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Effects on Reading Achievement of Low Socioeconomic Third Graders After Participation in a Computerized Reading Support Program

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Effects on Reading Achievement of Low Socioeconomic Third Graders After Participation in a
Computerized Reading Support Program

By

Vanessa E. S. Chapman

An Applied Dissertation Submitted to the
Abraham S. Fischler College of Education
in Partial Fulfillment of the Requirements
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I declare the following:

I have read the Code of Student Conduct and Academic Responsibility as described in the *Student Handbook* of Nova Southeastern University. This applied dissertation represents my original work, except where I have acknowledged the ideas, words, or material of other authors.

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Acknowledgments

“I can do all things through Christ which strengthened me.”

-Philippians 4:13

This dissertation is dedicated to my children, Alexius C. and Elbert Jr., but especially to my husband Lawrence for your continued support and encouraging words that helped me to finish this project. Lawrence, you kept me going when I became discouraged and felt like giving up. You would always tell me that everything would work out. Throughout this entire process, you were there for me and I thank you and love you more than words can say.

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Abstract

Effects on Reading Achievement of Low-Socioeconomic Third Graders After Participation in a Computerized Reading Support Program. Vanessa E.S. Chapman, 2016: Applied Dissertation, Nova Southeastern University, Abraham S. Fischler College of Education. Keywords: vocabulary instruction, vocabulary development, reading comprehension, instructional technology

This applied dissertation was designed to describe the effects of using a computerized reading and vocabulary development program with struggling third-grade students in a low socio-economic school setting. Vocabulary knowledge is paramount to developing and understanding unknown or unfamiliar words. Many students struggle with comprehension due to their limited exposure of vocabulary words. Students who have a limited vocabulary are often poor readers and continue to be a part of the academic achievement gap. This achievement gap appears to continue throughout the student's time in school. In an effort to lessen this achievement gap, the educational system is now incorporating computerized instructions as a means to increase student's academic achievement. Several benefits of incorporating computerize instructions into the school's daily curriculum can be seen in both reading comprehension and literacy skills. Computer assisted instructions or CAI are designed to fit the specific needs of students and to provide differentiated activities that will further supplement the instructions in the classrooms. Computers are being used to present activities that are more interesting thereby motivating the students to become active learners who are also actively engaged in the learning process. The computers and the computer programs that are being implemented into the school systems are beginning to become an integral part in the daily curriculum of the schools. Using technology is just another way to provide students with opportunities to improve in the areas of vocabulary, reading, writing and their listening skills.

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Chapter 1: Introduction

Vocabulary knowledge is critical in the lives of all students and especially true in the area of reading proficiency (Beck & McKeown, 2007). Children learn the words they know and understand by oral conversation. However, oral contexts are not effective for children once they enter school (Beck, & Mckeown, 2007). The rationale for this research is based upon the need to address the continuing failure rate among low socio-economic students who are currently in third grade and their lack of proficient vocabulary and comprehension skills.

Vocabulary knowledge or the knowledge of word meanings is a predictor of reading comprehension and also an indicator of vocabulary acquisition (Biemiller & Boote, 2006). Vocabulary knowledge is more than just knowing the definition of a word, but knowing what the word means and how the word is actually being used in the academic contexts (Townsend, Filippini, Collins & Biancarosa, 2012). Vocabulary is also a predictor of overall reading comprehension (Fisher & Frey, 2014). The value of vocabulary was once evident in content standards, however the Common Core State Standards for English Language Arts has changed this value. There is a total of 32 English language arts standards, but only four of these standards focus on vocabulary. The focus relates to interpreting words and phrases, using context clues, figurative languages and accurately using general academic and domain-specific words and phrases for reading, writing, speaking and listening (Fisher & Frey, 2014).

Vocabulary is the core of literacy and the demand on vocabulary knowledge increases throughout the school years (Fisher & Frey, 2014). Vocabulary is dependent upon the understanding of concepts, alphabets, syntax, and semantics of language and should not be taught in isolation (Fisher & Frey, 2014). Recently, the use of instructional technology to support

reading comprehension and vocabulary has proliferated particularly as more schools widely adopt handheld devices and incorporate digital texts. The purpose of this study is to determine the effects of a computerized reading program on the reading achievement of low-socioeconomic third graders.

Bromley (2007) goes on to say that vocabulary knowledge is considered as a predictor of reading comprehension and is a principle contributor to fluency and achievement. He also believes that teaching vocabulary should include instructions that engages the student in learning new words along with developing phonemic awareness. Repeated studies have documented the low reading and vocabulary achievement in at-risk student populations. To remedy that, school districts have undertaken measure to boost instruction, often using digital technologies.

Background and Justification

One of the many goals for all students entering school at the elementary level is to become independent readers. The National Reading Panel (2000) stresses the importance of early literacy to ensure that students become competent readers before they enter third grade. In order for this to happen, the teachers must teach the students how to apply their knowledge of word structure and context clues to determine the meaning of unknown or unfamiliar words. This type of direct instruction should be provided in both direct and indirect instruction of vocabulary across the contents in order to be effective for the students (http://doe.virginia.gov/testing/sol/standards_docs/english/2010/vocabul).

Vocabulary knowledge is required in order to achieve the ultimate reading goal, which is comprehension. Children entering school from a higher economic background have been exposed to thousands more words than the children who are from a low economic background (Hart & Risley, 1995). These differences are shown to grow larger in the early grades (Biemiller

& Slonim, 2001). Whether using the results of the National Assessment of Educational Progress, local standardized testing, or informal classroom assessments, this achievement gap becomes more evident by fourth grade and increases as children get older (Sanacore & Palumbo, 2009).

Graves (2006) states that one way to help close this academic achievement gap, especially for students with limited vocabulary is to help these students move at an accelerated rate in order to be on the same academic level as their peers. Grave's (2006) framework for increasing vocabulary knowledge is based upon providing various experiences with language, teaching words individually along with using word learning strategies and developing a consciousness for words. Weak vocabularies can create vicious cycles for readers, leading to less enjoyment in reading, less reading time, and failure to develop the vocabularies that are needed in order for the students to become competent and strong readers (Stanovich, 1986). The lack of vocabulary development in children from low socioeconomic households has long perplexed reading specialists. Children from low socioeconomic households who begin kindergarten behind their middle socioeconomic counterparts in vocabulary development seem to continue to lag behind throughout their schooling (Hart & Risley, 2003). Vocabulary instruction is a necessity in teaching students how to read (Rupley & Nichols, 2005). Allen (2006) supports increasing the amount of time the teachers read to and with their students and the amount of time the students spend reading independently as a way to increasing the students receptive and expressive vocabularies. Allen (2006) also supports and believe that students should be exposed to both print and richer language experiences through text choices especially since it is becoming such a difficult task for students to comprehend the material that the teachers are presenting through text.

Reading failure is the highest within schools that service disadvantage, minority and limited English Language Learners (Chambers et al., 2016). Hence, teachers are now implementing computer-based programs into their classrooms as a means to provide additional support for students, but especially for struggling readers (Stetter & Hughes, 2010). The National Reading Panel and the RAND Reading Study Group agree to the benefits of using computerized instructions to boost student's reading comprehension and literacy skills (Stetter & Hughes, 2010). Computer assisted instructions (CAI) programs are rather simple to implement, adapt to the specific needs of the students and provide activities with graphics that can further supplement classroom instruction (Chambers et al., 2016). The research for this study addresses the effects of computerized reading and vocabulary support on the reading achievement of third-grade students from a low socio-economic background.

Furthermore, the school in this study did not meet the accreditation benchmark requirement in both reading and math for the 2014-2015 school year. The pass rates for the students in third grade during the 2014-2015 school year for this study is below the state's required minimum passing rate. Accordingly, under the Virginia Elementary and Secondary Education Act waiver application, schools within the district must meet and maintain their Annual Measurable Objectives (AMOs) in reading and math to gain and sustain state accreditation. (http://www.doe.virginia.gov/statistics_reports/school_report_card/index.shtml).

The state allows this requirement to be met by either using the test results from the most recently completed school year, test results that are based on a three-year rolling average or by reducing the failure rate in the school by 10 percent. Failure to meet these requirements causes the school to become non-accredited. Currently, the state required passing rate in reading is 75 percent and the state required passing rate for math is 70 percent. The Annual Measurable

Objectives (AMOs) in reading and math will continue to increase until the year 2017-2018. At that time, the required passing rate for reading will increase to 78 percent and the required passing rate for math will increase to 73 percent

(<https://p1pe.doe.virginia.gov/reportcard/report.do?division=121&schoolName=4005>).

Consequently, many of the students in the fourth grade are beginning to experience a slump in reading comprehension, which contributes to the Fourth Grade Slump phenomenon and the importance of vocabulary knowledge to comprehension (Biemiller & Boote, 2006).

Educational researchers have explained that part of the fourth-grade slump is due to students having difficulties with informational texts (Chall, Jacobs, & Baldwin, 1990).

Stuckwisch (2013), superintendent of a K-12 school district located on the east coast of the United States, strongly believes that effective instructional techniques in reading as well as extensive teacher training in providing differentiated instructions to the students will result in higher academic success for the students and increased standards of learning scores for the school division (D. Stuckwisch, personal communication, September, 2013). Accordingly, the mission statement for this school district is to challenge the minds, challenge the bodies, and challenge the dreams of all students while focusing on excellence.

The Topic. The area of focus for this study is to describe the effect of using a computerized reading and vocabulary development program with struggling third graders in a low socio-economic setting. The performance of these third grade students in the area of reading has decreased based on the 2014 Standard of Learning State Assessment Scores. Comprehension is the reason for reading, and vocabulary plays a significant role in comprehension (National Institute of Child Health and Human Development, 2000). The National Reading Panel Report (2000) states that the importance of vocabulary in reading achievement has been recognized for

more than half a century and that vocabulary is tied to words while comprehension is tied to thoughts about larger units of information. A critical component to academic reading comprehension is understanding the vocabulary terms being used (Larson, Dixon and Townsend, 2013). For struggling readers in grade four and beyond, the use of direct instruction in word meaning is the most effective way to teach vocabulary. Vocabulary is an important goal in literacy and learning (National Institute of Child Health and Human Development, 2004) and vocabulary is the crucial key used in all subject areas. Therefore, it is critical that the students learn new words that contribute to achievement and comprehension in the school curriculums.

Research has proven that children from low-socioeconomic status (SES) families have an extremely smaller and very limited vocabulary acquisition compared to children from a high socioeconomic status family (Rowe & Goldin-Meadow, 2009). Success in school is parallel with success in reading. As a continuing effort to integrate more technology usage into the curriculum and promote more reading comprehension for the students, the school district in this study adopted a computer program called i-Ready that provides online instruction in reading comprehension and vocabulary building.

The i-Ready program is a computerized diagnostic tool that plays like a video game. Students choose an avatar to complete the program with them. The level of difficulty is adjusted as students go through the testing (Educational Research Institute, 2012).

The domains addressed in the lessons include vocabulary, comprehension in both literature and informational text, phonics and phonological awareness. The online lessons are designed to build conceptual understanding for all learners. The i-Ready program is expected to successfully predict the student's proficiencies on their end of the year state assessments. The computer program has been installed and fully operational in the school for this study since July

of 2015. The district is expecting all students in the schools to advance in the areas of vocabulary and reading comprehension based on the results of the state assessments results.

According to Richeck (2005) reading comprehension occurs when the students know the meanings of the words that they read. However, vocabulary becomes increasingly complex for third grade students because they are now expected to read to learn, after learning to read in the primary grades (Chall, 1983). In addition, vocabulary learning is the continuous process of experiencing new words in meaningful and comprehensible contexts (Harmon, Wood, and Kiser (2009).

