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AN EVALUATION OF PROJECT iREAD: A PROGRAM CREATED TO IMPROVE SIGHT WORD RECOGNITION

A Dissertation

Presented to

The Faculty of the School of Education

The College of William and Mary in Virginia

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Education

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by
Theresa Meade Marshall
May 2014

AN EVALUATION OF PROJECT iREAD: A PROGRAM CREATED TO IMPROVE SIGHT WORD RECOGNITION

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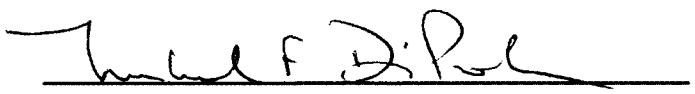
Approved May 2014 by



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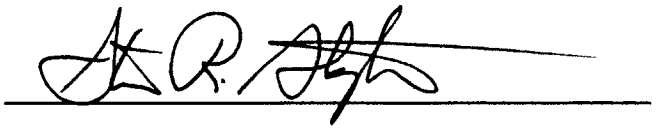

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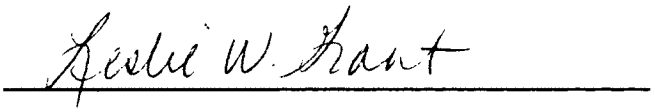

Leslie W. Grant, Ph. D.

Dedication

We see the word family so often and in so many contexts. There is a reason for this. Families stand by us and with us and sustain us. I dedicate this work to my family. You, beloved ones, are the reason I am.

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Acknowledgements

Completing one's doctorate is an enormous undertaking. It does not begin alone, progress alone, or end alone. I am a fortunate woman. Dr. Michael DiPaola sat beside me in the halls of our school of education and asked me, point blank, what I was thinking. When we are called to examine our motivation and our goal, we are forced to articulate our plans, hopes, and dreams. Sir, I thank you. My journey was easy because of you.

My committee members have been more than just evaluators. Dr. Steven Staples and Dr. Leslie Grant challenged me to think about the larger picture of student achievement, fidelity of school participation, and district decision-making. Their input continues to help me find ways to improve my leadership.

Additionally, I am indebted to Marcie Walsh. She created Project iRead. Her efforts are recognized by our school district. Marcie has been a tireless advocate for students. I truly believe this program can positively impact student growth. I also believe Marcie will find a path to ensure Project iRead meets its potential.

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AN EVALUATION OF PROJECT iREAD: A PROGRAM CREATED TO IMPROVE SIGHT WORD RECOGNITION

ABSTRACT

This program evaluation was undertaken to examine the relationship between participation in Project iRead and student gains in word recognition, fluency, and comprehension as measured by the Phonological Awareness Literacy Screening (PALS) Test. Linear regressions compared the 2012-13 PALS results from 5,140 first and second grade students at adopting and non-adopting schools. Similar regressions were performed at early and late adopting schools. The outcomes for Project iRead indicated statistically significant improvement in word recognition at the district level. However, the results were not practically significant as less than 1% of the variation was explained by the model. In addition, Project iRead appeared to have negative relationships with word recognition, fluency, and comprehension when comparisons were conducted at early and late adopting schools. Practice changes and further research would improve our understanding of both sight word instruction and Project iRead. Amendments to Project iRead's implementation manual and additions to its Virtual Flash Card repertoire may increase practical outcomes. A qualitative study may explain present outcomes. Research that includes disability status and word recognition as predictors may provide more insight into Project iRead's best uses. Finally, limiting the data set to students 2 standard deviations from the mean or to students who are at or below grade level benchmarks may be more indicative of this program's relationship to gains in reading.

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EDUCATIONAL POLICY, PLANNING, AND LEADERSHIP

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AN EVALUATION OF PROJECT iREAD: A PROGRAM CREATED TO IMPROVE SIGHT WORD RECOGNITION

Chapter One

Background of the Study

Today, America's schools fight a battle for accreditation. They strive to meet the annual measurable objectives (AMO) specified by the Elementary and Secondary Education Act (ESEA) (2012). The latest iterations of the ESEA, No Child Left Behind (NCLB) Act and Race to the Top (RTTT) require annual growth and standardized testing with ever-increasing achievement expectations for every demographic group and every child (NCLB, 2002). The pressure to prepare all students for the standardized assessments and produce necessary student gains is at the forefront of many educational conversations. The majority of the impact and stress of these federal mandates are both exerted and felt at tested grade levels. While this varies from state to state, the tension—and the standardized testing—typically starts in third grade as only California and Iowa test primary students.

The need to meet these standards is felt by school superintendents, principals, and teachers. These educators and leaders search for proven programs that allow them to meet the challenge of educating students with diverse backgrounds and abilities. One of those school districts, named Central County for this study, encourages its teachers to go beyond the basic requirements of state and federal standards in order to deliver a premier education to all its students. The results should be seen in students' career and college readiness.

And yet, learning does not begin in high school or in third grade. Indeed, critical foundations are laid in the primary grades. Although students in kindergarten, first, and second grades do not typically take standardized tests, under NCLB (2002) their teachers are still responsible for ensuring children read by the time they reach third grade. This

call for early literacy began with action from the United States Congress. In 1997, congressional leaders called for a review of extant research on early literacy and on what can be done to improve both reading and writing skills in the primary grades. The result was the *Report of the National Reading Panel: Teaching Children to Read* (National Institute of Child Health & Human Development, 2000). This government funded meta-analysis of over five hundred research articles yielded information on children's early abilities, instructional approaches, environmental settings, and student characteristics which might be linked to later outcomes in reading, writing, or spelling. Alphabet knowledge, phonological awareness, and oral language were identified as essential components in early literacy instruction.

