

iPad 2 APPLICATIONS AND EMERGENT LITERACY:  
DO THEY HAVE AN IMPACT ON THE ACQUISITION OF EARLY  
LITERACY SKILLS?

By

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## ABSTRACT

Within the walls of our schools lies the future of our society. The contributions and achievements of the next generations will determine the course of our country and the world. The responsibility for preparing and educating this population falls on our school systems and the teachers within them.

The demands and expectations placed on our educational systems are ever-changing. One of the most significant of these changes has been an increase in the level of accountability for the achievement and growth of every student. Teachers in the primary grades, working with our youngest students, are the first to see the disparity of skills and readiness they demonstrate. Charged with developing not only academic skills, but also social, emotional and interpersonal skills, this first experience to structured education lays a critical foundation.

Kindergarten is the time during which students begin to develop their knowledge base, as well as their perception of themselves as learners. Reading readiness and the acquisition of its component skills, form the scaffold upon which all later skills will be layered. Dr. Seuss said, “The more you read, the more things you will know. The more that you learn the more places you'll go” (Seuss, 1990). While it is clear that literacy skills are critical elements of early instruction, it is not clear in what format or with which approach, these skills are most appropriately taught. Additionally challenging in the instructional process is keeping students motivated and engaged in the learning process. Effective means by which to achieve these outcomes are also not universally accepted. Teacher education organizations, as well as researchers in the field identify the use of technology as a tool for thinking, decision-making and learning (Couse & Chen, 2010).

This study looks to examine the impact of the use of iPad 2 literacy based applications on the acquisition of emergent literacy skills in the areas of phonemic awareness and alphabetic

principle. iPad use occurs for kindergarten students in a learning center structure for 30 minute periods twice each week. Students progress in their development of these skills through an independent learning center format. Centers are designed around identified literacy applications that reinforce skills presented through core instruction. Achievement data is to be collected using the kindergarten level Dibels Next measure. Data from students in the intervention and control groups will be examined to determine the impact of the use of technology. Specific demographic student information will be analyzed to explore if there are trends or characteristics that may be correlated to achievement and/or growth. Student information gathered at the time of assignment will include gender, district demographic, socio economic status and baseline score from the initial benchmark DIBELS assessment. Additional information will be explored in relation to the kindergarten teachers who are part of the study. Both age and teaching experience with kindergarten students will be examined as potential variables in the degree of both achievement and growth. iPad 2 applications that are used as part of the remediation process, including their order and frequency, will be the final variable considered in relationship to the achievement and growth experienced by the students in the intervention group.

*Keywords:* iPad2, DIBELS Next, Digital Native, Learning Centers, No Child Left Behind Act of 2001, Urban Area, Suburban Area, Rural Area, Nonsense Word Fluency, First Sound Fluency, Phoneme Segmentation Fluency.

## Dedication

This project is dedicated to my parents, Charles and Carol Cubelic who taught me the importance of hard work and the value of learning. To my mother, your strength and independence has always encouraged me to be my own person and follow my own path. To my father, you are to me, an inspiration and mentor. The profound impression and influence you have had on the person I am today is beyond explanation. You have shared this journey with me, day in and day out, and I celebrate this accomplishment with you by my side.

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## TABLE OF CONTENTS

### Chapter 1

Introduction.....	1
Statement of the Problem.....	3
Purpose of the Study.....	8
Significance of the Study.....	9
Limitations.....	14
Delimitations.....	15

### Chapter 2

Early Childhood Education.....	17
Historical Foundation.....	18
Kindergarten.....	20
Developmentally Appropriate Practice.....	22
Engagement and Motivation.....	27
Literacy.....	30
Emergent Literacy.....	31
Historical Perspective.....	34
Curriculum.....	37
Instruction.....	40
Technology in Schools.....	43
Integration Challenges.....	49

### Chapter 3

Design of the Study.....	51
Population and Sample.....	51
Experimental Treatment.....	52
Instrumentation.....	53
Reliability.....	57
Validity.....	58
Procedures.....	59
Staff Training.....	60
Administration.....	64
Data Collection.....	65
Data Analysis.....	65



## Chapter 4

Introduction.....	67
Demographics.....	68
Meta-Analysis.....	76
Post Meta-Analysis.....	86

## Chapter 5

Introduction.....	90
Summary of Findings.....	91
Limitations.....	102
Conclusions.....	104
Recommendations for Future Research.....	104

References.....	107
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## Appendices

Appendix A - Institutional Review Board.....	121
Appendix B – Teacher Survey Questionnaire.....	122
Appendix C – DIBELS Student Assessment Booklet.....	124

## Chapter 1

Shortly after taking office in January, 2001, President George W. Bush announced, as a framework for educational reform, the No Child Left Behind Act. Framed as the “cornerstone of his administration,” Bush called for bipartisan support of this reauthorization of the Elementary and Secondary Education Act (USDE, 2002). The No Child Left Behind Act (NCLB) (2000) is based on five core principles: 1. strong accountability for results, 2. expanded flexibility and local control of schools, 3. an emphasis on teaching methods based on scientific research, 4. expanded options for parents, particularly those whose children attend low-performing schools, and, 5. highly qualified teachers. The act and its subsequent benchmarks of Adequate Yearly Progress (AYP) have established accountability measures that require each state to set test scores with increasing levels of expected proficiency. Schools that are unsuccessful in their efforts to reach them face incrementally challenging sanctions and consequences established by the state. In their quest to meet the prescribed expectations, schools must be diligent in their pursuit of quality programs and effective implementation processes. A system of continuous monitoring and analysis of curriculum, instruction and assessment practices is necessary to provide educational opportunities for all students. The ultimate goal of NCLB is to bring all students, regardless of specific demographics, to a level of “proficiency” on established state assessment measures by the end of the 2013 – 2014 school year (Plucker, Spradlin, Cline, & Wolf, 2005).

With its defining features of increased achievement and accountability, NCLB has been highly controversial over the decade since its inception (Smydo, 2006). Standardized assessments and their set measures of achievement are aspects of the Act

that are discussed in board rooms and lamented by teachers and faculty rooms across the country. Another strong goal is an increased focus on reading. NCLB calls very specifically for a stronger emphasis, specifically for our youngest children (USDE, 2002). As a result of this direction, the bar has been raised for the literacy instruction American classrooms, which in turn created a set of increased expectations for achievement. Federally mandated tests beginning in grade three have significantly altered the look and feel of early education. Kindergarten is no longer a time of discovery through dramatic play and arts and crafts (Pappano, 2010). The pressures of accountability under NCLB have found their way into kindergarten programs where the direction has shifted to focus solidly on developing academic skills, specifically, around explicit literacy instruction. A massive restructuring of our educational system, including the development of revised academic standards and the teacher training and professional development to implement them has occurred (Smydo, 2006). The effect of these reforms has had a clear impact on instruction in the primary grades. Students come into the school environment with a wide range of developmental levels. Differences in the early years are present in physical, emotional and academic development (Green, 2007). Delivering quality instruction in early literacy to young children that leads to reading achievement is a goal shared by many educators. It is clear that establishing the foundation for future achievement occurs in the early years of school. With the kindergarten experience serving as the first exposure for most students to formal education, its place on that instructional continuum is critical (Whitehome, 2006). Developing strong early literacy skills at the kindergarten level establishes that critical foundation for future success.

## **Statement of the Problem**

"A world-class education is the single most important factor in determining not just whether our kids can compete for the best jobs but whether America can out-compete countries around the world. America's business leaders understand that when it comes to education, we need to up our game. That's why we're working together to put an outstanding education within reach for every child" (OBAMA, JULY 18, 2011).

The Partnership for 21<sup>st</sup> Century Skills has identified four areas, critical thinking, communication, collaboration and creativity and innovation, that, when joined with the 3Rs of traditional education will produce college and career ready graduates (Partnership for 21<sup>st</sup> Century Skills, 2010). After a full decade into the 21<sup>st</sup> Century, our educational systems have slowly begun to embrace the skills "millenials" will require to successfully compete in a global market.

The new millennium was ushered in by a dramatic technological revolution. We now live in an increasingly diverse, globalized, and complex, media-saturated society. According to Dr. Douglas Kellner at UCLA this technological revolution will have a greater impact on society than the transition from an oral to a print culture (21<sup>st</sup> Century Skills, 2010).

"Experts suggest that the use of personal technology devices and the use of tablets and iPads can increase motivation, organizational skills, independence, active learning and self-directed learning" (Harmon, 2011).

The 2006 Classrooms for the Future Grant, sponsored by the Pennsylvania Department of Education (PDE), was an initial step on the road to school reform.

Designed to improve teaching and learning, specifically at the high school level, this sweeping implementation, supported by sustained professional development, set the tone for the role technology would play in 21<sup>st</sup> century schools (Ziegler, 2010). School districts across the Commonwealth were able to apply for funds to establish cutting edge labs and technology rich classrooms that promoted inquiry, and project-based learning (Ziegler, 2010). Two hundred million dollars were allocated for use over a three year period on technology intended to enhance and extend traditional instruction in 21<sup>st</sup> century skills and in core academic content. This infusion of resources made a significant impact on the availability and use of technology in secondary education (PDE, 2008). The tools and technology that produce this type of learning response also need to be accessible to our youngest learners. Although their proximity to the college and career readiness goals of the 21<sup>st</sup> Century Partnership is more distant, their inquisitive and curious nature is a perfect fit for the intuitive structure of technology based instruction. Currently the focus of both excitement and controversy in the world of education, some insist the iPad signals the demise of traditional textbooks and instruction (Harmon, 2011). Can these iPads be used effectively in the instruction of our youngest learners?

An extensive review of the literature provides evidence of wide spread interest in the use of technology as a tool for instruction. Despite mixed results, a meta-analysis of computer-assisted instruction supports favorable outcomes (Schmid, Miodrag, & Francesco, 2008). Increased motivation and engagement are cited as positive outcomes of technology use, often leading to better performance. According to Cassady and Smith (2009), the research on education technology and literacy development has not been compelling. They further contend that the programs that include performance gains only

do so as long as enriching content is available (p. 950). In times of shrinking budgets and dwindling resources, decision makers will need hard evidence to support increasing technology. The instructional impact of these costly resources needs further investigation and data if they are to withstand the budget scrutiny.

Former Governor of Maine, Angus King, launched the state's first technology integration wave some ten years ago (Multiple Pathways, 2012). Now a proponent of the Kindergarten Project undertaken in Auburn, Maine, which put 300 iPads in the hands of five and six-year olds, King is thrilled. "If your students are engaged, you can teach them anything. These devices are amazing" (Multiple Pathways, 2012). Computer-assisted instruction in an early childhood setting has proven successful due to its interactive construct. Visual appeal, attractive interfaces and immediate feedback are positive components of its design (Schmid et al., 2008). The 10" screen that renders content beautifully and the large touch interface make the iPad a great fit for kindergarten age students (Roscorla, 2011). The literature failed however, to provide studies showing definitive, quantitative evidence of the impact of technology as an instructional tool on student growth or achievement. As of 2009, no research had conducted rigorous studies on the effect of iPad use on the learning for the increasingly diverse group of students entering public schools (Harmon, 2011).

As the proportion of diverse learners in America's schools – children of poverty, students with disabilities, students for whom English is a second language - has grown dramatically, efficacy has become an increasingly important teacher trait (Hodgkinson, 1991, 1992). There is also a greater expectation for districts to provide children with varying abilities and needs, core instruction within in the general education classroom

setting. Estimates of the range of instructional levels in general education already are high, with more than five grade levels of difference per classroom in some schools (Jenkins, Jewell, Leceister, Jenkins, & Troutner, 1991). Thus, it has become vital that the teachers in these settings attend to the diverse learning needs of all students if there is going to be any chance of increasing student achievement. Effective, high quality instruction has the greatest potential to impact the achievement of not only diverse learners, but all learners. The quality of instruction is heavily influenced by the instructional tools and materials available to teachers and the “architectural design” of the curriculum (Simmons, Kame’enui, & Chard, 1998). This factor alone substantiates the need to explore instructional tools to impact student achievement. One such tool that has great potential to support learning is the iPad. With its colorful interface, vibrant graphics and touch screen, it is particularly appealing to young children. The level of engagement that it can support through interactive and highly intuitive content can significantly impact our youngest learners.

“Early childhood is the period of life from birth through age 8 years when growth and development are rapid.” (Couse & Chen, 2010). The need to provide effective instruction is even more critical when working within the realm of early childhood. Kindergarten students enter the school setting with a range of developmental levels, as well as varied skill sets. “Each child will have varying literacy experiences, depending on the home environment, parents’ education level, parents’ degree of involvement and modeling of reading behaviors, child care experiences and individual cognitive and language capacity” (Stegelin, 2002). Educators are charged with establishing equity within their program for all students. The Center for Applied Special Technology

(CAST) was developed to explore ways to provide better educational experiences to students with disabilities (CAST, 1984). Their work led to an understanding of the importance of an approach that uses flexible methods and materials to enable these experiences. The Universal Design for Learning approach seeks to achieve this equity and experience for all learners through three guiding principles:

1. Multiple methods of *representation* that give learners a variety of ways to acquire information and build knowledge;
2. Multiple means of student action and *expression* that provide learners alternatives for demonstrating what they have learned;
3. Multiple modes of student *engagement* that tap into learners' interests, challenge them appropriately, and motivate them to learn (Colorado State University, 2010).

Though there are varying levels of development, literacy and experiences, the use of technology as a scaffold to instruction enables us give all kids access to the same information in a way that meets each of their needs.

Kindergarten is the beginning of formal education for many children. Although some may have attended preschool or a childcare center, their exposure to structured schooling and explicit literacy instruction is just starting. Classified as “emergent” readers, these young students, if exposed to a dynamic, literacy rich environment, will likely make rapid growth. (NCREL, 2009). According to Slavin, Karweit, and Wasik (1994), “success in the early grades does not guarantee success throughout the school years and beyond, but failure in the early grades does virtually guarantee failure in later schooling” (p. 3–4).



Establishing a positive attitude and disposition with literacy impacts the future of the child's educational experience (Stegelin, 2002). Children born during the 21<sup>st</sup> century are being raised in a fast paced environment that is immersed in technology. From automated home appliances to high-tech gadgets and toys, the exposure is widespread. Schools can no longer ignore this fact. Students raised in this period of rapid technology growth need something other than the traditional print-based approach. Teachers need an alternative way to capture their attention (Harvey-Woodall, 2009). Incorporating and embracing technology as a tool integral to the learning process is necessary if teachers are to connect with these students. How can teachers adapt their instruction to respond to the learning styles of these digital natives?

### **Purpose of the Study**

The objective of this quasi-experimental research study will be to examine the relationship between achievement scores of kindergarten students who received supplemental literacy instruction using iPad 2 applications and those students who did not. iPad applications, selected by the kindergarten teachers in the study were chosen through a search of iTunes based on their alignment to the identified early literacy skills. The project will seek to determine whether the structured use of these applications, on a weekly basis, in a learning center arrangement, for 60 minutes, had an effect on the achievement of the students using them in the areas of phonemic awareness and alphabetic principle, specifically, through the analysis of Dibels Next assessment data.

Specific Research Question:

1. Does the use of iPad applications which present literacy skills in an engaging and visual manner, impact the early literacy achievement of kindergarten students as

measured by the Phonemic Awareness and Alphabetic Principle components of the Dibels *next* assessment?

2. Is there added learning value to the use of iPad applications for acquiring the early literacy skills of phonemic awareness and alphabetic principle?
3. Does that achievement and/or growth data suggest that there is an advantage in the use of iPad 2 applications for specific student group or student profile?

### **Significance of the Study**

Although kindergarten is listed as the initial descriptor in the commonly referenced K-12 continuum, the reality is quite different. Kindergarten, does not meet the compulsory requirement for attendance in Pennsylvania, which begins at age eight (PDE, 2012). As a result, it does not receive the same level of standing, in terms of either support or funding, that is given to grades one through twelve. Disparity exists both nationally and locally regarding kindergarten attendance and the value of both half and full day programs. Currently only 16 states require students to attend any Kindergarten program. Six states, including Pennsylvania, do not have compulsory attendance nor do they require school districts to even offer kindergarten programs (Kaurez, 2010). This inconsistent and very loose commitment to early childhood education is often exacerbated when budgets are cut and funding is scarce. This was the case in the spring of 2011, when Governor Tom Corbett released his preliminary budget. The budget proposed significant cuts in basic education funding, with more than \$260 million to Pre K and full day Kindergarten programming. Districts across Pennsylvania had made clear strides in their commitment to early childhood education in recent years. The introduction of Accountability Block Grant funds in 2004 gave districts additional

discretionary funds. By 2011 more than 350 districts had used ABG funds to support an increase from half day to full day Kindergarten. The elimination of these funds would reduce that program and its associated benefit for more than 50,000 students statewide (PDE, 2011). The current focus on increased accountability and the need to raise achievement at all levels makes the prospect of early learning even more daunting. School districts have had to make tough decisions with regard to how best service their population. Facing increasing public criticism and scrutiny after several years of Corrective Action as a result of failing to make Adequate Yearly Progress, the Pittsburgh Public Schools took bold action. They decided to turn their school improvement focus to their early childhood programming in an attempt to try to impact their youngest learners. In 2006, the district made a significant investment in the remodeling and repurposing of nine of its buildings. These would serve as student Achievement Centers. These centers were strategically placed in some of the city's most disadvantaged neighborhoods and targeted the early childhood level, housing only grades Pre K – 3. Intended to fully immerse these students, the curriculum design of the centers included 2.5 hours of structured literacy instruction each day (Smydo, 2006).

In addition to academic and achievement challenges, American education faces an equally challenging prospect in the form of funding. Pennsylvania Governor Tom Corbett's budget for the 2011-2012 fiscal year included cuts for K-12 education in excess of \$860 million. These cuts were realized by districts as larger classes, fewer teachers and instructional aides, losses in remedial and tutoring programs, as well as the elimination of early learning programs. The greatest impact of these cuts was felt by the poorest districts where the student population had less potential access to resources to fill

the gaps created by these cuts (Wertheimer, 2012). An additional principle of the No Child Left Behind Act provides for greater choice for parents whose children attend a failing school (USDE, 2002). This provision adds increased pressure to districts that face the possibility of losing students and the funding that is provided to educate them as a result of inadequate achievement.