The Research Problem. In the state of Virginia, the Standards of Learning (SOL) for all Virginia Public Schools establish a minimum expectation for what students should know and be able to accomplish by the end of each grade level, especially in Reading and Math. The Standards of Learning assessments are 30 to 50 questions that measure content knowledge, scientific and mathematical processes, reasoning and critical thinking skills. These questions are scored using a scaled score of 0 to 600 with a score of 400 being the minimum level of proficiency (<http://www.doe.virginia.gov/scoring/index.shtml>). The Standards of Learning also require that all students develop a more advanced vocabulary as the students move to higher grade levels. (<http://www.doe.virginia.gov/scoring/index.shtml>). The school in this study has not met their state required passing scores in the areas of reading and math and has failed to achieve state accreditation for the last three consecutive years. The problem seems to stem in the lack of reading comprehension skills which is linked to incorporating direct vocabulary instruction to promote and advance reading comprehension for students in the third grade. Accordingly, for the 2013-2014 school year, the school had a pass rate of merely 40.85 % in reading. The entire school division had a pass rate of 57.80 % in reading and the state had a pass rate of only 70.66

percent in reading. The required passing rate for the state is 75% in reading. Needless to say there is a severe problem that exist in the content area of reading. The National Center for Education Statistics, 2004 findings indicate that in order for students to be successful readers, they must develop proficient vocabulary and word recognition skills along with effective comprehension processes. Students are entering third grade with an inadequate deficiency in vocabulary knowledge and are behind academically and continue to stay behind in literacy because of the lack of interest in reading. Vocabulary knowledge is, and appears to have always been, among the best predictors of reading achievement (Richek, 2005). Schools should have an ample selection of books that the students would be interested in reading and not just the recommended reading textbooks. Educators must work with an expanded vision of literacy strategies and concepts in school to help the students become more proficient in literacy. Vocabulary knowledge is the most important indicator of oral language proficiency and failure to understand even 2 percent of a text begins to corrode or wear down on a student's comprehension (Stahl, 2003).

Deficiencies in the evidence. Many teachers continue to fail in stimulating and engaging the students in the area of vocabulary concepts (Phillips, Foote & Harper, 2008). Teachers continue to have the students copy definitions as a strategy in vocabulary instructions. The reasoning behind this strategy is to save time. However, time is being wasted when the students are only copying the terms and definitions and not mentally engaged in the learning process (Phillips, Foote & Harper, 2008). Research has shown that students learn best by being actively involved in constructing knowledge or the learning process. The structure and the limited resources that are often found in traditional classrooms are often not conducive or support learning, whereas technology can stimulate teaching to meet the needs of the diverse learners.

(Roschelle, Pea, Hoadley, Gordin & Means, 2000). Technology is quickly becoming an influence in helping student learn better things and also in helping students learn things better (Roshelle et al., 2000). Access to information and communication technologies will continue to increase based on the U.S. Department of Education's inclusion of technology in education reform (National Education Technology Plan, 2010). It can also be stated that nearly 100% of schools across America has access to the internet (Well & Lewis, 2006)

Research has concluded that some students are entering school knowing far less vocabulary words than their peers and this lapse in vocabulary knowledge is based on the students having a very limited exposure or opportunities that involve rich vocabulary (Brabham & Villaume, 2002). Children whose family incomes are at or below the poverty level are the children who continues to struggle with reading and literacy development (Hemphill & Tivnan, 2008). Literacy instruction is supported by knowledge of letters, experience with types of prints, vocabulary, syntactic and the ability to understand text (Morris, Bloodgood, & Perney, 2003).

This gap in vocabulary knowledge continue to grow well over five thousand words by the time the students are entering into third grade (Brabham & Villaume, 2002). Students who are exposed to rich vocabularies have an extensive and complex understanding of many concepts of words and are able to intelligently decipher how the word is being used in and out of context. Oral language and emergent literacy skills that develop in the preschool years are the foundations for literacy in the latter grades (Hemphill & Tivnan, 2008).

Teachers of vocabulary should continue to provide explicit instructions for important content and concept vocabulary for the learners (Phillips, Foote & Harper, 2008). In spite of the attention given to the increase towards struggling readers and the fact that academics knowledge only increases in complexity throughout the grade levels, little attention has been placed in the

push to improve students' academic literacy skills, especially in the areas of vocabulary knowledge and reading comprehension (Fang, Schleppegrell, & Cox, 2006). According to Biemiller (2001), large vocabulary differences are present by the end of the second grade and if this gap is not addressed early, then the vocabulary deficiencies will linger and affect the student's reading performances in the latter grades of school. This gap is especially noticeable between economically disadvantaged and economically advantaged children (Blachowicz, Fisher, Ogle, & Watts-Taffe, 2006). The RAND Reading Study Group (RRSG: 2002) acknowledged a strong link between vocabulary knowledge and reading comprehension. Furthermore, RRSG stated that the relationship between vocabulary knowledge and comprehension is extremely complex due to connections between vocabulary knowledge, conceptual and cultural knowledge and instructional opportunities. Cunningham and Stanovich (1997) state that building a broad vocabulary creates a knowledge base that allows readers to comprehend beyond individual words, but comprehend their semantic and syntactic relationship as well. In addition, children with poor comprehension may continue to struggle with reading because of weak semantic processing abilities. For instance, the reading PALS-K scores were 11.8 percent out of a scaled score of 30.2 percent for the 2011-2012 school years and a percentage score of 10.2 percent from a scaled score of 38 percent for the 2012-2013 school years. The decrease in the scores clearly confirms that a reading problem does exist for these elementary school students in the effectiveness of the Early-Up program and the implementation of the strategies that were put into place as a means of increasing the reading readiness of the students in the lower elementary grades. Two very important factors that contribute to vocabulary learning are reading to build up or increase word knowledge and a rich vocabulary contributing to learning and better comprehension (Bintz, 2011). Teachers throughout the many

school districts are inclined to use a variety of strategies for vocabulary instructions but what is still missing is a comprehensive, integrated and schoolwide approach to vocabulary for reading and learning (Blachowicz, Fisher, Ogle & Watts-Taffe, 2006). Integrated in the sense that vocabulary is the major focus in teaching content, comprehensive in the fact that vocabulary instructions should encompass a common philosophy based on the understanding of vocabulary development and word learning which is supported by the school curriculum (Blachowicz, Fisher, Ogle & Watts-Taffe, 2006). Vocabulary growth is also dependent on the amount of reading a student does whether it is free choice reading or assigned reading from the teacher (Bintz, 2011).

Per the superintendent of the school district in the study, the school(s) that is/are performing below the required standards of learning in the area of reading will be targeted for school improvement with a corrective action plan to successfully improve the academic skills of the students thereby meeting and or exceeding what is required by the state for the school to obtain accreditation. Two schools in particular were targeted as schools that need to demonstrate a higher level of academic achievement in the area of reading. To assist in helping these two schools demonstrate a higher level of academic achievement in the area of reading, the school district Reading Program Specialists began to conduct research on several reading programs that would be both cost effective and beneficial in meeting the needs of the teachers as well as the needs of the students. After much debate, the district Reading Program Specialists along with the school's literacy coaches all agreed upon implementing an adaptive computer based reading program entitled i-Ready Diagnostic and Instruction.

The i-Ready Diagnostic & Instruction computer program which was developed by Curriculum Associates is created to provided administrators, teachers, and students with

resources that are data-driven, engaging and rigorous, aligned to the state standards, and support teachers in planning differentiated instructions for the classroom. The i-Ready Diagnostic & Instruction computer program provides adaptive assessments and instructions to help the teachers identify why the students are struggling with a particular skill. In addition, the i-Ready program is also capable of providing a valid and reliable measurement of a student's yearly progress and growth. The teachers are in favor of the new computer program because it can provide each student with his or her own individualized online instructions that are targeted to the student's needs.

Audience. The research study will take place in a Title 1 school located on the East coast of the United States that serves a predominant low-socioeconomic African American community. This Title 1 School is currently on a school improvement plan in an effort to increase student achievement because it did not meet all of the Federal Annual Measurable Objectives for the academic year. According to the information on the Virginia Department of Education enrollment and demographics, a breakdown of the ethnicity of the student Fall membership for the 2013-2014 consisted of a total of 549 students of which 96.17% are Black, 1.82% are White, 1.09% are Hispanic, 0.18% American Indian, and 0.73% designated as Multicultural. Of this total number, 79 students were in the third grade. The i-Ready and reading achievement scores to be analyzed will be taken from 55 third-grade students that have a variety of learning needs. Further data analysis will look to determine if there are additional effects on special populations, namely students with documented learning disabilities and the gifted, compared with a mainstream population. Of the 55 students, 17 of the students were reading at a pre-primer or primer reading level. In addition, the organizational makeup of the school consists of one principal, one assistant principal, and 30 classroom teachers. The school in the study also

has on staff, three reading specialists, one math specialist, one guidance counselor, one speech pathologist, a school nurse, two technology technicians, and five paraprofessionals.

Definitions of Terms

The following are conceptual and operational definitions. The conceptual definition is derived from the literature and the operational definitions are based on the characteristics of the study.

Annual Measurable Objectives (AMO) are the minimum required percentages of students determined to be proficient in each content area.

Assessment is a test or other method for measuring achievement.

Benchmark Assessment an assessment that is administered every nine-week interval to test the student's knowledge

Curriculum Intervention is a plan or document that a school or school division uses to define what will be taught and the methods that will be used to educate and assess students.

Decoding the ability to blend sounds and break words into syllables

Fourth-Grade Slump is a term referring to a substantial decline of standardized test scores of children from low-income backgrounds compared to their economically advantaged peers (Stockard, 2010).

Fluency the ability to read accurately and with automaticity.

i-Ready Diagnostic and Assessment is an assessment designed to identify a student's strengths and weaknesses in reading and math through computer adaptive testing and to provide differentiated online instruction.

Literacy-the ability to read and write and an awareness to print (eric.ed.gov)

Phonological Awareness Literacy Screening (PALS) is a voluntarily state provided screening tool that is design to provide additional reading instruction to prevent further reading concerns.

Reading Achievement Gap is the difference between the performance of subgroups of students especially those identified by gender, race/ethnicity, disability and socioeconomic status.

Standards of Learning (SOL) describe the Virginia Public Schools expectations for student learning and achievement in grades K-12 in English, mathematics, science, history/social science, technology, the fine arts, foreign language, health and physical education.

Reading Comprehension is the level of understanding or the active process of getting meaning from written text (Bursuck & Damer, 2011).

Tier Vocabulary are vocabulary terms that are placed in categories based on importance and frequency of being taught (Marzano, 2012)

Vocabulary word knowledge refers to the words that are used by individuals to understand meaning and words used to communicate (National Institute for Literacy, 2006).

Purpose of the study

The purpose of this study is to describe the effects of a computer-based reading and vocabulary support program on reading achievement in low socioeconomic students in third grade, and if special population such as those with learning disabilities or the gifted experience different effects. The idea of teaching and improving vocabulary knowledge by encouraging wide reading, teaching words and word learning strategies and by promoting interest in words

should now be centered on the use of technology in achieving these same accomplishments (Dalton & Grisham, 2011).

The computer based diagnostic and instruction program i-Ready will be used in this study to provide evidence regarding the implementation of technology to instruct and support vocabulary and reading comprehension in the classrooms. Improving a student's vocabulary knowledge is paramount in developing and advancing the student's literacy level and future success in school (Dalton & Grisham, 2011). Research suggests that students who have high comprehension ability also have well developed vocabulary (Pullen, Tuckwiller, Ashworth & Lovelace, 2011). Reading, writing, speaking, and listening skills are all grounded in vocabulary (Fisher & Fry, 2014).