The NCLB Act tapped this research as part of its justification for funding the Early Reading First (ERF) and the Reading First programs that offered three-year grants to various agencies. These grants were used to improve oral language, phonological awareness, print awareness, and alphabet knowledge for students from low-income families in school systems not meeting federal standards (NCLB, 2002). The federally mandated national review of ERF revealed that the program had a positive impact on the number of hours of professional development for teachers and on their classroom practices. However, while ERF was found to positively impact print and letter recognition, it did not have the same impact on students' phonological awareness or their oral language. Additionally, funding for this program ended June 30, 2012.

Reading First was funded to improve student performance in what the NICHHD identified as the "essential five"—phonemic awareness, phonics, vocabulary, fluency, and comprehension (National Institute of Child Health & Human Development, 2000).

The methods of improvement included providing professional development, progress monitoring, materials, interventions, and reading coaches. In 2008, the federal government called for a report on the efficacy of the program. The *Reading First Impact Study Final Report (RFISFR)* (Gamse, Jacob, Horst, Boulay, & Unlu, 2008) detailed those results. The researchers found that Reading First had a positive and significant impact on instructional time on task, professional development, and decoding. However, the program had no discernable impact on student comprehension. Regardless of utility, funding for this program ended June 30, 2010.

The issue of early literacy impacts the nation's schools at multiple points and is measured with a variety of instruments. Data can be examined at the national, state, district, school, classroom, or student level. Statistics indicate a continuing deficiency in our students' reading abilities. The National Center for Education Statistics (NCES) conducts a biennial National Assessment of Educational Progress (NAEP) (U. S. Department of Education, 2011). NCES rates student performance on this test as basic, proficient or advanced. Students scoring in the basic range manifest only partial mastery of the knowledge and skills necessary for grade level work while proficient students exhibit solid academic performance and competency. In 2011, the NAEP indicated that only 32% of all fourth grade students nationwide scored at a proficient level or higher. The tests also revealed that 39% of Virginia's fourth graders performed at the same level. The tests are meant to be representative of the state and the nation, not of a particular school district. However, the data in Table 1 indicates that Central County Public School's (the school district's and its schools' names have been changed to protect anonymity) pass rates for the Virginia Fourth Grade Reading Standard of Learning Test

(SOL) are quite similar to the state's overall results (Virginia Department of Education, 2012). Thus one might extrapolate that the results of NAEP are similarly representative of the county's students. And while a high percentage of students are passing the SOL, their success does not translate to the NAEP statistics.

Table 1

Fourth Grade SOL Pass Rates from Central County's School Report Card

Student Subgroup	Type	2009-2010	2010-2011	2011-2012
All Students	Division	90	88	89
	State	88	87	88
Female	Division	92	90	92
	State	90	89	90
Male	Division	89	87	86
	State	87	85	86
Black	Division	87	85	86
	State	80	77	79
Hispanic	Division	84	83	84
	State	85	81	83
White	Division	95	94	94
	State	92	92	92
Students with Disabilities	Division	74	70	68
	State	76	68	67
Economically disadvantaged	Division	83	80	81
	State	81	79	80

While NAEP measures achievement of fourth grade students, it is the instruction they receive in the primary grades that builds the basis of literacy. The National Early Literacy Panel found several strong and consistent predictors of successful development of literacy skills (2009). These include understanding graphemes and their associated

phonemes, knowing how to manipulate syllables, and being able to write one's name. Central County is grappling with early literacy on several levels. The district has forty-five elementary schools. However, only twenty-two of those schools house federally funded preschool classes. Even then, there are a total of just thirty classes. In comparison, the county provides one hundred ninety-three kindergarten classes. The federally funded preschools have a maximum of 18 students while kindergarten classrooms typically consist of 20 students. This grants access to federally funded preschool to less than 14% of the district's students. Thirty-eight percent of Central County's student body is eligible for free and reduced lunch (Virginia Department of Education, 2011). Studies have indicated that children from a low socioeconomic background struggle to master spoken and written language skills (Pruitt, Oetting, & Hegarty, 2010; Terry, Thomas-Tate, & Love, 2010; Whitehurst & Fischel, 2000). Therefore, less than half of the students who might benefit from preschool are able to participate in the program due to shortages in funding from federal, state, and local sources.

In addition to providing preschools Central County Public Schools, like other districts across the nation, relies upon the research theories of NICHHD (2000). Their "essential five" components of reading—phonics, phonemic awareness, fluency, comprehension, and vocabulary—are central in today's research-based reading programs. There is no doubt that phonemic awareness is a large part of both reading and reading comprehension (Ehri & McCormick, 1998; Snider, 1997). However, success is also predicated on fluency (Rasinski, Samuels, Heibert, Petscher & Felle, 2011; Samuels, 2006). That fluency is impacted not only by students' phonemic abilities, but also by

their facility with common sight words. Before students can learn to read words automatically and effortlessly, as suggested by the NICHHD (2000) and as mandated by NCLB (2002), students must learn and practice words in isolation (Carnine, Silbert, Kameenui, & Tarver, 2004). Gunning (2003) adds that students must become accurate readers and they will "have automaticity if they recognize the words rapidly" (p. 196). Additionally, Hiebert, Samuels, and Rasinski (2012) argue that "proficient silent reading is the means whereby individuals access the ever-increasing stores of knowledge within texts that are required for the workplace and community" (p. 114). Such proficiency can occur only when students have both the ability to decode words and the ability to recognize words.