The simultaneous decline of state and local school funding sources, combined with the elimination at the federal level of both the American Recovery and Reinvestment Act (ARRA) and Ed Jobs Program, created the most significant budget challenge for public schools in decades (PASBO/PASA, 2011).

As a result of limited funds and increasing demands, the need for districts to make strategic decisions regarding instructional strategies and resources is critical. With its design to serve as an instructional resource, this study looks to investigate the use of iPad applications for developing early literacy skills in kindergarten and the potential impact they have on student achievement. The collection of achievement data will show the impact of technology integration on the acquisition of emergent literacy skills. This study will generate specific information that districts can use as part of the decision making process.

The educational reform movement has begun to shift its parameters and look at the concept of development more broadly. Systemic frameworks that are focused on achieving 21<sup>st</sup> century outcomes have begun to look at Pre K as the designated starting point on the educational continuum (Kaurez, 2010). Additionally, the national literacy initiative, titled, The Striving Readers Grant, designed around a birth to grade 12

developmental span, clearly illustrates the importance of early childhood on future development and academic success (Striving Readers, 2012). Recognizing the critical importance of developing proficiency with early literacy, focus then turns to choosing the process or approach to most efficiently and effectively facilitates this learning. While no single strategy or approach is universally accepted, commonalities do exist in the aspects that comprise a successful environment including authentic literature, text rich resources, well-developed centers, opportunities for students to collaborate and active engagement. A study conducted by the United States Army on innovative instruction states, to be effective, strategies must be focused on active student thinking that taps into areas of strength. The use of an innovative instructional approach, like the use of iPad in developing early literacy skills, provides a way to present material that is likely to increase student engagement and attentiveness (Rushkin & Kronheim, 1990).

Providing sound and meaningful instruction to five and six-year old learners is not a new challenge. The Gaskins settlement of 2005 was a class action lawsuit involving 12 plaintiffs who sued the Pennsylvania of Education for violating federal laws around Least Restrictive Environment. This judgment resulted in increased efforts and expectations for school districts to focus on including in the regular education setting, students with special needs. “A full range of supplementary aids and services” are to be considered in attempting to achieve this placement (Kids Together Inc., 2012). This movement has created significantly more diversity in kindergarten classrooms, and increases the complexity of instruction.

Students enter our kindergarten classes with vastly disparate skills and life experiences that impact the level of confidence and readiness with which they approach

the learning process. The ability for teachers to establish instructional models that meet the needs of all of their students requires a paradigm shift. Traditional direct instruction with reinforcement tasks completed with paper and pencil will not engage today's learner. The world into which these students were born is information rich, filled with visual images and opportunities for instant feedback. In response to this generation, schools are shifting their focus from traditional paper and pencil instructional approaches to more dynamic and active, computer-based learning. By matching applications to learning styles, students have the potential to experience significant increases in creativity, critical thinking and analysis (Schmid et al., 2008). Universal Design for Learning addresses diversity among students, including varied life experiences, language backgrounds, learning styles, abilities and disabilities. It also recognizes technology's ever-growing role in education—a role that is often critical for students with disabilities. With its goal to proactively design instruction and instructional approaches that avoid learning problems before they are internalized, the use of technology can be a powerful tool in meeting the needs of each learner.

The significance of this study is its focus on the impact of one such supplemental instructional approach on the early literacy skill development of kindergarten students. The research will detail the frequency and specific use of skill-based iPad 2 applications geared toward the acquisition of phonemic awareness and alphabetic principle skills as measured by the DIBELS Next kindergarten assessment. To date, few formal studies have been conducted in educational settings that specifically target the early literacy skills outlined here. Currently, a number of studies are looking at the use of tablets and technology integration. This study will be the first to provide valuable insight into the

potential use of this technology with kindergarten students to improve, extend and support direct instruction in these areas.

### **Limitations**

The study focuses solely on the use of iPad 2 applications related to early literacy. The use of iPads is restricted to eight kindergarten classrooms. Sets of four iPads will be used by students in a rotating learning center format. Classroom teachers that are actively involved in the study with their class are those that volunteered to participate. As a result of the design of the study and the selection of participants in the intervention class, confidence that the findings suggest the iPad applications are responsible for any achievement or growth is likely limited by:

- The non-random assignment as a potential problem;
- Additional information relative to student and teacher demographic information to be examined;
- Availability of little information to inform the researcher about student use of technology, specifically iPad use, prior to the period of intervention;
- It is likely, that due to the demographics of the study, including predominantly low socioeconomic status and the urban and rural nature of the participants, the limitation is minimized.

Statistical Regression is another potential limitation of the study. While all of the classes that are involved, both intervention and control, are classified as general education classes, there does exist potential of a greater preponderance of students with special needs in some of these classes.

The ability to extend the study to academic areas outside of literacy would require additional training for the participating teachers. District administrators may be reluctant to provide the necessary release time that training would require. The ability to provide more than the 32 iPads included in the study could potentially be a significant financial investment and may have made the project cost prohibitive.

### **Delimitations**

Baseline data that is gathered during the initial assessment in September will help to establish a relative starting point from which to measure both growth and achievement. Design contamination or demoralization of participants in the control group is possible. The degree of resentment or jealousy over non-participation in the iPad group is greatly diminished by the geographic spread of these schools and should protect from this issue. The impact of resentment on the part of the control teachers who did not get iPads is also a consideration. This is addressed through the training process, which encourages the control teachers to attend and learn the applications and strategies. In an attempt to limit the resentment or jealousy between teachers, the results of the assessments will not be shared with the control group teachers until the study is concluded.

The selection process for participating schools is guided by the responses provided on the interest questionnaire, including the existence of a full day kindergarten program with instruction provided through embedded learning centers. The ultimate selection of the intervention teachers however, was completely voluntary. The teachers that volunteered have an interest in the study of student achievement and the use of iPads for instruction.



Students in the intervention classes, as well as the control classes were heterogeneously grouped. They were placed in classes through district-level procedures aimed at establishing classes that were relatively similar in terms of ability, need, chronological age and gender. As a result, their achievement and growth were representative of a typical kindergarten population. This will allow the results of this study to generalize to a similar technology implementation in similar public schools.

Criteria for participation in the study were framed by the responses to an interest questionnaire distributed to all 27 districts that are part of the Midwestern Intermediate Unit. These districts originated in Butler, Lawrence and Mercer counties and were quite diverse in their size and population demographics. These demographic differences may cause disparity in the resources and technology found in the homes. Parents were notified of the study and the use of iPad 2 applications for reinforcement of early literacy skills. Although the specific applications were not formally shared by the teachers, there was nothing preventing the students from sharing them. It is not possible to know if there was additional iPad use by students outside of the school setting.

For inclusion in the study, districts were required to have multiple kindergarten classes and they had to be full day programs. Classes were required to have an existing learning center structure and the intervention teacher had to commit to a thorough training and ongoing collaboration. Finally, participating schools were required to agree to administer the DIBELS Next assessment to both the intervention and control group students at three designated times over the course of the school year.

## Chapter 2

### Literature Review

#### Early Childhood Education

Coined as a broad descriptor since the early years of children's programming, early childhood education refers to the development of young people from birth through age eight. The wide span of age and development encompassed in this definition is commensurate with the variation in interpretations that its meaning has in the field. During the early education years, Kaurez (2009) identifies three types of skills and knowledge that children acquire:

- Foundational cognitive skills including literacy and numeracy;
- Social and emotional competence to interact constructively;
- Patterns of engagement in school and learning.

Over the last decade there has been significant attention devoted to research and investigation of the subject of early education (Brendekamp, Knuth, Kunesh, & Shulman, 1992). Educators and students in the United States face reform measures that include required curriculum mandates and accountability measures (Spencer, 2011).

Represented by the National Association for the Education of Young Children, early childhood educators entered the forum on educational debate by issuing a series of position statements on developmentally appropriate practices for the education of young children (Brendekamp, 1987). Committed to the development of early learning, this organization spoke out on the emphasis of drill and practice and the focus on isolated skill acquisition. They encouraged the inclusion of relevant, meaningful learning

activities that are interactive and hands-on and produce opportunities for exploration and critical thinking that are critical in the development of young children (p.2).

### **Historical Foundation**

Early childhood education has a rich and complex background. Educators, philosophers and psychologists have conducted research for centuries on the dynamics and strategies associated with early learning. English philosopher John Locke was a pioneer in the field of learning theory in the 17<sup>th</sup> Century. His philosophical framework was embraced and extended by the curricular and structural work of Fredric Froebel, Marie Montessori, and John Dewey. More recent theorists contributing on the topic include Sigmund Freud, Jean Piaget and Eric Erickson. This research and study produced a wide array of theories. Piaget was the early pioneer who conducted studies on the value of employing different teaching styles. One style he studied very closely was that of Mary Montessori, who believed that it is the child that leads the learning through the realization of his or her strengths and interests (Lipoff, 2012). Despite obvious differences in specific ideals and the best instructional approach, these theorists support a common belief that early childhood programs must focus on maturity needs, and the abilities and interests of the child (Elkin, 2009). The value and relevance of this early research is evident by its presence in current day practice, specifically with regard to the prevalence of differentiated instruction.

Formalized early childhood education began at the start of the 19<sup>th</sup> Century with the first nursery school opening in 1816. Established as a service available for cotton mill workers in England, the loosely framed day care design gave way to the growth of more structured programs until 1870, when five-year old programming became

mandatory. Throughout the next thirty years, similar programs were implemented in other parts of the world, notably the first Montessori School in 1907.

This time period marked the Industrial Revolution in the United States. This era of dramatic change and advancement also marked the entrance of women into the previously male-dominated workforce. It was an effort to support working parents, especially women, which served as the impetus for the initiation of early childhood education. The legislative provision, created in Wisconsin and then further amended in 1873, provided for a free education for all children ages four through 20 and for the start of kindergarten programming. Advocacy groups and organizations with a vested interest worked to further the cause of early childhood education. One significant group was the National Association for the Education of Young Children. Initiated in 1926, the mission of this organization stated that it was “created and dedicated to improve the well-being and education of children birth to age eight” (Lipoff, 2009). Later programs were formed and had specific goals for early learning including Head Start, which was launched in 1960 and designed to support low income families. The organization’s name gave the impression that in the “early childhood race,” these children would have an advantage over their peers. The competitive human element, and the promise of a better finish, created increased interest in Head Start programs by middle income families. This level of interest significantly raised the overall profile of early childhood education.

Sells (2011) reported that the effects of early childhood education programs have resulted in reduced delinquency, welfare dependency, as well as fewer drop outs and arrests. He further stated that it has significantly contributed to the establishment of productive citizenry.

## **Kindergarten**

The word kindergarten comes from German, meaning “children’s garden” (Adams, Foorman, Lundberg, & Beeler, 1989). This definition clearly defines the intent of kindergarten as a place where young children “grow and blossom.” Started by Fredrick Froebel, the first kindergarten was founded in Germany in 1837. The Osh Kosh Normal School, the first kindergarten in the United States, opened many years later in Philadelphia. For those families that chose to send their children, kindergarten long served as the first year of formal schooling. It was seen primarily as the point of transition between the home setting and school. A number of variables had an impact on the decision of whether to send a child to kindergarten. The level of parent education, age of the child and, the issue considered most recently, whether the mother was employed outside of the home, were often considerations. Over the past 30 years the kindergarten dynamic has changed dramatically. In 2000 more than 95% of school age children attended kindergarten, an increase from about 50% in 1950. Preschool attendance during the same period had risen as well, from about 16% in 1970 to more than 60% in 2000 (Graue, 2009). With more and more students in formal schooling at young ages, the discussion inevitably turned to the scope and content of these early learning environments. Frequent questions and discussion points included the structure and level of academic focus that should be in place these classrooms. What was the role of discovery and traditional play in these classrooms? Are the kindergarten children of the 21<sup>st</sup> Century more developmentally ready to handle higher level concepts and more demanding expectations than their predecessors were? These are several of the issues

that the literature shows are heavily debated by educators and early childhood psychologists.

Initially conceptualized as a half-day, play-based program, many believe that societal and educational changes have caused a shift in thinking about the framework of kindergarten. Kaurez (2009) notes that the influence of several major initiatives including Race To The Top, the adoption of the Common Core Standards and the reauthorization of the Elementary and Secondary Education Act have greatly impacted education. All of these have prompted our reform efforts to also look closely at early childhood learning and its role as the foundation for future learning. This increased focus has resulted in a call for real change. Greater expectations and philosophical and developmental perspectives create differences of opinion. Considerable debate exists on the topic of kindergarten, not only the length of the day, but also the content of the curriculum. Advocates for increased time address the need for more structure and intentionality to address academic demands. Social development and interactive play, once the hallmark of kindergarten classrooms, are now seen as a repeat of preschool and a waste of precious learning time. With an eye toward numeracy and literacy development, most programs are full day and heavily academic with little if any unstructured time. Opponents argue that an over focus on the standards and outcomes that are expected in later grades has resulted in educators attending more to what is tested than what is truly learned (Graue, 2009).

Kindergarten should not be seen as a “pass through “ to higher grades, but an environment that is inclusive, with resources to support students at all levels of ability and readiness. “It should not put children at risk” (p.3). Graue identifies clear indicators that kindergarten programs and expectations are out of balance, including parents delaying student entrance, student retentions and children referred for testing. Although considerable philosophical debate exists on the topic, a great deal of research has been done that indicates significant gains have been made by children who attend full-day programs when compared to their half-day peers, specifically in the area of early reading skills (Kaurez, 2009). An ideal kindergarten environment needs to include the knowledge of child development and the value of diverse learning activities. It is this combined with the content and enhanced learning opportunities that create a rich instructional experience. It should include a curriculum designed to capture the eagerness and excitement for learning that typical five and six-year olds demonstrate, while preparing them with a sound academic foundation.

### **Developmentally Appropriate Practice**

Coined by the National Association for the Education of Young Children, the term developmentally appropriate practice is defined as “matching the environment to the varying needs of young children” (Crosser, 2007). Intended as a guiding premise for the design of early childhood programming, this practice is not universally understood nor applied. The events and experiences that make up the first years of life play an important role in development as they design the frame or foundation for future learning. A study conducted in 2000 by the National Research Council identifies principles that shape that

initial foundation including, human development, cultural influences, timing of influences and the impact of interventions and supports (Piotrowski, 2010).

Readiness is the issue that is often at the heart of developmental practice. The definition of readiness is highly subjective and one on which teachers often have differing opinions. In a study conducted by the United States Department of Education (1993), 88% of kindergarten teachers surveyed stated that readiness came about as a result of growth and maturity and could not be pushed, while 94% felt that rich experiences could enhance readiness levels. The rate and pattern of student growth is influenced by many factors including personal experiences, heredity and exposure (Characteristics, 2011). Crosser (2007) contends that American kindergarten classrooms are impacted by the lack of formal articulation of standards and outcomes resulting in unrealistic and often developmentally inappropriate instructional experiences. Five and six-year old children are learning to exhibit pro-social behavior and have a positive adjustment to the school environment. This requires a degree of self-regulation and awareness, engagement and acknowledgement of strengths and needs (Perry, 2009). As these areas develop, teachers are to provide to students a degree of autonomy through collaboration, routines and the ability to make choices. Crosser (2007) identifies teachers as facilitators that serve in a coaching role, guiding the learning by providing rich opportunities, asking probing questions and encouraging deep understanding. He references Kostilnik's (1992) work on developmentally appropriate practice in which the teacher and student learn from each other in a classroom that supports student interests and the teacher as a learner.



Despite ranges in age, development and exposure, kindergarten children have a number of characteristics in common. In relationship to their socio-emotional development, they are becoming more aware of their surroundings and less self-absorbed. As they become less egocentric, children begin to explore and develop relationships. Kindergarten students are eager to gain a level of independence and want to take on responsibility. This furthers their exposure to both new people and experiences. Intellectual development during this period includes the growth of visual and auditory memory along with a desire to construct meaning from tasks and activities. Physical growth varies greatly, but includes the development of fine motor skills and improved dexterity. Through their study of technology use in preschools, Scaife and Bond (2003) found clear evidence of this trait. The children in their study were equal to the adults in their ability to manipulate a touch screen. In a similar 1996 study conducted by the American Educational Research Association, parents and teachers identified specific characteristics that students should possess to be successful in kindergarten. The characteristics included the readiness to do pre-academic skills, the ability to hold and show interest in books and the ability to finger count. They also identified non-academic categories that should be common for these children, specifically, good health, and the ability to express wants and needs and enthusiasm (Haight, 2005). A repeat of this study in 1999 produced similar results for teachers but a shift in thinking for parents who felt more strongly about the importance of more academic skills around literacy and numeracy (p. 4).

The individual, developmental differences in children are often gleaned not through formal assessments, but through keen observation. Research from the Early

Child Care Network in 2000 states that “a child’s home environment accounts for the biggest variation in what children know and are ready to learn upon entering kindergarten” (Piotrowski, 2010). A standardized curriculum has the potential to suggest that all children are developmentally equal. Students do not all come with the same skills, characteristics of experiences, or the same pace of learning, nor should it be expected that they will all perform similarly on assessments. Child development theory indicates that this level of individuality should be identified and used by teachers to inform instructional planning. Embracing the critical developmental practice will allow students to enjoy genuine and appropriate exploration from which growth and learning ultimately occur.

As the demographics in U.S. schools change, so does the need for formal instruction. English Language Learners, and those from both rural and challenging urban settings will greatly benefit (Kaurez, 2009). Despite obvious advances in the discussion of early childhood education, kindergarten still languishes on the periphery of focused reform due to the lack of compulsory requirement and continued debate over developmental practice. The inconsistency over program duration and content causes great disparity nationally and raises serious issues of educational inequity (Kaurez, 2009).

