THE IMPACT OF INSTRUCTIONAL READING TECHNOLOGY PROGRAMS ON STUDENT READING ACHIEVEMENT

By

DANIEL TODTFELD & WHITNEY WEAKLEY

Submitted to

Dr. Timothy Wall and

The Educational Leadership Faculty

Northwest Missouri State University Missouri

Department of Educational Leadership

College of Education and Human Services

Maryville, MO 64468

Submitted in Fulfillment for the Requirements for

61-724 Research Paper

Fall 2013

December 3, 2013

ABSTRACT

This study was designed to analyze the results of iReady, a computerized reading instruction program currently implemented at the elementary level in a Midwestern suburban school district. The purpose of this study was to determine if iReady improves student achievement as measured by the Communication Arts Missouri Assessment Program (MAP). The MAP test is a state assessment administered once a year in the spring in the state of Missouri. Three grade levels were used as sets of data in this study. Each grade level had two control groups and one test group. The test group received iReady intervention for one school year. An Analysis of Variance (ANOVA) was used to analyze the three groups at each grade level. The researchers have recommended that this study be continued to examine the possible impact of iReady over a longer period of time. One grade level that implemented iReady showed significant gains in student achievement. This grade level indicates a possibility that iReady can make a difference.

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CHAPTER ONE

INTRODUCTION TO THE STUDY

Background

In the spring of 2012, a midwest suburban school district hired a deputy superintendent to aid in guiding the district through the economic and academic challenges needed to stay on the cutting edge of educational practices in the 21st century. The following year this same individual was hired as the Superintendent of Schools and our journey has begun. The district has begun purchasing personal devices for students at all levels and has increase technology access for teachers as well.

Following the model of the Mooresville School District in Mooresville, North Carolina the new Superintendent of this district has chosen to begin what is known as a one to one digital transformation (Farrell, 2013; Schwartz, 2012). Mooresville, which sits about 20 miles outside of Charlotte, has turned technology into learning for students (Farrell, 2013; Schwartz, 2012). Through a massive digital conversion, teachers and students have transformed what learning looks like and how classrooms function (Farrell, 2013). Students work collaboratively in a Project Based Learning (PBL) model and guide much of their own instruction. This is possible because teachers are required to attend an adequate amount of professional development focused on technology usage in classrooms (Farrell, 2013). The transformation model will be adjusted to fit the needs of the individual district, but it is hopeful the results will be the same. All students in grades 9-12 will be provided new technology to ensure our learning environments more accurately reflect the world beyond the school walls. This technology and training for students and teachers should lead to more highly engaged classrooms, an increase in student achievement, and a more sustainable education model.

Educators, legislature, parents and all other stakeholders want to know that these transformations will be beneficial to our students (Wall & Symonds, 2012). The school system is setting new goals that will help students leave our school system with all the tools they need to find success in the future and to create an education system that is not only high performing, but also sustainable for years to come. Specifically, districts are looking at adaptive technologies that diagnose students' strengths and needs as well as create an individualized lesson plan for each student. Some programs that offer adaptive lessons in reading are iReady® (made by Curriculum Associates), Reading Assistant® (made by Scientific Learning) and Journeys® (made by Houghton Mifflin Harcourt). The reading programs that the school district is using to assess and instruct students should be analyzed and tested in the school setting for effectiveness. This study is designed to test the effectiveness in schools.

Conceptual Underpinnings for the Study

In 2002, President George Bush signed the No Child Left Behind (NCLB) act which changed the way society holds schools accountable (No Child Left Behind [NCLB], 2002). NCLB mandated that schools make a certain amount of progress each year (AYP) in order to maintain accreditation (NCLB, 2002). Educators began analyzing data much more systematically and looking for trends (Lee, 2006). It is necessary for school districts to begin analyzing efficiency of meeting students' needs. In the specific midwest suburban school district focused on in this school, population is increasing quickly, but revenue is not.

As technology develops and becomes more affordable, schools have begun looking at technology as a way to supplement teacher effectiveness and instruction to ensure individual students' needs are being met (Song and Keller, 2001). Adaptive technology diagnoses a student's areas of weaknesses and assigns specific learning experiences aimed at instructing a

student at their level and where the student has gaps. Students still receive whole group instruction, but are able to receive specific individualized instruction when this technology is used (Song and Keller, 2001). Further research has also been done involving the methodology of reading instruction as a whole.

Research in the area of reading instruction has indicated that methodical reading instruction is necessary for struggling readers (Foorman and Torgesen, 2001). Computerized reading programs are very systematic in their approach to instruction (Song and Keller, 2001). Another reason teachers select computerized reading instruction is the amount of diagnostic data that a computer can provide teachers (Song and Keller, 2001). Because computers can provide systematic and progressive instruction and specific diagnostic reports, school districts are considering implementing computerized reading instruction programs to help deal with rising populations (Song and Keller, 2001). Furthermore, computerized instruction allows teachers to differentiate and meet each students' invidual needs. In theory, this would raise student achievement.

Statement of the Problem

A midwest suburban school district is currently implementing a one-to-one MacBook Air® program phasing in from secondary through middle and elementary levels. While the technology is fast and offers enormous advantages compared to traditional teacher driven instruction, the efficacy of this technology-driven instruction has not been studied. Technology is advantageous comparing teacher feedback to computerized feedback. Computerized feedback is instant for all students, while teachers take time to work through an entire class' assignments that has been turned in (Blok, Oostdam, Otter, & Overmat, 2002). Teachers in the elementary schools are leery of allowing computerized reading programs to become a large part of the

reading instructional blocks. Without statistical evidence proving efficacy of these computer programs, teachers will not execute the resource effectively.

Currently there is a large body of multimedia software available in the area of reading for elementary students (Blok, Oostdam, Otter, & Overmat, 2002). Determining which program is right involves research and knowing on which areas of remediation to focus. A competent program needs to provide applications that are both student based and teacher based (Greenlee-Moore and Smith, 1996). Teacher based activities might include assessment and diagnosis, utilities of grade management and planning of instruction (Greenlee-Moore and Smith, 1996). Student based activities include games, instructional simulations, direct instruction and solo-mode learning.

iReady is one type of technology based reading intervention program. iReady is a diagnostic tool that we are using to first screen all students and pinpoint their needs down to the sub-skill level. This aids instruction for students by finding where their specific needs are and how we can provide a plan of action for our instruction (i-Ready, 2013). The next component of iReady is instructional delivering an automated individualized instructional plan for each student. The final component of the program is a computerized tool that monitors progress for each student, class, grade, school and district. This computerized tool that monitors progress is important for schools. Progress monitoring reports allow teachers and administrators to make instructional decisions to ensure that students are making adequate growth toward state mandated benchmarks.

Purpose of the Study

As technology continues to advance, more occupations require high levels of education or specialized training for which reading ability is vital. Automation and foreign competition

have eliminated many unskilled and semiskilled jobs. Many displaced workers become unemployed because they do not possess the minimum reading and technology skills required for success in new positions or job-training programs.