How can Central County provide high quality, research based programs which not only meet the need to increase students' sight word vocabulary, but do so in a systematic and engaging way? This was the question facing the program's creator in the summer of 2008 when she created Project iRead. This program originated as a method to enlarge the sight word vocabularies of students in a single classroom. It has since grown to serve approximately 7,000 students.

Project iRead: Theory

Fitzpatrick, Sanders, and Worthen (2012) use program theory to explain the logic of a program. One of Central County School District's answers to the problem of word recognition is Project iRead. A logic model supporting Project iRead is illustrated in Figure 1. While a logic model provides a structure for understanding the machinations of Project iRead and facilitates the program evaluation, grounding this logic model in the

program's underlying theory will help ascertain if and why the program will achieve its intended goals.

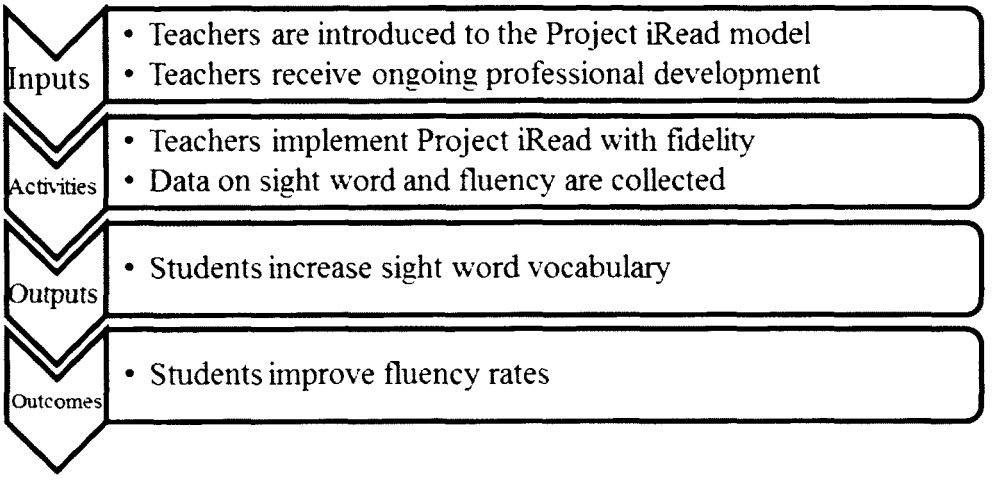

Figure 1. Project iRead Logic Model

If one knows the program's extant and stated inputs, activities, outputs, and outcomes, then it is possible to align these components with the program's underlying theory (Weiss, 1997). "Theories help people understand phenomena, guide how people react to and make sense of the natural world, and should help frame how people explain and understand phenomena under study" (Amrein-Beardsley & Haladyna, 2012, p. 18). Weiss adds that theory-based evaluation can "show the series of micro-steps that lead from inputs to outcomes....if some of the posited steps are not borne out by the data, then the study can show where the expected sequence of steps breaks down" (p. 43).

Project iRead's developer and a major stakeholder stated that she has anecdotal notes suggesting the program's ability to improve sight word recognition and student fluency rates (personal communication, January 17, 2013). Thus, Project iRead was created on her theory that repeated exposure to sight words at each student's individual

ability level would lead to improved reading outcomes for students in kindergarten, first and second grades. Weiss (1997) maintains that researchers should avoid sole reliance on stakeholders' overly simplistic theoretical models and instead suggests combining stakeholder input with extant research to build program theory.

Research analyzed in *Report of the National Reading Panel: Teaching Children to Read* (NICHHD, 2000) offers several theories about reading. These suggestions may support Project iRead's design and expected outcomes. The panel, through extensive review of existing research, found that repeated oral reading led to improvements for both good and poor readers. However, research also suggests that such repeated readings should be accompanied by feedback and guidance. The National Reading Panel also maintains that, while accuracy of word recognition is not the goal of reading, such accuracy, efficiency, and automaticity is essential for fluency. And, as noted previously, fluency is essential for reading comprehension (Rasinski et al., 2011; Samuels, 2006). Hence, an existing theory regarding early literacy supports teaching sight words by giving students multiple opportunities to read both to themselves and to others in order to improve their accuracy and automaticity (Biemiller, 2006; Carnine et al., 2004; Homan et al., 1993). This notion of improved facility is the foundation of Project iRead, supports the program creator's anecdotal observations, and provides the theoretical groundwork for this program.

Project iRead's Program Design

Project iRead utilizes iPods to teach Dolch sight words. The program's creator used Microsoft PowerPoint to combine QuickTime movies and sound. The selection of movies includes all the sight words at a particular level—from pre-primer through third

grade. Additionally, students can access a smaller subset of those sight words as the program's creator has crafted practice sets of ten words to reduce frustration rates for some students. Younger students can also practice letter recognition and letter sounds while older students or those who need more challenging work can read passages in order to improve their fluency.

Project iRead consists of virtual flash cards (VFC) and virtual repeated readings (VRR). This program evaluation, due to its limited scope, will focus only on the results achieved using VFC which allow students to work on their own level with either letter names and sounds or sight words. The Dolch (1936) sight word list is not the only list of sight words, but it is one of the oldest and perhaps most popular English sight word lists. Dolch built on the work of contemporaries and published his research in 1936. Dolch's list consists of 220 sight words common to the International Kindergarten Union, the Gates List, and the Wheeler-Howell List. In 1970, Johns conducted research and found the Dolch sight word list continues to be relevant to the subject matter students are taught. Today, teachers continue to utilize this list.