The work of Vygotsky, Erikson and Piaget focuses on the principles of child development that are critical to developing appropriate practice. Berk and Winsler (1995) state that Vygotsky’s approach emphasizes the identification of student strength as the base for learning. Identifying what children can do with assistance from others, as well as independently isolates what he terms the “zone of proximal development.” Effective instruction is most likely to occur within this zone (pg. 347). Brendekamp et al.

(1992), identify six principles that are key to early learning: safety and security, the ability to construct knowledge, opportunities for social interaction, learning through play, interest-based learning and individualized learning. Creating a safe and secure environment that allows for collaboration and risk-taking supports young learners. Doing so through the development of individual talents and interests, with opportunities to explore and play, builds confidence and creates a sense of one's self as a learner (Brendekamp, 1992). The ability to embrace these principles completely is challenged when it is put in the context of the demands and accountability currently in place in education. Graue (2009) states that we need to think of kindergarten as more than just a step to the higher, tested grade levels. It is rather, as suggested by Kaurez (2009), an incremental next step to further the development of cognitive, social and emotional skills. Kindergarten is the pivot year that serves as the pedagogical bridge between Pre K and the elementary grades.

With an increased focus on the academic demands of kindergarten, the elimination of exploratory learning and play has led to the assumption that today's children are more able and ready than those in the past. A national study by the Gessell Institute for Human Development, named for child development pioneer Arnold Gessell, looked at the dynamic of child development. The 18 month study compared 2010 data with the initial findings of the original study from 1925 to determine the effect of modern culture on child development. The study sought to determine if children were smarter and more able to learn things sooner than those a quarter century ago. With over 1,287 children ages three to six participating in one-on-one assessments, the results showed remarkably similar data to the initial study with regard to cognitive milestones. This data

indicates that today's children are no smarter or savvier than those of the 1930s and 40s and have similar profiles in relation to developmental milestones that relate to kindergarten expectations. This research challenges the notion that our classrooms should rely heavily on academic content and skills development at the exclusion of exploratory learning. It supports the notion that consistent with Gesell's earliest research, the pace of human development has not been altered by modern society (Pappano, 2010).

### **Engagement and Motivation**

The processes of teaching and learning are organic and require a delicate balance of give and take by both the instructor and student. Teachers construct the setting into which students enter. The ability for that setting to produce the intended learning outcome requires engagement. "Notwithstanding its definitional variability, research indicates that when children are engaged in classroom activities, their learning increases" (Poitz & Rimm-Kaufman, 2009). They define engagement as "correspondence between the child's observable behavior and the demands of the situation, including attending to and completing tasks responsibly, following rules and instructions, persisting in the face of difficulty, and exercising self-control" (p. 104).

In his book, *The Motivated Student: Unlocking the Enthusiasm for Learning*, author, Robert Sullo writes, "In order to engage young people in lessons, teachers must allow them to connect with one another; develop increased competence; make choices; and enjoy themselves in a safe, secure environment" (2012). Additional support for behavior engagement is found in *The Framework for Effective Instruction*, which includes 22 instructional components spread across the four domains of Planning and

Preparation, Classroom Environment, Instruction and Professionalism. These areas frame the supervisory framework that assesses teacher effectiveness toward increasing student achievement. Research on these components indicates that when applied effectively in the instructional process they will have the greatest impact on student learning (Danielson, 2011). The component dealing with student engagement is the one that is said to be the most critical indicator contributing to student learning.

Doug Wilms (2011), Director of the Canadian Research Institute in New Brunswick, sees engagement as a necessary condition for learning and achievement. In addition to having a strong benefit to academic achievement, he recognizes that the tenets of engagement: viewing learning as important and enjoyable, working as part of a team and as part of a social institution, as skills that have lifelong value (p.3). Along with Friesen and Milton (2009), Wilms identifies three dimensions of student engagement: social, academic, intellectual. Social engagement deals with the sense of belonging and connectivity that is evident through the establishment of interpersonal relationships. Academic, often referred to institutional engagement, is the other dimension that has been included in the previous research. It is seen in the commitment to the processes and procedures that are associated with school. Regular attendance, following the rules, being on time and completing assignments are indicators of academic engagement or demonstrating that there is an investment or value placed on learning. Intellectual engagement, a relatively new dimension to the research, deals with the emotional investment in the learning process. An obvious opportunity for teachers, intellectual engagement is characterized as student effort toward the learning process (p. 4). Akey (2006) identifies the key role that teachers play in fostering student engagement by

capitalizing on motivation through the creation of relevant and exciting lessons.

Teachers need a variety of strategies that appeal to a variety of students. Strategies that are collaborative and geared toward student interest, as well as interactive, have been shown to greatly increase achievement (p. 2). Instructional technology and computer assisted instruction are receiving a great deal of attention as a strategy to address the elements of engagement. Colorful and vibrant graphics and sound effects as well as immediate and specific feedback are specific strengths of this type of programming (Marcuso & Rodman, 2008).

Strong, Silver, and Robinson (1995) studied the key elements of student engagement most closely linked to the acquisition of literacy. They identified relevant and interest-based activities that included student choice and teacher support and encouragement as critical elements. They added student confidence as an additional element necessary to student success. Also supported in the research by Akey (2006), this potential for students to lack confidence and a sense of security around the learning process is highly variable. The impact of environmental factors such as poverty, challenging family dynamics and increased diversity contribute significantly to possible disengagement from the learning process, making the importance of teacher support and encouragement all the more critical.

Kindergarten children are naturally curious. They like to explore and investigate things to learn about them and understand how they work. These youngsters are very tactile and often “see” by touching and manipulating things. This “connection” with objects helps to form a deeper understanding. We are challenged in schools to provide genuine opportunities for students to make connections with their learning, moving them

away from passive observer to active and engaged learner. Nowhere is this challenge greater than with young children and the acquisition of early literacy skills. Learning to read through the development of pre-reading skills is the foundation of most kindergarten programs. Incorporating the use of technology into this critical instructional content can provide significant enhancement to the degree of engagement and connection that these curious and tactile learners experience as they explore reading, writing, listening and speaking as they relate to learning in school. The use of technology in instruction can provide students with authentic learning and can assist teachers as they strive to provide authentic opportunities for students to demonstrate their emerging skills in literacy.

### **Literacy**

“In a modern society, the ability to read well is the cornerstone of a child’s education. In a modern economy, literacy is a prerequisite for a successful life.” (United States Department of Education, 2011). For young children, the ability to create meaning from the words on the page creates a sense of accomplishment which becomes a critical skill in later learning. Adult literacy is the key to employment, enjoyment and the means to interpersonal connections. Literacy is crucial for participation in democratic society (p. vii).

Defined in Webster’s Dictionary as the ability to read and write, literacy in the 21<sup>st</sup> century is a much more complex concept. The International Reading Association (2005) defines this term in the following:

Literacy is the ability to understand and use those written language forms required by society and/or valued by the individual. Young readers can construct meaning from a variety of texts. They read to learn, to

participate in communities of readers in school and everyday life, and for enjoyment (PIRLS, p. 1).

This definition involves thinking critically about what one reads, as well as expanding the term to encompass literacy as a form of social engagement. This broader definition extends the basic skills associated with being literate to include purposeful application. This extension is further supported by the Workforce Investment Act of 1998 which defines literacy as:

An individual's ability to read, write, speak in English, compute and solve problems at levels of proficiency necessary to function on the job, in the family of the individual and in society. This is a broader view of literacy than just an individual's ability to read, the more traditional concept of literacy. As information and technology have increasingly shaped our society, the skills necessary to function successfully have gone beyond reading, and literacy has come to include the skills listed in the current definition (Scherba de Valenzuela, 2012).

The inclusion of College and Career Readiness Standards as a complement to the Common Core Standards, by grade level, further reinforces their importance. These standards specifically address the skills and competencies related to deep reading and analysis of complex, technical and informational text often associated with success in college and career (Common Core, 2012).

### **Emergent Literacy**

Early childhood literacy, often called emergent literacy refers to “a child’s efforts to understand both oral and written language, beginning at birth” (Early Literacy



Education, p. 10). Literacy begins to develop long before the initiation of formal schooling. Steps toward learning to read and write occur very early in child development. Children initially gain exposure to the concepts and functions of literacy through their earliest attempts at communication (Learning to Read and Write – DAP). It is through these interactions and experiences that children begin to read words and process the relationship between sound and print. Through interactions with their environments and cultures, young children become literate. Their engagement in genuine interaction and the activities of daily life help children learn how both written and oral languages are used. Morrow (2001) states that children are not passive participants in the process of languages acquisition, but rather constructing their own language at their own pace and based on their life. Halliday (1993) further asserts that function and relevance of language is what dictates its pace as outlined in the following seven steps:

- Instrumental: language that satisfies a personal need      “Mommy, potty.”
- Regulatory: language to control behavior      “Eat, now.”
- Interactional: language to socialize      “You want to play?”
- Personal: language to tell about themselves      “I’m sleepy.”
- Heuristic: language to learn about things      “What’s doggy  
doing?”
- Imaginative: language to pretend      “Let’s play house.”
- Informative: language to inform others      “I’ll tell you how to  
play.”

Examples of behavior that indicate recognition of oral and written language and attempts to communicate occur from a baby’s squeal at a familiar book to pointing at the

pictures in a story book to imitating writing by making a shopping list while playing. Goodman (1984) adds that further evidence of this can be readily seen in the eyes of a two or three-year old child that recognizes a favorite food package or fast food chain (Goodman, 1984). According to Morrow (2001) these behaviors indicate the need to reframe early literacy development to focus on birth to age five, and developing positive attitudes that will produce successful readers (p.14).

Vygotsky (1978) states that meaning-making is much more complex than mere memorization, and, that “children construct their knowledge from the interactions with the knowledge of others” (p. 28). Holdaway( 1979) explains oral language is the earliest form of literacy in which a baby initiates sounds and noises to match those of parents and caregivers. With the supportive response that follows, so begins the challenging task of learning language. Notwithstanding the obvious difficulty, the ease with which most all children learn to speak conveys a false idea of its nature. Holdaway further explained that it is rather, the “highly motivated, purposeful and meaningful rewards” that are the true driving forces to language acquisition (p. 22).

Unlike reading readiness theory, which suggests that there exists a point in time at which children are ready to read and write (Crosser, 1992) emergent literacy theory contends that the process is occurring naturally within the child from birth. The innate learning ability within each child “emerges” gradually over time as the appropriate conditions are encountered. Whether evident in written form, through early scribbling, or by attempts to identify signs or pictures, children attempt to communicate long before they can read or write.

Emergent literacy includes several key elements:

- The process of reading and writing begins very early in a child's life;
- Reading and writing are interrelated and develop concurrently;
- Literacy is not a set of skills, but rather a set of processes children use to achieve goals;
- Children learn literacy through active engagements;
- Literacy is best promoted early through reading aloud so that children understand the function of reading and the nature of the connected word.

Clay (1975) states that an emergent literacy approach recognizes that written and oral language develop concurrently and are best supported by an environment in which children can interact with others who read and write. As with all stages of the developmental process, children pass through the stages of emergent literacy at different rates and different ages. The impact of this theory and the combined research of sociologists, teachers, psychologists and child development experts have significantly impacted the focus of literacy and the role of early childhood programs.

### **Historical Perspective**

History teaches us that literacy refers to a malleable set of cultural practices that are shaped and reshaped by different, often competing social and cultural interest. As a result, we do not view how to teach literacy as a scientific decision, but rather as a more political and cultural decision about the kind of literate practices that are needed to enhance peoples' agency over their life trajectories...literacy education is ultimately about the kind of society and the kinds of citizens that could and should be constructed (Luke & Freebody, 1999).

Providing early literacy instruction that leads to success and reading achievement is a goal widely shared by educators. The implications of a strong foundation in early literacy to later academic progress are supported by extensive research. Additional research (Tracey & Young, 2007) states that children who do not progress adequately in the acquisition of early literacy skills remain as at risk learners for the balance of their academic years (p. 443).

Current day literacy instruction is grounded in the tenets of learning theory, as well as the social and historical roots of our society. The theory and practice of today have evolved from centuries old beliefs that centered education as an important value right alongside family and God. Early colonial schools were mandated through legislation in Massachusetts in 1647 for settlements numbering more than 50 households (Cubberly, 1934). By the turn of the century, this practice had spread throughout New England and across the Mid-Atlantic states. Despite the inclusion of literacy into the curriculum, the study of religion still dominated the instruction for the balance of the decade.

Even in early colonial times, there was disagreement on the content of educational curriculum. The changing times, and the influence of important leaders like Benjamin Franklin, encouraged a freer environment that would promote innovation and economic development. It was during this period of the American Revolution that education realized its most significant change to date. One notable change was the shift to the New England Primer, which was to be used as the accepted text. Originally connecting the letter A to the Biblical story of the Garden of Eden and Adam, the newly revised Primer now connected the letter A to the angler, who fished with a hook (Vensky,

1987). This subtle change was indicative of the move away from connecting education to Bible study.

The 19<sup>th</sup> century initiated the exploration of various approaches to literacy education. Significant research on the psychology of learning and child development informed instructional practice well into the 20<sup>th</sup> century. The predominant philosophy of instruction embraced a readiness perspective that supported formal reading instruction beginning in grade one. Durrell's (1958) readiness study, *Success in First Grade Reading*, determined the following outcomes: 1. reading difficulties can be prevented by instruction in letter names and sounds, applied phonics, sight vocabulary and silent reading, 2. testing letter names is predictor of end of first grade achievement, 3. children who demonstrated readiness should skip readiness material and, 4. there is no basis for a number or mastered sight words to be mastered prior to initiating word analysis. Bond and Dykstra's 1967 study compared the effectiveness of alternative reading programs and achievement. Their data related the importance of phonemic awareness and letter recognition at the beginning of grade one as indicators of success. Chall's *Learning to Read* study, conducted the same year, echoed these findings while also noting and increase in the diversity of students, including higher numbers of low income families and students with low ability.

In 1985, the research known as "Becoming a Nation of Readers" (Anderson, 1985) recommended a balanced approach to literacy instruction with an emphasis on the previously recognized foundational skills of phonics, phonemic awareness and alphabetic principle. It was the first study to include a focus on letter sound relationships along with blending and word reading. This study began to shift the

conversation away from what was to be taught to a greater interest in the way in which instruction was best delivered. Over the final decade of the 20<sup>th</sup> century, several studies were conducted that placed phonemic awareness as a key factor for inclusion in beginning reading programs. It was the work of the National Reading Panel in 2000 that confirmed the value of phonological awareness as a foundational skill. This study also confirmed the need for relevant and meaningful practice to engage all the reading skills. The 2008 report by the National Institute for Literacy (Strickland, 2010) identified the skills and abilities that were required for success in reading as knowledge of the alphabet, phonological and phonemic awareness and print and oral language development. The National Association for the Education of Young Children supported those skills in their 2009 research stating that it was necessary to bring research and practice together. They reported that in addition to the goals of implementation of best practices and reducing the achievement gap, educators needed to prioritize a comprehensive curriculum and well prepared and skilled teachers in our literacy classrooms.

## **Curriculum**

“Reading proficiency is arguably the most important academic skill, enabling students to acquire content knowledge needed for other subject areas” (Gibson, Cartledge, & Keyes, p.261). The Nation’s Report Card (2002) reported that more than 50% of students in the United States scored below grade level on reading tests. The history of literacy is filled with competing ideas and methodologies more focused on teaching than learning. There is no doubt that the process and skills of literacy are complex. Shanahan (2007) states, “literacy is complex and requires the integration and

coordination of many cognitive, perceptual and linguistic skills and abilities” (p. 1). As a result, the process presents complex challenges with no easy answers. Strickland (2010) identifies a number of challenges to early literacy:

1. The definition of literacy has changed. While the basic skills of decoding and recall are still necessary, they are not enough. With exposure to television, email, text messages and other electronic media, today’s children need to apply literacy in all forms and adapt accordingly;
2. Public awareness and expectations for literacy achievement have never been greater. Increased demands on the content are a point of attention and discussion;
3. Teacher competence and the ability to provide quality instruction are at issue. Preparation programs and professional development efforts have increased;
4. Reform efforts are heavily focused on student achievement. Increased accountability efforts include data collection and monitoring student progress;
5. Changing demographics have created additional challenges for early literacy. Increased diversity reflects our changing populations including multi-lingual, multi-cultural and low income. Teachers need to adopt strategies to work with these students;
6. With the increased focus on early childhood education and the prevalence of preschool attendance, the importance of curriculum articulation and programming are critical.

These challenges certainly impact the literacy environment and instruction.

Marcia Henry (2010) characterizes literacy as a continuum from the basic level, the ability to read and write, to the advanced level, the knowledge of ideas, events and the

values of society. Two factors of significance in the acquisition of literacy are word identification or decoding, and comprehension. The ability to decode, or “break the code” is the key to comprehension. Chall (1983) places literacy at incremental stages. Stage 0, pre-reading, is when prerequisite skills, both visual and auditory develop. This stage includes phonological awareness and understanding the role that sound plays in language. Stage one includes initial decoding using the alphabetic principle and sight word recognition. These two levels correspond to the early literacy outcomes supported by research. Stages two to five include fluency, the acquisition of new information, layering facts on to prior knowledge, and analysis to construct abstract ideas. Phonological awareness is the ability to manipulate sounds. It includes the specific skills of rhyming, blending and segmenting, all done orally. Phonemic awareness, the most advance level of phonological awareness, requires a conscious knowledge of individual sounds of phonemes and the ability to manipulate them.

Alphabetic principle, the other critical factor in early literacy learning is comprised of four components according to Strickland (2010). The first component is letter shape or recognition. Children must recognize letters according to their shape, direction and orientation. Mastery is the ability to do so across various fonts, sizes and styles. Component two, letter naming, is the ability to connect the symbol (letter shape) with a name. Students must learn that each letter has two symbols, capital and lower case that may be similar (C, c) or very different (G, g). The letters in a child’s name are often the first to be named. The third component is the relationship between the letter and its sound. Students come to understand that letters are represented by sounds and that in



some cases, their name may provide a clue. Letter sounds fall into five categories, as some have multiple sounds:

1. Letters whose sound is at the beginning of their name - B, D, J, K, P, Q, T, V ,Z;
2. Letters whose sound is at the end of their name - F, L, M, N, R, S, X;
3. Letters whose name is their sound, but they also have another - A, E, I, O, U;
4. Letters whose sound is at the beginning and they also have another - C, G;
5. Letters whose sound has no connection to their name - H, W, Y.