The purpose of this study is to provide teachers and policy makers at the district level with statistical information regarding the effectiveness of the iReady computerized reading program. If our findings indicate that this computerized reading program does have a positive impact on reading achievement scores, curriculum designers will have evidence to implement computerized reading programs as part of the curriculum.

Research Questions

RQ_1: Is there a difference in third – fifth grade Communication Arts composite Missouri Assessment Program (MAP) scores from 2011-2013, when considering students who have received the i-Ready reading intervention 2013 and students who have not received the intervention from 2011-2012?

Null Hypothesis

NH_1: There is no difference in third – fifth grade Communication Arts composite Missouri Assessment Program (MAP) scores from 2011-2013, when considering students who have received the i-Ready reading intervention 2013 and students who have not received the intervention from 2011-2012.

Anticipated Benefits of the Study

The midwest suburban district where this study was conducted is shifting to a one-to-one platform in the secondary schools and is working to explore one-to-one options at the elementary level. This study will study the impact of computerized reading instruction on student achievement measured by state assessments. As the district shifts to using a one-to-one platform,

there is a lack of information regarding the efficacy of using computers as supplemental instructional tools. If this study shows that the i-Ready intervention makes a positive impact, it will support the shift the district is making to a one-to-one environment.

Summary

The one-to-one program that a Midwest suburban school district is implementing is very new and is very different from the current model of instruction. Unfortunately, very few researchers have studied the impact of computerized reading instruction, but districts are still purchasing the reading programs. By completing this study, we will be able to determine the impact of computerized reading instruction on student achievement scores. This specific study is looking at Communication Arts Composite MAP scores. Furthermore, this study will provide information to influence policy at the district level as the one-to-one program continues to roll out and how computerized reading instruction is integrated into the current school curriculum.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Reading Instruction

Educators agree in their support for good reading skills. What constitutes *good reading skills?* For more than three decades now, reading educators have recognized that particular practices are more likely to be responsible for effectiveness of reading instruction, rather than a specific program (International Reading Association, 2002). The most commonly-mentioned instructional requisites for reading well are the skills entailed in reading comprehension and vocabulary building. Embedded in those skills are the sub-skills of decoding, automaticity, fluency and spelling. From the earliest exposure to reading, to the most well-read scholar, building proficiency through a variety of methods and strategies each day has the greatest impact upon the success of the reader. (Arlington, 2006) With this in mind, districts are looking to find alternative programs that will aid in the continual reading improvement of the students they serve.

Reading problems emerge commonly from weakness in basic decoding skills according to Blok, Oostdam, Otter, and Overmat (2002). Further, the authors state that to be good writers and speakers, as well as readers, children need to master two aspects of the alphabetic code: visual identity of letters and the speech sounds of letters (phonemes). McCandlis, Beck, Sandak. and Perfetti (2003) conducted a study of children (after first grade) identified as having deficient decoding skills. The intervention in this study was a progressive attention to letter position within a word, leading to a significant improvement in alphabetic decoding, reading comprehension and phonological awareness skills.

Solid reading skills are the critical element to our students' future in academic success. Children who are early readers and can break through the barrier to master phonemic awareness skills holds the key to success in an information rich world. The tools we have today through technology provide an efficient way to help teachers facilitate and customize learning for each student. Our students are coming with more diversity and challenges than ever before and technology can help to gap those challenges. Using sight, touch and sound, teachers can directly address diverse learning styles and ability levels (The Journal, 2001). Technology provides an unlimited number of opportunities for practice while making learning fun and engaging.

In their clinical study of reading improvement via computer instruction, Balajthy, et al. (2001) found that students demonstrated a significant improvement in reading fluency by using meaning-oriented reading and writing activities, reading and writing skills, word identification, synthetic phonics, word families, and structural analysis.

Using Technology in Reading Instruction

Apple K-12 Effectiveness Reports (2002) advocates using technology to support the development of comprehension skills by posing questions and providing story support. Remedial reading students may show significant gains of reading achievement and improved attitudes toward reading. LeFevre, Moore, & Wilkinson (2003) conducted a study to determine the effectiveness of a modified reading intervention for reader with poor decoding skills and poor comprehension. The experimental group's students were taught to develop and use cognitive and metacognitive strategies to improve their comprehension of high interest expository texts. The results were significant for demonstrating that students who developed

adequate decoding skills also showed improvements in comprehension. A current model for supporting technology in the improvement of reading skills would be the i-Ready program.

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. This leads to a more personalized test than what we have provided for students in the past. The i-Ready program contains a leveling system that has an override option the teacher can utilize for those students who need it to further customize the learning and assessment (Educational Research Institute, 2012). This instruction is tailored for all learners.

For the teacher, i-Ready holds much promise as well. High student engagement allows for teachers to conduct small group lessons. The reports make it easy for teachers to make grouping decisions and accurately know what skills students are missing. The reports on each student that this program offers is valuable to staff, students and parents as they drill down to specific skills that the student is missing. This gives teachers a direction for Response to Intervention (RTI) groupings and instruction. Students can easily monitor progress and witness the gains that are being made providing the immediate feedback that we know is needed in learning. This feedback is crucial to continued growth. This program can be accessed by students at home to practice exactly what they need. Teachers can monitor what students are doing. Teachers are reporting that, "kids who were working on i-Ready at home were achieving at higher levels" (p. 2). (Educational Research Institute, 2012). Our school day is limited and if students are motivated to work on their own, we can use this motivation to capture more learning time and improve achievement.

In a case study performed in New Middletown, Ohio the i-Ready program was implemented and the Springfield Elementary School showed an 20% increase in their reading national percentile rank, a 40 scale score point increase in math and a 37 scale score point increase in reading. This was done with 399 students grades K-4 in the timeframe of six months (Educational Research Institute, 2012). The process of pinpointing what individual students need and then teaching to those needs is crucial to our support for our students and teachers. The i-Ready program makes this differentiation possible and available to teachers and students. (Educational Research Institute, 2012).

Only 50 percent of people living in rural areas of the United States have high-speed Internet according to a 2010 report by the Federal Communications Commission (U.S.News & World Report, 2011). Making programs like i-Ready available to all students at school and at home will be next steps for educators. These new tools and programs come with a high price tag. Digital access is not available for all students outside the walls of our schools (Ferriter, 2010; Sheehy, 2011). Many students do not have access to outside technology and for many of those who do, high speed is not available and dial-up is simply not the same internet. Many rural schools also do not have the funding to provide up to date computers and technology for their students and staff. Albert Bryant, a new Math teacher at Everton High School in Everton, Missouri, notes that if the school computers are not up to par, both the students and school suffer. The computers at Everton High are the same ones he used when he attended the school as a student. They are slow and unreliable at best. Some students hand write their research papers and try to find time before and after school to come in and type those papers on a school computer (Sheehy, 2011). With so much of what we do tied to computers and technology, these students are not receiving the resources they need to be successful in today's rapidly changing

world. This disparity and lack of connectivity will put students in rural areas behind their technologically connected counterparts. (Ferriter, 2010). As we continue to strive for learning environments that will most benefit students we need to find the resources and tools to connect students with technology. The world of information can only be at your fingertips if we have the right tools in students' hands.