Project iRead's VFCs provide visual, oral, and aural practice of sight words. When using VFCs, students see the word, say the word, and hear the word. There is a three second delay between the time the word appears and the time the recording of the word is heard. Students are expected to speak the words aloud during this pause and then listen for the correct word as the recording plays. In this way, students either receive immediate reinforcement for words read correctly or immediate correction for words read incorrectly. The program's creator has designed 10-word lists for students with difficulty

attending to an entire list of 40 to 50 words. This allows teachers more freedom in scheduling students for the program and in differentiating for individual student needs.

Project iRead Program Context

The program's creator was a Central County exceptional education teacher working in a collaborative fourth grade classroom in 2007. Her school, Left Bank (all school names are pseudonyms), received Title I funding and her students functioned on many different reading levels. Project iRead's creator found traditional sight word instruction cumbersome and ineffective with the high variation in reading levels. During the summer of 2008 Project iRead's creator learned how to turn Keynote presentations into Quicktime® movies. She used this skill to create flash card files that would allow the audio portion of a Quicktime® movie to provide the immediate reinforcement or correction she had been doing in person. This portion of the program aligns with the theory of sight word development and fluency noted in the National Reading Panel's research (NICHHD, 2000).

The project expanded after Project iRead's creator attended a second summer professional development institute offered by Central County which dealt with reading fluency interventions. She realized that several research-based fluency practices could be replicated using the recording functions on MacBooks and iPods. This led to the development of the second component of iRead—the Virtual Repeated Readings. This component uses variations on the fluency practices of repeated readings, modeled reading, choral reading, and paired or supported reading (Adlof, Catts, & Little, 2006; Armbruster, Lehr, Osborn, 2001; Hicks, 2009).

Project iRead's creator was able to conduct her work due to the financial support of a grant from the county's educational fund. Her grant was the first one awarded specifically for technology equipment and the program was monitored on a quarterly basis. Subsequently, Project iRead's creator presented at the Central Educational Foundation's Literacy Conference in 2010 which was co-sponsored by the Title I. This gave Title I teachers and administrators exposure to Project iRead and led to a meeting in the spring of 2011. From this meeting, the coordinator for Federal Programs agreed to fund Project iRead in all 20 Title I schools in the district. The implementation of Project iRead will be completed in these schools in 2013-2014.

Description of Project iRead

Central School District's site-based and central office administrators are on record supporting the creation of multiple and varied opportunities for students to become successful in their experiences with early literacy. One of the multitude of supports was actually created within the district—Project iRead. This program presently consists of a part-time project manager, 17 sites, approximately 200 teachers, 7,000 students, and 200 iPod Touches.

Activities

Project iRead was designed to support struggling readers. The intervention has several components including sight word instruction and practice, repeated readings, modeled readings, and paired readings. Typically, such instructional or intervention practices require either small group or individual attention from the teacher. Instead, Project iRead utilizes an iPod Touch to deliver instruction. The goals in creating this product were not only to allow the teacher to provide targeted, individualized instruction

to students but also to provide that instruction in the most engaging manner possible, i.e. the novelty effect of using an iPod Touch.

Each iPod Touch is loaded with Virtual Flash Cards (VFC). These were created using Apple's Keynote and then rendered as QuickTime® movies. Ideally, students see a word—visual stimulus, then say the word—oral stimulus, then hear the word—aural stimulus. As stated previously, there is a three second pause between the appearance of a word on the iPod's screen and the time the recording can be heard. This delay creates a "game" aspect for Project iRead because students strive to say the words they encounter before the other player—Project iRead's creator—is able to say them. Thus, students increase their sight vocabulary with immediate reinforcement or correction. All of this occurs without direct teacher or interventionist supervision.

Students may also utilize the Virtual Repeated Readings (VRR) loaded onto the iPod Touches. In this option, students record themselves reading an unfamiliar passage. Students then read the passage silently while listening to a teacher-generated recording which models proper fluency. The next step in this process requires students to record themselves reading aloud with the teacher-generated recording as a paired reading. The final step is for students to record themselves reading the passage alone. Teachers may listen to the initial student reading and the final student reading in order to gauge student progress. Running records can be utilized to gather these data.

Data collection is another component of the program. A baseline screening allows educators to determine which sight word list is appropriate for students to use. Words are available from letter recognition and pre-primer levels to third grade. Running records allow teachers to determine students' fluency rates before and after VRR.

The combination of sight words and short passage readings give primary grade teachers a host of options for differentiating instruction in the classroom. More importantly, Project iRead provides students direct instruction at their level. The question for this study is whether participation in Project iRead instruction is meeting its goal of increasing student reading performance as measured with the fluency and comprehension components of the Phonological Awareness Literacy Screening (PALS).

Participants

Seventeen of the Central School District's 45 elementary schools presently use Project iRead as an instructional tool with kindergarten, first grade, and second grade students. Twenty-seven schools do not use Project iRead, and one of the district's schools only serves students in grades 3-5. The populations and accreditation status in reading of the participating schools are displayed in Table 2.