Chapter 2: Review of Literature

Theoretical Perspective

Why is vocabulary learning so important? Neuman and Dwyer (2009) defines-vocabulary as words that we must know and understand to effectively communicate. The words that are spoken are termed expressive vocabulary and the words that are heard are termed receptive vocabulary (Neuman & Dwyer, 2009). Similarly, Townsend (2009) defines general academic vocabulary as words that are used across the content, have abstract definitions and are often harder to comprehend. Academic vocabulary can be defined as either domain specific academic vocabulary or as general academic vocabulary according to some researchers and theorists (Baumann & Graves, 2010). Domain specific are content specific vocabulary words and general academic vocabulary are cross content vocabulary but may vary in their definition depending the discipline (Baumann & Graves, 2010). Reutzel and Cooter (2008) identified four types of vocabulary. The first type is the listening vocabulary. Listening vocabulary are the words that we can hear and understand. Speaking vocabulary is determined by the words that we can speak. Reading vocabulary are the words that we can understand and identify as we read text. The last type of vocabulary according to Reutzel and Cooter (2008) is the writing vocabulary, which are the word we used when we write. Word knowledge is essential for reading comprehension provided the methods to teach vocabulary are based on the age of the student and the student's reading ability (Reutzel & Cooter, 2008). Accordingly, Lehr, Osborn, and Hiebert (2006) all agree that vocabulary is the knowledge of words and word meanings indicating that vocabulary has two parts: the word and the meaning that the word stands for.

A deficit in vocabulary knowledge presents a constant obstacle towards long term academic success for so many students (Manyak et al., 2014). Beck and McKeown (1985) suggest that vocabulary can be categorized into tiers. Then in 2002, Beck, McKeown, and Kucan, suggested that vocabulary terms be categorized into three tiers. Tier one vocabulary words were basic and consisted of high frequency words that were seen in oral and written language. Tier two words were infrequently seen and were learned through direct vocabulary instruction. Tier three words or terms were subject-specific terms that are important to general literacy in the specific subject areas (Beck et al., 2002). In addition, Beck and her colleagues agree to the fact that organizing the basic terms into clusters provides teachers with a scaffold infrastructure that can be used in instruction.

To add to the scaffolding of instructions, Marzano's (2004) Six Step Vocabulary Building Process incorporated a variety of research-based strategies to promote vocabulary acquisition. The research behind Marzano's Six Step Vocabulary Process supports his beliefs about effective vocabulary instruction. Blachowicz and Fisher (2000) additionally identified four principles for effective vocabulary instruction. The first being the students becoming involved in word learning. The second principle is that the students make a personal connection to the vocabulary instruction. Third, the students need to be immersed in vocabulary. Carlo and Snow (2006) found that students who have developed an extensive word bank can retrieve words effortlessly and encounter deeper and richer meanings to new grade level texts. The final principle is that of information sources. The students should use multiple sources to consolidate meaning. Direct explicit instruction provides clear descriptions of new terms and ensures that students do not develop incorrect versions of the true meanings of word (Blachowicz & Fisher, 2000). Good vocabulary instructions are inclusive of a language and word rich environment,

includes intentional teaching of selected words and incorporates word learning strategies to assist with learning (Temple, Ogle, Crawford & Freppon, 2011).

Vocabulary Knowledge

Larson, Dixon, and Townsend (2013) began and completed an action research project that sought to answer the question “How should students be held accountable for taking an active role in learning new vocabulary?” In researching this question, the evidence proved that active engagement means “learning the meaning of specific words (where it is important to make connections between and among words and concepts), and learning strategies to become independent word learners” (Larson et al., 2013). In addition to this question being answered, it is also noted that active vocabulary practice is invaluable to academic success because active vocabulary practice helps the students develop academic language and access academic texts Larson et al. (2013). It can also be noted from the study that focused vocabulary instruction is not about cutting curriculum or extending teacher’s instructional day, but about inserting a curriculum focused on meaningful words (Larson et al. 2013). Vocabulary is a skill that is ever increasing without a time limit attached to the amount of words that should be taught by the teacher or learned (Marulis & Neuman, 2013). Teachers can support the student’s academic language development by using vocabulary as the means to entering into a better understanding of the linguistic features of academic English (Townsend, Filippini, Collins & Biancarosa, 2012). Vocabulary development and knowledge has a huge impact on student’s reading comprehension and academic success (Christ & Wang, 2010). It has been concluded from research that children can learn on average 10 words a day especially if the children are being exposed to new words within their environment (Christ & Wang, 2010). The key to learning new words is having exposure to new vocabulary, self-motivation and engagement, multiple exposures to new words

that give contextual and definitional information and lastly, the use of independent word-learning strategies (Christ & Wang, 2010). Although children may hear or even see a new vocabulary word, children learn new vocabulary if they are interested in learning the new words. They develop a consciousness to words and an interest in learning the new vocabulary and the meaning of the new vocabulary (Christ & Wang, 2010). Vocabulary knowledge is dependent upon word consciousness and having an interest in new words and their meanings (Christ & Wang, 2010).

Academic words are words that allow communication of ideas relating to social and natural phenomena that is not commonly expressed in everyday language communication (Townsend, Filippini, Collins & Biancarosa, 2012). Academic word knowledge can be discipline specific or cross content in instructional lessons. A research article written by Duke and Block (2012) seeks to examine whether or not specific key recommendations for promoting vocabulary knowledge has been implemented in classrooms as suggested based on a previous report entitled “*Preventing Reading Difficulties in Young Children.*” These recommendations would promote vocabulary knowledge, comprehension strategy use and conceptual and content knowledge. In an effort to improve reading in the lower grades, Duke and Block (2012) identified three obstacles that have prevented success in this area: Short-term orientation toward instruction and instructional reform, lack of expertise on how to effectively teach the harder to master reading skills, and limited time in the school day and year to meet the expectation for the children’s learning.

In addition to the obstacles that were founded by Duke and Block, The National Early Literacy Panel (NELP) is credited for citing six variables that are also used in predicting literacy issues in decoding skills and in reading comprehension for elementary students (Carlson,

Jenkins, Li & Brownell, 2013). These variables include alphabetic knowledge, phonological awareness, automatically naming letter, digits, objects and colors, writing and writing name and the final variable being phonological memory (Shanahan & Lonigan,2010). However, Christ and Wang (2012) encourages teachers to use word-learning strategies to teach vocabulary. There are four research-based strategies that a teacher should implement into the teaching of vocabulary. First, teachers should provide the students with purposeful exposure to new words. This would include selecting read aloud books that include illustrations and text that provide context clues in determining the meaning of unfamiliar words. Reading books aloud within the classroom is one way to introduce children to new vocabulary in a meaningful contextual way (Christ & Wang, 2012). Children that are actively engaged with read alouds and with cognitively challenging discussions about books tend to enhance their vocabulary learning (Christ & Wang, 2012). Next, teachers should intentionally teach the word meanings to the students. During intentionally teaching, the teachers would use direct teaching strategies that includes asking and answering questions to assist and prompt the students into generating a meaning to the new words. Intentionally teaching or direct word meaning instructions is inclusive of using embedded definitions to support a student's understanding of words and to quickly explain how the vocabulary word is being used in the context of the sentence. Extended instruction is part of the intentional teaching of word meanings and is also used by teachers to promote vocabulary comprehension (Christ & Wang, 2012). Additionally, the teach word learning strategy is a process that is being used to infer word meanings and is centered around several steps. The first step is to model to the students how to use a think aloud, context clues and background knowledge in determining the meaning of a word. After the modeling, the teachers should begin to ask the students questions to guide them into developing meanings of the words and how the

words are being used in context. Finally, the teacher should provide a variety of opportunities for the students to use the newly learned vocabulary (Christ & Wang, 2012). The significance of vocabulary acquisition is unlimited exposure to new vocabulary in order to acquire word knowledge.

Research continues to support the connection between vocabulary knowledge, word identification skills and reading achievement (Mitchell & Brady, 2013). Vocabulary knowledge is one aspect of oral language that is essential to reading comprehension (Mitchell & Brady, 2013). Vocabulary knowledge is essential for word-level reading skills to prevent a deficiency or weakness in word knowledge that is bound to have a profound effect on a student's ability to decode words (Mitchell & Brady, 2013). Vocabulary knowledge is founded on the principle of reading achievement that initially begins in the elementary grades (Loftus & Coyne, 2013). The students who enter school with limited vocabulary knowledge continue to lag behind their peers throughout school allowing the gap to remain (Loftus & Coyne, 2013). This gap in vocabulary knowledge is often seen prior to the students entering second grade (Loftus & Coyne, 2013). This deficiency in vocabulary knowledge continually to affect reading comprehension and academic achievement (Manyak et al., 2014). The rate of vocabulary knowledge is dependent upon factors such as word families and how the words are counted, but children should learn at least eight new words every day and this acquisition of word knowledge is gained through independent learning and direct instructions (Loftus & Coyne, 2013). Students who are classified as at risk or have language and literacy issues will have difficulty with word meaning due in part to decoding issues (Loftus & Coyne, 2013). Vocabulary instructions should be multifaceted to include word learning strategies, teaching of individual words and the importance of word knowledge (Manyak et al., 2014). Students who enter school with limited vocabulary knowledge

should receive direct instructions with target vocabulary words to build upon comprehension (Loftus & Coyne, 2012).

Manyak et al. (2014) were obstinate in promoting the principles behind the multifaceted, comprehensive vocabulary instructional program known as the MCVIP Project. This project was designed to enrich practical and meaningful vocabulary word instructions. The MCVIP Project was funded for three years by the Institute of Education Sciences and it primarily focused on comprehensive vocabulary instructions for native and English language learners in fourth and fifth grades. The MCVIP consisted of six steps for introducing target word meanings. The first step was to present the word in the context in which it appeared. Then, the teacher would provide a more basic or friendlier version of the word for the student. Next, the teacher would provide multiples examples of how the word can be or could be used in a sentence. Then, the students would have an opportunity to practice using the target word in a sentence. This would allow the students time to think about how the word is being used in context. After the students had time to practice using the words in sentences, the teacher would present to the students a visual image of the word as a way to make a connection with the word and how to correctly use the word in context. Finally, the teacher would end the target word practice with a formative assessment or interactive activity. This final modeling for introducing target words gives the students exposures to and active engagement with words (Manyak et al., 2014).

However, for some students introducing a target word is not efficient enough to build upon reading comprehension. Lesaux and Kieffer (2010) determined in a study that struggling readers were well versed in the foundational skills for reading, but could only read words without truly understanding the meaning of the words. Lesaux and Kieffer (2010) referred to these kind of students as word callers because they were able to read with some fluency the words in print.

In a second study, a group of Spanish speaking students were also good with reading words, but had poor reading and comprehension scores (Lesaux & Kieffer, 2010). The key ingredient that is often time missing from the classrooms is direct instruction with comprehension strategies and foundational skills (Kelley, Lesaux, Kieffer & Faller, 2010).

Direct vocabulary instruction is highly effective when it provides the definition and the contextual explanation of unfamiliar words to the student (Loftus & Coyne, 2013). One approach to direct vocabulary instructions includes choosing words to teach, providing a simple definition for the words that are being taught, using the word or words in the context of the story and presenting engaging activities to help the student gather the meanings of the words (Loftus & Coyne, 2013). The activities should assist the students with reaching and maintaining a higher level of vocabulary knowledge (Loftus & Coyne, 2013).

Still the question remains. What words should be taught? The goal, according to (McKeown, Beck & Sandora, 2012) is to teach the words that will be the most productive to the students in comprehending context. The words that are more common and seen on a regular basis are termed Tier One words (McKeown, Beck & Sandora, 2012). Tier Two words are general words that can be used across contents. However, Tier Three words are the most difficult words and are less likely seen or taught. The concept of tiers is heuristic for putting vocabulary words in some sort of category (McKeown, Beck & Sandora, 2012). It is important for teachers to select and teach vocabulary words that the students will see on a regular basis and words that are regularly found in text. The lexical bar must be lifted in order for vocabulary learning and written language to be productive (McKeown, Beck & Sandora, 2012). Students need to experience and be exposed to an abundance of language in order to expand and build upon their vocabulary knowledge (McKeown, Beck & Sandora, 2012). Effective instruction in vocabulary

acquisition is dependent upon deep and or rich processing of the information and the opportunity to think, use and interact with the vocabulary in multiple avenues (McKeown, Beck & Sandora, 2012).