The complexity of this understanding is significant and its mastery will provide the tool with which students will master decoding. The ability to correlate letters to their sounds correlates to later achievement while deficits in this area are often a trait in reading disorders (Henry, 2010). The final component of the alphabetic principle is letter writing. In emergent literacy, letter writing occurs concurrently and often reflects an awareness of the letter – sound relationship. Opportunities to explore the alphabet are critical to emergent readers.

### **Instruction**

Armbruster, Lehr, and Osborn (2001) report that the understanding of what works in reading is fluid and dynamic, and, subject to ongoing review and assessment, often dictated by research (p.1). In 2000 The National Reading Panel was charged with helping parents, teachers and policymakers identify skills and methods key to successful reading achievement. Through a review of more than 100,000 studies the Panel's report discusses five areas for instruction: phonemic awareness, phonics, fluency, vocabulary and comprehension. These areas develop incrementally with the first two as part of early literacy instruction. A joint statement by the International Reading Association and the

National Association for the Education of Young Children (Cassady & Smith, 2004) reported that teaching children to read in kindergarten was most successful with a systematic and structured instructional program that promoted acquisition of phonological awareness and the alphabetic principle, as well as contextualized reading activities.

It is clear that children encounter a variety of developmental influences that impact the varied literacy skill sets they bring to kindergarten. Considerable diversity in oral and written language experiences, as well as different resources and degrees of support at home occur during these years. Because of these individual and experiential differences, a typical kindergarten class could have a five year range in children literacy related skills. Vygotsky's work (2000) supports the influence of experiences and environment on learning. Despite these differences, The National Institute for Literacy (2006) established a list of skills that should be in place to start kindergarten, including shape and name of some letters, common sight words (I, a, the), writing some words including first name, and rhymes and blends some spoken words. Shanahan (2004) echoes the value of these skills but further identifies specific precursor skills: Letter Knowledge, Phonological Awareness, Concepts of Print and Rapid Naming. When educators discuss programs and the contents of effective literacy instruction, opinions abound. The National Reading Council (2002) recommends reading instruction geared toward word-attack strategies. Additional research by Bachman (2000) shows an important link between phonological awareness and reading advancement.

No one teaching method or approach is likely to be effective for all children (Strickland, 1994). Recent studies (DAP) wrestle with the sequence of phonological awareness and alphabetic principle, questioning whether the sounds are more readily

applied once the letters are known or vice versa. While many children enter kindergarten with a basic knowledge of alphabet letters, the instructional goal is for increased fluency and ease of recognition and discrimination of letter shapes (NAEYC, 2012)

For decades the pendulum has swung back and forth between phonics or sight word-based instruction. Chall and Squire (1999) note the first widely used textbook the New England Primer included many rhymes, pictures and Bible verses. In the 1800s, Noah Webster's American Spelling Book focused more intently on spelling with a concentration on pronunciation and sounding out of words. From 1836-1920, the McGuffey Readers were widely used and approached reading through the alphabet and phonics. William D. Gray introduced the Dick and Jane series in the 1930s. This whole-word method focused on word recognition through the use of a controlled vocabulary. The repeated use of words within increasingly lengthy passages encouraged context-based comprehension and was the basis for later whole language instruction. This approach assumes that exposure to rich literature will provide opportunities for reading and writing. It expects that children will develop phonics generalizations and pick up the alphabetic code from the reading. Stahl and Miller (1989) found that students educated within a whole language environment lacked effective decoding skills. They felt whole language instruction had little application beyond kindergarten, when exposure to rich literature could spark interest and excitement.

The ability to incite interest and excitement with reading is fundamentally important in establishing positive feelings about reading that enable students to work through challenges and persevere. The use of technology is one way to establish this excitement and is an obvious tool as part of solution. With its colorful images, and

pleasing graphics, the “hook” for students is seamless. Teachers in Auburn, Maine, who are piloting the use of iPads in their kindergarten classes, are encouraged with the level of engagement they have seen in their students. They reported that despite the visible engagement that can be observed, the connections go much deeper.

Because they are engaged, students are practicing longer. They are getting immediate feedback so they are practicing better. Because we correlate apps to our curriculum, they are practicing the right stuff. Because we select apps that won't let students do things just any way, we know the students are practicing the right way. Because they are engaged, teachers are more free to work one on one with the students who need extra support at that moment (Washuk, 2012).

### **Technology in Schools**

Virtually every facet of modern life is impacted in some way by technology. Its prominence in our daily activities is often taken for granted, if not overlooked completely. From the automatic timer that starts the coffee pot each morning, to the sensor that controls the car's fuel gauge, we are surrounded by technological advances that have revolutionized the way we live. Our schools however, have not experienced the same level of technology advancement in their classrooms. The degree of sophistication and level of use of technology by students is a direct reflection of the times in which they live and the integration of it into their jobs is inevitable. The intentional and incremental development of these skills as well as their application is necessary to sufficiently prepare children for success in the careers they will be expected to assume in the 21<sup>st</sup> century.

## **Integration Challenges**

While technology and its advances have served as a change agent in the field of education throughout the Twentieth Century, its potential has not come without corresponding challenges (Bitter & Pierson, 2002). A number of factors have been identified in relationship to the limited integration of technology into our educational practices. Issues including limited teacher interest, inadequate skill for effective implementation and ongoing district struggles over insufficient funding (Whitney, 2007) are mentioned throughout the literature. High stakes testing expectations and administrative directives are roadblocks for some teachers, while others fundamentally disagree with the developmental appropriateness of technology based instruction, especially for young learners (Davidson, 2009). Still other teachers identify the lack of awareness, time and expertise to explore and evaluate software options as challenges to implementation (Turbill, 2001).

While no established formula exists for the successful implementation of instructional technology, there are common themes that emerge throughout the literature. A fundamental belief that a correlation exists between student achievement and technology integration has prompted many schools to increase their hardware purchasing (Woodall, 2009). Responding to the need for increased technology use by infusing state of the art equipment, while important, is simply not enough. In a 1996 kindergarten study, teacher, Carol Holmes, was asked about the appropriate use of technology with young learners. She responded,

I can't just set it up, show it once and expect kids to use it and learn from it... I've got to help them think of it as a tool they can use. Not just a big

pencil, but a whole bunch of pencils and paints and erasers and pictures and sounds and .....It's all a bit overwhelming, isn't it? (Labbo, 1996)

Her comments reflect the frustration and uncertainty expressed frequently by teachers when asked about their plans for technology integration. As is the case with any successful reform strategy, schools need to have a comprehensive plan for implementation. Plans should be developed that support both established and projected district goals and include input from all stakeholders (Woodall, 2009). "Another critical factor to be considered is personnel, both administrators and teachers." Overbay, Mollette, and Vasu (2011) assert that "the initiative is all about people – the people who plan with, teach with and learn with the technology" (p. 56). Teachers need to feel connected to the implementation process so that they are actively engaged and invested in it. The final common theme that exists throughout the literature that is critical to the successful integration of technology is targeted, high quality professional development for faculty. Turbill (2001) after participating in a focus group discussion with principals, reported concern that despite sufficient, high quality equipment, teachers were still reluctant, some even resistant to fully integrate technology into their instruction. Davidson (2009) conducted an investigation into the institutional changes resulting from the use of technology. She found "little evidence that instructional practices had been transformed" (p. 37). This was also the case with the study done by Fallon and Wann (1994) in which teachers tended to use technology for simple drill and practice in basic skills rather than as a genuine instructional tool. These studies illustrate clearly the teachers' discomfort and lack of confidence that result from insufficient training and experience. Conflicting results were seen by Guthrie and Richardson (1995) during their

longitudinal study that examined the role of educational technology in educational reform. Here teachers participated in targeted staff development sessions. These sessions, ranging in length from two to several days, were conducted with structured collegial support and led by expert instructors. Specific feedback on the project stated, “Ongoing collaboration and administrative teams working together appear to be more effective at technology integration and reform in general” (p. 16).

### **As an Instructional Tool**

Scherer (2011) suggests that technology is not a code intended only for young people, but rather a valuable tool for teachers to support the goals of learning. If we are truly intending to refocus and reform education, we need to recognize the impact that technology use can have in the classroom. Rosen (2007) says, “The iGeneration is immersed in technology. Their tech world is open 24/7” (p. 15). Children reared during the computer age unlike their predecessors, will not respond well to traditional methods of teaching as they will not capture, or sustain their interest (Woodall, 2009). The designation of an entire generation as members of the “digital age” is not a universal descriptor. Significantly changing demographics have created an increasingly diverse population. Many of today’s students do not have traditional family structures, are not native speakers, live in poverty or have special learning needs (Bitter, 2002).

Kindergarten students enter our schools asking questions, often thoughtful, unanswerable questions aimed at finding things out, or finding out about things. This curiosity fuels their sense of discovery and enables them to connect concepts and begin to see relationships (Characteristics, 2012). The charge for schools is to provide an atmosphere in which the curiosity of 21<sup>st</sup> Century learners, accustomed to stimulating

environments and immediate gratification, often at the hands of technology, can be embraced and fostered. Addressing diverse needs and leveling the playing field for students of all backgrounds is an additional challenge for our schools, with teachers and resources as key factors in creating equity.

The successful implementation of technology is a complex proposition. Despite commonly accepted indicators of positive potential, concrete evidence of the impact of technology on achievement is scarce. Studies, like the one conducted by Mioduser, Turkaspa, and Leitner (2000) focused only on a comparison of computer-based instruction to conventional instructional delivery methods. The use of technology solely as a tool for one-on-one tutoring was the topic of the study done by Schmid, Miodrag, and DiFrancesco (2008). While certainly informative relative to the use of technology, these studies failed to inform the education community with quantified learning outcomes. Despite the limited research on the achievement effects of integrated technology, interest in the application of this instructional medium continues to gain momentum. The advancement of and prevalence of technology in our society is unprecedented. Our daily lives include virtual meetings, web and video conferences, conference call and web searches, all of which can and often do include participants from across the country or around the world. The future in which our kindergarten students will engage is one that we cannot yet imagine, but it is certain to include technological advances. This is the way of the future and the way of today, and, for our students, a mind set and skill set to embrace. Our schools have for centuries served as a great equalizer in providing consistent and needed programming to equip all students for success. Technology as a learning tool and communication tool is the equipment of this generation and it is our



responsibility to determine how best to incorporate it into our instructional practice. In order to do so, further study on the impact of technology use on the achievement of students is needed.

The focus of the current investigation will be to examine the potential impact that the use of technology, specifically iPad 2, has on the development of early literacy skills. It will further seek to determine what characteristics of demographic criteria may be significant in the use of this technology to reinforce and remediate the core literacy skills that serve as the critical foundation for future literacy and overall academic success.

## Chapter 3

### **Methodology**

The study was designed to assess the potential of using iPad 2 early literacy applications to improve the quality of programming in kindergarten. A thorough examination was done to investigate the impact of iPad 2 use on the achievement and growth of kindergarten students in the area of early literacy, specifically with phonemic awareness and alphabetic principle. The study explored a relationship between the use of iPad 2 applications as used for review and reinforcement added to the existing reading curriculum and the assessed literacy skills. The curriculum in each of the schools within the study was determined by an internal review process. The determination of content is aligned with the Common Core Standards for kindergarten. The classrooms particularly targeted phonological awareness and the alphabetic principle. Curriculum and daily planning activities were within the control of the individual teacher, however, the core of the academic focus was on the skills associated with these areas. Literacy instruction predominantly involved the use of an adopted reading series embedded within a larger literacy framework. The primary instructional difference between the intervention and control classrooms was the implementation of the iPad 2 applications into their learning centers. The nature of the study and program evaluation necessitated a quasi-experimental, pre-test-post-test research design.

This chapter describes the methodology used for the research. In the first section, data is provided relative to the participants, including demographics, selection process, site details, and participant training. Section two explains the data tool including the specific subtests, benchmarks and cut scores. The processes and procedures for

administration are presented along with detailed information on the DIBELS Next assessment. The psychometric properties of the instrument by component are also explored. The next section describes the data collection process used in the study, along with the data analysis procedures including statistical methods. The chapter concludes with a summary of the research methodology.

Student assessment data was used to examine a potential relationship to overall achievement over the course of the year, as well as growth from one assessment administration window to the next. Initial scores were used as the baseline from which progress an achievement was monitored. Student assessments were done at three intervals over the course of the school year beginning in September with the baseline. December and May administrations were the benchmarks upon which growth was measured. All students in both the control and intervention classes were assessed using the DIBELS Next assessment.

### **Research Questions**

1. Do the use of iPad applications which present literacy skills in an engaging and visual manner, impact the early literacy achievement of kindergarten students as measured by the Phonemic Awareness and Alphabetic Principle components of the DIBELS Next assessment?
2. Is there added learning value to the use of iPad applications for acquiring the early literacy skills of phonemic awareness and alphabetic principle?
3. Does that achievement and/or growth data suggest that there is an advantage in the use of iPad applications for specific student group or student profile?

## **Design of the Study**

The study is a quasi-experimental design as subjects were not randomly assigned, but rather identified through their placement in the selected kindergarten classroom. The study sought to answer the primary research question regarding the value of committing instructional time and funding to the use of iPad 2 applications in kindergarten classrooms for the review and reinforcement of literacy skills critical to the acquisition of reading.

## **Participants**

### **Population and Sample**

The nonrandom study sample included 16 kindergarten classrooms, two in each of eight school districts. The districts were spread across a three county region of northwestern Pennsylvania, including Butler, Lawrence and Mercer counties. Of the eight districts in the study, three met the demographic criteria and are classified as urban. These districts serve racially and economically diverse populations. They have many single parent families and have a high numbers of families (72%) whose socio-economic status identifies them as “in need.” These districts offer extensive support programs to the families they educate including free breakfast and lunch, after care, tutoring and summer programming. Two of the districts in the study met the geographic and population criteria to be classified as rural. They cover very large geographic areas with residents living far apart from one another. Students are transported significant distances to attend school. These areas include many working farms and ranches. Fewer support programs are offered to families in these districts. Due to the great distance that many students live from school, access to resources is challenging. The remaining three

districts that are included in the study were categorized as suburban. They serve a smaller geographic region that consists of both residential and commercial properties. The community is made up largely of middle income families in which both parents are high school graduates and many have post high school education. Many of the families in these communities have two working parents in the home.

Each district in the study identified an elementary school to participate. Five of the schools have a configuration that is kindergarten through grade six, and three have kindergarten through grade three. Each building included at least two kindergarten classrooms. One kindergarten classroom served as the control group and another participated by implementing the iPad 2 applications as an intervention. All 16 classrooms in the study have students heterogeneously grouped. Classes include a relative balance of boys and girls and range in size from 17 to 23 students. These numbers are consistent between the control classrooms and the intervention classrooms in each of the eight districts.

### **Experimental Treatment**

Intervention teachers worked collaboratively and with the support of the Intermediate Unit staff and the educational team at Apple Inc. to select applications to be used by students for remediation and reinforcement of identified early literacy skills. During the training and early weeks of the school year, teachers explored applications that were aligned with the early literacy skills of phonemic awareness and alphabetic principle. After this vetting process was completed, selected applications were identified for use in the study. Each teacher was required to collect data on the frequency of use for each student and each application. This data was shared with all participants as part of an

electronic discussion board. Participants also convened face-to-face at quarterly sharing sessions.

Dynamic Indicators of Basic Early Literacy Skills (DIBELS), a set of procedures and measures for assessing the acquisition of early literacy skills, were used to assess students. The probes are designed to be one minute long and are used to regularly monitor the development of grade appropriate early literacy and reading skills.

DIBELS Next at the kindergarten level is comprised of multiple measures that serve as indicators of phonemic awareness, knowledge of the alphabetic principle, and accuracy and fluency with connected text. The assessment is administered three times over the course of the school year, fall, winter and spring. Individual subtest scores are reported separately, but are also combined to create a composite score. Assessments for the study were administered, during the same time frame to all kindergarten students, both those in the intervention and control groups.

### **Instrumentation**

The Dynamic Indicators of Basic Early Literacy Skills (DIBELS) was used as the primary form of measurement for the current investigation. DIBELS was designed to measure children's acquisition of the skills critical to literacy. The kindergarten assessment includes specific measures as well as an overall measure. The specific measures are Letter Naming Fluency, First Sound Fluency, Phoneme Segmentation Fluency and Nonsense Word Fluency. A composite score is also provided that combines the subtests. DIBELS was developed by Dr. Roland Good III and Dr. Ruth Kaminski from the University of Oregon in response to research conducted by the National Reading Panel (2000) and the National Reading Council (1998). The panels' research indicated

five important areas of reading instruction and skill development including phonemic awareness, phonics, fluency, vocabulary, and comprehension. These areas are distributed over the developmental continuum from kindergarten to grade six and are delineated into subtest categories. For the beginning of the school year, the test guidelines dictate the assessments that kindergarteners are to be given. The DIBELS Next assessment was specifically used to obtain baseline measures of pre-literacy skills.