Table 2

Participant Demographics

	Number of Students		Accreditation Status	
School	Total	K-2	State	Federal AMO
Anderson	468	214	Accredited	Fully met
Barton	489	228	Accredited	Fully met
Downtown	493	228	Accredited	Not met in reading
Derbyshire	590	300	Accredited	Fully met
Fairlawn	366	149	Accredited	Fully met
Glades	538	170	Accredited	Fully met
Harvest	607	282	Accredited	Not met in reading
Highview	500	253	Accredited	Fully met
Jones	490	239	Accredited	Fully met
Lance	546	263	Accredited	Fully met
Lakeview	472	223	Accredited	Not met in reading
Left Bank	541	243	Accredited	Fully met
Meadowbrook	619	327	Accredited	Fully met
Rappahannock	465	205	Accredited	Fully met
Restful	524	254	Accredited	Not met in reading
Tidewater	669	341	Accredited	Fully met
Water's Edge	515	252	Accredited	Fully met

Fifteen of the schools using Project iRead receive Title I funds. As part of the Elementary and Secondary Education Act, Title I funding provides additional money for at risk students from impoverished communities (U. S. Department of Education, 2003). Those funds were utilized for Project iRead. Meadowbrook and Tidewater schools are not Title I schools. Instead, they received funding from their PTAs in order to implement Project iRead.

Expected Outcomes

The National Reading Panel (NICHHD, 2000) estimates that 20% of students experience difficulties with reading. Adams (1990) posits as many as one-third of primary students grapple with the skills necessary to read. Project iRead's comprehensive manual affirms the purpose of the project is to support struggling readers. Therefore, the goals of this program mirror the goals for many American schools.

This program evaluation will focus only on the VFC. Their purpose includes increasing sight word recognition, improving fluency, freeing working memory, and thereby boosting comprehension. An additional expectation is for students to retain those skills over time. The use of novel technology, differentiated instruction, and research-based methods are expected to create successful student outcomes.

Program Evaluation Model

Program evaluations take many forms. One noted researcher identified 22 approaches (Stufflebeam, 2000a). Fitzpatrick, Sanders, and Worthen (2012) assert that no single model meets every agency's needs. Rather, each situation should be examined to determine the best design to utilize. They distilled Stufflebeam's 22 approaches into five broad categories—expertise-oriented, consumer-oriented, program-oriented, decision-oriented, and participant-oriented. Additionally, the Joint Committee on Standards for Educational Evaluation (JCSEE) has identified areas of utility, feasibility, propriety, and accuracy researchers should consider as they conduct studies (Yarbrough, Shulha, Hopson, & Caruthers, 2011). These JCSEE standards dictate that a program evaluation must be responsive to stakeholder needs, conducted in a timely manner, serve

its intended purpose, be comprised of practical procedures, employ systematic information collection, and yield reliable information.

This study will apply a decision-oriented design. In particular, Stufflebeam's CIPP model provides the framework to allow the evaluator to make decisions regarding product evaluation (as cited in Fitzpatrick, Sanders, & Worthen, 2012). Such a design provides the framework for examining the product of a program thereby providing "a knowledge and value base for making and being accountable for decisions that result in developing, delivering, and making informed use of cost-effective services" (Stufflebeam, 2000a, p. 41). This research approach allows stakeholders to measure outcome success. Therefore, the decision-oriented CIPP program evaluation design is the most reliable and valid approach to use for this study.

Stufflebeam's (2000b) CIPP model delineates the four categories of evaluation it encompasses: context, input, process, and product. This particular evaluation model can be either formative or summative. When conducting a study, it is important to differentiate between formative and summative evaluations. A formative program evaluation is useful to the program's creators and implementers while a summative evaluation can provide information about the continuation or expansion of a program (Fitzpatrick et al., 2012). It is possible for evaluations to include both formative and summative qualities. However, they typically tend to fall primarily in one category. Indeed, the CIPP model may be utilized in its entirety or may form the basis of focused examination of a program. This evaluation was entirely summative as the program has been in place since 2008. Table 3 illustrates the uses of CIPP.

Table 3

Uses of CIPP in evaluations

Evaluation's Role	Context	Input	Process	Product
Summative	Compares assessed strengths, weaknesses, opportunities and threats to goals	Compares strategies, design, and budget to competitors or beneficiaries	Describes processes and compares designed to actual processes	Compares outcomes to needs and interprets the results in light of context, input and process
Formative	Provides guidance for identifying intervention needs and ranking goals	Assists in choosing a program	Guidance for implementing the operational plan by monitoring and adjusting program activities	Determines whether the program should be continued, modified, or terminated

Research Questions

This study was undertaken to determine the effectiveness of the Project iRead program. In particular, Central County wished to understand the impact of this program on early literacy. The following research questions will guide this study:

1. What is the relationship between participation in Project iRead and student word recognition as identified by student growth on the PALS test?
2. What is the relationship between participation in Project iRead and student fluency as identified by student growth on the PALS test?
3. What is the relationship between participation in Project iRead and student comprehension as identified by student growth on the PALS test?

4. What is the relationship between participation in Project iRead and student word recognition at early adopting schools as identified by student growth on the PALS test?
5. What is the relationship between participation in Project iRead and student fluency at early adopting schools as identified by student growth on the PALS test?
6. What is the relationship between participation in Project iRead and student comprehension at early adopting schools as identified by student growth on the PALS test?

Limitations of this Study

This evaluation of Central County's Project iRead program was limited to the district's use. Although the data may provide further understanding of the relationship between word recognition and comprehension, the evaluation itself may not be generalizable to other school districts due to the specificity of context in Central County.