Schools that use direct instructions to directly address the crucial areas relating to the fourth-grade slump could indeed attest to the fact of significantly gains in reading vocabulary and comprehension. However, schools that use the Open Court curriculum or some other curricula will not see any significant gains in vocabulary or comprehension (Stockard, 2010). Accordingly, direct instruction, which was developed by Siegfried Engelmann, Wesley Becker and their colleagues was created to accelerate students' learning by using explicit instruction (Stockard, 2010). In order for some students to be able to comprehend challenging texts, these students need direct and explicit teaching of word learning strategies and ample practice with using these word learning strategies in order to develop and internalize new academic vocabulary words (Kelley et al., 2010). The ability to accurately read words is connected to language knowledge and language processing (Lesaux & Kieffer, 2010).

Literacy Skills in Vocabulary Acquisition

Vocabulary acquisition falls into several categories. The first category is indirect instruction followed by direct instruction and the last category being that of teaching vocabulary words within context (Willingham & Price, 2009). Indirect vocabulary instruction is focused on the importance of a student's prior knowledge relating to words and to what extent a student can and will read text and understand words. Indirect vocabulary is viewed as incidental learning because the students are not receiving any specific instructions toward acquiring the meaning of the words. The students are inferring the meaning of the unknown words based on prior knowledge and or schema and by listening to how the word is being used in the text (Willingham

& Price, 2009). However, Marzano (2012) believes that students should receive a comprehensive plan that is inclusive of direct vocabulary instructions which include words that are retrieved from the tier 1 list of vocabulary words. These words are usually seen frequently in the English language and are easily understood. Direct vocabulary instruction is teacher led, practiced by the students in the classrooms and designed to meet a specific objective (Willingham & Price, 2009). Direct vocabulary instructions are necessary for vocabulary development and a critical component of reading instruction (Wanzek, 2014). Direct instruction is founded upon self-learning strategies that are used for vocabulary acquisition (Willingham & Price, 2009).

Multiple tiered approaches are often times used as an intervention for children with limited oral language skills (Spencer et al., 2013). The multiple tiered approach is categorized as a universal tier of high quality instruction for all students (Spencer, et al., 2013). But we all know, that a one size set of instructions does not work for every student. So, the multiple tiered instructions are supplemented with additional tiers of support (Spencer et al., 2013). The intensity of the instructions is increased as the students move to higher tiers. The intensity of the tiers varies from changing the type of instruction, changing the person who is providing the instruction to changing the format of the instruction (Spencer et al., 2013). The supplemental instruction for the students who are in other tiers and need more support can range from additional instructional time, repeated opportunities to practice, and support with the foundational skills for reading (Spencer et al., 2013). Supplemental interventions need to be implemented effectively to evoke improvement in oral language skills for the students with limited oral language skills (Spence et al., 2013). Early supplemental reading intervention emphasize development of word reading skills through phonological and word reading

instruction and development of oral language skills and vocabulary (Vadasy, Nelson, Sanders, 2011). Automated methods of instruction are being used by teachers as a means to ensure the implementation of high fidelity in interventions (Spencer et al., 2013) Computer assisted instructions and interactive electronic books are both used to improve phonological awareness skills and to teach early language and literacy skills (Spencer et al., 2013). Automated methods of instructions are consistent and are able to provide effective instructions in a classroom setting.

Reardon, Valentino and Shores (2012) conducted a study that illustrated the data results from national and international literacy assessments to answer the question “How well do U.S. students read?” The results indicate that U.S. students can read if reading is defined as basic procedural word-reading skills, but there are concerns when comprehension is needed for integrating background knowledge and contextual information to help the students make sense out of the information being presented (Reardon et al., 2012). The study further expresses that one-third of U.S. students in middle school have the necessary skills needed to read and comprehend the material. The key concern is literacy skills and the socioeconomic status of the individual student (Reardon et al., 2012). Students with low or pre literacy skills can benefit from individual tutoring before the student learns to read (Regtvoort, Zijlstra & van der Leij, 2013).

Stoner, Beck, Dennis and Parette (2011) states that preschool curricula must include explicit vocabulary instruction especially for the children who are classified as being in a low socioeconomic status. The acquisition of obtaining appropriate vocabulary is a major factor in building the foundation for preliteracy skills which includes phonemic awareness, fluency, vocabulary development and comprehension. It is extremely important that these preliteracy skills are being taught on a continuous basis to ensure that the children will be able to develop higher language skills (Stoner, et al., 2011). In addition to building upon the student’s language

skills, technology is now becoming second nature to receiving vocabulary instructions.

Instructional technology (IT) has altered the way the students are now receiving the information in the school's curriculum. Instructional technology is being used to assist the teachers in preparing and planning instructional interventions, teaching skills and assessing the student's learning (Stoner, et al., 2011).

The National Early Literacy Panel (2009) is advocating for the improvement of language and pre-literacy experiences in school programs that service students in low income families. Many of the foundational skills such as phonics, vocabulary and print knowledge are acquired during the preschool years, and these skills are pertinent for the advancement in developing fluent readers. (Wasik & Hindman, 2011). However, due to the limited access for the student to gain these pre-literacy experiences, and the fact that these children are from low income families, the achievement gap continues to widen (Wasik & Hindman, 2011). The National Early Literacy Panel (2009) identified vocabulary as one of the five factors that impedes a child's ability in learning how to read. Vocabulary is inclusive of language skills and builds comprehension.

Reading is the main avenue for students to obtain and increase their vocabulary, but for the struggling reader, this feat is next too impossible to accomplish. In order for the student to become knowledgeable in vocabulary acquisition, the instruction must include questioning, explanation, clarification and repetition (Sobolak, 2011). Teachers must enhance oral vocabulary instructions and experiences to increase academic and content-rich vocabulary learning (Falk-Ross & Evans, 2015). Studies have also shown that students who are active participants in the vocabulary instructions tend to learn more vocabulary words (Sobolak, 2011). Students who are not exposed to rich vocabulary are at a higher risk of not becoming a proficient reader (Sobolak, 2011). Students who are avid readers are known to develop better reading skill, larger

vocabularies and more world knowledge (as cited in Flippini, 2015). It can be further noted that explicit instructions coupled with high student engagement, multiple practice opportunities and teacher feedback tend to produce growth in early literacy skills and often times reduce or even close the achievement gap for at risk students (Goldstein & Olszewski, 2015). It is vitally important that the schools develop and implement instructional strategies to assist the students who are struggling to read and comprehend text. Some schools are even offering professional development sessions for the teachers as a way to effectively teach the teachers how to teach the students in the areas of vocabulary and comprehension. However, for the professional developments to be effective, they should be ongoing and intensive allowing enough time for the teachers to process the information before integrating the practices into the classrooms. (Wasik & Hindman, 2011).

The literacy challenge is seeking ways on how to prepare the students for the 21st century literacy demands and addressing the disparities in literacy outcomes between children of low social economic backgrounds to those from more affluent and privileged backgrounds (Murnane, Sawhill & Snow, 2012). Research has shown that there is a significantly lower level of literacy skills acquisition for both Hispanic and black students and this decline in literacy continues to contribute to the widening of the achievement gaps among the less advantage students (Murane et al., 2012). Furthermore, the literacy level among children whose family is economically challenged tends to affect the possibility of any future upward mobility. Parents interactions are critical to their children's early literacy acquisition (Murane et al., 2012). Parents should provide a word rich environment through reading and other stimulating activities as a way to support literacy skills (Murane et al., 2012).

However, in the 21st century of learning, literacy skills are more than just reading a text selection then responding or answering a few simple multiple choice questions. The literacy skills for the 21st century learner will be based on the student's ability to synthesize information from a variety of sources, evaluate and analyze arguments, and to read with an understanding from different perspective on numerous issues (Murane et al., 2012). Students who are able to apply these skills are the students who will become successful 21st century learners. Successful reading comprehension is knowledge and knowledge creates the framework on which reading comprehension is built (Murane et al., 2012). However, the literacy skills needed to acquire knowledge in one subject are different from those needed to acquire knowledge in another subject matter (Murane et al., 2012).

Literacy is making the connection by accessing the information to make the interaction between the learner and the reading or writing context (as cited in Flippini, 2015). However, the contexts are rapidly changing as new technology evolves and new communication modes develops (Flippini, 2015)

Computer-Assisted Instruction

Differentiated instruction is designed to meet the diverse needs and ability level of students in both the inclusive and regular education classrooms. Computer assisted instructions (CAI) can also be used to differentiated and augment traditional face-to-face literacy instruction (Boone & Higgins, 2007; Kennedy & Deshler, 2010; McKenna & Walpole, 2007). CAI is used to instruct the difficult to teach student at a pace that is comfortable for the student, provide immediate feedback to the student who is receiving the instructions, provide instructive and consistent corrections, allow for extensive rehearsal or repetition of the material being instructed and CAI's are highly motivating (Hall, Hughes & Filbert, 2000). Computer-assisted instruction

helps with the development of reading comprehension skills and the acquisition of vocabulary by activating the student's prior knowledge and allows the students to become engaged into the activities with repeated use to ensure specific concepts have been mastered (Kilickaya & Krajka, 2010). Research on the effectiveness of the various forms of educational technology applications such as computer-assisted instruction (CAI) for improving the students' learning outcomes has continued to expand since 1980 (Cheung & Slavin, 2012). Likewise, the growing use of technology within the schools can be seen as an opportunity for improved specialized instructions for the students (Regan, Berkely, Hughes & Kirby, 2013).

In addition, computer technology supports learning by enhancing vocabulary development and reading comprehension using multimedia such as text, audio, video, graphics, animation and interactivity (Constantinescu, 2007). CAI programs are designed to build phonological awareness and phonics skills, especially in younger readers (Macaruso & Rodman, 2009). Research has determined the valuable benefits of computer- assisted instruction to support reading development for low performing students (Macaruso & Walker, 2008). CAI is used as a supplementary aid in providing direct reading instruction (Macaruso & Walker, 2008). The activities that are presented during the computer instructions are interesting and motivate the students into learning new material. In addition, the students can work at their own pace and receive enough practice to support word recognition skills and eventually become fluent readers.

Traditional vocabulary instruction that includes looking up the meaning of unknown words in the dictionaries and copying the definitions of these unknown words has failed to promote vocabulary growth and this process does not meet the learning needs of diverse students. Additionally, these students are not fully able to use the taught vocabulary words in academic or daily practice (Huang, 2015). Literacy researchers have suggested the alternative

instructional practice of using new technologies to teach vocabulary (Huang, 2015). Technology is being integrated into the curriculum as a way to provide opportunities for the students to improve in their literacy skills which include vocabulary strategies and practice with reading and writing instruction (Huang, 2015). Research has stated that the use of technology is a very powerful way to teach vocabulary and it can also be used as an aid for all readers to practice parts of speech and language structures (Watts-Taffe & Gwinn, 2007; Reutzel & Cooter, 2013). Other studies have found that the use of computers in vocabulary instructions has proven to be more effective than the traditional method of teaching vocabulary and that software programs are becoming valuable aids to classroom teachers in the area of vocabulary instruction (Reutzel & Cooter, 2008).

Computers are now becoming the tools that are being used in the classroom in an effort to prepare the students for college and career readiness. Computers are also being used as one alternative in helping students become actively engaged in reading and building literacy. In a recent survey regarding computers in public schools, 97 % of schools had one or more instructional computers in the classrooms and 58% of schools had laptops on carts or computers on wheels (COWS). The survey also indicated that that 97% of public schools have liquid crystal display (LCD) and digital light processing (DLP) projectors, 93% have digital cameras, and 73% of public schools have interactive whiteboards (Cheung, Slavin, 2012). Computers and technologies are offering new ways for the students to access information, support independent word learning and word use (Filippini, 2015). The U.S. Department of Education continues to provides grants to state education agencies in an effort to support the use of educational technology in K-12 classrooms (Cheung, Slavin, 2012). Educators are given the rights and permission to even install educational reading software onto the computers that has the capability

of reading the stories or passages to the students. However, some students are not fully developing their listening skills by having the information read to them via the computer.

