teacher perceptions of learning-based technology use can be explored in other school settings across grade-levels. Ultimately, future empirical research may focus on the differences between learning-based technology across settings, grade levels, and subject areas. More information can be gathered both quantitatively and qualitatively to examine teachers', parents', and students' perceptions of using learning-based technologies in the classroom and in the home.

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Appendix A

Permission to Perform Research

Telephone: [redacted]
Fax: [redacted]

[redacted] **BOARD OF EDUCATION**

Administration Building
[redacted] **Avenue,** [redacted], **N.J.** [redacted]

[redacted]
Superintendent of Schools

[redacted]
School Business Administrator
Board Secretary

December 14, 2017

Beth Radano
CST

Dear Ms. Radano,

Please be advised that at a meeting on Wednesday, December 13, 2017 the [redacted] Township Board of Education took action to approve your Dissertation Research for Doctoral work at [redacted] Elementary.

If you have any questions or concerns, please do not hesitate to call.

Sincerely,

Beth [redacted]
Superintendent of Schools

Appendix B

Letter and Consent to Participate in the Research

Dear Kindergarten Teacher,

I invite you to participate in my doctoral dissertation research study entitled, "Teacher Perceptions of Technology-based Reading Interventions with Kindergarten Students and Differences between Technology-based Interventions on Student Reading Growth." I am currently a Doctor of Education student in the Educational Leadership and Innovation program at Wilmington University in New Castle, Delaware. I am conducting this research to explore kindergarten teachers' perceptions of the barriers and benefits to technology-based intervention use in the classroom. Also, to examine the differences between technology-based learning interventions on Kindergarten students' reading growth.

The teacher interviews will take place at a mutually-agreed-upon location between the teacher and researcher. The interviews will take no more than thirty minutes, and will be recorded for the researcher to transcribe and find themes within the results. Your participation in this research project is completely voluntary. You have the right to decline participation, and may withdraw participation at any point while completing the interview. There are no known risks involved with this study. Your responses will remain confidential and anonymous. Data will be kept under lock and key and will be reported anonymously.

If you are in agreement to participate in this study, your signed consent is required. If you have any questions about this project, you may contact Dr. Joseph Massare, Ed.D at (302)327-6581, at 31 Reads Way, New Castle, Delaware, 19720.

Thank you for your assistance in this important endeavor.

Sincerely,

Elizabeth A. Radano

My signature acknowledges the following:

1. My participation is strictly voluntary, and I understand that I may choose to respond to any, all, or none of the questions asked during the interview.
2. I have been assured that my responses will remain strictly confidential with regard to my identity.
3. I understand that the interview will be audio recorded as part of this study.
4. I have the ability to request the transcript of my responses from the interview.

Participant's Signature _____ Date _____
Researcher's Signature _____ Date _____

*This study has been approved by the Human Subjects Review committee at Wilmington University. Any questions or comments regarding this study may be directed to Dr. Joseph Massare, Ed.D, Dissertation Chairperson, by email: joseph.a.massare@wilmu.edu or by telephone: (302)327-6581.

Appendix C

Teacher Interview Questions

1. How long have you been teaching?
2. What types of learning-based technologies do you use in your classroom? Why?
3. What do you find difficult about using technology in the classroom?
4. How much of your daily routine involves using learning-based technologies?
5. Do you have the resources (Professional Development and support) that you need to implement the current learning based-technology in your classroom?
6. In your opinion, what are the benefits of using learning-based technologies?