Additionally, this evaluation was limited by the resources available to complete it. Money, personnel, and especially prevented a complete CIPP analysis of all components likely to be identified by concerned stakeholders. Instead, this program evaluation focused on key questions that provide the best indication of the connection between the Project iRead and student achievement.

As the researcher, a county employee, and previous site coordinator for Project iRead, I brought my own limitations to this study. It is possible that bias may have played a part in the manner in which components were chosen for review, in the rigor of

analysis, and in the specificity of the final reporting. Thus, the very nature of using an internal program analyst limits the generalizability of this research.

Delimitations

This study was delimited in several ways. These include the choice of problem, population, research questions, and choice of philosophical framework. Although there are many ways in which this research is delimited, there remains the possibility for an increased understanding of the development of reading and the practicality of this particular program in supporting reading. By using a constructivist framework, the researcher worked with program stakeholders to build an understanding of the program outcomes.

Operational Definitions

Concept of Word – The awareness of the match between the spoken word and the written word in the reading of text (Morris, 1993)

Fluency – the combination of accuracy, automaticity, and prosody which facilitates a reader's construction of meaning and supports comprehension (Kuhn, Schwanenflugel, & Meisinger, 2010)

Phonemic awareness – The ability to focus on and manipulate phonemes in spoken words (National Reading Panel, 2000)

Phonics – The relationship between written letters and sounds (Carnine, Silbert, Kame'enui & Tarver, 2004)

Program evaluation – the identification, clarification, and application of defensible criteria to determine the program's worth or merit in relation to those criteria (Fitzpatrick, Sanders, & Worthen, 2012)

Reading comprehension – The ability to process both the graphemes and phonemes of a word in a manner that renders meaning to the entirety of the text (Ehri, 1998)

Sight words – Words that are recognized and known by rote memorization and the use of visual cues such as word length, letter configurations, or logos as mnemonic aids (Ehri & McCormick, 1998)

Stakeholder – Anyone involved in a program being evaluated or who might be affected by or interested in the findings of the evaluation (Gall, Gall & Borg, 2007)

Vocabulary – The productive and receptive words known to a person and used for listening, speaking, reading or writing (Pearson, Hiebert, & Kamil, 2007)

Word recognition – Words that are recognized or used in print (Armbruster, Lehr & Osborn, 2003)

Organization of the Study

Chapter One presented the introduction, problem, research questions, limitations, delimitations, and a definition of terms. The following chapter contains a review of the literature as it relates to present educational mandates, early childhood literacy, and sight word vocabulary. Chapter Three outlines the methodology and procedures to use in gathering the data for this study. The results and findings will be reported in Chapter Four. The final chapter will contain a summary of the study, its findings, conclusions drawn, a discussion, and recommendations for further study.

Chapter Two

Review of the Literature

The purpose of this literature review is to ground the Project iRead program evaluation in the context of extant, relevant research. The literature review begins with the background of word recognition and its impact on reading. The process of developing a sight word vocabulary and the importance of that vocabulary are also explored. The review then turns to the research on struggling readers and current models for providing intervention. The findings are summarized at the end of this chapter. The evaluation itself will gather information regarding the implementation and outcomes of an early literacy program utilized for struggling students in primary grades. The information garnered from this study will aid the program's designer and other stakeholders as they continue to refine Project iRead.

Development of Reading

From the time children first begin to vocalize words, they learn that particular sounds are associated with specific objects, events, and psychological states (Klein, 1981). However, the ability to link written texts to oral language is a skill that must be explicitly taught to our children (Foorman, Chen, Carlson, Moats, Francis & Fletcher, 2003). The National Early Literacy Panel (2008) and Snow, Burns, and Griffin (1998) maintain that experiences with print are extremely valuable to preschool students. However, although President Obama has called for universal preschool, federal mandates for preschool do not currently exist. Thus, as the International Reading Association (IRA) and the National Association for the Education of Young Children (NAEYC) have

observed, our kindergarten students arrive at school with a vast and problematic difference in their knowledge about concept of word (IRA,1998; NAEYC, 1998).

This notion of direct instruction was further supported by a joint position statement from the IRA and the NAEYC wherein they argue that no one naturally becomes literate (1998). Instead, the leaders of the IRA and NAEYC contend the combination of play and the exposure to informal adult instruction form the basis for literacy (Anbar, 1986; Scarborough & Brady, 2002). Reading aloud constitutes the most important form of informal instruction parents and early childcare providers can give young students (NICHHD, 2000). Reading with children allows them to develop the alphabetic principle—the idea that "the letters that comprise our printed language stand for the individual sounds that comprise our spoken language" (Byrne, 1998, p. 1). Indeed, the ability to link oral language—phonemes—to written language—graphemes—is fundamental for reading (Ehri, 2005).

The importance of the five pillars of reading must be recognized here. Research shows that the development of reading is complicated. No single factor determines a child's ability to read. Rather, the combination of phonemic awareness, phonics, fluency, vocabulary, and comprehension act in unison to produce readers (NICHHD, 2000). However, Ehri (2005) argues one of the ultimate goals of reading instruction is automaticity with word recognition which "is essential for achieving text-reading skill" (p. 170).

Phonemic Awareness

Phonemes are the sounds that comprise our language. Phonemic awareness is the ability to understand and manipulate those sounds (NICHHD, 2000). Griffith and Olson

(1992) suggest there are levels of phonemic awareness. The easiest tasks call for students to rhyme words. Blending phonemes is an intermediate phonemic skill. The most difficult phonemic awareness tasks involve the complete segmenting of words and then manipulating phonemes to create new words. Examples include asking a student to pronounce the word nest without the s sound or saying hill without the h sound.