The school websites can be seen as the communication link between teachers, parents and students (Olmstead, 2013). The educational websites can provide the parents with the needed information and be used as a resource to stay abreast of their child's learning (Olmstead, 2013). Two-way communication such as blogs, wikis and email can also be assessed and used by the parents to actively share information and stay involved in their children's academics (Olmstead, 2013). The school districts are advocating for the use of technology into the school's curriculum and the students are excited about using technology. Technology is another means to increase parental involvement with the schools. Therefore, parents are encouraged to become and remain proactive in the educational and academic success of their child or children.

The students in this study have been utilizing the i-Ready computer program since September 2015 to effectively increase their vocabulary knowledge and reading comprehension skills. The i-Ready program is designed to provide differentiated online instruction that actively engages the student in the learning process. The program also provides the students with visual information in building vocabulary as well as provides animated characters and short videos to break up the monotony of the learning process. The National Reading Panel (2000) states that texts accompanied by speech or animated characters promote reading development and provide greater opportunities for independent practice. The integration of technology into the classrooms has had a positive impact on some of the students' attitudes and behaviors at home. The i-Ready program is accessible to the students from home using a stand-alone computer. The students are able to log into the i-Ready program using their unique credentials and are able to continue practicing and building upon their vocabulary acquisition and learning. Since the integration of

technology, especially for the students in this study who have been utilizing the i-Ready computer program, there has been an increased in student's motivation and student's interest in learning. Research studies are consistent in revealing that the integration of vocabulary-technology instruction has the capability to connect "dynamic, interactive vocabulary learning with reading, writing, spelling and content area subjects" (as cited in Huang, 2015, p. 20).

Technology has the potential to benefit children learning and revolutionize the educational system (Blackwell, Lauricella & Wartella, 2014). In 2010, the U.S. Department of Education released the National Education Technology Plan that was based upon student-centered learning using technology to improve student achievement (U.S. Department of Education, 2010). Berry and Wintle (2009) concurs that learning experiences are enhanced with the use of technology and that students who use computers show a deeper level of comprehension and engagement compared to students who do not use the computers. In a study done by Lei and Zhao (2007) concluded that computer usage leads to positive learning experiences and that those learning experiences yielded greater student results in specific contents. In addition, research has proven that the use of computers provides the students more practice opportunities with written and spoken language (Lin & Wu, 2010). Furthermore, computer assisted instruction has shown to enhance reading skills of pre-schoolers, elementary school students, at-risk students and English Language Learners and enhance vocabulary development as well as verbal language development (Keengwe & Hussein, 2012).

Students who use computer-assisted programs have a greater chance of closing the achievement gap and meeting the NCLB requirements compared to those students who do not use computer-assisted instruction (Keengwe & Hussein, 2012). Greater gains in reading has been observed when CAI has been implemented. Technology adoption and implementation is beyond

receiving the necessary funding, but more of enforcing an ongoing effort of learning to use the technology.

Computerized Programs

In an effort to meet the demands of the current high-stakes climate and to teach academic vocabulary, the school district in this study has invested and continue to invest into programs that are researched based and are proven to meet the literacy needs of a diverse group of students (Dewitz & Jones, 2013). The programs that have been selected by the school district were chosen based on the programs capability of providing ample reading opportunities for students with a range of reading abilities and reading levels. Computer programs that have been selected for this school district include Accelerated Reading, Reading Eggspress, Education City, i-Ready and Orchard Reading.

The Accelerated Reader (AR) program is a computerized reading program that is designed to assess reading comprehension for students in grades Pre-k through grade 12. The Accelerated Reading program provides the teacher with an analysis of the student's scores and other diagnostic information (Vollands, Topping & Evans, 2011). The students are able to self-select and read a book that is listed on the AR list before they complete the comprehension assessment on the computer. The results of the assessment inform the students as well as the teachers to the student's reading ability (Vollands, Toppin & Evan, 2011). The Accelerated Reader (AR) program is used to motivate the students to read by rewarding them with reading points, measure the student's reading achievement, and to overall promote reading (Stiggins, 2008). The Accelerated Reader program is whole group designed to promote independent reading among primary and secondary age pupils (Siddiqui, Gorard & See, 2015). The Accelerated Reader program is solely practiced through online resources and suggests that the

teachers allow the students to thirty to sixty minutes of independent reading time daily (Siddiqui et al., 2015). The quizzes attached to the reading program can be used by the teachers to assess the student's comprehension to the book that the student has selected to read (Siddiqui et al., 2015). The students receive points for each successful quiz that is passed. Teachers usually set specific point goals as an incentive for students to become actively engaged in the reading process.

Reading Eggspress is an online computer reading program that is designed to build all students' reading, comprehension, spelling and vocabulary skills. The program provides engaging literacy activities and games to improve the student's literacy skills. The program contains over 200 online e-books that include a variety of genres and reading levels. Electronic storybooks (e-books) are the digital versions of children's books which are usually obtainable in print format. Children are being exposed to a highly technological era whereas electronic storybooks (e-books) are available on the internet or on CD-ROMs (Korat, 2010).

Moreover, the program is based on four core elements: step by step comprehension strategies, reading widely and reading often, effective comprehension strategies that help the students think about and comprehend what they are reading and the last element is motivating the students to read. The overall goal of the program is to develop confident lifelong readers. "Research continues to support the fact that when primary grade students receive optimal comprehension instruction, their performances on measures of literal, inferential, and metacognitive comprehension increases, as do their vocabulary; decoding, problem-solving, and cooperative learning skills; and self-esteem." (Ness, 2011, p.99).

The Reading Eggspress comprehension program combines best practices of direct instruction with a range of engaging activities so the students can independently build upon their

higher-order thinking skills (Russo & Pike, 2014). In addition, the program focuses on literal, inferential and critical reading comprehension questions for skill building and metacognitive understanding (Russo & Pike, 2014). Studies continue to support the benefits of online software programs in the areas of literacy skills.

The computerized program that is being used for this study is the i-Ready computer program. It has been said that the i-Ready program is an adaptive computer based reading program that is data driven and aligned to the state standards. It has been further stated that the i-Ready computer program provides differentiated instructions for each student and that the student's level of motivation to learn has increased since the implementation of this program. According to Roberts (2000), several K-12 schools and higher education institutions are investing in the computer infrastructure and advance communications technology. Research estimate that 60% of children between the ages of 8 and 17 all have personal computers and internet capabilities in their homes (Subrahmanyam, Kraut, Greenfield, & Gross, 2000; Wartella & Jennings, 2000). One benefit of the i-Ready program is that it can be assessed from the student's home computer. However, students from lower income families do not have a computer at home, so the majority of the computer usage is at school (Lee, Brescia & Kissinger, 2009). Family income is interconnected with having a home computer and better academic performance at school (Lee, Brescia & Kissinger, 2009). In a survey taken in 2000, the data indicated that 22% of children in families with annual incomes of less than \$20,000 had access to a home computer, compared to 91% of students in families whose annual income is more than \$75,000 (Becker, 2000). The socioeconomic status of a student is based upon his or her economic, social, physical environment as well as the demographics in which the student live. (Lee, Brescia & Kissinger, 2009). There is little research data that clarify the interaction between

a family financial conditions to computer use and academic performance (Lee, Brescia & Kissinger, 2009). Nonetheless, it is necessary for students to develop strategies to effectively use computers and advanced communication technologies to improve academic performance (Lee, Brescia & Kissinger, 2009).

Computer Interventions to Support Vocabulary

The growing awareness of academic vocabulary and academic language proficiency for student's success in school has put a greater demand on readers, writers and on interventions to help students meet these demands (Nagy, Townsend, Lesaux & Schmitt, 2012). The goals of the interventions are to help the students improve in the areas of vocabulary and comprehension that is tied directly to instructions. However, the vocabulary interventions must remain indefinitely as a part of the classroom routine in order to show evidence or proof of reading comprehension (Nagy et al., 2012). In addition, vocabulary can be supported with the use of multimedia allowing students to be exposed to a variety of opportunities to acquire vocabulary knowledge. Multimedia can also provide students with learning disabilities a specific type of vocabulary instruction (Kennedy, Deshler & Wills Lloyd, 2015).

Students with learning disabilities are limited in the amount of vocabulary words that they can acquire without constant direct, structured and sequential instruction (Narkon, Wells & Segal, 2011). Research has proven that students with learning disabilities require repeated and continuous exposure to vocabulary words in order to develop an understanding to the vocabulary (Narkon et al., 2011).

Inclusive practices for students with disabilities must now be addressed in the general education classroom. Students with disabilities must have access to the general education curriculum as well and master the general education curriculum to have success in the public

school setting (Goldstein et al., 2011). The term inclusion, as thought of from the educational aspect, is an educational approach for students with disabilities to be included, regardless to the disability or ability of the student, in the general education classrooms (Goodfellow, 2012). The inclusion of students with varying disabilities in the general education classrooms is causing the general education teachers to teach a curriculum that is deemed accessible for all students at all socioeconomic levels (Goldstein et al., 2011). General education teachers should have a general knowledge of inclusive practices in addition to more specific knowledge in the nature and the needs of specific disabilities and specific skills in making accommodations in the classrooms and in the curriculum for the success of the students' needs (Goldstein et al., 2011).

Beck & McKeown (2001) states that visual representations can support students with vocabulary as they learn the meanings of the words and examine how the words are connected with other words. Harvey & Goudvis (2007) expressed the importance of visualizations otherwise known as visual representations in which the students create mental images with pictures to help the students understand and comprehend the meaning to the vocabulary term. This strategy is research based and proven to increase learning. Additionally, there are an abundance of free web tools and online resources that are available for student use in an effort to stimulate student's understanding of new academic vocabulary. These tools are interactive, thereby causes the students to use higher order thinking skills to create, synthesize and apply their understanding (Warner & Jones, 2011). Dalton and Grishman (2011) acknowledges the technological use of eVoc strategies to promote interest in vocabulary and to capitalize on the learning styles of students. WordSift is a technology tool that allow for the visualization of text as is Thinkmap Visual Thesaurus that is used by the students to assist in developing visual representations of new terms and increasing academic vocabulary (Warner & Jones, 2011).

Equally as important in supporting vocabulary with visual aids are multiple modes such as writing, audio, graphic, video, and animation (as cited in Warner & Jones, 2011). The use of these modes will allow the students to build upon their academic vocabulary comprehension as the students read a definition, listen and articulate a new word, add or view a caption, identify a related graphic or develop a conceptual word map (Proctor, Uccelli, Dalton & Snow, 2009). The use of technology and multimedia in the development of students' academic vocabulary through generative, multi-modal expression, is motivational, academically beneficial and allows the students to gain experience with digital technologies that is required in the 21st century (Warner & Jones, 2011). Digital literacy is considered as using digital technology, communication tools and or networks to locate, evaluate, use and create information (Vacca, Vacca & Mzra, 2014).

Audiotext is another example of technology where the student is actively engaged in wide reading and using their listening comprehension skills to expand their semantics, develop background knowledge and hear how the vocabulary is being used in the context (Filippini, 2015). Audiotext bypasses decoding and places more focus on making meaning and receiving opportunities for the student to become engage with morphology and word analysis (Filippini, 2015). Technology is seen as a powerful tool that is being used to strengthened a student's academic vocabulary knowledge beyond definitions (Filippini, 2015). Technology is being used as the avenue to support and increase a student's breadth of word knowledge through wide reading, structured word inquiry, and visual supports (Filippini, 2015).