Designed as a screening tool, DIBELS Next is administered at intervals over the course of the academic year, generally in the fall, winter and spring. In addition to these administration periods, more frequent assessments can be administered for progress monitoring of students with significant deficits, or for those receiving targeted or intensive remediation. DIBELS Next kindergarten assessments include the subtests Letter Naming Fluency, First Sound Fluency, Phoneme Segmentation Fluency and Nonsense Word Fluency. First Sound Fluency is assessed during the fall and winter windows, while Phoneme Segmentation and Nonsense Word Fluency are assessed in the winter and spring. Only Letter Naming Fluency is assessed at all three intervals. In addition to the individual skill-based subtests, DIBELS includes a composite score that is an overall combination of the separate assessments. Each subtest includes specific benchmark targets, which are criterion-referenced scores that indicate adequate progress toward competency. These scores, based on predictive validity research, suggest that if a student achieves a score within the benchmark range, presumably, later achievement will also be within range (DIBELS, 2010). Students that successfully achieve these benchmark goals have an 80% to 90% chance of achieving future early literacy goals. Cut scores are also identified and serve as indicators of at-risk skill development that may

indicate a need for intervention. These scores are those at which a student is unlikely to achieve subsequent benchmark goals. Students who score just below the benchmark, and at or just above the defined cut score, have a 40% to 60% chance of reaching target goals, while those below the cut scores are less than 20% likely to achieve them.

Each of the kindergarten subtests requires one minute for administration. In the Letter Naming Fluency (LNF) subtest,

The child is presented with a printed page containing rows of ten, randomly ordered upper and lower case letters and is asked to name as many letters as he/she can in one minute. The total number of letters correctly identified in one minute is the score. (Hintze, 2002, p. 6)

This test has alternative form reliability of .93. First Sound Fluency (FSF) is a task that assesses phonological awareness and requires children to identify a target sound produced by the test administrator. For example, the administrator will say man and the student says /mmm/. FSF has 20 alternate forms and a reliability of  $\alpha = .72$ . Phoneme Segmentation Fluency (PSF) assesses phonological awareness skills, a child's ability to fluently segment multiple phoneme words into individual phonemes. During the assessment session, words are presented orally to the student for one minute and the child is instructed to repeat the word segmented into phonemes. Children hear the word "sat" and are asked to say the individual phonemes /s/, /a/, /t/. The number of correct phonemes per minute represents the child's score (Hintze, p. 7). Nonsense Word Fluency (NWF) is designed to assess students' knowledge of the alphabetic principle, their ability to map sounds to print. This letter-sound correspondence is the next skill in developing strategies for decoding. During the one-minute administration, students are presented



with randomly ordered consonant-vowel-consonant words. Letters represent their most common sound; for example the letter c says the hard sound as in c-a-t. Students are to identify and verbally produce each individual sound, and if possible blend the sounds together and read the word. The authors (Good & Kaminski, 2002) of DIBELS note, “because the measure is fluency based, students receive a higher score if they are phonologically recoding the word and a lower score if they are providing letter sounds in isolation.” (p. 2). The NWF subtest has alternate form reliability ranging from  $\alpha=.67$  to  $\alpha=.87$ . All assessments were administered according to the published protocols and were conducted by staff trained in the measures. The test administrators were objective parties who did not work directly with the students.

DIBELS provides construct validity measures for each subtest at each grade level. In the tables below, each subtest is listed along with the type of validity, grade level, range and normative data.

Table 1

*Validity*

Validity Type	Grade	Test	Range	Normative Data
Concurrent	Kindergarten	Stanford-Binet	Abstract Visual 59 to 130 .15 - .31	Data collected at 6 points in time during one academic year.
Predictive	Kindergarten	DIBELS PSF (spring)	62 to 82 .34 - .46	Data collected at 6 points in time during one academic year.
Predictive	Kindergarten	DIBELS NWF December-Gr.1	50 to 60 .22 - .33	Data collected at 6 points in time during one academic year.

Validity Type	Grade	Test	Range	Normative Data
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Concurrent	Kindergarten	Stanford Binet	57 – 131 .23 - .35	Data collected at 6 points in time during one academic year.
Predictive	Kindergarten	DIBELS NWF (spring)	63 – 150 .37 - .49	Data collected at 6 points in time during one academic year.
Predictive	Kindergarten	DIBELS NWF (winter–Gr. 1)	50 – 60 .33 - .68	Data collected at 6 points in time during one academic year.

Validity Type	Grade	Test	Range	Normative Data
Concurrent	Kindergarten	Stanford Binet	64 – 131 .26 - .32	Data collected at 6 points in time during one academic year.
Predictive	Kindergarten	DIBELS NWF (winter–Gr. 1)	50 – 60 .61 - .77	Data collected at 6 points in time during one academic year.
Predictive	Kindergarten	Woodcock Johnson (spring – Gr. 1)	0 – 44 .44 - .69	Data collected at 6 points in time during one academic year.

As indicated above, DIBELS performs as well as the Stanford-Binet and Woodcock-Johnson with norming groups. Therefore, the construct validity of the DIBELS is established. For the current investigation, the estimates of reliability and validity were examined with the study's sample.

#### Reliability

The DIBELS Next Technical Manual, published in January 2011, identifies three measures of reliability. Alternate-form reliability indicates the extent to which individual assessment results are able to generalize to different item samples. This measure states that students are tested with two different but "equivalent" forms of the test, and the scores from these two tests are correlated. Twenty alternate forms of the DIBELS Next

enable multiple testing administrations to occur within a given academic year. Three subtests comprise the kindergarten assessment protocol. According to the extensive research done by Good and Kaminski (2001), the 20 alternate forms, single probe reliability for the Phoneme Segmentation Fluency subtest is  $\alpha = .88$ . For the Initial Sound Fluency subtest, the reliability measure is .92 and for Nonsense Word Fluency it is .65.

Test-retest reliability is an index of score stability and indicates the degree to which the same result is found over two assessment periods. In other words, when a student is tested twice, with a short interval between the test administrations, the scores would be comparable. Scores from the two test administrations are then correlated. A measure for test-retest is not available for the kindergarten level of the DIBELS Next.

Inter-rater reliability indicates the extent to which results generalize across assessors, meaning, if two people assessed the same student, at the same time, would their scores be the same? The inter-rater reliability coefficients below were calculated based on two independent assessors scoring the same student during the same test administration. They are: First Sound Fluency is .94, Letter Naming Fluency has a reliability measure of .99, and Phoneme Segmentation Fluency is .96

### **Validity**

Another essential characteristic of measurement is validity. The concept of validity simply examines the degree to which the instrument used measures the trait or characteristic intended. Further, do the results of the assessment reflect the intended use? Several approaches to determining the validity of an instrument exist. Logical analysis is

a judgment of the content of an educational characteristic, while empirical analysis uses criterion measurement of a standard or outcome.

### **Procedures**

Twenty-seven school districts in the three-county region were invited to complete a detailed questionnaire. Questionnaires were developed and distributed using Survey Monkey. The responses were gathered electronically and used to glean information on the kindergarten programs. Critical components on which information was requested and necessary for the study included having multiple kindergarten classrooms, a full day program, heterogeneous grouping, and the use of learning centers as part of the instructional plan. Districts were also asked about their willingness to administer a standardized assessment at three intervals over the course of the school year. In addition, interested districts were told they would need to commit to three days of professional development for the identified intervention teacher, as well as ongoing training in the use of applications and the structure of the learning centers.

Districts that met the criteria and qualified to participate in the iPad 2 study were contacted. An agreement was signed by each superintendent that included required instructional procedures and assessments, as well as materials and training. Each district that participated in the study was provided with five iPad 2 tablets. The elementary building administrator of each district was asked to identify an interested kindergarten teacher to participate as the intervention classroom. The selected teacher was provided with information on the training that would be held, the record keeping and assessments that would be required and the technology that would be included. The role and responsibilities of the control group and teacher were also defined. The assignment of

that role for each district was determined by the building principal. This assignment was intentionally done on a building level basis to ensure consistency of instructional schedule, classroom procedures and the highest level of similarity with the instructional approach and process. This structure also enabled the communication of expectations and oversight to be managed by a single principal. Through the course of the survey completion and district commitment, data collection, eight classroom teachers, six female and two male, were included. The classrooms had 164 ( $n=164$ ) students. The intervention group included eight teachers, six female and two male, and 169 ( $n=169$ ) students represented the control group. All assessments were administered to both groups as part of the study.

### **Staff Training**

As a result of their participation in the project, teachers were engaged in a number of resources and professional development to effectively implement the instruction. Prior to the start of the school year, all of the teachers in the intervention classrooms group participated in thorough training. Those working directly with the intervention classrooms were required to attend three full-day sessions. Two of the required sessions were presented by the training team at Apple, Incorporated. The training modules focused on touch screen technology and the use of the tablet. The primary purpose of the sessions was to provide an overview of device, its features and use. Teachers were instructed on how to operate the iPad2 and presented with an introduction to its use for students. The third day of training was conducted by the technology staff at Midwestern Intermediate Unit IV. The staff instructed the participants on the process for selecting

and reviewing applications. They were also taught how to purchase and house applications on the iPad so that they could be easily accessed by students.

In addition to participation in the technology training sessions, the teachers were charged with the identification and selection of instructional material. As a benefit of their involvement, schools were given technical and financial support to offset the cost. Specific support included, in addition to the iPads, screen protectors, technical consultation, cases and a \$50 iTunes gift card with which to purchase the selected applications. An introduction was provided to all participants on the DIBELS Next assessment. Through the subtests that comprised the kindergarten battery, teachers were able to identify the skills on which students would be assessed. These skills served as the framework for the selection of applications to be included in the study protocol. As part of the training session, teachers reviewed applications related to each of the identified skills to be assessed on the DIBELS Next. Applications were selected based on the suggestions of the Apple trainers, their alignment to the DIBELS Next and teacher recommendation. After review and discussion of the initial list, specific applications were identified. These would be the applications on which students would work during the school year.

The fall assessment included the measure, First Sound Fluency. This was the first skill set to receive instruction and for which students received remediation and reinforcement using the iPad. Five applications were selected for each subtest. For the First Sound Fluency measure, the kindergarten teachers chose from a selection of hundreds of applications available through iTunes. They selected the following applications as the best match to the core skill instruction:

- ABC Phonics – Grasshopperapps.com;
- Build A Word – Word World;
- Magic Penny – Magic Penny reading UC;
- Starfall – Starfall Education;
- Word Family Phonics – Brain Counts.

These applications were introduced by each intervention teacher through a self-created lesson. During the lesson, the teacher was able to show students how the application worked and to reinforce the connection to the skill it would be used to reinforce.

Students were then placed into heterogeneous groups and a rotation was established.

They would work on the iPad application as each was introduced, one per week. Once all were introduced, the teacher would direct the students to the application that best supported a specific skill. Learning Center time would rotate based on teacher judgment, ensuring that each child received 30 minutes per week.

After two months of working on the First Sound Fluency applications, teachers introduced the applications for the next set of assessment subtests, Phoneme Segmentation Fluency and Nonsense Word Fluency. Both of these subtests would be assessed in both the winter and spring windows. The selected applications for Nonsense Word Fluency were:

- ABC Touch & Learn – Alligator Apps.;
- Bee Sees – Headlight Software;
- Kindergarten Lite – Demansol;
- Starfall – Starfall Education;

- Super Why – PBS Kids.

The applications for the reinforcement and remediation of Phoneme Segmentation Fluency were:

- First Word Sampler – Learning Touch;
- My Word Wall – Emantras, Inc.;
- Pocket Phonics – Apps in my Pocket Ltd.;
- Skill Builder Spelling – Ben Keiser;
- Phonics Monsters 1 – Blue Pin.

The applications for these two subtests were introduced on a rotating basis, one each week to ensure that the focus between the development of the two skill areas was balanced.

Learning centers were identified as the instructional delivery model for the use of the iPad 2. As part of the participation agreement, teachers were to have students use the iPad to work through the selected applications for 30 minutes per week. Since participants had stipulated the inclusion of learning centers in their existing literacy framework, little change was required. With obvious variations arising from the typical schedule and school interruptions, students rotated through centers daily. Teachers managed and monitored student progress and assigned applications to coincide with progress or needs in the reading curriculum. Therefore, the students in the intervention group did not follow a predetermined order or sequence, but rather an individualized, skill-driven support structure consistent with the control group. Classroom teachers were required to keep a log of activity for all students in the class. Logs were to include



the date, length of time and application being used. Students participated in ten or fifteen minute increments, two or three times per week.

In addition to the initial technology and management trainings, the intervention teachers were required to participate in quarterly meetings. The primary purpose of these quarterly meetings was to share information and collaborate with the other participants. In addition, teachers had the opportunity to discuss their implementation strategy, record keeping structure and application choice. At the fall and mid-year sessions, participating teachers also researched and selected additional applications to be included in the protocol. These selections reflected the change or addition of skills as dictated by the DIBELS Next assessment. An incentive to earn continuing education credit, ACT 48 hours was made for participation in these sessions. Teachers were also afforded opportunities for collaboration through a personalized wiki space. The use of this social media enabled them to network with other participating teachers, ask questions or make suggestions and support one another throughout the implementation process.

### **Administration**

To track progress and growth in phonological awareness and alphabetic principle, assessments were administered to students in both the intervention class and those in the control classroom in testing sessions at three points in the academic year. Each subtest of the DIBELS Next assessment was administered individually to each student by a trained educator. Completion of the assessment was done in a single session with any absences or make up sessions completed within a week. The first administration was in the fall immediately upon establishing the classroom structure and procedures. The second assessment was administered in January to capture the

differences between the intervention and control groups during the first semester. The third session was completed in the spring to look at growth, along with the comparison data. All testing occurred during the regular school day and was conducted in an environment familiar to the students and in close proximity to the classroom. Upon completion of the assessment, test administrators totaled and recorded the scores for each subtest as well as the composite score.

### **Data Collection**

At the conclusion of each testing session, student scores were compiled by the individual examiner. In order to maintain privacy, student and teacher participants in both the intervention and control classes were identified by a numerical designation rather than by name. This practice was also intended to maintain both objectivity and confidentiality of data. Student scores were reported by separate skill subtests, as well as by composite scores.

In addition to DIBELS scores, data relative to the student and teacher populations were examined. Data collection included the participation logs that teachers kept throughout each instructional period. These logs detailed the frequency and specific applications on which the student worked. This allowed for a close examination to look for trends and patterns related to usage and achievement, as well as growth from the baseline or from one administration period to the next.

### **Data Analysis**

The data for this investigation was meta-analyzed by comparing the DIBELS Next scores of the students in the intervention group with those in the control group. Meta-analysis was employed because it allowed for analyzing program impact across

groups of different sizes (Hedges & Olkin, 1985) by weighting each group's impact according to its sample size. A comparison was conducted to see the impact of the use of iPad 2 applications on the acquisition of the assessed early literacy skills in kindergarten students. In addition, student demographic data was examined including gender, district demographic topology, socio-economic status and race. Measures of growth were explored in relationship to student level of risk as determined during the initial testing administration.

Although not specifically gathered, the anecdotal and narrative information shared by the teachers was reviewed. The comments and discussion threads that were part of the wiki space collaboration were consistently reporting high levels of engagement by students in the remediation and reinforcement using the iPad. The impact of the tools on motivation and enthusiasm of students was observed by the test administrators, as well as the project coordinator during site visits. Students often spoke with great pride about their learning and how much they enjoyed using the iPad as part of it. The observations and feedback indicated that the use of the iPad to support instruction had an impact on the learning process and played a significant role with regard to the achievement and growth that occurred.

## Chapter 4

### **Data Analysis**

The intent of this research was to examine the impact of the use of selected iPad applications for the remediation and review of early literacy skills on levels of student achievement. The relationship was explored specifically through an analysis of student achievement results as measured by the subtests of the kindergarten edition of the DIBELS Next assessment. Subtest area analysis of each measure was done by comparing students who used the iPad applications to those who did not.

Assessment data was gathered at the conclusion of each of the three testing sessions and was entered into the DIBELS website. Specific groups were configured that included each of the schools in the study and both the control and intervention classes. The completed files were then exported to an Excel workbook. Additional student, teacher and district information was gathered in an attempt to determine if a specific demographic or student profile responded better to the iPad applications. All data was transferred for analysis into SPSS Version 20. Data sets that were incomplete were eliminated from the study. Meta-analytic analyses were conducted in Comprehensive Meta-Analysis (CMA).

Students ( $n=376$ ) in the study were enrolled in full-day kindergarten classes in public school districts across Butler, Lawrence and Mercer Counties in the northwestern region of Pennsylvania. These three counties were not equally represented in the study, with six of the districts in or partially in Mercer County. They were however, more equally representative of rural, suburban and urban populations.

## Demographics

Descriptive data was aggregated from the respondents. Demographic variables of gender, race, and socio-economic status were gathered for each student from district data bases. Teacher information including gender and years of teaching experience, both in kindergarten and overall was provided as well. As suggested by Glass, McGaw, and Smith (1981), all variables were defined and coded so that they could be charted and analyzed along with assessment data. The survey form that was provided to teacher participants is included to represent the additional demographic and anecdotal student and teacher information that was collected is provided as Appendix B. A sample copy of the DIBELS Next student assessment booklet is also included (Appendix C).

The specific demographic information collected was examined to get a more complete picture of the participants that were included in the sample. Students that did not have a complete assessment protocol had their data deleted from the sample. These deletions were made without regard to group membership. Evaluation sample data was used to determine if particular characteristics were relevant to the degree of achievement experienced by individual students.

Participants in the study were identified as part of the intervention group or the control group. Table 2 provides a breakdown of the students by class grouping. Sample sizes indicate the differences in each group once incomplete data sets were eliminated.

Table 2

*Student groupings*

	Full Sample	True Sample
Control	176	147
Treatment	171	144

As indicated, the participants were balanced between the control and intervention classes, representing 51% and 49% respectively.

Table 3 indicates the distribution of students across the eight school districts that participated in the study. The range of group size across districts was 18 and the median district size was 34 students.

Table 3

*Student distribution by district*

District	Frequency
1.0	31.0
2.0	34.0
3.0	35.0
4.0	33.0
5.0	34.0
6.0	30.0
7.0	49.0
8.0	45.0

In Table 4, the participants are further delineated into class grouping. When grouped by class, the control classes ranged in size from 15 – 23 with a median size of 18 students. The intervention classes ranged in size from 12 students to 27 students, with a median class size of 16.5. Both groups within the sample reflected a class size that is fairly representative of the national average kindergarten class size of 22 students, as reported by the National Center for Educational Statistics (2012).