Authentic learning environments for students prove to provide the greatest dividends for learning and technology tools allow this to happen almost naturally. Using the internet to allow students the flexibility to choose segments of their own curriculum provides for authentic learning. This type of use also leads to higher student motivation to perform academic tasks. Student engagement is also increased by this type of authentic instruction. As motivation increases basic reading and writing skills are also reinforced (Armbruster, 2006; Castellani, 2001).

Technology literacy is a gray area that holds a wide range of definitions from the educational perspective. As technology advances, the definition of technology literacy changes. In 1980, it meant knowing how to program code. In 1995, it meant knowing how to work basic tools like word processing and spreadsheets (Technology Literacy Assessment Project, 2009). Current technology literacy includes using technology to analyze and problem solve. Providing technology literacy is agreed by most, to have a strong place in our current academic settings. Superintendent of Schools in Baltimore County, Joe Hairston stated, "Today in education, we must teach children where they are and not where we were...We should work to support students in responsibly using technology to access, manage, and evaluate information, solve problems and build and share knowledge" (Trotter, 2009, p. 21).

Most teachers now have the ability to use computers and other technology in their classrooms in some form to help improve learning, productivity and performance. Technology can influence our understanding of the cognitive traits commonly associated with both strong and struggling readers (Coiro, 2003). Computer supported environments have been found to engage readers labeled at risk in ways that may help compensate for inadequate reading ability (McKenna, Reinking, Labbo, & Kieffer, 1999).

Research shows that as children progress through school their interest in reading for pleasure and their motivation to read to learn diminish (Robb, 2000). Teachers can draw on technology applications to engage students in challenging authentic learning. In a Software and Information Association study, new educational technologies help improve self-esteem and attitudes towards learning. As a result of access to these new technologies, students typically unmotivated and uninterested in applying their reading and writing skills are now choosing to engage in challenging authentic learning tasks. Students responded to these tasks with confidence and a renewed assurance (Coiro, 2003).

Incorporating technology into the classroom can be an effective means to increase student achievement and understanding. Watts-Taffe, Gwinn, Johnson, and Horn (2003) examined the effects of integrating technology into the classroom of three teachers. One of their focuses was on way in which technology could make literacy instruction even better or enable effective instruction that would not happen without it. Throughout the study, the teachers were asked to describe the ways in which their use of technology had enhanced student learning. The teachers responses focused on student motivation and engagement, the learning of skills related to literacy and the learning of content area information. Through the use of different computer software, the teachers also noted that students strengthened their writing skills. One teacher stated,

"students are learning about using proper grammar and writing by typing and editing their writing through the use of different computer programs." (p 136).

Smolin and Lawless (2003) also examined the role that technology plays in the classroom and with students. The authors conclude that technology affords instructional methods that traditional methods do not. Technology enables information to be presented in multiple ways. A teacher can use presentation software to introduce a new topic of study to the entire class. Then moving into a small-group format, students can delve into key aspects of the information most times even moving beyond. Technology can help students organize and synthesize information in different ways, facilitating their ability to construct and refine their knowledge. Finally teachers can use technology to reconfigure information in a manner that is tailored to students' individual needs. One of the guiding principles of learning is that all students can learn.

How do we level the playing field for all learners? This has been a question for decades. Technology, used and distributed correctly, might well be the answer we are looking for. Tools themselves will not improve education any more than the typewriter, moving pictures or film projectors. We need to look into great PD opportunities for our teachers in order to fully utilize how to move our students forward in our rapidly changing environment (Educational Technology, 2013). Our mission is always to maximize the potential in every child. Used correctly, technology in education offers both the struggling and the brilliant; the haves and have nots a route to higher achievement. When rolling out a technology plan in any district and before tossing out the textbooks; many factors come into play. In a school outside of Charlotte, North Carolina technology is the new norm. Textbooks sit piled in corners and students rarely sit and listen quietly to teachers lecture. Superintendent of schools Mark Edwards says it is more about

the culture that has been created than the technology tools that are being utilized. In this article he gives ten things that they used to lead this transformation (Farrell, 2013):

1. Build a foundation
2. Form strategic alliances
3. Thoroughly think through logistics
4. Rethink fund allocation
5. Apply gentle yet sustained pressure
6. Empower and educate your teachers
7. Watch the transformation
8. Collect and use data wisely
9. Share best practices
10. Continue to evolve

Technology also encourages students to think differently about school. Research has shown that the most meaningful learning happens when students are engaged in authentic activities that ask them to think and behave like chemists, computer programmers, mathematicians, engineers or archeologists — that is, when they are engaged in activities that mirror the real life task (National Center For Technology Innovation, 2010). Access to technology makes school seem more real world to the students and consequently their learning increases. Students are no longer limited to the materials and information found in their schools or in their textbooks. The technology in the classroom is not the focus of the learning, but it provides an essential vehicle for getting to the destination. Technology also acts as an external implement that enhances cognition, particularly in the areas of reading and writing (Castellani, 2001).

MacArthur, Ferretti, Okolo, and Cavalier (2001) examined 15 years of research from 1985 through 2000 on the use of technology to teach or support literacy among students with literacy problems. The research on computer-assisted instruction and on synthesized speech feedback to improve phonemic awareness and decoding skills was of interest. Their research revealed that most students with reading problems have difficulty acquiring fluent and accurate

word-identification skills due to problems in processing the phonological feature of language. The finding from their research were mixed because only a few research teams conducted programmatic, well-designed research whereby one could draw confident conclusions. Further, there were limitations and insufficient information about the sample characteristics, as well as the outcome measures. On a positive note, however, the research on technology and word identification was the most methodologically strong. This research provided qualified support for the worth of technology-based interventions for improving phonological awareness and word identification. Optimistically, the researchers predict that technology will have important effects upon the literacy of students with reading difficulties.

The extent to which new technologies effectively support reading instruction and learning in the classroom is unknown. There is little empirical research on the topic generally and even less that applies to effective instruction using technology. Still from the work that has been done, there is promising evidence of the effectiveness of reading instruction that integrates print and visual texts such as computer based technology. There is also evidence that students are making valuable connections with reading and writing while utilizing computer assisted learning. Moreover, researchers have found a pattern in their data to suggest that students who appear most at risk of failure in the academic arena are sometimes the most adept and interested in understanding and utilizing computer based learning (Alvermann, 2001). Implementing technology into daily instruction will also require appropriate and ongoing professional development (Castellani, 2001; Farrell, 2013; Ferriter, 2010). Schools will need to provide appropriate teacher training.

Providing teachers with technology will also require training in how to integrate technology tools with instruction. The integration factor is probably one of the most important in

determining whether technology will enhance or detract from the learning objectives. While taking an old activity and adding technology to it will make it a bit faster and easier, it does not guarantee that the outcomes of learning are any better. Teachers should be willing to ask, "How can student learning be enhanced?" (Farrell, 2013).