Importance of the Library

In addition to the recommendations from the Duke and Block study, the use of the library has grown in population as it relates to increasing the reading achievement for the students in the lower elementary grades. In an article written by Johnson and Donham (2012), many states are

putting into place a mandate to retain third-grade students who are not reading proficiently according to standardized test scores. Results of a longitudinal study of almost 4, 000 students show that students who are not reading on a proficient level by third grade are four times more likely to leave school without a diploma compared to the students who are reading on a proficient level (Johnson & Donham, 2012). Enriching the print environment by means of a school library will result in more students reading more books. However, when surveyed, librarians were more concerned with the students losing the books as opposed to the students reading the book. So, some schools have a limit on how many books may be checked out at one time due to the small collection of certain books (Johnson & Donham, 2012). Still, students who take advantage of visiting the library each week tend to have higher test scores (Johnson & Donham, 2012). It is vitally important for the students in the elementary schools to have access to books in the library. Students that access the libraries are motivated readers (Hibbard & Franklin, 2015).

The American Association of School Librarians (2011) stated that school libraries must provide a variety of high quality collection of materials to reflect the academic needs of the students. The effects of poverty and cultivating enthusiastic readers can be accomplished through the availability of a library and having access to a multiple genre of books (Johnson & Donham, 2012). Impoverished children or children from a low-income family view the library as the only opportunity to experience literacy. A well versed librarian continues to promote a positive school environment as well as implement and integrate cutting-edge technology as preparation for 21st century learning (Russo & Swan, 2015). The library has a vital role in educational reform and learning. The library is also the mediator between the school and the community. The librarian primary role is to provide literature and to encourage students to

engage in reading for pleasure (Hibbard & Franklin, 2015). The partnership between the three is designed to advance learning, share resources and help prepare the students in the communities on becoming technology-savvy productive citizens (Russo & Swan, 2015). The mission of the library should encompass student's achievement by promoting a student's love for reading and how to effectively use informational and technological resources to empower the students in becoming lifelong learners (Russo & Swan, 2015). The American Association of School Libraries (AASL) continues to work on documenting the importance of school libraries and how the libraries support student learning (Matthews, 2011). It is evident that technology is increasing on a regular basis, and the concern may stem to the importance of the library, but the relief is in the fact that the school library is a place where student's access to use technology is being monitored and managed (Gorospe, 2013). An additional responsibility of the library is to keep the students from gaining access to unreliable sources and be directed or redirected to more reliable sources. The library can be considered as the gatekeeper to the school's web wide world of information (Gorospe, 2013).

Summary

This chapter provides information in reference to developing literacy skills in order to acquire vocabulary knowledge and using technology to support vocabulary acquisition. Vocabulary acquisition begins with the words we hear and understand all the way to the words we write or our writing vocabulary (Reutzel & Cooter, 2008). A deficit in vocabulary knowledge is a major obstacle in academic achievement. Therefore, it is suggested that students use computer programs in an effort to build their academic vocabulary and hopefully come closer in closing the academic achievement gap. Integrating technology into the curriculum offers the

students the opportunity to enhance their learning outcomes through motivation and self-determination.

Research Questions

1. Is there a difference in the reading achievement of low socioeconomic status third graders after participation in the i-Ready computer program?
2. Is there a difference in the reading achievement of third graders with learning disabilities after participation in the i-Ready computer program?
3. Is there a difference in the reading achievement of third graders identified as gifted after participation in the i-Ready computer program?

Chapter 3: Methodology

Aim of the Study

The purpose of this study was to determine the effects of a computer-based reading and vocabulary support program on the reading achievement of low socioeconomic third graders. Further, the study would also consider these effects on students with learning disabilities and those in gifted programs.

Research Questions and Hypothesis

As the first question was examined using quantitative methods, the null hypothesis was as follows:

Ho: There is no difference in the reading achievement of low socioeconomic status third graders after participation in the i-Ready computer program.

The second question was also examined using quantitative methods and the null hypothesis was as follows:

Ho: There is no difference in the reading achievement of third graders with learning disabilities after participation in the i-Ready computer program.

The third question was also examined using quantitative methods and the null hypothesis was as follows:

Ho: There is no difference in the reading achievement of third grades identified as gifted after participation in the i-Ready computer program.

Participants

The data from the study was taken and analyzed from a group of students that was comprised of 55 African-American third-grade students of low socioeconomic status. Their scores on i-Ready activities will be compared with reading scores on quarterly benchmark

assessments. Further analysis was also conducted on data from students with learning disabilities and those in gifted programs. Data from this study was taken from 29 third-grade girls ranging in ages from 8 to 9 years of age and 26 third-grade boys ranging in ages from 8 to 10 years of age. From out of the total of 55 students whose data was analyzed, 20 of the students were reading at least two reading grades levels below their current third grade reading level. In addition, five of the participants from this same sample were presently repeating third grade. Furthermore, five of the male participants from this sample have recently been selected for a child study based on the participant's constant underachieving academic abilities.

The participants for this study have recently completed a district baseline reading assessment that was administered in October for the 2015-2016 school year. The student scores were indicative that over half of the participants have a deficit in the areas of vocabulary and possess limited reading comprehension skills. As a result, this research study will serve as a means to justify the importance of computer-based reading and vocabulary instruction on improving reading achievement for students in third grade.

Data for analysis was taken from a Title 1 school located on the East coast side of Virginia that serves a predominantly low-socioeconomic African American community. This Title 1 School is currently on a school improvement plan in an effort to increase student achievement. The researcher of this study is presently working in the public education system and has over seven years of teaching experience in a Title 1 elementary school setting. Out of the seven years of teaching, the researcher has taught third grade for the last three years and during those years the researcher has been solely responsible for teaching in the areas of reading, language arts, writing, mathematics, science and social studies.

Program Implementation

The participants for this study received a total of 45 minutes each week to work on the activities in the i-Ready program during their reading block. The reading block was Monday through Friday and only seventy-five minutes long. The reading classroom contained only five stand-alone computers, but the classroom teacher would allow the participants to use her school issued computer. Due to the limited amount of classroom computers, the students had to rotate and were allowed to spend only fifteen minutes per class period on the i-Ready activities. It was apparent that the participants did not like to rotate nor log off the computers when their time limit was reached. In seeing the reactions of the participants when it was time to rotate off the computers, the teacher in the study asked and received approval from the building principal to access the school's computer lab in an effort to allow all of the participants from each of the reading classes to receive their allotted time for the i-Ready activities and assignments set up on the program. The teacher and the participants from the three reading classes were scheduled and allowed to use the school's computer lab on Thursday of each week. Now, each participant from each reading block would have access to a computer and time for participation in the i-Ready computer activities and assignments. The participants enjoyed playing the activities and challenging their classmates if they were on the same level or same lesson. There was very limited teacher assistance while the students were independently completing the activities. However, the teacher was able to monitor the student's progress and the amount of time the participants were spending on each lesson by logging into the i-Ready system to check on the status of each of the participants. The i-Ready program was a new diagnostic program to the grade level, but the teacher in the study has been teaching in a Title 1 elementary school setting well over seven years in the areas of reading, language arts, writing, mathematics, science and social studies.

Research Design

For each of the research questions, one-sample T-tests were conducted. An analysis of variance (ANOVA) was used to compare the scores of mainstream, learning disabled and gifted students who participated in the i-Ready program. An ANOVA is the best test to run because it provides the capability to compare the means of two or more groups, (Kranzler & Moursund, 1999). An alpha level of 0.05 was used to determine acceptance of the null hypothesis. Creswell (2012) advises the use of an effect size of .5 (or one half of an standard deviation) or above is often the standard use when examining the mean scores. Quarterly reading benchmark scores was collected and used as the data points. Quarterly benchmarks were chosen as the most appropriate scores to be used because they are used district-wide and administered on a regular basis so students are familiar with the testing modality, thus ruling out unfamiliarity with the assessment format as a factor affecting data points. Furthermore, benchmark scores are considered in high-stakes decision-making within school settings. Additionally, Tukey's HSD post hoc test was run.

The data from the participant's school district first nine-week assessment consisted of four reading passages and a total of 24 multiple choice questions. There was a total of nine vocabulary test questions, 11 fictional text and poetry comprehension test questions, one comprehension of fiction test question and three comprehension of non-fiction test questions. The data from the participant's school district second nine-week assessment also consisted of four reading passage and a total of 24 multiple choice questions. This assessment contained seven vocabulary test questions, five fictional text and poetry comprehension test questions and 12 comprehension of non-fiction texts test questions. Each of the two school district benchmark assessments would test a total of 13 Standards of Learning skills.

Data Collection and Instrumentation

Archival data had been identified to facilitate this study. Data was collected to answer the research questions posed in this study. The data from the school district benchmark assessments was also retrieved using the Interactive Achievement secured website. The Interactive Achievement onTrac system requires both a username and a password in order to access the information from the site. To determine which records are necessary for the study, permission was obtained from the Institutional Review Board. The list of scores that was obtained by the researcher will not contain any identifying information related to individual students.

Limitations

One of the limitations in this study is the inability of the students to comprehend the information that is being presented due to the participant's limited reading abilities. Over half of the participants who are participating in this study are reading two to three levels below their current grade level. Still, the students are required to be assessed on the information that has been instructed during the timeframe prior to the district testing. Since the initial development of the proposed study, the number of participants has decreased by one participant. The students at the proposed participating site often transfer back and forth throughout the school term. Another limitation is the amount of time allotted for the participants to complete the district test. The reading assessment is schedule to be completed in one day with a maximum of two hours to complete. The district test is designed to demonstrate a student's ability to comprehend what is being read (Temple et al., 2008). Another point to consider is that the i-Ready program was designed to be used in a home setting as well as a school setting to incorporate support from the home. However, due to the lack of financial resources, the group under study has limited ability to implement the program at home. Results will reflect only the classroom component of

implementation. Further, there was a limited population of students with learning disabilities and students identified as gifted in order to make generalizations from the research findings.

However, the results for these two groups will be reported. The study was further limited due to having to work with a sample of convenience that fluctuated due to student mobility.

Chapter 4 Results

This chapter describes the findings of a quantitative study intended to investigate the effects of participation in a computerized reading support program and potential effects on students of low socio-economic status who are at greater risk of struggling with reading. Data sources included demographic information, pre and post scale scores from the i-Ready reading support computer program, percentage scores from two district benchmark assessments that mirror the Virginia Standard of Learning Assessment and final report card grades in reading for all participants. The chapter begins with the results of the quantitative analysis of the pre-assessment, the post-assessment, as well as the results of benchmark testing in reading.

Early on in the project, due to working with a sample of convenience, it was determined that there would be limited numbers of study participants identified as having a learning disability or identified as gifted. Therefore, no valid conclusions could be made with such a limited sample size for those groups. Rather, further quantitative analysis was conducted to determine if a difference existed in participating students' reading comprehension ability after participation in the i-Ready program.

i-Ready Effects on Low Socio-Economic Students

An *a priori* power analysis was conducted to determine the number of participants to achieve significance at the $\alpha=.05$. As this was one group, a target of 80% was set for the population. A target score of 60% was set for the sample. Based on these parameters, it was determined that a sample size of 137 participants was needed to achieve the desired power. However, given that this study employed a convenience sampling strategy, it was not possible to attain the desired 137 participants. Instead, the sample consisted of 55 participants resulting in a

reduced amount of power. Given that this was an exploratory study; the lack of power was anticipated.

Descriptive Statistics

In order to understand growth in reading comprehension, the assessment provided by i-Ready was administered as a pre and post assessment at the beginning of the academic school year and at the end, see Table 1. The data from the pre and post assessments were analyzed using descriptive and inferential statistics. The mean and standard deviation for the pre assessment are 51.7% and 21.95 respectively. The mean and standard deviation for the post assessment were 57.38% and 21.35, respectively, see Table 3. Based on these descriptive statistics, there was a positive change in participants' scores from the pre assessment to the post assessment, indicating that participants had grown in their reading comprehension achievement over the course of the academic year.

Next, to determine whether the growth in reading comprehension was significant, a paired t-test was done comparing scores from the initial i-Ready pre-assessment and i-Ready post-assessment. The results of the paired t-test was significant at $p < .01$. The adjusted R^2 value that corresponded to this finding was .52, which in an educational setting is considered moderately high. Given that significance was achieved for the i-Ready pre/post assessment, participants did increase in their reading achievement as measured by the i-Ready program assessments.