Table 4

*Student distribution by class*

Class	Frequency
1	15
2	16
3	16
4	18
5	18
6	17
7	17
8	16
9	18
10	16
11	18
12	12
13	22
14	27
15	23
16	22

Districts in the study were classified by their typology as rural, suburban or urban as defined by The Department of Transportation (2012). Students participating in the study were representative of all three demographics descriptors. Table 5 illustrates the breakdown of each classification and number of student participants.

Table 5

*District Topology*

Topology	Frequency
Rural	64
Suburban	114.0
Urban	113.0

The fewest number of students in the study ( $n = 64$ ) were from rural areas, with suburban ( $n = 114$ ) and urban ( $n = 113$ ) representation almost identically. This data is in contrast with the information collected by the United States Department of Education which on a national level classifies 27% of schools as urban, 64% as suburban, and 13% as rural (2010). The data is, however, consistent with the 23% rural population that exists across the state of Pennsylvania.

Study participants were coded by gender. In Table 6 a summary of the students across all schools indicates that the participants were relatively balanced with 10% more female than male.

Table 6

*Students by Gender*

Gender	Frequency
Boy	131
Girl	160

Gender information was also gathered for the teachers in the study and is represented in Table 7. Of the 16 teachers in the study only two, or 12%, were male. This data is indicative of the national trend which identifies 85.64% of primary grade teachers as female (USDE, 2010).

Table 7

*Teachers by Gender*

Gender	Frequency
Male	2
Female	14.0



Treatment and control teacher participants were asked to report on their teaching experience, both number of years overall and those at the kindergarten level. Rated along with class size as the factor most consistently tied to higher levels of student achievement, teaching experience has the potential for significant impact (Parents Across America, 2012). Table 8 shows a range of participant experience from two to 36 years. For purposes of coding and analysis, teaching experience was clustered into three categories, one to three, four to ten and more than ten years. These clusters were selected to reflect a continuum of professional experience. The initial range, from one to three years, is described in the work of Charlotte Danielson (2007) as novice. Danielson's *Framework for Teaching* is the foundation for the evaluation system used in Pennsylvania since 1990 (PDE, 2012). Research conducted as part of a study done by the Gates Foundation (2012) indicates that teacher effectiveness is still growing beyond the fifth year. This data supported the identification of the next cluster of teaching experience from four to ten years. Further support for these groupings of teaching experience is found in the Status of Rural America Report (National Center for Educational Statistics, 2007). This national report groups experience in clusters from zero to three, three to nine and ten or more years.

Table 8

*Teachers Total Years Experience*

Experience	Frequency
0 – 3 Years	38
4 – 9 Years	119
10 + Years	134

In order to gather additional information related to the potential factors impacting the study, further delineation of teaching experience specific to kindergarten was

reported. Table 9 illustrates the range of experience for participating teachers from one to 24 years. For purposes of analysis, this experience was grouped and coded into three categories: teachers in their first year, those with two to three years, and those with more than three years. Seidentop and Elder (1989) studied effectiveness as measured by the experience of the teacher. Their observations referred to Benjamin Bloom’s earlier work around automaticity, citing that while first year teachers may accomplish the same tasks, it is the ease with which veteran teachers do so that creates effectiveness. This degree of ease is certainly a potential variable in the management of a kindergarten classroom and the implementation of learning center based instruction. Additional guidance on measure of instructional experience comes from the state of Pennsylvania which has designated the completion of three years of teaching as its point to award tenure, or official employment (PDE, 2012).

Table 9

*Teachers years of kindergarten experience*

Experience	Frequency
0 – 1 Year	35
2 - 3 Years	53
4 + Years	203

Table 10 summarizes the ethnicity of the study participants. This data set reveals that 79.4% of the students in the study are White. Information provided by the Pennsylvania State Data Center (2012) described the ethnic breakdown by the three-county region as: Butler 4.3% minority, Lawrence 7.0% minority, and Mercer 9.0% minority. These statistics combine for a consistent representation as 20.3% minority and 79.7% White of the total population of 392,000.

Table 10

*Students by Race*

Race	Frequency
White	231
Black	48
Multi-Racial	7

Socio-economic status of the student participants is reported in Table 11.

Table 11

*Socio-economic status*

Status	Frequency
Free lunch	135
Paid lunch	156

Skewness and Kurtosis test was used to measure for normality. Sample size of 320 ( $n = 320$ ) contributed favorably to the normality measure. Sub-constructs each had missing data that was identified. The end of the year measure of Nonsense Word Fluency (Skewness = 2.27 and Kurtosis = 8.031) appears leptokurtic. After careful examination, the data does not reveal a kurtosis issue. Normality measure is illustrated in Table 12.

Table 12

*Normality measure for Sub-constructs*

Sub-construct	Mean	SD	Skewness	Kurtosis
First Sound Fluency Beginning	14.53	12.24	0.43	-0.87
First Sound Fluency Middle	37.77	13.7	-0.78	0.33
Letter Naming Fluency Beginning	22.63	15.5	0.62	0.16
Letter Naming Fluency Middle	41.26	15.48	-0.07	0.1
Letter Naming Fluency End	51.31	16.5	-0.16	0.02
Phoneme Segmentation Fluency Middle	38.13	20.45	-0.31	-1.04
Phoneme Segmentation Fluency End	51.61	17.2	-0.75	0.57
Nonsense Word Fluency Middle	25.6	15.05	0.83	1.11
Nonsense Word Fluency End	40.89	29	2.27	8.03

Note: \* $p < .05$  \*\* $p < .01$

Based on the zero-order correlation, significant correlations were revealed between the eight sub-constructs. Each of the sub-constructs shows a correlation that is positive and significant. Correlation ranged from .249 to .741 indicating moderate to large correlations between these factors. The correlations are found in Table 13.

Table 13

*Zero-Correlation of Sub-Constructions*

	2	3	4	5	6	7	8	9
(1) First Sound Fluency Beginning	0.420	0.35	0.3	0.32	0.46	0.38	0.41	0.25
(2) First Sound Fluency Middle	1	0.3	0.38	0.37	0.59	0.45	0.38	0.25
(3) Letter Naming Fluency Beginning	-	1	0.65	0.56	0.37	0.27	0.49	0.4
(4) Letter Naming Fluency Middle	-	-	1	0.74	0.41	0.35	0.58	0.5
(5) Letter Naming Fluency End	-	-	-	1	0.47	0.44	0.55	0.53
(6) Phoneme Segmentation Fluency Mid.	-	-	-	-	1	0.52	0.54	0.34
(7) Phoneme Segmentation Fluency End	-	-	-	-	-	1	0.42	0.36
(8) Nonsense Word Fluency Middle	-	-	-	-	-	-	1	0.64
(9) Nonsense Word Fluency End	-	-	-	-	-	-	-	1

Note: \* $p < .05$  \*\* $p < .01$

Each of the sub-constructs of the DIBELS Next assessment was analyzed for reliability. The items that comprise each sub-construct were assessed for internal consistency. Cronbach's Alpha indicated acceptable reliability for each sub-construct with levels ranging from .590 to .848. A reliability coefficient of .70 or higher is considered acceptable. The coefficient for the First Sound Fluency sub-construct is .590. This is likely a result of the relatively small number of assessment items included in this sub-construct. The results are displayed in Table 14.

Table 14

*Reliability of Sub-constructs*

Construct	Cronbach's Alpha
First Sound Fluency	0.590
Letter Naming Fluency	0.848
Phoneme Segmentation Fluency	0.681
Nonsense Word Fluency	0.694

**Meta-Analytic Analysis of Impact of iPad Intervention**

A fixed analysis of the complete set of data, with both groups combined, indicates a large effect overall, from pre to post for both groups,  $d = .850$ ,  $p < .001$ . The analysis also indicates that heterogeneity exists within the data set. The existence of heterogeneity suggests that there may not be a single intervention effect, but a distribution of intervention effects that will require further analysis. Of more significant interest to the current investigation, effect size measures were examined across the two groups, revealing that these groups demonstrated similar effects from pre to post over the data collection period,  $p = .558$ . These results are provided in Table 15.

Table 15

*Group Comparisons*

Group	n	Between	Mean Effect Size (d)
Group Variable		0.343	
Control	48		0.865
Treatment	48		0.838

Although there were no significant differences between the two groups, further analysis was conducted in an effort to understand if any of the moderators did produce notable differences. The subsequent analysis presents each moderating variable by group membership. This analysis measured the pre- test to-post impact of each group in the study on all measures.

The impact of instructional strategies on the acquisition of early literacy skills across the eight different school districts involved in the current investigation revealed that significant differences exist,  $p < .001$ . All districts are presenting large effect sizes according to Cohen (1992) with notably large effects found in districts two, three and five. The district results are included in

Table 16.

Table 16

*District by Group*

District	Control	Treatment
1	0.566	0.857
2	1.427	0.993
3	1.134	1.128
4	0.49	0.641
5	1.485	0.848
6	0.811	0.748
7	0.749	0.666
8	0.911	0.638

These districts differ in a number of characteristics including topology, race, teacher experience level and socio-economic status. The smallest impact was found in district four and is likely due to a confounding of variables. Each district in the study had a control and a treatment class; this district break out provides that specific school-level analysis. The results are included in Figure 1.

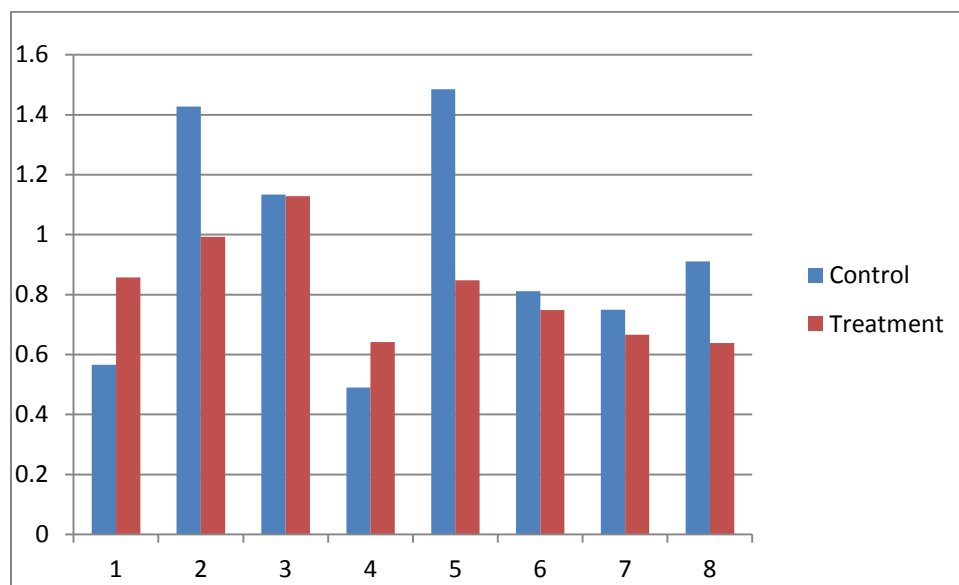


Figure 1. *District by Group*

Analysis at the classroom level indicates consistently large effect sizes  $d > .5$  across groups, with the exception of the control class in district four  $d < .5$ . District three had relatively equal gains in both the treatment and control classroom, while districts two and five had significantly greater effects in their control classes. District four had the smallest effect size in the control group and the second smallest effect in the treatment group.

Demographic data, collected at the district level was across the three topology categories by group. Analysis of the rural, suburban and urban data for both the treatment group and the control group is presented in Table 17 below.

Table 17

*District Topology*

Topology	Treatment	Control
Rural	0.759	0.541
Suburban	0.798	1.131
Urban	0.901	0.851

The data indicates significant effect sizes ( $d > .5$ ) for all groups, across all topology categories. Considerable consistency exists among the categories for the treatment group students. Effect sizes, while also significant, vary across the control group with the rural students the lowest ( $d = .451$ ) and suburban students at the highest ( $d = 1.131$ ). The effect size of the urban students fell in between and was consistent with those of the treatment group ( $d = .851$ ). Figure 2 further illustrates this data by group and topology.

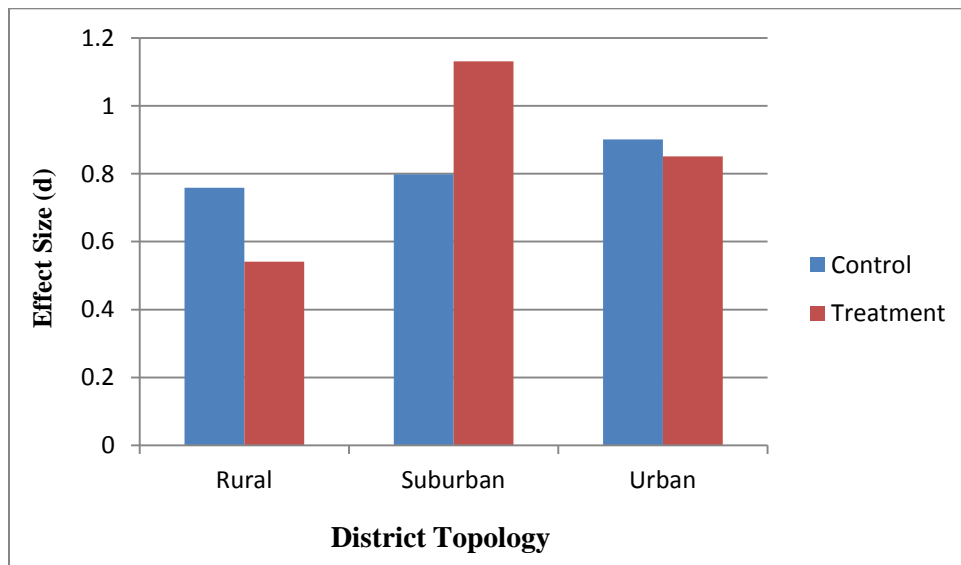


Figure 2. *District by Group and Topology*



Examination of teaching experience was done for all teachers in the study. This information was analyzed by looking at total teaching years and specifically at years teaching at the kindergarten level. Table 18 reflects the distribution of total teaching experience across treatment and control groups.

Table 18

*Total Teaching Experience*

Experience	Treatment	Control
1	0.733	
2	0.917	0.887
3	0.847	0.842

For purposes of analysis, total experience was chunked into three clusters, 1= 0-3 years, 2 = 4-10 years, and 3 = more than 10years. No significant differences are present between the groups, or within groups when looking at total number of years of teaching experience. This detail is further depicted in Figure 3.

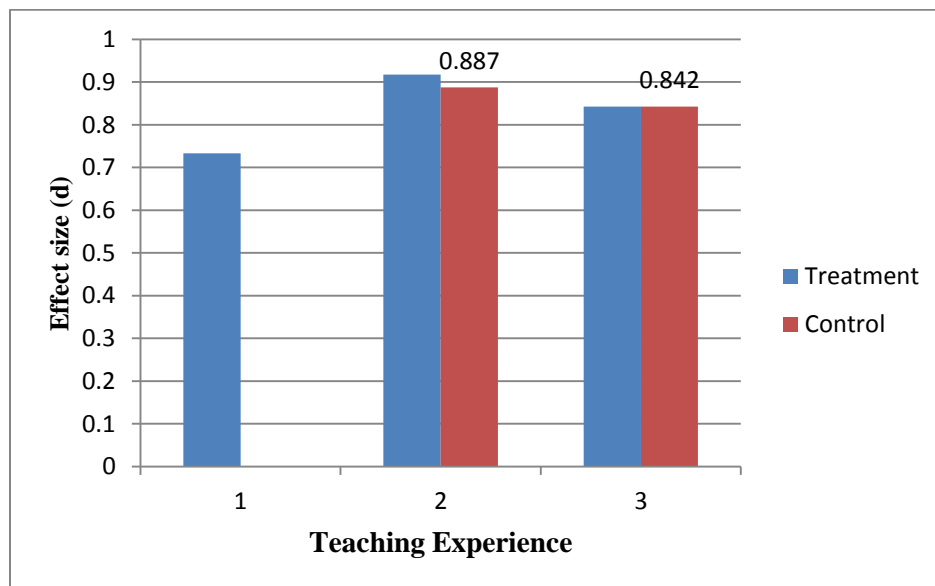


Figure 3. *Total Teaching Experience*

Teaching experience, specifically at the kindergarten level, was further analyzed to look more deeply at its potential impact on student achievement. In an attempt to differentiate, this experience was also chunked into three categories: first year, two to three years and four or more years. Table 19 below displays the breakdown of this experience across groups.

Table 19

*Kindergarten Teaching Experience*

Experience	Treatment	Control
1	0.993	0.49
2	0.733	0.566
3	0.827	0.966

The data for the control group teachers shows a correlation between an increase in number of years and the effect size with the first year teacher having the smallest effect size  $d = .49$  and the teachers with more than four years, the largest  $d = .966$ . Although not significant, the trend follows a contradictory pattern in the treatment classes with the first year teachers having the greatest effect size  $d = .993$ . Figure four below depicts teaching experience, by category in kindergarten.

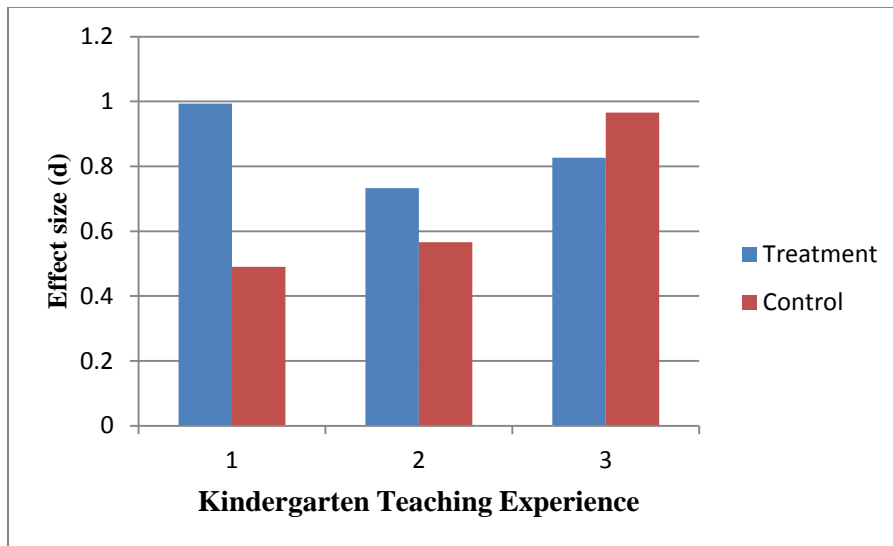


Figure 4. *Kindergarten Teaching Time*

Student participant gender data was gathered for both treatment and control groups. Data was analyzed by placing classes in three categories; majority boys, majority girls or equally balanced by gender. Table 20 illustrates the gender data.