In the face of using technology in the classroom, some teachers who recognize the positive potential of technology may unknowingly limit its benefits by inappropriate use (Balajthy et al, 2001). Educators need to carry out the planning necessary to make the most use out of their technology based instruction. Time using computers should focus on instruction and skill development instead of play. Great care must be taken when students are allowed access to the Internet and other Web-Based activities. Students must be led to realize the importance of Cyber responsibilities and integrity.

For a student to become proficient in reading, he or she must master the skills of decoding, comprehension, spelling, vocabulary leading to fluency and their antecedents (Foorman, B.R. & Torgesen, J, 2001). Although some researchers might split hairs over which sub skills are inherent to each skill, there is a consensus about the need for these specific and daily skills instruction (Foorman, B.R. & Torgesen, J, 2001). Thus, it is incumbent upon educators to provide timely and precise instruction to children in order for the children to attain reading competency. The ultimate goal being, that once readers feel confident about understanding and comfortable with reading a variety of materials, they will read for pleasure.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

Research Design

This research study takes place in an elementary school in a midwest suburban district. This elementary school piloted the computerized reading instruction program called iReady in the 2012-2013 school year. An Analysis of Variance (ANOVA) was used to compare the scores of groups of students who received the iReady Intervention to groups of students who did not receive iReady instruction. An ANOVA was the best test to run because it provides the capability to compare the means of two or more groups, (Kranzler & Moursund, 1999, p. 127). An alpha level of 0.05 was used to determine acceptance of the null hypothesis. Missouri Assessment Program (MAP) Communication Arts Composite scores were collected and used as the data points. MAP scores were chosen as the most appropriate scores to use because they are standardized and administered state wide. Missouri Department of Elementary and Secondary Education (DESE) use MAP scores when grading school districts.

Variables Used in the Study

Both Independent and dependent variables were used in this study.

Independent Variable: The year the MAP score was taken (which describes whether or not iReady intervention was received).

Dependent Variable: Communication Arts Composite MAP scores.

Research Questions

RQ_1: Is there a difference in third – fifth grade Communication Arts composite Missouri Assessment Program (MAP) scores from 2011-2013, when considering students who have

received the i-Ready reading intervention 2013 and students who have not received the intervention from 2011-2012?

Null Hypothesis

NH_1: There is no difference in third – fifth grade Communication Arts composite Missouri Assessment Program (MAP) scores from 2011-2013, when considering students who have received the i-Ready reading intervention 2013 and students who have not received the intervention from 2011-2012.

Study Group

The study group was made up of three years of third, fourth and fifth grade students all enrolled in the same elementary school. The groups of students tested in 2011 and 2012 did not receive any computerized reading instruction. In 2013, students received the computerized reading instruction in addition to the normal classroom instruction.

Data Collection and Instrumentation

Archival data has been identified to facilitate this study. Data was collected to answer the research questions posed in this study. Communication Arts Composite MAP scores were collected from the district assessment office. To determine which records were necessary for the study, permission was obtained from the Institutional Review Board (See Appendix A). The list of scores obtained by the researchers did not contain any identifying information related to individual students.

Data Analysis

Three Analysis of Variance (ANOVA) tests of significance were run. The first ANOVA test was run on third grade. The second ANOVA test was run on fourth grade. The third and final ANOVA was run on fifth grade. Each ANOVA consisted of one group of students that received

the computerized reading instruction and two groups that did not receive the instruction. Each test sought to determine if there is a difference in the Communication Arts composite MAP scores from 2011-2013, when considering students who have received the i-Ready reading intervention 2013 and students who have not received the intervention from 2011-2012. The ANOVA was the best test to run because it provides the capability to compare the means of two or more groups, (Kranzler & Moursund, 1999, p. 127). This study involved three test groups, so a T-Test would not have been sufficient. The ANOVA was able to compare all three groups in each test to determine if a significant difference existed.

Summary

Upon analysis of this research, these findings will be shared with the administration of our district. The data gathered will be thoughtfully reflected upon steps to ensure our district makes appropriate decisions regarding purchases of computerized reading instruction programs in the future. As the district moves forward, many computerized reading programs will be considered. If i-Ready is proven to make a positive impact on student achievement, the researchers will be able to make an informed recommendation to the district. Ultimately, this study will help to ensure that our district is moving forward and preparing our students for a successful future.

CHAPTER FOUR

FINDINGS AND RESULTS FROM DATA ANALYSIS

Results for Research Questions #1:

RQ_1: Is there a difference in third – fifth grade Communication Arts composite Missouri Assessment Program (MAP) scores from 2011-2013, when considering students who have received the i-Ready reading intervention 2013 and students who have not received the intervention from 2011-2012?

NH_1: There is no difference in third – fifth grade Communication Arts composite Missouri Assessment Program (MAP) scores from 2011-2013, when considering students who have received the i-Ready reading intervention 2013 and students who have not received the intervention from 2011-2012.

Researchers chose to run an Analysis of Variance (ANOVA) to determine if the iReady reading intervention made a difference in student MAP Communication Arts scores. The ANOVA enabled the researchers to compare three groups (Kranzler & Moursund, 1999, p. 127). The Three tests were run, one for each grade level that used the iReady intervention. Those results are summarized below.

ANOVA Results – Third Grade

Table 1

Summary of Descriptive Statistics for MAP Communication Arts Composite Scores for Third Grade over three school years

School Year	*n*	Mean	*SD*
2011	115	653.722	24.862
2012	141	655.610	28.748
2013	131	662.522	27.608

Table one gives a summary of descriptive statistics for the third grade MAP Communication Arts assessment. Group one consisted of students tested in 2011 who did not receive the computerized reading instruction, *i-Ready*. Group two consisted of students tested in 2012 who also did not receive the computerized reading instruction, *i-Ready*. Group three consisted of students tested in 2013 who did receive the computerized reading instruction, *i-Ready*. Group 1 consisted of 115 students and had a mean score of 653.722. Group 2 consisted of 141 students and had a mean score of 655.610. Group 3 consisted of 131 students and had a mean score of 662.522. The mean score of group 3 (students tested in 2013) was the highest, which may indicate that the intervention helped. The tables below provide deeper analysis regarding this topic. Figure 1 displays the mean communication arts MAP scores for third grade from 2011, 2012 and 2013. Figure 2 displays the standard deviation of the MAP scores for third grade from 2011, 2012, and 2013.