In order to further understand growth in reading comprehension, the district benchmark assessments were administered as a pre and post assessment at the beginning of the academic school year and at the end, see Table 2. The data from the pre and post assessments were analyzed using descriptive and inferential statistics. The mean and standard deviation for the pre

assessment are 52.91% and 21.99 respectively. The mean and standard deviation for the post assessment were 56.12% and 21.35, respectively, see Table 3. Based on these descriptive statistics, there was a positive change in participants' scores from the pre assessment to the post assessment, indicating that participants had grown in their reading comprehension achievement over the course of the academic year. However, there were no significant effects on district benchmark scores in reading following participation in i-Ready, which was implemented in the district with the intent of increasing student achievement in reading on the annual high-stakes assessment.

Table 1
Average Scaled Scores for i-Ready Beginning and End-of-Year Assessment

Sample	Average Scaled Scores on i-Ready (beginning of year)	Average Scaled Scores on i-Ready (end of year)
Students in the i-Ready program	481.26	433.10

Table 2
Average Scores (as percents) for District Benchmarks 1 and 2

Sample	Average Score (percent) on District Benchmark 1	Standard Deviation Total Score (beginning of year)	Average Score (percent) on District Benchmark 2	Standard Deviation Total Score (end of year)
Students in the i-Ready program	51.7	21.95	57.38	21.35

Table 3

Descriptive Statistics for i-Ready and Benchmark Pre/Post Assessments

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	i-Ready Pretest	474.9	48	52.09	7.52
	i-Ready Post Test	442.85	48	77.19	11.14
Pair 2	Benchmark Pretest	52.91	53	21.99	3.02
	Benchmark Post Test	56.13	53	21.35	2.93

Chapter 5

Discussion, Recommendations and Conclusions

Summary of Findings

This chapter presents a summary of the current study, a discussion of the findings along with recommendations for future research based on these findings. This study aimed to determine the effects of a computerized reading support program on the reading achievement of low-socioeconomic students. Further, effects on special populations, those with learning disabilities and those identified as gifted, were expected. Increase in reading achievement was investigated in terms of district benchmark scoring in reading, as well as the final report card grade in reading. Results indicate that while student scores increased within the i-Ready computerized reading support program, these gains had no effect on district benchmark testing in reading or the final reading report card grade. Potential explanations regarding the lack of transfer of reading skills are presented in this chapter.

The data from the study were taken and analyzed from a group of students that was comprised of 55 African-American third-grade students of low socioeconomic status. Their scores on i-Ready activities were compared with reading scores on two benchmark assessments. Further analysis was also conducted on data from students with learning disabilities and those in gifted programs. Data from this study was taken from 29 third-grade girls ranging in ages from 8 to 9 years of age and 26 third-grade boys ranging in ages from 8 to 10 years of age. Out of the total of 55 students whose data was analyzed, 20 of the students were reading at least two reading grades levels below their current third-grade reading level. In addition, five of the participants from this same sample were presently repeating third grade. Furthermore, five of the male participants from this sample have recently been selected for a child study based on the

participant's continuing lack of progress in academic activities. The participants for this study have also completed a district baseline reading assessment that was administered in October for the 2015-2016 school year. The outcomes of the student scores were indicative that over half of the participants have a deficit in the areas of vocabulary and possess limited reading comprehension skills. As a result, this research study will serve as a means to justify the importance of computer-based reading and vocabulary instruction on improving reading achievement for students in third grade.

Discussion of the findings

This study has several important implications for educators who use the i-Ready program with students from low socio-economic backgrounds who struggle with reading. The following is a discussion of each implication.

Using i-Ready with mainstream students of low ses

The i-Ready reading support program from Curriculum Associates in the present investigation appears to have improved participants' success with reading material within the i-Ready platform. Student scores from the i-Ready pre assessment to the post assessment indicate some improvement. However, scores on the district benchmark testing did not improve for these same students. Since the districts tests are designed to mirror reading content on the annual high-stakes assessment and pass rate for the benchmarks is not being met, it can be inferred that students who struggle with district benchmark assessments in reading will also underperform on the high-stakes assessment. There appears to be limited transfer of reading skills presented and practiced within i-Ready. Student gains in i-Ready do not transfer to higher achievement in reading on other measures of reading achievement. Factors affecting this transfer of reading skills will now be discussed.

Fidelity of Implementation

In order to successfully implement the i-Ready program and for the students to achieve the maximum results from using the i-Ready program, it would be in the best interest for all teachers of reading to receive continual professional development courses and/or training on the use as well as the implementation of the program. Professional development training would give the teachers opportunities to ask questions and to practice a particular lesson before having the students complete a similar lesson. Professional development training would also allow the teachers time in becoming more knowledgeable in administering a diagnostic test and also being able to read and comprehend the results of the diagnostic report in order to provide an action plan for differentiated instructions and activities for the students to complete on the computers. The results from the diagnostic tests must be interpreted in order to determine a student's progress or lack thereof. Accordingly, i-Ready recommends that each student spend at least 45 minutes a week on the computers working in the online lessons. It is the responsibility of the teachers to ensure that the students are getting their fair share of time spent utilizing the i-Ready program and the differentiated activities set up in the program for the students.

In addition to the professional development, diagnostic reports and the time spent on the computers, the teachers must monitor each student's progress at least twice a week. Monitoring the student weekly progress is beneficial in helping the students achieve success with the program. Monitoring progress also shows the teacher which students are advancing to the next lesson and also shows which students are struggling with a lesson and having significant trouble with advancing to the next lesson. Teacher monitoring is also advantageous in determining the student strengths and area of need, and providing a lesson or lessons to meet the needs of the students. For the students who are constantly struggling with a lesson, the teacher can then pull

those students into a teacher-led intervention small group and present and practice with this group of students' different strategies to assist with the difficult skill or skills. Teacher monitoring can eliminate or drastically reduce the chances of the students becoming off task and unfocused and becoming a distraction for the other students in the class or on the computers, and thereby helping the students become and stay engaged in the lessons.

The i-Ready program's initial purpose was to identify a student's area of need(s) and to differentiate and develop an individualize plan of action using weekly online instructions. However, there were several factors that often times affected the results of this program, with the first being teacher training. Teachers were not properly trained on how to successfully implement the i-Ready program. There were so many unanswered questions relating to the administering of the diagnostic tests, how to run a report, which report to run to determine the student's growth and even questions on who the teachers should contact if they had questions about the program itself. The teachers were even unsure on how to read the results of the diagnostic tests or if the results showed improvements or digression in the material for the students. The teachers were given a 30-minute, one-day training session and only the literacy coaches received an i-Ready training guide. The teachers had a pre-set roster that did not include all of the students in the class and if the teachers needed to add more students, they would have to seek out the assistance from an administrator at the school. However, the administrators were not involved with the setting up of the classes, so some of the students were not able to use the i-Ready program because they had not been originally listed in the class roster. Then, there was the issue of having only five computers in a class of 25 students. The teachers were responsible for ensuring that every student in the class was giving computer time to spend on completing the assigned activities set up in the i-Ready program.

According to the research behind the i-Ready program, time spent on the computers was supposed to equate to academic gains for the students. So, now the issue becomes an issue of time management and organizing a schedule to allow each student time on the computer. The required time according to the i-Ready program is 45 minutes each week for each student.

Likewise, according to the research, utilizing 45 minutes of online instruction has shown academic gains in both reading and math. The students were excited about using the computers and in their minds, playing a game. So, in addition to not having enough computers in the classrooms, the students did not have enough headphones for each of the computers in the classrooms. The headphones that were in the classroom were either broken or missing and due to the limited amounts of computers and or headphones in the classes, some of the students were often times sent out of their class into another teacher's class just to use the computer or borrow a set of headphones. Every day, at least two or even three students would have to spend their computer time in another teacher's class due to the unavailability of having enough computers in one classroom. The teacher was able to track the students' progress and on several occasions, the teacher noticed that the students were not completing the assignments and rushing through the work. The ideal scenario was to allow each student to have 45 minutes on the computer to begin and hopefully complete the lessons that were set in the i-Ready program. However, due to other curriculum expectations, some of the students were not given that opportunity to spend 45 minutes each week on the computers.

In addition, since the students had to log into the i-Ready site using the computers, it was further noted that the students' log-in numbers would remain. The students log-in information all begin with the same first four digits. So, once another student tried to access the site and begin to input their log-in information, the previous student log-in number would display. So, some of the

students would log in under the previous student's account and continue to work on that student's account instead of logging into his or her own account. This loop in the security of the program caused the teacher to constantly monitor the students even more once the students logged onto the i-Ready site.

One of the biggest factors that has impeded the results of the i-Ready program is the lack of training and program support. During the beginning of the school year, the teacher was informed to a new reading program that would be installed to help the students gain advances in reading comprehension and vocabulary. Throughout the school year, there was no accountability for the initiation and the overseeing to the effectiveness of this program because the teacher was not given the necessary training to effectively support this program in the way in which it was designed to track and promote student academic growth. However, the students absolutely enjoyed the time spent on the computers and playing the games, but the teacher was limited in how to interpret the student's data to provide additional resources for continued academic growth and success.

Lack of Transfer of Reading Skills

With curriculum support programs, whether teacher or computer delivered, there is the expectation that improvement within the program will mean improvement in the curriculum area of focus. In the current investigation, the district had the expectation of investing financial and human resources in the use of i-Ready for the benefit of students who struggle with reading comprehension, as measured on the high-states assessment. While the results of this study indicate that student scores within the i-Ready program did improve during the implementation, there were no significant effects on student achievement in reading on district benchmark tests.

Test modality. Several years ago, the district benchmark tests were administered by means of paper and pencil. The students were escorted to the designated testing area and distributed the assessment. The students were allowed an adequate amount of time to complete these assessments. Once the time allotted had expired, the assessments were retrieved and given to the testing coordinator to be scored. In an effort to prepare the students for the digital age, the paper and pencil administered assessment were no longer used and the students began to take the benchmarks on the computers. Benchmarks are now administered solely on the computers and are scored instantly once the student submits the test. Students taking benchmarks and using i-Ready are using the same modality (via computer), so this would not be a factor in the lack of transfer of reading skills from the reading program to related reading tasks.

Reading content. The district benchmarks are given at nine-week intervals. The subject matter that is tested is based on the first nine weeks of skills that have been taught based on the curriculum pacing guide. The benchmarks contain several passages that consist of several questions relating to each passage. Some of the questions that are asked relating to the passages require the students to select more than one correct response. The students understand the acronym as “MAQ” which means multiple answer question. Then for those passages that only require one correct response, the students remember the acronym as being “SAQ” or single answer question. Poetry is often tested on the second nine-week benchmark assessment. Since the assessments are administered on the computers, the passages on the computers carry over onto several screens, unlike the i-Ready passages which are not as long in comparison. Both the benchmarks and i-Ready content contain visuals. The passages on the benchmark may consist of one or two illustrations or pictures and several questions that relate to the images. i-Ready is very animated with a variety of sounds and movements. One potential explanation for the lack of

transfer of reading skills could be the disparity in the shorter passage length and visual support evident in i-Ready, compared with longer passages and limited images on the benchmarks. Students are more successful with the shorter passages that are better scaffolded for comprehension. Lack of reading stamina in struggling readers appears in the literature as having effects on comprehension when reading longer passages, as does eye fatigue when reading a digital text (Hiebert 2014; Jeong, 2012).