Table 20

*Participant Gender by Group*

Gender	Treatment	Control
1	0.811	0.736
2	0.740	0.999
3	0.933	

The data here as well as in Figure 5 below indicates that no significant differences exist between the effect sizes of groups based on their gender configuration. The data presented here indicates that no significant differences exist between classes based on the gender category. As illustrated in Figure 5 below, classes with a majority of boys performed more consistently across treatment groups than did those that had a majority of

girls. It is also to be noted that the control group did not have a class that was balanced according to gender.

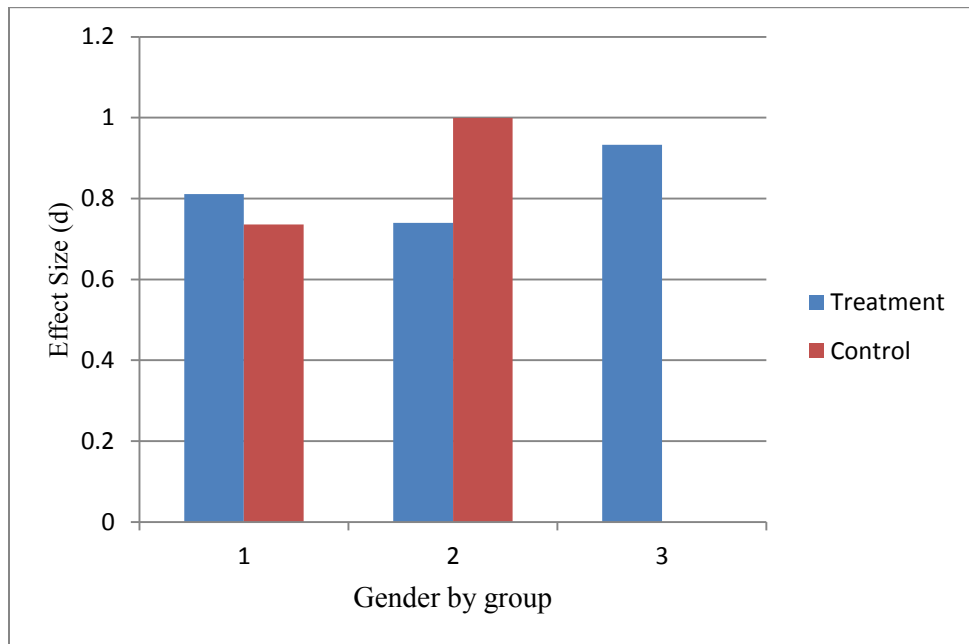


Figure 5. *Gender by Group*

Socio-economic status information was gathered for each participant based on eligibility for free lunch. This eligibility is determined through a formula that includes the total household income and the number of inhabitants in the home. While not all who are eligible for the support take advantage of it, the designation as calculated by eligibility is what was reported for purposes of demographic information. As presented earlier, participants in the study were relatively equal in number with regard to socio-economic status (free = 135, paid = 156). In further analyzing the impact of SES, data was clustered according to the percentage of students within each class that qualified. Groupings were done at five intervals of need: 1 < 20%, 2 = 21- 40 %, 3 = 41-60%, 4 = 61 – 80%, and 5 = 81 – 100%. Table 21 illustrates the effect sizes by cluster of economic need across groups.

Table 21

*Socio-economic Status by Group*

S.E.S.	Treatment	Control
1	0.641	0.911
2	0.715	0.865
3	0.912	
4		0.811
5	0.917	0.88

Analysis of the data reveals no significant differences between treatment and control groups across socio-economic categories. The largest difference is within interval 1 which represents classes that had fewer than 20% of their students meeting the qualification for free lunch.

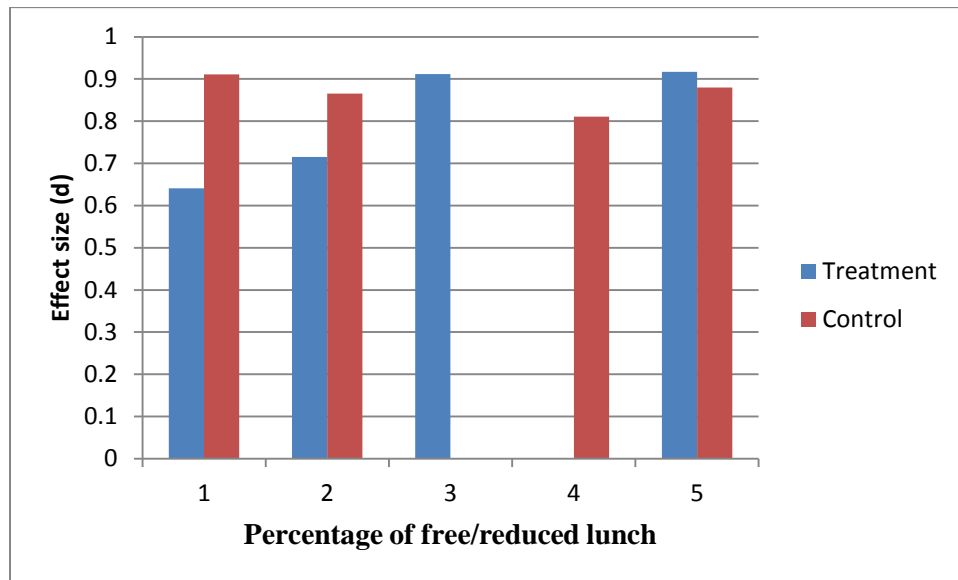


Figure 6: *Socio-economic Status by Group*

Student participant data was gathered for each class by race. Table 22 below represents the study participants across groups by race.

Table 22

*Race by Group*

Race	Treatment	Control
All white	0.861	0.897
Not all white	0.740	0.829

To delineate race, kindergarten classes in the study were sorted into two racial categories, all white or not all white. These categories are illustrated in Figure 7.

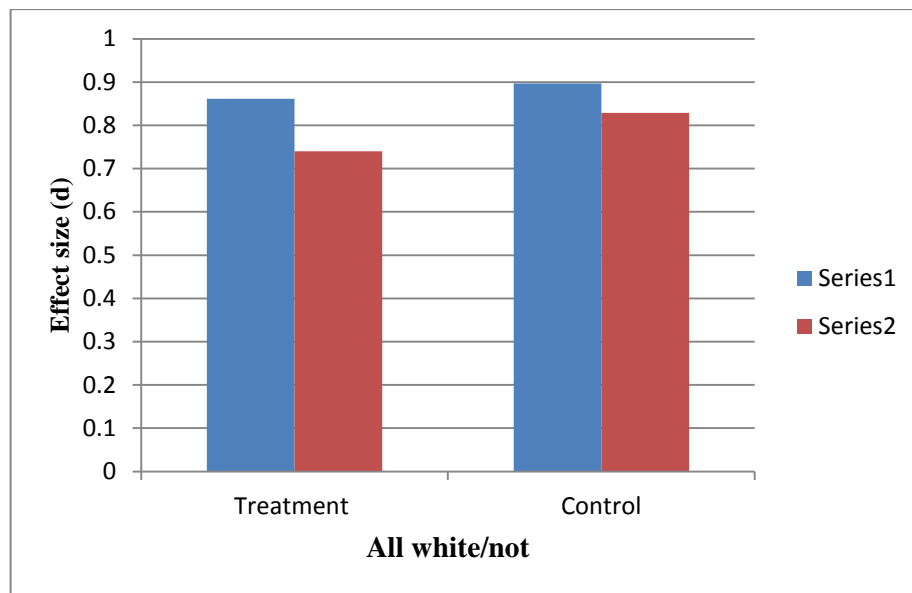


Figure 7. *Race by Group*

The effect scores across treatment groups by race do not reveal significant differences (treatment,  $d = 0.838$  and control,  $d = 0.865$ ). Further delineation of participants was done to look specifically at the potential impact of race on achievement. The racial diversity of each class in the study was categorized by percentage of minority students. Four categories of diversity were identified, 1 = < 25% minority students, 2 = 26 – 49% minority students, 3 = 50 – 74% minority students, and 4 = more than

75% minority students. The effect sizes of these grouping are presented in Table 23 below.

Table 23

*Racial Diversity by Group*

Racial diversity	Treatment	Control
< 25%	0.767	0.829
26 - 49 A sample copy of the student assessment booklet is included as %	1.128	0.862
50 - 75%	0.748	0.811
More than 75%	0.993	1.427

Figure 8 illustrates the racial diversity of the study participants according to percentage by treatment group.

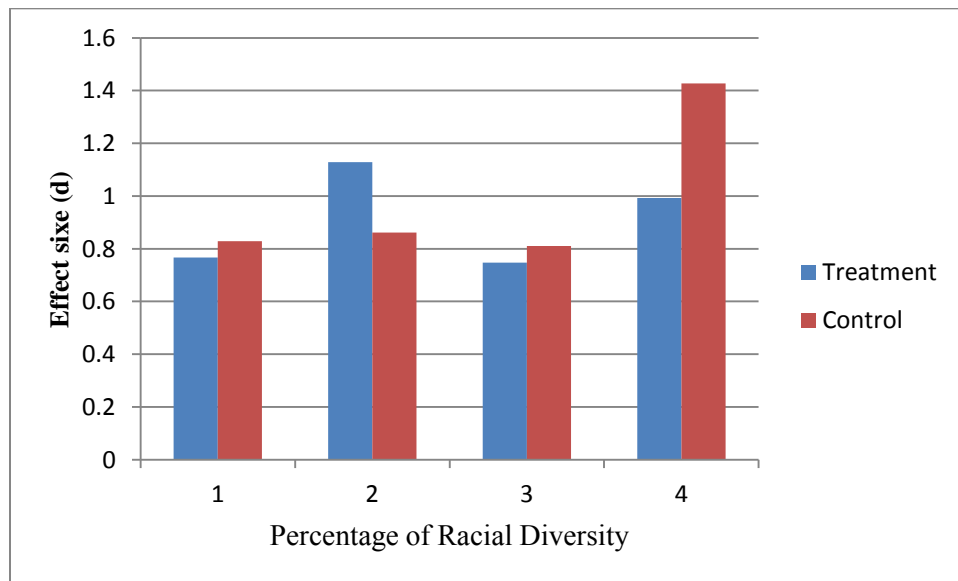


Figure 8. *Racial Diversity by Group*

**Post Meta-Analysis**

Additional analyses were conducted to determine whether differences existed between the two groups (treatment vs control) across the moderators of gender, race and socio-

economic status, with non-aggregate data. A multivariate analysis of variance revealed a significant difference across the four designations by overall test results,  $F(12, 265) = 3.57, p < .001$ . Consistent with meta-analysis results, differences were revealed for change scores across test administrations in Phoneme Segmentation Fluency  $p = .005$ , and Nonsense Word Fluency,  $p = .047$ , specifically across the different SES categorizations (Free Lunch vs Paid Lunch). These differences can be seen in Figure 9 and Figure 10.



Figure 9. *SES by Group on change scores for Phoneme Segmentation Fluency*





Figure 10. *SES by Group on change scores for Nonsense Word Fluency*

Additionally, a trend was revealed across gender in First Sound Fluency scores.

Specifically, female students outperformed the male students on the First Sound Fluency change,  $p = .068$ . These outcomes are provided in Figure 11.

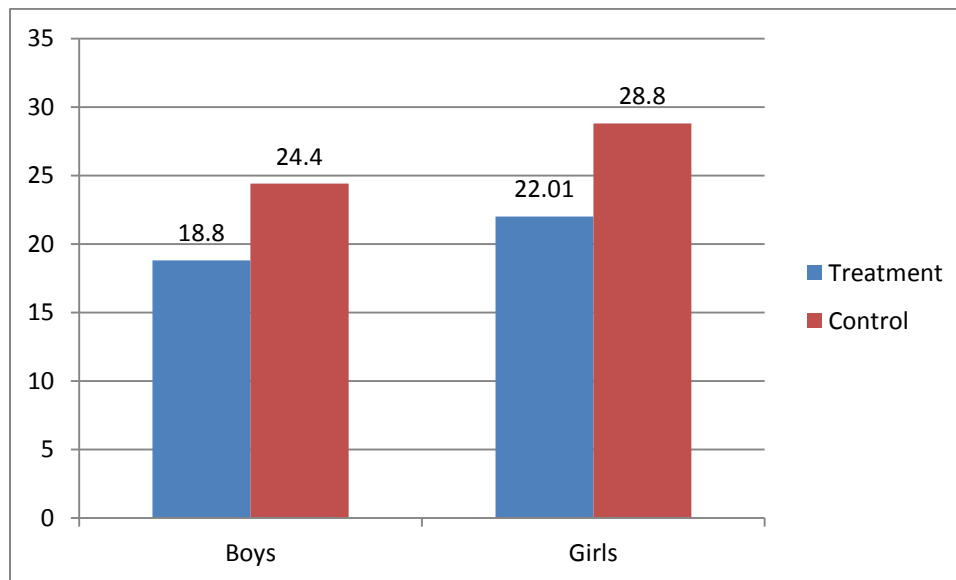


Figure 11. *Gender by Group on change scores for First Sound Fluency*

As indicated by the meta-analysis, no other differences were revealed when examining Group Assignment by Gender, by SES, or by Race, across the six assessment areas.

## Chapter 5

### **Conclusions and Recommendations**

Previous chapters introduced the investigation, presented and analyzed literature related to the study, defined and described the methodology undertaken, and presented the results of the meta-analytic study. Chapter five will summarize the findings of the investigation on the use of iPad 2 applications as a tool to review and reinforce early literacy skills in kindergarten classes. In addition to the interpretation of the findings, this chapter will provide an analysis of the moderating variables and implications for future research.

#### **Purpose of the Research Study**

Education is the single most powerful tool in a society's arsenal. It has the potential to impact the current population and future generations, more significantly than any other factor. In his recent article on the decline of American schools, author, Paul Sran (2012) contended that a sound education is one of the most important, if not the most important foundation to be instilled in today's children. He further asserted that, "our education level will play a major role, in whether or not our future will produce success in today's competitive marketplace."

The goal of this study was to examine the value of using iPad 2 applications in kindergarten to remediate and reinforce early literacy skills. The project used a learning center delivery model and content-based applications targeted intentionally at the areas of phonemic awareness and alphabetic principle. The investigation was designed to examine two specific relationships: (a) the relationship between the achievement of students who did and did not have supplemental instruction using iPad 2 applications,

and (b) the relationship between the use of the iPad 2 applications and the acquisition of early literacy skills as measured by the skill subtests of the DIBELS Next assessment. Chapter four presented the results of the statistical analysis used in this study, summarized the results of the study, and explored the meaning of the findings. Additionally, this chapter sought to identify the implications of this study on the field, as well as the direction for continued research in the areas of early literacy i.e., the integration of iPad technology into kindergarten literacy instruction.

There were three primary research questions in this study:

1. Does the use of iPad applications which present literacy skills in an engaging and visual manner, impact the early literacy achievement of kindergarten students as measured by the Phonemic Awareness and Alphabetic Principle components of the DIBELS Next assessment?
2. Is there added learning value to the use of iPad applications for acquiring the early literacy skills of phonemic awareness and alphabetic principle?
3. Does the achievement and/or growth data suggest that there is an advantage in the use of iPad applications for specific student group or a defined student profile?

### **Summary of Findings**

The investigation examined the impact of six moderators identified through the survey data provided by the teachers in the study. The selection of these moderators was derived relative to their descriptive characteristics related to classroom composition and configuration. The measure of moderator impact was effect size as demonstrated on the DIBELS Next benchmark assessment. Subtests of the assessment were Letter Naming Fluency, First Sound Fluency, Phoneme Segmentation Fluency, and Nonsense Word

Fluency. Moderators were examined across treatment and control groups to assess the relationship between achievement and the instructional approach used. The total population sample was 291 students.

Findings from the statistical analysis demonstrated that there was no definitive relationship between participation in supplemental instruction using the iPad 2 applications and the acquisition of early literacy skills. In other words, participants in the classrooms that used learning centers to facilitate the use of interactive technology activities to reinforce early literacy skill acquisition were no more or no less likely to achieve a higher or lower score on the DIBELS Next assessment. Even when controlling for demographic variables of race and family income, the findings remained unchanged. These results reflect that no clear relationship exists between the use of iPad applications and increased achievement.

Meta-analysis of the complete data set did not reveal significant differences in the effect sizes of the two groups. The overall impact for the treatment group  $d=0.838$  and the control group  $d=0.865$  were statistically equivalent indicating that despite the use of the iPad applications by the treatment group, the instructional impact was the same. While somewhat surprising in terms of the balanced outcome, it could be said that the impact of the use of the iPad 2 was highly valuable to instruction. The implementation of the iPad 2 as a portion of the literacy instruction served in lieu of teacher directed learning. The students in the treatment group, for whom this was the case, fared equally to their peers in the achievement of the early literacy skills. This dynamic indicates an opportunity to use of the iPad 2 as an aid to the teacher's instructional repertoire or as an

independent source of instructional support that enables the teacher to attend to other students.