Adams' (1990) seminal research on reading indicates that it is "not working knowledge of phonemes that is so important but conscious, analytic knowledge. It is neither the ability to hear the difference between two phonemes nor the ability to distinctly produce them that is significant. What is important is the awareness that they exist as abstractable and manipulable components of the language" (p. 65). The NICHHD's (2000) meta-analysis showed that phonemic awareness can be taught to students thereby increasing the likelihood they will become successful readers.

Phonics

"Phonics instruction teaches the relationships between the letters of written language (graphemes) and the individual sounds of spoken language (phonemes)" (Carnine, Silbert, Kame'enui & Tarver, 2004, p. 38). While phonemic awareness is the ability to segment spoken words into segments and then manipulate those segments (NICHHD, 2000), phonics moves the student a step further towards reading by associating specific sounds with particular letters. The purpose of phonics instruction is to encourage students to learn and use the alphabetic principle—that connection between phonemes and graphemes—to recognize familiar written words and decode new ones (Harris & Hodges, 1995). This is a particularly important connection for those who

speak English as this language has a strong tie between the spoken language and its written code (Moats, 2000; Venezky, 1999).

One might ask how important the connection is between the abstract symbols representing words, spoken language, and the ability to read. The NICHHD's (2000) meta-analysis of extant research indicates that planned phonics instruction creates significant gains for all students in kindergarten through sixth grade, particularly those children having a difficult time learning to read. Thus, research indicates that explicit phonics instruction is both valuable and essential in classroom reading programs (Starrett, 2006).

Fluency

Fluency describes a person's ability to read with speed, accuracy, and expression (NICHHD, 2000). Speed refers to the number of words per minute a student reads, accuracy refers to reading those words accurately either by sight or by decoding and prosody means reading in a conversational tone with proper expression and phrasing. These three components of fluency are all critical to success in reading, but one component alone cannot guarantee that students make the leap to good reading comprehension. The National Reading Panel states, "Although accuracy in word recognition is, indeed, an important reading milestone, accuracy is not enough to ensure fluency—and without fluency, comprehension might be impeded" NICHHD, 2000, p. 193). Hudson, Lane, and Pullen (2005) expound upon this argument by adding, "Each aspect of fluency has a clear connection to text comprehension. Without accurate word reading, the reader will have no access to the author's intended meaning, and inaccurate word reading can lead to misinterpretations of the text. Poor automaticity in word

reading or slow, laborious movement through the text taxes the reader's capacity to construct an ongoing interpretation of the text. Poor prosody can lead to confusion through inappropriate or meaningless groupings of words" (p. 703).

Schreiber's (2001) research indicates that fluency also describes the ability to group words into meaningful units by determining where to place emphasis and where to pause in order to make sense of the text. The Institute of Education Sciences' evaluation of the Reading First Initiative showed that, although many students became adept at decoding text, they did not make equal gains in comprehension ability (Gamse, Jacob, Horst, Boulay, & Unlu, 2008). Additionally, the National Assessment of Educational Progress (NAEP) found that 44% of fourth graders are not fluent readers. The National Reading Panel (NICHHD, 2000) contends that reading requires both the recognition of words and the construction of meaning for those words. If students are utilizing their working memory to decode and are not fluent the consequence is a loss of cognitive resources to expend upon comprehension.

Vocabulary

Heibert and Kamil (2005) claim "vocabulary is not a developmental skill or one that can ever be seen as fully mastered. The expansion and elaboration of vocabularies is something that extends across a lifetime" (p. 2). They add that vocabulary is a working knowledge of the meaning of words. More specifically, readers must have an adequate receptive vocabulary in order to continue to develop their reading ability. In fact, Carnine et al. (2004) assert that "with inadequate vocabulary knowledge, learners are asked to develop novel combinations of known concepts with insufficient tools" (p. 331). The National Reading Panel's (NICHHD, 2000) meta-analysis of extant research found

that vocabulary is strongly related to reading comprehension. The NRP adds that vocabulary and comprehension are closely linked because of the nature of their definitions. Vocabulary describes the understanding of single words while comprehension involves understanding larger units thus separating the two processes is nearly impossible.

Comprehension

The National Institute for Literacy defines comprehension as "the reason for reading" (Armbruster, Lehr, & Osborn, 2003, p. 41). Willis (2008) adds that most reading researchers conceptualize reading comprehension as the depth of understanding a reader has for the text. It is also important to note that while students may sound fluent when reading a text aloud, if those students are merely calling out words, then they are not extending their capacity as readers (Chall, 1999; Diehl, Armitage, Nettles, & Peterson, 2011).

The NRP (NICHHD, 2000) compiled the results of studies on the effects of metacognitive awareness, comprehension monitoring, cooperative learning, curriculum plus strategies (the teaching of strategies such as prediction, clarification, and summarizing), use of graphic organizers, active listening, mental imagery, mnemonics, multiple strategy instruction, reciprocal teaching, prior knowledge, question answering, question generation, story structure instruction, summarization instruction, and vocabulary instruction on comprehension. The panel also investigated the impact of teacher training on student comprehension. The panel did not find one particular method of instruction superior to any other method.