Delivery. i-Ready includes a teaching component that presents information on the skills of focus to the students, including the objective of a lesson, and it will allow the students several opportunities to repeat a lesson if the student did not pass before allowing the students to advance to the next lesson. i-Ready is auditory, so the students who are not able to read or students who are not avid readers can listen as the stories that are being read to them. In the benchmark assessments, the information and passages are not orally read to the students. Therefore, struggling readers are not having the information read to them out loud. Due to their weakness in comprehension, these students all go through the motion of reading the passages and appear to randomly select a response to the questions being presented. Clearly, the accompanying read-aloud function of i-Ready supports comprehension within that platform. Without this support in the benchmarks, struggling readers will score lower on the assessments. It is important also to consider the importance of explicit direct instruction when working with students who have severe struggles with reading. Passive engagement with a computerized reading development program is not enough to reinforce essential reading skills with this population. Direct instruction involves meaningful teacher-student interactions and teacher guidance when demonstrating essential reading skills. Teacher-directed instruction of essential skills includes explicit explanations, modeling, and guided practice, with continuous correction

and feedback to the learner (Rupley, Blair, & Nichols, 2009). A computerized reading program can provide the semblance of teacher-led support, but it will never replace critical interaction with a trained educator.

Motivation. The students are highly motivated to log into the i-Ready site to work on the online activities. Although, the students are working on skills, the students see this learning as an opportunity to “play” a game on the computer instead of being in a reading group working on reading skills. It is unfortunate that the majority of the students are not avid readers outside of the i-Ready program. The students are rarely even given the opportunity to obtain books from the school library. Although the classroom does contain a variety of reading books and leveled readers, the students are hesitant in selecting and reading books in the classroom. The students are more excited about spending time on the i-Ready activities than spending time reading books or spending time in the reading group preparing for the benchmarks. As an incentive for the students in completing the online lessons, the i-Ready program deposits coins into the student account which they are then able to use to play additional games on the i-Ready program site. The “game” aspect of educational programs has always posed concerns. Some students are not able to recognize the learning component beyond the edu-tainment factor. For some, this may increase motivation to participate fully in the educational computer program, but for others the “game” component serves to distract (Chiappone, 2003).

Since i-Ready is a computerized website, the students who have access to a computer at home can also access their accounts and continue to work on their lessons at home thereby giving the students more opportunities to gain additional practice with reading comprehension. The aspect of motivation plays an important role in determining effectiveness of reading skill transfer in the present study. Motivation based solely on extrinsic factors, such as accruing coins

in a game-like learning platform will have limited success. A reading role model, such as an inspirational reading teacher, is needed to support intrinsic motivation for persisting with reading and reading-related tasks.

Recommendations for Future Research

In view of the findings resulting from this study, recommendations for future research can be made. First and foremost, a new study might incorporate extensive training for the teachers on the use of the computer program before implementing the program into the classroom. Due to the limited exposure of training for the teacher on using the i-Ready program, the teacher as well as the students did not fully benefit or achieve the desired results from the program. Additionally, a similar study might address the amount of time that is allotted for each student. It was ideal for each student to spend 45 minutes each week working in the online lessons, but perhaps the students should spend less time working on the lessons to avoid off task behaviors or perhaps spend more time working on the online lessons for the students that are working above their current grade level. The i-Ready program was developed for K-12 learners and provides lessons for each grade level. Additionally, best practices in integrating teacher-led instruction to support i-Ready should be identified and disseminated to districts to maximize effects of i-Ready for students who have severe struggles with reading. The role of the teacher cannot be de-emphasized, even in the era of digital technologies dominating curriculum.

Next, future research might conduct a longitudinal study to track and investigate whether the students who started in the i-Ready program in the lower grades continues to make progress throughout the upper grades. The i-Ready program was designed to deliver online differentiated instructions that would promote student growth in the areas of phonics, phonological awareness, vocabulary and comprehension in both literature and informational text.

Finally, future research might consider administering a student survey before implementing the i-Ready software program and after the students have used the i-Ready program for a length of time. The data would be recorded using a Likert scale to rate, score and determine how the students felt before and after the implementation of the reading program.

Conclusions

This study was conducted to determine the effects of the implementation of a computerized reading program to support the vocabulary and reading achievement for third grade students in a low socio-economic status. Upon review of the results, the study found that student reading scores within the i-Reading computer reading support program improved; however, reading achievement scores on other measures did not. Additional gains are feasible for the students who participated in the i-Ready reading program provided the teachers receive more instructional training or professional developments on how to best implement this program within the school and other factors related to modality, content, delivery, and motivation are explored to determine factors that best support transfer of learning from i-Ready to other reading tasks.

Overall, the students seemed to enjoy using the i-Ready reading program and should continue to spend equal amounts of time on the computers utilizing the i-Ready reading programs both in school and at home to develop and improve their vocabulary and comprehension skills. On the other hand, teachers should continue to ensure the fidelity of the program and the work of the students who are actively engaged in the lessons. Teachers must be prepared to provide the students additional instructions when the students are not performing to the mastery level (Sobolak, 2011).

Technology can potentially be beneficial in improving learning in both vocabulary and comprehension skill by activating prior knowledge and engaging the students in repeated activities to ensure concepts are thoroughly learned (Kilickaya & Krajka, 2010). The i-Ready reading program was created to assist the struggling readers with building these concepts but at a pace that is individually crafted for each student. Although the i-Ready reading program is designed to provide differentiated lessons, the benefit of providing additional instruction from a teacher can increase students' reading and vocabulary gains and the probability of closing the achievement gap among students from varying socioeconomic levels (Biemiller, 2004; Hargrave & Senechal, 2000; Juel, Biancarosa, Coker, & Deffes, 2003; Stahl & Stahl, 2004). A delicate balance must be struck between computerized support tools and meaningful human interaction in literacy development activities, as the medium alone is *cannot* be the message (L. Chiappone, personal communication, August 1, 2016; McLuhan, 1964). Educators and those in powerful posts making decisions affecting educators and learners must maintain a critical eye and not blindly integrate technologies, no matter how pervasive in the digital age.

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Appendix A

Phonological Awareness Literacy Screening

Appendix A

Phonological Awareness Literacy Screening - PALS (Fall 2015)

Student no.	Instructional Oral Reading Level	Summed Score	Benchmark Score
Student 13	Primer	40	54
Student 15	Pre-Primer	30	54
Student 16	Primer	20	54
Student 17	Pre-Primer	45	54
Student 18	Primer	41	54
Student 24	Primer	40	54
Student 27	Pre-Primer	21	54
Student 30	Primer	48	54
Student 32	Pre-Primer	7	54
Student 33	Primer	49	54
Student 34	Reading Readiness	0	54
Student 35	Pre-Primer	13	54
Student 36	Primer	23	54
Student 49	Primer/1 st	30	54
Student 51	Primer	22	54
Student 54	Pre-Primer	9	54
Student 55	Pre-Primer	28	54

Appendix B

i-Ready Performance by Domain and Student Placement Distribution

Appendix B

i-Ready Performance by Domain and Student Placement Distribution

Class 1				
Domains	Average Scale Score (Beginning of School Year)	Student Placement Distribution		
		>2Levels Below	1-2 Levels Below	On, Above or Emerging
Overall Reading Level	499	0	7	10
Phonological Awareness	449	1	1	15
Phonics	496	4	4	9
High-Frequency Words	524	0	5	12
Vocabulary	487	0	7	10
Comprehension: Literature	502	2	1	14
Comprehension: Information Text	490	3	4	10

Class 1				
Domains	Average Scale Score (End of School Year)	Student Placement Distribution		
		>1Level Below	<1 Level Below	On Level (Mid/Late) Or Above
Overall Reading Level	468	10	5	4
Phonological Awareness	346	3	0	16
Phonics	483	13	2	4
High-Frequency Words	458	10	0	9
Vocabulary	474	10	3	6
Comprehension: Literature	478	7	8	4
Comprehension: Information Text	448	12	4	3

i-Ready Performance by Domain and Student Placement Distribution

Class 2

Domains	Average Scale Score (Beginning of School Year)	Student Placement Distribution		
		>2Levels Below	1-2 Levels Below	On, Above or Emerging
Overall Reading Level	454	5	10	16
Phonological Awareness	404	4	1	16
Phonics	454	9	6	6
High-Frequency Words	471	5	7	9
Vocabulary	452	6	8	7
Comprehension: Literature	448	7	8	6
Comprehension: Information Text	452	6	8	7

Class 2

Domains	Average Scale Score (End of School Year)	Student Placement Distribution		
		>1Level Below	<1 Level Below	On Level (Mid/Late) Or Above
Overall Reading Level	394	18	4	0
Phonological Awareness	328	11	0	11
Phonics	419	17	2	3
High-Frequency Words	398	17	0	5
Vocabulary	373	17	5	0
Comprehension: Literature	404	18	3	1
Comprehension: Information Text	386	18	4	0

i-Ready Performance by Domain and Student Placement Distribution

Class 3

Domains	Average Scale Score (Beginning of School Year)	Student Placement Distribution		
		>2Levels Below	1-2 Levels Below	On, Above or Emerging
Overall Reading Level	475	3	5	9
Phonological Awareness	364	3	0	14
Phonics	486	3	6	8
High-Frequency Words	511	2	4	11
Vocabulary	464	3	5	9
Comprehension: Literature	471	3	7	7
Comprehension: Information Text	465	4	6	7

Class 3

Domains	Average Scale Score (End of School Year)	Student Placement Distribution		
		>1Level Below	<1 Level Below	On Level (Mid/Late) Or Above
Overall Reading Level	465	6	10	1
Phonological Awareness	382	4	0	13
Phonics	485	8	5	4
High-Frequency Words	506	5	0	12
Vocabulary	464	10	7	0
Comprehension: Literature	461	9	7	1
Comprehension: Information Text	429	14	2	1

Appendix C
Benchmark Achievement Results

Appendix C

Benchmark Achievement Results (Student Performance Report in Reading)

Assessment Results		
Class 1	Benchmark 1 Scores	Benchmark 2 Scores
Student 1	95.8	83.3
Student 2	91.7	91.7
Student 3	79.2	66.7
Student 4	75.0	45.8
Student 5	70.8	70.8
Student 6	70.8	83.3
Student 7	70.8	87.5
Student 8 ^R	62.5	58.3
Student 9	62.5	50.0
Student 10	54.2	70.8
Student 11 ^R	54.2	58.3
Student 12	50.0	62.5
Student 13	41.7	58.3
Student 14	37.5	66.7
Student 15	37.5	29.2
Student 16	37.5	20.8
Student 17	29.2	33.3
Student 18	20.8	58.3
R-Repeating Grade	*- Special Education	G-Gifted

Appendix C

Benchmark Achievement Results (Student Performance Report in Reading)

Assessment Results		
Class 2	Benchmark 1 Scores	Benchmark 2 Scores
Student 1	79.2	79.2
Student 2	75.0	91.7
Student 3	70.8	75.0
Student 4	70.8	58.3
Student 5	70.8	62.5
Student 6	58.3	54.2
Student 7	50.0	54.2
Student 8	45.8	66.7
Student 9*	41.7	41.7
Student 10*, ^R	37.5	54.2
Student 11	33.3	54.2
Student 12*	29.2	33.3
Student 13*	29.2	37.5
Student 14	20.8	45.8
Student 15	20.8	37.5
Student 16*	16.7	12.5
Student 17*	16.7	54.2
Student 18*	16.7	33.3

Appendix C

Benchmark Achievement Results (Student Performance Report in Reading)

Assessment Results		
Class 3	Benchmark 1 Scores	Benchmark 2 Scores
Student 1-G	87.5	95.8
Student 2	87.5	83.3
Student 3-G	79.2	66.7
Student 4	79.2	83.3
Student 5	70.8	25.0
Student 6	70.8	58.3
Student 7	66.7	62.5
Student 8	62.5	66.7
Student 9-G	62.5	87.5
Student 10	62.5	N/A
Student 11	54.2	37.5
Student 12	50.0	70.8
Student 13 ^R	41.7	41.7
Student 14 ^R	41.7	25.0
Student 15	33.3	58.3
Student 16	33.3	33.3
Student 17	29.2	16.7
Student 18	29.2	20.8
Student 19	25.0	N/A