Appendix D

National Institutes of Health Certificate of Completion

Certificate of Completion

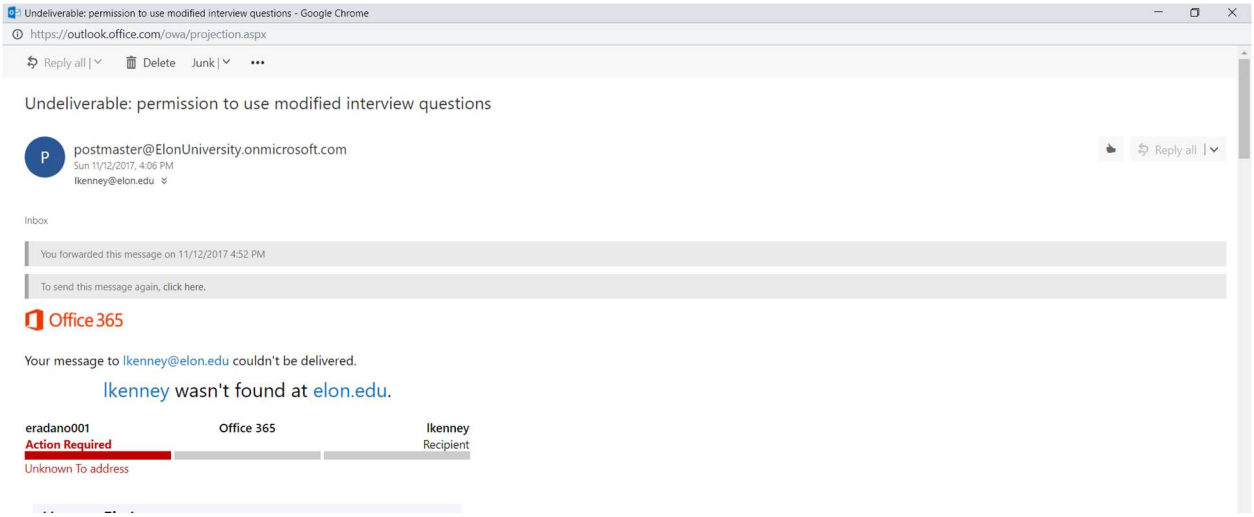
The National Institutes of Health (NIH) Office of Extramural Research certifies that **Elizabeth Radano** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

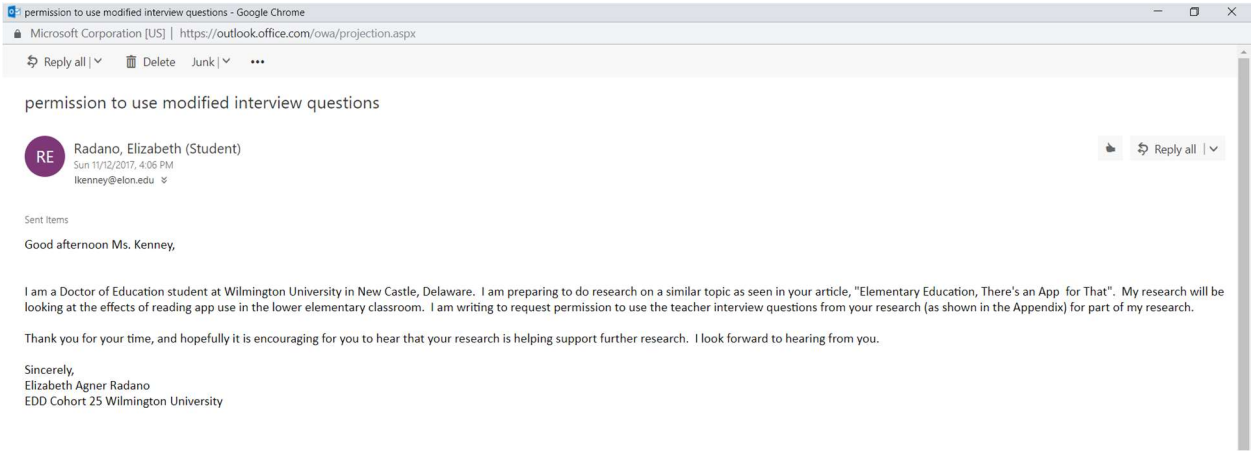
Date of completion: 01/24/2016.

Certification Number: 1965248.

Appendix E

Attempted Request to use Teacher Interview Questions from Previous Study





Appendix F

Human Subjects Review Committee Approval

WILMINGTON UNIVERSITY
HUMAN SUBJECTS REVIEW COMMITTEE (HSRC) HSRC-11

PROTOCOL REVIEW

This section is to be completed by the HSR Committee Person.

Principal Investigator: Elizabeth Radano

Date Submitted: 7/17/18

The protocol and attachments were reviewed:

The proposed research is approved as:

☐ Exempt ☑ Expedited ☐ Full Committee

The proposed research was approved pending the following changes:

☐ See attached letter

☐ Resubmit changes to the HSRC chairperson

The proposed research was disapproved:

☐ See attached letter for more information.

HSRC Chair or Representative

Todd Hackett-Slimm
Printed Name

Todd Hackett-Slimm
Signature Date 7/17/18

HSRC Chair or Representative

Joanne Fletcher
Printed Name

Joanne Fletcher Ed.D, RN, CNE
Signature Date 7/17/18

Draft Version: 0.2
Last Revision: 6/12/2016