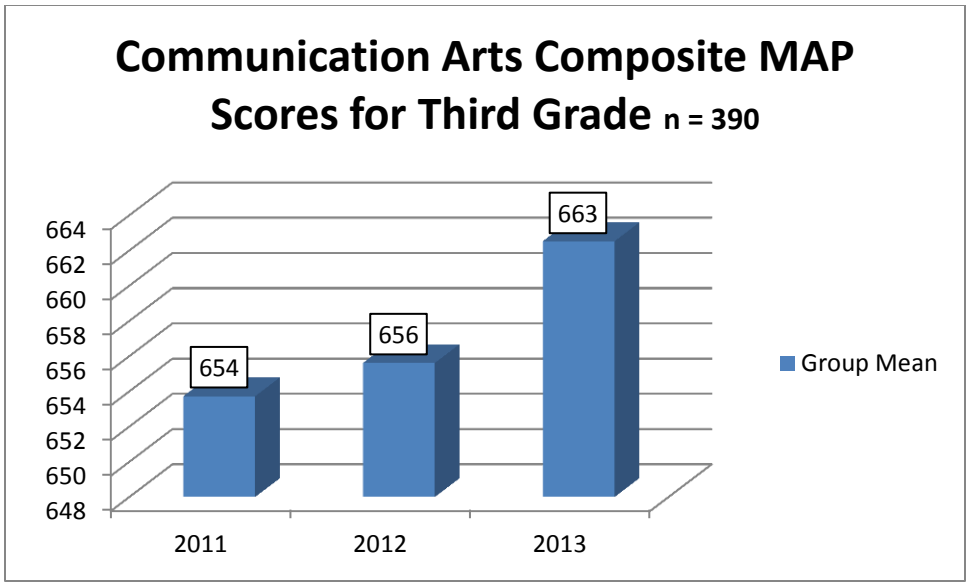

Figure 1: A chart displaying mean dependent variable (Communication Arts Composite MAP Scores for third grade) disaggregated by the testing year.

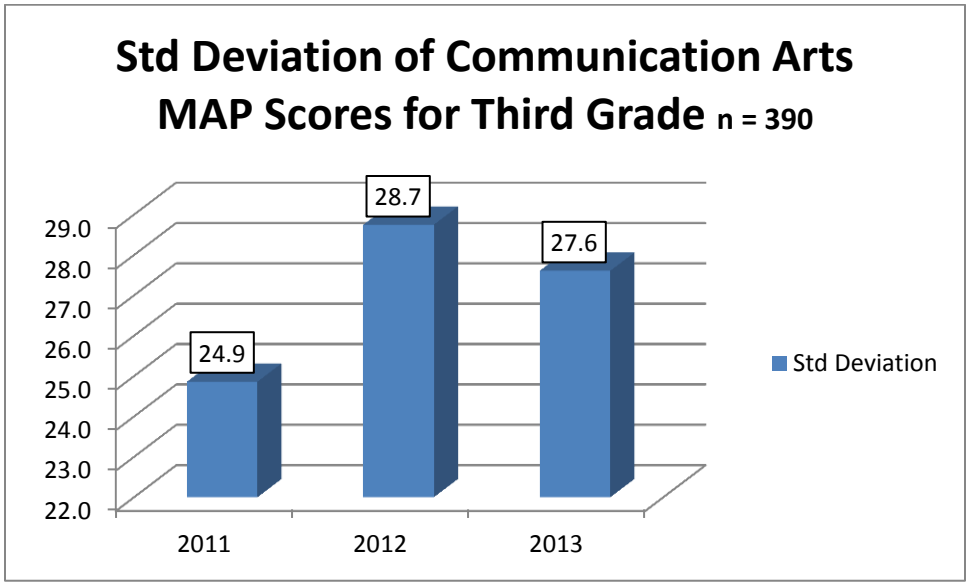

Figure 2: A chart displaying standard deviations (Communication Arts Composite MAP Scores for third grade) disaggregated by the testing year.

Table 2

Summary of ANOVA Test of Significance Results for Third Grade MAP Communication Arts Scores

Source	*SS*	*df*	*MS*	*F*	*p-value*
Testing Year	5523.42	2.00	2761.71		
MAP Comm Arts	287544.07	387.00	743.01	3.72	.025

Note: Significance = < 0.05

Table 2 contains a summary of ANOVA test of significance results for Third Grade MAP Communication Arts results. The independent variable was the year the test was given and whether or not the group received any i-Ready instruction.. 2011 and 2012 were years where no computerized reading intervention was executed. In 2013, the i-Ready reading intervention was utilized. The dependent variable was the MAP Communication Arts test. The sum of squares for the testing year was 5523.415 and the degrees of freedom was 2. The sum of squares for the MAP Communication Arts test scores was 287544.075 and the degrees of freedom was 387. The mean square for MAP Communication Arts was 743.008. The f value was 3.717 which indicated the variance of the group means. The alpha level was 0.05 and the p-value was 0.025. The null hypothesis was rejected because the p-value was less than the alpha level determined a priori by the researches. This states that there is a statistical significant difference. A post-hoc pair wise comparison analysis was done and was summarized on the next page.

Table 3

Summary Post Hoc Analysis Results for Third Grade MAP Communication Arts Scores Over Three Years

Year Tested	Year Tested	Mean *D*	Std. Error	*p-value*
2011	2012	1.888	0.001	0.579
2011	2013	8.801	0.027	0.009
2012	2013	6.912	0.015	0.043

Note: Significance = < 0.05

This table is a summary of the Post Hoc Analysis for the MAP Comm Arts score over three years. Group 1 represents third grade students who took the test in 2011. Group 2 represents students who took the test in 2012. Group 3 represents students who took the test in 2013 and received the i-Ready intervention. The first row summarized the comparison between group 1 and group 2. The mean difference between groups 1 and 2 was 1.888. The null hypothesis stated that there was no statistically significant difference in test scores for students in groups 1 and 2. The p-value was 0.570 and the alpha level was 0.05. The p-value was greater than the alpha level so the null was not rejected; there was no statistically significant difference in MAP Communication Arts scores for students tested in 2011 and 2012.

The second row summarized the comparison between group 1 and group 3. The mean difference between groups 1 and 3 was 8.801. The null hypothesis stated that there was no statistically significant difference in test scores for students in groups 1 and 3. The p-value was 0.009 and the alpha level was 0.05. The p-value was greater than the alpha level so the null was rejected; there was a statistically significant difference in MAP Communication Arts scores for students tested in 2011 and 2013.

The third row summarized the comparison between group 2 and group 3. The mean difference between groups 2 and 3 was 6.912. The null hypothesis stated that there was no statistically significant difference in test scores for students in groups 2 and 3. The p-value was 0.043 and the alpha level was 0.05. The p-value was greater than the alpha level so the null was rejected; there was a statistically significant difference in MAP Communication Arts scores for students tested in 2012 and 2013.

ANOVA Results – Fourth Grade

Table 4

Summary of Descriptive Statistics for MAP Communication Arts Composite scores for Fourth Grade over three school years

School Year	*N*	Mean	*SD*
2011	111	677.054	30.801
2012	118	683.898	28.947
2013	147	677.068	32.878

Table 1 gives a summary of descriptive statistics for the fourth grade MAP communication Arts assessment. Group one consisted of students tested in 2011 who did not receive the computerized reading instruction, *i-Ready*. Group consisted of students tested in 2012 who also did not receive the computerized reading instruction, *i-Ready*. Group three consisted of students tested in 2013 who received the computerized reading instruction, *i-Ready*. Group 1 consisted of 111 students and had a mean score of 677.054. Group 2 consisted of 118 students and had a mean score of 683.898. Group 3 consisted of 147 students and had a mean score of 677.068. See the following charts for Mean MAP Communication Arts scores for fourth grade and the standard deviations for each group. Figure 3 displays the mean communication arts MAP

scores for fourth grade from 2011, 2012 and 2013. Figure 4 displays the standard deviation of the MAP scores for fourth grade from 2011, 2012, 2013.