The current tide of heightened accountability and increased achievement, coupled with the significant challenge and scrutiny over educational spending brings an important focus to these results. Districts are placing a high priority on the inclusion of technology in their efforts to respond to these challenges. iPads are the newest tool in this deployment process, with more than one million sold in the K-12 sector in the last quarter of 2012 (FOX, Business). Larry Cuban, professor at Stanford University, cautions this practice, citing that “There is little evidence that kids learn more, faster or better using these machines” (Hu, 2011). Simply adding the technology to the classroom as an additional resource is not going to produce unilateral results. In the current study, the use of the iPad 2 was layered onto the existing curriculum as a support to the learning process rather than as an integrated part of the learning process. A more intentional plan for the implementation as an integrated feature of the literacy environment may have provided a clearer measure of the instructional impact.

Further analysis of the moderating variables produced trends and patterns for discussion. When looking at the participants by district across the two instructional groupings, the data revealed that the two districts in that study classified as rural, showed the smallest impact with the lowest overall effect sizes. In addition, these two districts were the only ones in the study in which the treatment class’ effect size was greater than that of the control group.

Topology categories revealed additional trends in relationship to the impact of the instructional approaches on achievement. Student participants in the treatment classes

demonstrated very similar effect sizes across the three descriptors, rural  $d = 0.759$ , suburban  $d = 0.798$  and urban  $d = 0.901$ . However, the impact of the traditional approach to literacy instruction, as evidenced in the control group effect sizes, showed a degree of disparity between the rural  $d = 0.541$ , suburban  $d = 1.131$  and urban  $d = 0.851$  students. Further noted within this pattern, was the significant difference between the three suburban district treatment  $d = 0.798$  and control classes  $d = 1.131$ .

Extensive research has supported the importance of early childhood education on future learning and success. Although not mandated, kindergarten serves as the unofficial starting point for formal education. As a result, the background and schooling of the students entering kindergarten is important. Preschool attendance is one indicator of student background and skill. Children in rural communities are less likely to attend both structured center-based child care and preschool than their peers. Although still an area for continued research, preliminary research indicates that attendance is affected by several factors, most notably household income and population density. Swensen (2005) indicated that rural households have a lower income level than those in urban and suburban areas and may not be able to afford the cost of these programs. Additional factors include the limited population density which would influence the availability of these centers within a reasonable distance. Their rural locations and small numbers also may impact the ability for them to employ high quality staff and teachers. This potential lack of quality further compounds the issue for rural students. Although not collected specifically on each student, teachers shared, anecdotally, that the lack of formal childcare and preschool was a concern in the rural schools within the study.

Teachers that participated in the study had a range of experience, both at various grade levels and in years of teaching. With a span of more than 30 years of teaching from novice to the most veteran teacher, this factor warranted examination. No notable differences existed in the achievement of students in relationship to the number of total years teaching their teacher had. It was noted however, that data on the experience level of the teacher in kindergarten did indicate a trend in which veteran teachers showed strong and more consistent results with traditional instruction. The opposite trend was evident in the treatment group data where the strongest achievement occurred in the group with the first-year kindergarten teacher.

Teacher impact has long been touted as the most important factor in the achievement of students. Pennsylvania has taken a firm stance on this issue with its work on Educator Effectiveness (PDE, 2012). Through the work of Charlotte Danielson and the Framework for Teaching (1996), the Department of Education has established a formula for looking at the effects of instruction on student achievement through multiple measures. A critical factor in effectiveness and a component of the Instructional Domain is student engagement. Defined as the promotion of deep thinking, this engagement is often hands-on and includes the application of skills (p. 304). The emphasis on engagement has gained significant momentum over the past several years with an increased focus on differentiated instruction and individualized learning. The work around Universal Design for Learning, as detailed in the Literature Review, focuses on creating connections to the content that will engage all types and levels of learners. This theoretical construct was not part of teacher training and professional development until quite recently. As a result, iPad use is not likely familiar to many of the veteran teachers



in the study, while the novice teachers have been exposed more recently in their educational training. This dynamic may be indicative of the effect experienced by the students in the treatment group who had teachers new to the kindergarten environment. Additional factors impacting the differences in effect across levels of teacher experience may include formal training and experience. The data revealed that classes with the most senior teachers demonstrated the greatest effect sizes in the control group. This instruction in the core program is reflective of many years of experience in kindergarten and in the delivery and integration of a structured literacy curriculum.

Analysis of gender data was conducted based on class composition. Classes were categorized as majority boys, majority girls, or equally balanced. Effect sizes of the various configurations did not show significant differences across groups. Slight differences were seen with boys showing an advantage over girls in the treatment groups, and girls over boys in the control group. Learning style may account for this result as studies show that boys see things differently than girls. David Chadwell, South Carolina's coordinator of single gender education, identifies visual and auditory tendencies that draw boys to motion and direction. He further asserts that boys are more likely than girls to see themselves as capable which leads them to explore unknowns and take risks (Kaufman, 2012). These characteristics are a natural fit for the use of the iPad. The game driven nature of its application design, along with its rich color and interactive applications align very closely to the defined profile that would tend to have more appeal for boys.

Socio-economic status was analyzed according to clusters of students within each class who qualified for free lunch. In comparing the treatment and control groups, the

data revealed that classes with less than 20% of the students qualifying for free or reduced lunch demonstrated the smallest effect for the treatment and the largest effect for the control.

The final moderator analyzed across groups was race. The initial comparison of classes that were all White classes and classes that were not all White showed no differential effect. With a population of more than 74% White, it was important to look more closely at the diversity of classrooms. When analyzed by quartile, the data revealed that within the treatment group, the classes that had a racial diversity of between 25% and 49% showed that largest effect. In the control group, the largest effect was seen in the classes whose diversity composition was greater than 75%.

As presented in the review of literature, a recent study compared students of today with their peers from the early 1920s on intelligence and rate of learning (Pappano, 2010). The research found that developmentally, children have not changed, but their environments and life circumstances have. With the diversity of kindergarten classrooms, comes a disparity of skills and foundational knowledge. Factors of race and poverty contribute significantly to this diversity and have a substantial impact on the early learning of children. Homes with rich language and varied experiences contribute largely to the development of oral language, as well as auditory and verbal skills (NAEYC, 2012). Socio-economic and minority status correlate to limited exposure to the language rich environment in which these readiness skills are most likely to flourish.

An extension of the data analysis revealed differences across test administrations in several of the skill subtest areas between groups. Specific differences existed across socio-economic categories for Phoneme Segmentation Fluency and Nonsense Word

Fluency. The measure used was the change score for each group across administrations of the subtest, both of which were administered at mid-year and the year end. The DIBELS Next assessment is a formative assessment designed to maximize learning and student growth. It is to be used as a predictor of later success. The Phoneme Segmentation Fluency, as with all DIBELS subtests, is an indicator of progress, specifically, toward the long term goal of phonemic awareness (DIBELS, 2011). Students are scored, on their ability to repeat the auditory isolated phonemes in a word stated by the tester. The practice that students in the treatment groups had with the interactive applications may have been a contributor in their success as they did better across groups, significantly so in those not SES eligible.

Often the subtest that receives the most criticism, the Nonsense Word Fluency subtest, measured the ability of the student to decode a three to four phoneme cluster. Critics question the validity of a measure that negates any meaning of the associated sounds that frames the purpose for reading. It is also referred to as the most difficult of the subtests due to the lack of context. Data from the study revealed significant differences between the achievement of the students who met the SES eligibility and those who did not. Those in the treatment group outperformed their peers by a notable margin  $d = 18.25$ ,  $d = 9.23$ . It is again likely that the interactive and auditory features of the iPad applications contributed to this achievement.

The final sub-construct of note is First Sound Fluency. Unlike the previous subtests, this change score represented growth from the initial administration in the fall to mid-year. Data revealed that the control group had a greater effect across gender. In other words, both boys and girls responded better to the core instruction approach to the

acquisition of initial sounds. Students in the treatment group achieved at lower levels with girls outperforming boys similarly in both groups. The gaps in achievement by gender may reflect the level of readiness and early learning that is more indicative of girls at the beginning of the school year.

### **Discussion**

In recent years, as the field of education has moved toward a stronger focus on accountability and on careful analysis of variables affecting educational outcomes, the teacher has proven time and again to be the most influential school-related force in student achievement (Stronge, 2002, p. viii).

Studies conducted by Linda Darling- Hammond (1999) identified teacher effectiveness as a stronger indicator on student learning than class size or configuration. Additional studies stated that experience and effectiveness were not always correlated and that a better indicator of performance was recently acquired and voluntary knowledge (Murnane, 1985).

Also identified as significant to increased student achievement was the teacher's enthusiasm and excitement for the new learning. As voluntary participants to the study, it was assumed that the kindergarten teachers within the treatment classes were excited and enthusiastic. It is possible that this enthusiasm was a factor in the achievement of their students. Seidertop and Eldor (1989) also conducted research on the relationship between expertise, experience and effectiveness. They stated that the knowledge and understanding of content and pedagogy displayed occasionally by beginning teachers, occurred with automaticity by veterans. They further asserted that the more specific and skill-based the content, the more critical the need for experience. The study results

indicated that veteran teachers in the control groups, who had more experience with the core program and the literacy skills it included, showed greater effects than their novice colleagues. Conversely, the treatment groups that were spending less time with the structured, core academic literacy program, and more with the iPad applications, showed the greatest effect when they had a first year teacher.

In an era of significant funding challenges and unprecedented cut backs, districts are trying to balance their budgets and avoid layoffs. As a result, it would seem that investing considerable dollars into technology could be considered excessive. However, The Center for Digital Education (Kaufman, 2012) reports that IT spending has reached more than 20 billion dollars. Additional indicators are found in Apple's 2012 third quarter sales of more than one million iPads to buyers in the K -12 markets (FOX Business). Some critics are questioning the rush to invest so significantly in this technology without any solid research to validate its instructional impact. It was clear in the study data, that just incorporating the iPad into the instructional environment did not significantly impact the learning. Despite the trend and eagerness with which many districts are pursuing the implementation of iPads and the potential they have to transform our classrooms, the critical elements of teaching and learning remain the focus (edutopia, 2012). Incorporating the tools and technology into the service of learning is the key to fully realizing the benefits in that the use of iPads will have on student achievement (Daccord, 2012).

Reducing the achievement disparity between student groups was a major objective of No Child Left Behind (NCLB, 2001). "Researchers have consistently found associations between high risk demographic factors, such as socio-economic status and

minority status and language outcomes for young children” (Pungello, 2009, p.544). The ability to identify this relationship more specifically is very difficult due to the confounding of these variables that exists in most studies. This was further validated in 2005 when the United States Census reported that 33% of African Americans were living below the poverty level and had the lowest median income. The ability to isolate the impact of race or of socio-economic status, when they are so closely linked within the study population, is challenging.

With a participant population of fewer than 25% minority and almost 50% eligibility for free lunch, it was important to look closely at the relationship of diversity and student achievement. As part of participation in the study, teachers were asked to engage in discussions with their colleagues. In addition, survey data was collected periodically to monitor progress and share any concerns with regard to implementation. Throughout the study and across all settings, the issue of student engagement was the common theme. Teachers spoke about the excitement and anticipation with which students approached the use of the iPads. In working through the learning centers, students were eager to have their turn and reluctant to stop at the determined time. Many teachers referred to the willingness of students to persevere through incorrect responses to find success. Pointz and Rimm-Kaufman (2009) spoke about the importance of engagement in increased learning and the kindergarten teachers agreed. They echoed the work of Scullo (2012) that asserted the independence to make choices and felt competence was highly motivating. While not measured independently with the quantitative data, it was clear that the intangibles of the engagement the iPads created were relevant to the learning process. Specific examples shared by the teachers included

the importance of learning, feeling part of a social institution, and understanding that skills had lifelong value, all ideas supported by Wilms (2011).

Issues of quality assurance and accountability for student learning frame the educational landscape of the 21<sup>st</sup> century. As the initial step in the continuum, the importance of early childhood education is a large part of that discussion. The education and focus of policy makers is critical to ensure that educators can make the changes that are necessary. Data from the National Institute for Early Education Research (2011) indicated concerning trends. Statistics from 2011 showed a reduction in attendance in preschool programming attendance from 17% to 16% for four year olds. Additional data showed a reduction in state spending in Pennsylvania from \$6042 to \$5193 per pupil.

Pennsylvania Governor, Tom Corbett, has made education a front burner topic throughout his first term with regard to funding and expectations. His 2014 proposed budget includes additional funding and incentives for success in the area of Pre K to grade three. The recently unveiled "Passport for Learning" Block Grant, is a \$1 billion program for public schools over the next four years addressing four general areas, one of which is "Ready by 3." Here, funds go toward supporting and enhancing a quality kindergarten program that meets academic standards and enhances elementary reading and mathematics through third grade.

### **Limitations**

Several limitations impacted this study including the limited control of the researcher in the implementation. Although fidelity checks were incorporated into the study, the fidelity of implementation was primarily the responsibility of the classroom teacher. Upon reflection of the processes and opportunities that served as the safeguards

for consistency, including the use of the group wiki space training resources and the chat box, inequity was evident. There were no provisions in place to ensure that teachers were collaborating with their colleagues and sharing their questions and concerns with one another. Teachers were encouraged to check in regularly with their peers and share successes and challenges, but there was no obligation to maintain that expectation. As a result, some teachers were more engaged in that sharing process than others and some were more forthcoming with suggestions and supports as well. Firmer guidelines around the content and frequency of that communication would not only have created greater consistency, but it would have also encouraged more collaboration among study participants.

Another limitation of the study was the training that was provided to the teacher participants. The three sessions that were provided to them included an overview of the study guidelines and implementation, training on the use of the iPad, and the selection of applications that were aligned with the skills and subtests measured by the DIBELS Next assessment. Little time was devoted to the management and logistics of the implementation structure relative to establishing learning centers or the introduction and instruction of the identified applications.

In order to fully understand the technology and to be comfortable with the implementation plan and data collection, the training was less than adequate. Daccord (2009) identified “Lack of Teacher Preparation in the Classroom Management of iPads” as one of the 5 critical implementation mistakes that schools make.



## **Conclusions**

The technology –laden 21<sup>st</sup> century is filled with educators and politicians intent on digitizing classrooms. Funding has increased over the past 25 years to support this focus and to enhance learning opportunities for children. The results of this investigation clearly reveal that simply by incorporating the use of iPads in our kindergarten classrooms, achievement gains will not be realized. Instructional benefits can be achieved, but the complexity and nature of those gains require a much broader investigation.

## **Recommendations for Future Research**

The current study offers one view of the impact of iPad applications on early literacy achievement. Further research is needed to more fully investigate the potential this medium has on instruction and early literacy development.

1. To further examine the impact of the moderators in the study, intentional grouping of students is necessary. By creating balanced classes with regard to student ability, race, socio-economic status and gender, the correlation would more readily reveal the impact of the instructional strategy on the demonstrated learning. This design would also enable the research questions to explore each moderator separately and examine its impact on achievement. This could be easily accomplished by random assignment of the students to the treatment and control groups.
2. The routines in the classroom with regard to implementation of the study would also need to be closely monitored. In addition to the establishment of specific parameters with regard to instructional time, teacher documentation of usage is

necessary. Teacher logs of student participation, including the specific application used and duration, would provide beneficial data on the individual effectiveness of each, as well as for which students the effect was the most significant. One limitation of the study was the thirty minutes twice a week treatment. Future research with kindergarten level students should consider the impact of more frequent usage experienced in smaller increments of time.

3. The analysis and selection of the applications for use in the study suggests another area for further examination. In assessing the potential impact of these applications on the acquisition of early literacy skills it is important to consider their development. What qualifications and experience do the developers of these applications have? How knowledgeable are they about developmental readiness and age-appropriate graphics, images and illustrations? Do they work alongside professionals who have content and pedagogy specialties?
4. The impact of teacher experience on student achievement is another area that provides opportunity for further research. This moderator would be best examined in an environment where teachers within each district are paired based on similar levels of experience, both overall and in kindergarten. With one teacher serving as the treatment and the other the control it would create a clearer picture of the relationship that experience had on the two learning processes.
5. Finally, identifying the use of technology in the home would be valuable in further isolating the impact of the iPad on learning. This information would be best gathered through a parental survey that would indicate the type of technology in the home, as well as student access to it. Specific data would be collected on

the games and applications that are included and the length of time the student engages in its use.

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## Appendix A

### Institutional Review Board (IRB)

The research collection and analysis for this dissertation is a meta-analysis. The data collected for the study was already being gathered and involved no interaction with human subjects. Therefore, a Claim of Exemption form was submitted to the Institutional Review Board. The following response to the waiver was sent via United States mail on May 30, 2012 by the Dean and Research Compliance Officer, Dr. Peter J. Kasvinsky, “The IRB determined your project ‘iPad 2 Applications and Emergent Literacy is exempt from full committee review based on DHHS Category 1, 2, 3, & 4 : Do They Have An exemptions. The Institutional Review Board would like to extend its best wishes to you in the conduct of this study.”

## Appendix B

### Teacher Interviews

Name \_\_\_\_\_ District \_\_\_\_\_ Date: \_\_\_\_\_

#### Teacher Profile:

1. What is your certification and highest level of education?
2. Describe your teaching experience? How many years have you been teaching? How much in Kindergarten?
3. What, if any training do you have specific to implementation and use of instructional technology?

#### District/Building Demographic:

4. What percentage of your Kindergarten students attended preschool?
5. How many students had some familiarity with technology tools/resources prior to using the iPad2 in class?
6. What affect has the introduction to this technology had on your students. ie frustration, ease of transition, etc.?

#### Instructional Implementation:

7. Please outline your iPad learning center structure/schedule, including frequency and time of day.
8. What does the DIBELS data reveal about your students strengths/needs in early literacy skills? What are your instructional priorities?
  
9. How has the use of the selected applications impacted the acquisition of the determined skills?

**Motivation:**

10. What degree of engagement have you seen on the part of students?
  
11. Describe the interaction between students working collaboratively on iPad applications.
  
12. What motivation have you seen in students when working on the apps? Versus when using other resources?

**Perceptions/Communication:**

13. How have you shared/will share the program with your district administrator, staff and families? What has been the feedback from parents?
  
14. What advantages do you see to this type of instruction? What disadvantages?
  
15. What challenges had the use of iPad2 in the classroom created?

## Appendix C

### DIBELS Student Assessment Booklet