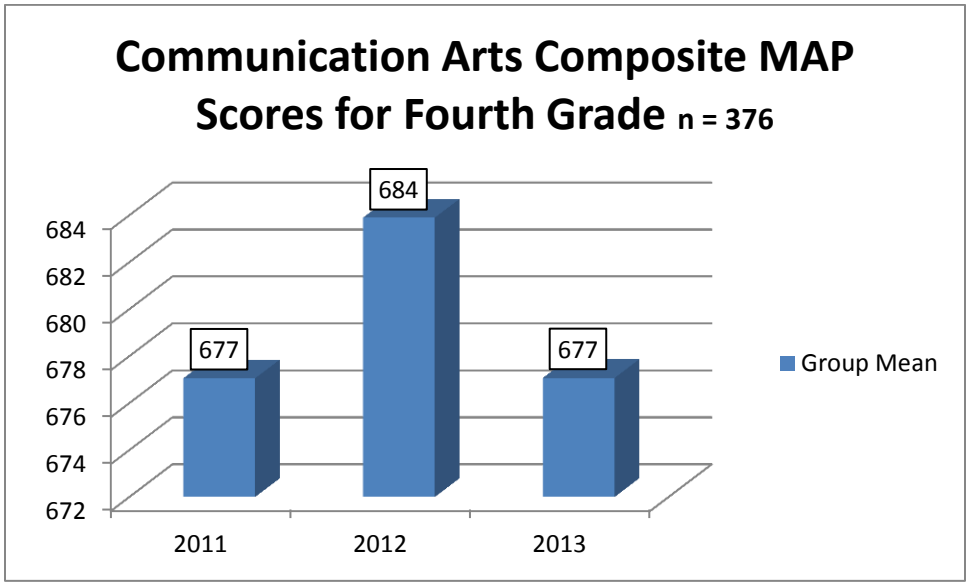

Figure 3: A chart displaying mean dependent variable (Communication Arts Composite MAP Scores for fourth grade) disaggregated by the testing year.

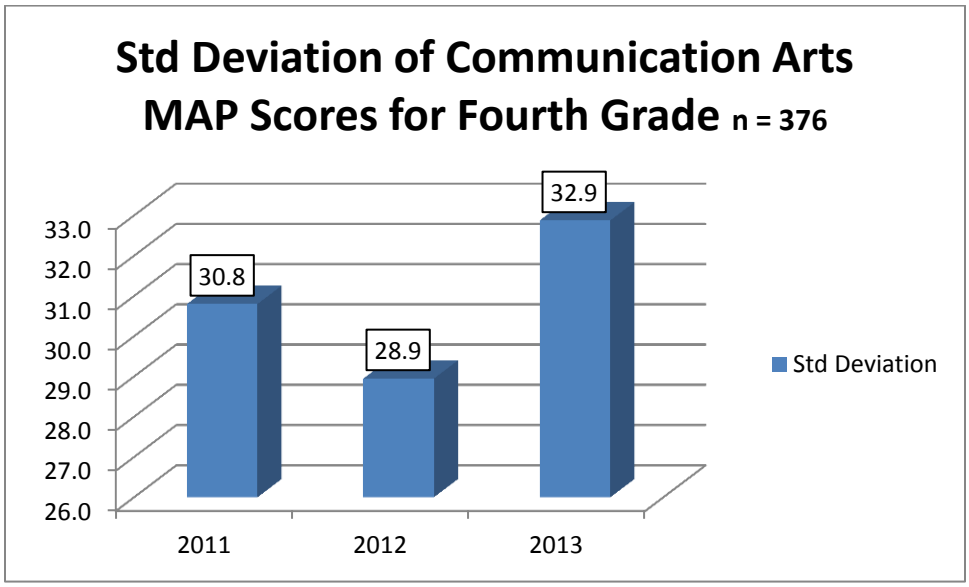

Figure 4: A chart displaying standard deviations (Communication Arts Composite MAP Scores for fourth grade) disaggregated by the testing year.

Table 5

Summary of ANOVA Test of Significance Results for MAP Communication Arts Composite scores for Fourth Grade over three school years

Source	*SS*	*df*	*MS*	*F*	*p-value*
Year Tested	3784.04	2.00	1892.02		
MAP Comm. Arts Score	360213.77	373.00	965.72	1.96	0.14

Note: Significance = < 0.05

Table 5 is a summary of ANOVA test of significance results for Fourth Grade MAP Communication Arts results. The independent variable was the year the test was given, and whether or not the group received any i-Ready instruction. 2011 and 2012 were years where no computerized reading intervention was executed. In 2013, the i-Ready intervention was utilized. The dependent variable was the MAP Communication Arts test scores. The sum of squares for the years tested was 3784.044 and the degrees of freedom was 2. The sum of squares for MAP Communication Arts test scores was 360213.775 and the degrees of freedom was 373. The mean square for MAP Communication Arts score was 965.721. The f value was 1.959 which indicated the variance of the group means. The alpha level was 0.05 and the p-value was 0.142. The p-value exceeded the alpha level; therefore the null hypothesis was not rejected. There was no statistically significant difference between groups of students who received i-Ready Intervention, and those who did not receive the intervention. A Post Hoc pair wise comparison analysis was not necessary.

ANOVA Results – Fifth Grade

Table 6

Summary of Descriptive Statistics for MAP Communication Arts Composite scores for Fifth Grade over three school years

Year Tested	*N*	Mean	*SD*
2011	96	696.177	28.266
2012	110	690.0882	29.744
2013	122	691.713	27.207

Table 6 gives a summary of descriptive statistics for the fourth grade MAP communication Arts assessment. Group one consisted of students tested in 2011 who did not receive the computerized reading instruction, *i-Ready.* Group consisted of students tested in 2012 who also did not receive the computerized reading instruction, *i-Ready.* Group three consisted of students tested in 2013 who did receive the computerized reading instruction, *i-Ready.* Group 1 consisted of 96 students and had a means core of 696.177. Group 2 consisted of 110 students and had a mean score of 690.0882. Group 3 consisted of 122 students and had a mean score of 691.713. See the following charts for the group means and standard deviations. Figure 5 displays the mean communication arts MAP scores for fourth grade from 2011, 2012 and 2013. Figure 6 displays the standard deviation of the MAP scores for fourth grade from 2011, 2012, 2013.

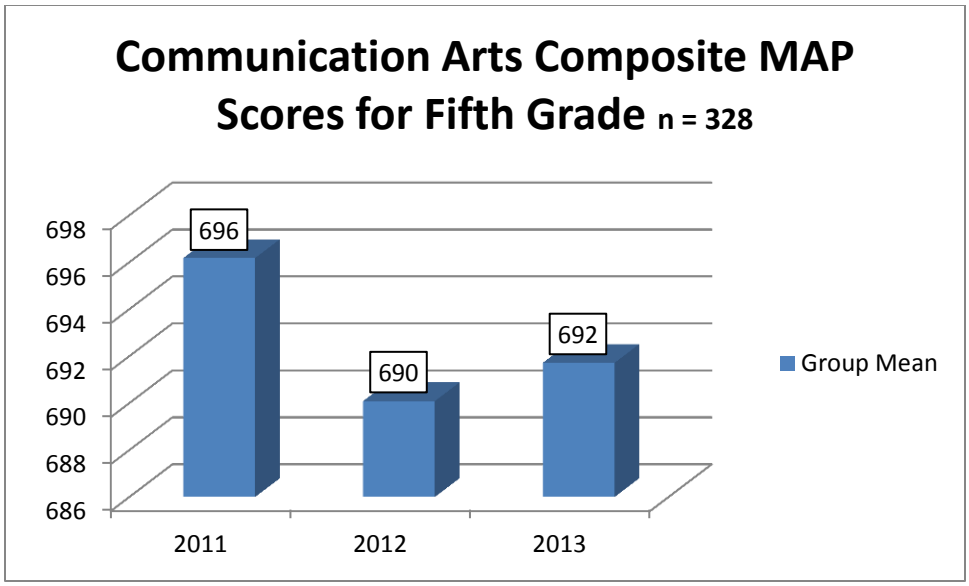

Figure 5: A chart displaying mean dependent variable (Communication Arts Composite MAP Scores for fifth grade) disaggregated by the testing year

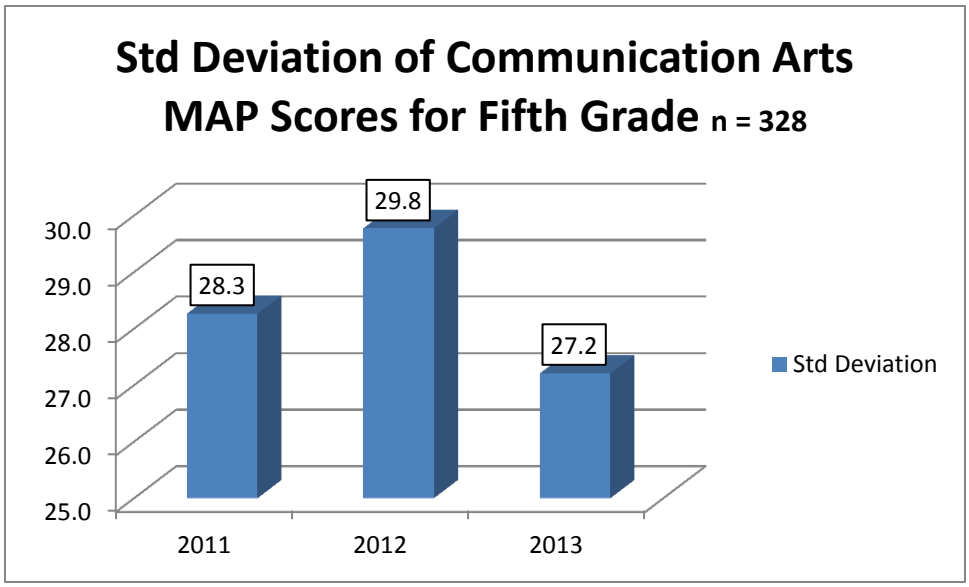

Figure 6: A chart displaying standard deviations (Communication Arts Composite MAP Scores for fifth grade) disaggregated by the testing year.

Table 7

Summary of ANOVA Test of Significance Results for MAP Communication Arts Composite scores for Fifth Grade over three school years

Source	*SS*	*df*	*MS*	*F*	*p-value*
Years Tested	2016.54	2.00	1008.27		
MAP Comm Arts Scores	262093.21	325.00	806.44	1.25	0.29

Note: Significance = < 0.05

This table is a summary of ANOVA test of significance results for Fourth Grade MAP Communication Arts results. The independent variable was the year the test was given, and whether or not the group received any i-Ready instruction. 2011 and 2012 were years where no computerized reading intervention was executed. In 2013, the i-Ready intervention was utilized. The dependent variable was the MAP Communication Arts test scores. The sum of square for the years tested was 2016.541 and the degrees of freedom was 2. The mean square for MAP Communication Arts test was 262093.212 and the degrees of freedom was 325. The f value was 1.250 and the p-value was 0.288. The p-value exceeded the alpha level, therefore the null hypothesis was not rejected. There was no statistically significant difference between groups of students who received i-Ready Intervention, and those who did not receive the intervention. A Post Hoc pair wise comparison analysis was not necessary.

CHAPTER FIVE

FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Overview

This field study was designed to provide information and analysis of a computerized reading intervention program to a Midwest suburban school district that is shifting to a one-to-one learning environment. i-Ready is a computerized reading program that diagnoses students' strengths and weaknesses then will prescribe a series of lessons to meet each students' individual needs. The overall purpose of this study was to determine if the i-Ready program made a difference in students' test scores.

Discussion of Findings, Conclusions and Recommendations

i-Ready is a diagnostic and instructional technology tool school districts can invest in for their students. The program utilizes video game type formats to capture the attention of students as it provides Communication Arts instruction. i-Ready has an extensive amount of information that is gleaned from the diagnostic component. Teachers and administrators can easily pinpoint the student's strengths and weaknesses in reading. Furthermore, i-Ready prescribes a set of lessons individualized for each student's needs (i-Ready, 2013). This customized series of lessons is aimed at closing the achievement gap assisting students to perform at grade-level. Another benefit of i-Ready is that it can instruct high achieving students at a level beyond their current grade level. i-Ready is a comprehensive instructional tool that meets every students needs and pushes them forward. From the case study connected in Ohio, the i-Ready program showed an increase in reading achievement, reported using national percentile rank (Educational Research Institute, 2012).

The Midwestern suburban district specifically used in this study began using the i-Ready reading program in the spring of 2013. The findings in this study do not indicate that the i-Ready program is effective in raising Communication Arts MAP test scores in all grade levels. Out of three grade levels studied, only third graders showed a statistically significant difference in MAP Communication Arts scores when the i-Ready intervention was used.

Additional research is needed before any conclusions can be recommended to district administration. This study compared one year of intervention data to two years of data without the intervention. The intervention did indicate improvement of third graders in a Midwest suburban school district who took the Communication Arts section of the MAP test. The researchers recommend the following:

1) The i-Ready intervention should continue to be implemented and studied.
    a. Students should spend equal amounts of time using the i-Ready program daily.
    b. Teachers need to ensure the fidelity of the program and student work.
2) Communication Arts MAP along with district assessment data should continue to be collected on an ongoing yearly basis and studied to determine if the i-Ready intervention raises student achievement in the area of reading.

Summary

At this time there is lack of research evaluating computerized reading instruction. This study was a first step toward understanding the impact of computerized reading instruction on student reading achievement. Third, fourth and fifth grade students were studied and only the third grade level had evidence supporting the notion that i-Ready makes a difference in MAP Communication Arts Composite scores. Because the third grade ANOVA results did show a statistically significant gain in test scores after i-Ready was implemented, the researchers

recommend this study be considered a pilot and continued. As this study is continued in the future, researchers should keep in mind the following ideas to improve the validity and reliability of subsequent studies:

1) Is i-Ready reading instruction being implemented with fidelity as evaluated by the following criteria:
    a. Protocols are standardized across all grade levels
        i. Time of day and number of minutes per day
        ii. Progress monitoring will have a set schedule
        iii. Integration into current reading curriculum is standard among all grade levels
    b. Appropriate technology for usage is consistently available
    c. Students in all grade levels spend an equal amount of time each week working through the i-Ready lessons
    d. Students complete progress monitoring assessments on a bi-weekly schedule and a diagnostic test monthly
2) Is i-Ready instruction integrated into the classroom reading instructional period and evaluated by the following criteria:
    a. Teachers use i-Ready to supplement reading instruction, not replace it
    b. All students participate in whole group lessons before participating in i-Ready instruction.

In the past, technology was seen as a special event in schools. Teachers would occasionally take classes to the computer lab for a thirty minute session playing math video games. There is a shift in the utilization of technology. Members of the school community are

using technology to create and consume information as well as collaborate with other professionals around the world. Students are also using technology to collect, analyze and synthesize information while collaborating in online environments with classmates (Schwarz, 2012). Furthermore, technology is becoming more prevalent in schools and it is the researchers' jobs to ensure that it is being utilized the best way possible (MacArthur, 2001). As more studies are conducted, educators will have a better understanding of the prolific impacts technology may have on our students. With the overwhelming saturation of products that will surely be thrown at educators in the years to come, studies like this one will need to be conducted to inform and justify decisions they are making with the public's dollars.

REFERENCES

Anonymous. (2002) Middle school language arts effectiveness reports: Why use computers in language arts? *Apple K-12 Effectiveness Reports.* Retrieved from http://www.apple.com/education/k12/leadership/effect7.html

Allington, R.L. (2006). What really matters for struggling readers: Designing research-based Programs (2nd ed.). Boston: Allyn & Bacon.

Arlington, R. (2002). The Six T's of Effective Elementary Literacy Instruction. *Reading Rockets*

Armbruster, B.B, Lehr, F., & Osburn, J. (2006). Put reading first: The research building blocks for teaching children to read. [On-Line serial].

Balajthy, E., Reuber, K., & Robinson, C. (2001, October). Teachers' use of technology in a reading clinic. Reading Online, 5(3). Retrieved, from http://www.readingonline.org

Blok, H., Oostdam, R., Otter, M.E., & Overmat,M. (2002). Computer-assisted instruction in support of beginning reading instruction. *Review of Educational Research*, 72(1), 101-131.

Castellani, J. (2001, May). Emerging reading and writing strategies using technology. *Teaching Exceptional Children*, *33*(5), 60-67.

Cleaver, S. (2012). Technology in the classroom: Helpful or harmful?. education.com, Retrieved from http://www.education.com/magizine/article

Coiro, J. (2003, Feb). Exploring literacy on the internet. *The Reading Teacher*, 56(5), 458-464.

Farrell, E. (2013). *10 lessons from the best district in the country*. Retrieved from http://www.scholastic.com/browse/article.jsp?id=3757944

Ferriter, W. M. (2010, October). Cell Phones as Teaching Tools. *Educational Leadership*, *68*(2),

Foorman, B.R. & Torgesen, J. (2001). Critical elements of classroom and small-group instruction promote reading success in all children. Learning Disabilities Research and Practice, 16 (4), 203-212

Greenlee-Moore, M. E., & Smith, L. L. (1996). Interactive computer software: The effects on young children's reading achievement. *Reading Psychology: An International Quarterly, 17*(1), 43-64.

I-ready diagnostic and instruction. (2013). Retrieved from http://www.curriculumassociates.com/products/iready/diagnostic-instruction.aspx

Kranzler, G., & Moursund, J. (1999). *Statistics for the terrified*. Upper Saddle River, N.J: Prentice Hall.

Lee, J. (2006). Tracking Achievement Gaps and Assessing the Impact of NCLB on the Gaps: An In-depth Look into National and State Reading.

MacArthur, C.A., Ferretti, R.P., Okolo, C.M., & Cavalier, A.R. (2001, Jan). Technology applications for students with literacy problems: A critical review. *The Elementary School Journal*, 101(3), 273-303.

McKenna, M.C., Reinking, D., Labbo, L.D., & Kieffer, R.D. (1999, Apr-Jun). The electronic transformation of literacy and its implications for the struggling reader. *Reading and Writing Quarterly*, 15(2), 111-127.

National Center for Technology Innovation. (2010). Using Technology To Support

Struggling Students. *Reading Rockets*, 1-4.

No Child Left Behind (NCLB) Act of 2001, Pub. L. No. 107-110, § 115, Stat. 1425 (2002).

Owens, R.F., Hester, J.L., & Teale, W.H. (2002, Apr). Where do you want to go today? Inquiry-based learning and technology integration. *The Reading Teacher*, 55(7), 616-625.

Robb, L. (2000). *Teaching reading in the middle school*. New York: Scholastic.

Sheehy, K. (2011, November 22). Rural Students Lost In Connectivity Gap. *US.News and World Report*.

Smolin, L.I., & Lawless, K.A. (2003, Oct). Becoming literate in the technological age: New responsibilities and tools for teachers. *The Reading Teacher*, 56(6), 570-577.

Song, S. H., & Keller, J. M. (2001). Effectiveness of motivationally adaptive computer-assisted instruction on the dynamic aspects of motivation.*Educational technology research and development*, *49*(2), 5-22.

SCHWARZ, A. Mooresville's shining example (it's not just about the laptops). *New York Times*. Retrieved from http://www.nytimes.com/2012/02/13/education/mooresville-school-district-a-laptop-success-story.html?_r=0&pagewanted=print

Technology literacy assessment project. (2009). Retrieved from http://www.coloradotechliteracy.org/org/documentation/index.htm

Trotter, A. (2009, January 21). Tech literacy confusion what should you measure. Digital Directions, 02(03), 20-22. Retrieved from www.edweek.org

Unknown. (2013, September 12). Educational technology catching on at last. The

Economist. Retrieved from www.economist.com/news/briefing

Wall, T. J., & Symonds, M. L. (2012). Preparing to pass the physical education praxis-ii examination: Increasing teacher candidate test-wiseness, self-efficacy and content knowledge in the era of accountability. *Journal of Assessment and Accountability in Educator Preparation*, *2*(1), 36-47. Retrieved from http://www.uni.edu/coe/jaaep/journals/PE PRAXIS-II 5-11-12 to pdf --tk really final.pdf

Watts-Taffe, S., Gwinn, C.B., Johnson, J.R., Horn, M.L. (2003, Oct). Preparing preservice teachers to integrate technology with the elementary literacy program. The Reading Teacher, 57(2), 130-138.