Reading is a layered and complex act. Extracting meaning from text depends upon the ability to utilize phonemic awareness, phonics, fluency and vocabulary (NICHHD, 2000). The NRP did not come to this conclusion on its own. Rather, it sought input from 125 stakeholders at regional hearings across the United States. The resulting examination of research revealed the complexity and intertwined nature of reading. Scharer, Pinnell, Lyons, and Fountas (2005) add that "reading is thinking cued by written language. We cannot think for students; we cannot even directly show them the complex operations they need to put in place" (p. 24). Instead, these researchers insist that educators must ensure the acquisition of basic skills while also striving to provide opportunities for deep comprehension through positive classroom experiences.

Word Recognition

The foundation of reading lays in understanding the printed word (Adams, 1990; Donat, 2006). This groundwork is created by integrating phonemic awareness—the spoken word—and phonics—the connection to the written word (Ehri, 2005). Cambourne (2002) adds "constructivist theory argues that the ends of reading instruction are very much determined by the means employed to teach it. In other words, the experiences and contexts in which learning to read is embedded will be critical to each learner's understanding of, and ability to use, reading" (p. 27). Thus, Cambourne argues that learners must be motivated and engaged before this complex act of learning to read can occur.

To understand printed words, students must grasp the alphabetic principle (NICHHD, 2001; Snow, Burns, & Griffin, 1998). The alphabetic principle for a language such as English describes the knowledge that graphemes are systematically utilized to

represent phonemes. That concept underpins the development of reading because it allows early readers to decode new words. In order for a student to master the alphabetic principal, that student must also possess phonemic awareness as defined earlier in this paper. Research indicates that phonemic awareness is a strong predictor of reading achievement in the primary grades (Juel, Griffith, & Gough, 1986; Snider, 1997). And while most children easily and naturally learn to *speak* English, all children require direct instruction in order to *read* English (Donat, 2006; Griffith & Olson, 1992).

Word recognition and learning to read are the beginning of a student's path to comprehension. However, students must move beyond the work of decoding before they can become fluent readers who are not consumed with the process of reading (Adlof, Catts, & Little, 2006; LaBerge & Samuels as cited in Homan, Klesius, & Hite, 1993, p. 94). LaBerge and Samuels theorize that the brain's limited working memory does not allow a reader to process the meaning of a word or chunk of words while also decoding those words. Thus, at some point in one's life, decoding must give way to automaticity. Torgesen and Hudson (2006) contend "the automaticity with which a reader can recognize words is almost as important as word-reading accuracy. It is not enough to get the word right if a great deal of cognitive effort is required to do so" (p. 134).

Research shows that word recognition is a complicated process which must be mastered before students can move from learning to read to reading to learn (Stevens, Slavin, & Farnish, 1991). The application of each of these components of reading—phonological awareness, the alphabetic principle, and phonemic awareness—combine to create the automaticity associated with word recognition. "When these processes are sufficiently automatized... this frees up working memory space for additional, or more

complex comprehension processes" (Hudson, Pullen, Lane, & Torgesen, 2009, p. 8). Thus, students are expected progress to a point where a large sight word lexicon allows them to concentrate on the real purpose of reading—comprehension (Juel, Griffith, & Gough, 1986; Scharer et al., 2005).

Sight Word Development

Ehri (1998) contends that "sight word learning" must be operationalized in order to be discussed. This pivotal researcher defines sight word learning as a process rather than an instructional strategy. By considering sight word development in this manner, one can separate methods from outcomes thereby focusing on the development of the skill and not the use of a particular tool or teaching method which enables the student to develop that skill. Browder and Xin's (1998) meta-analysis of 48 studies on sight word instruction further adds to Ehri's research. They found that "a variety of procedures have been effective in teaching sight words" (p. 150). Additionally, Browder and Xin note that providing a variety of instructional choices increases the likelihood that students will be motivated to learn.

This view of sight word learning may at first seem in conflict with Cambourne's (2002) assertion that experiences and contexts are keys to student success. It is true that Cambourne's research supports the constructivist approach to teaching reading. However, this researcher does not promote specific programs. Cambourne posits that teachers serve as guides, helping students discover the pleasure of reading. This is partially accomplished through explicitly teaching an awareness of the processes, knowledge, and skills necessary for reading. Thus in his own way, Cambourne makes the argument for including skill development in the classroom.

Before students build a sight word vocabulary, they must understand grapheme to phoneme correspondence and use this information to create connections among a word's written form, pronunciation, and meaning (Ehri, 2005; Invernizzi, Justice, Landrum & Booker, 2004; Vellutino, 2003). To build the competencies associated with a strong sight word lexicon, Ehri (1998) argues that students require special experiences that go beyond daily encounters with oral language. Indeed, neurological research indicates that Broddman's Area in the left hemisphere is more active when reading sight words while bilateral brain activation occurs in beginning readers who are more likely to use decoding skills (Simos, Fletcher, Sarkari, Billignsley-Marshall, Denton, & Papanicolaou, 2007). This indicates a physical difference in how we access words when we transition from decoding to "knowing" a word.

Importance of Sight Word Vocabulary

To understand the importance of sight words, one must first grasp how sight words relate to comprehension. Humans do not read so they may understand the relationships between graphemes and phonemes nor do we read so we may know words. Rather, the end goal of reading is to understand and to share thoughts—to comprehend (NICHHD, 2000). Hudson et al. (2009) have proposed a visual model explicating the relationship between the components which lead to comprehension. By examining Figure 2, it is possible to see how Hudson et al. conceptualize reading fluency. We start with simple decoding. With instruction, students continue to build skills. A combination of sight word vocabulary, decoding fluency, utilization of context clues, and orthographic knowledge then allows students to focus on comprehension. Thus, they progress from learning to read to reading to learn.

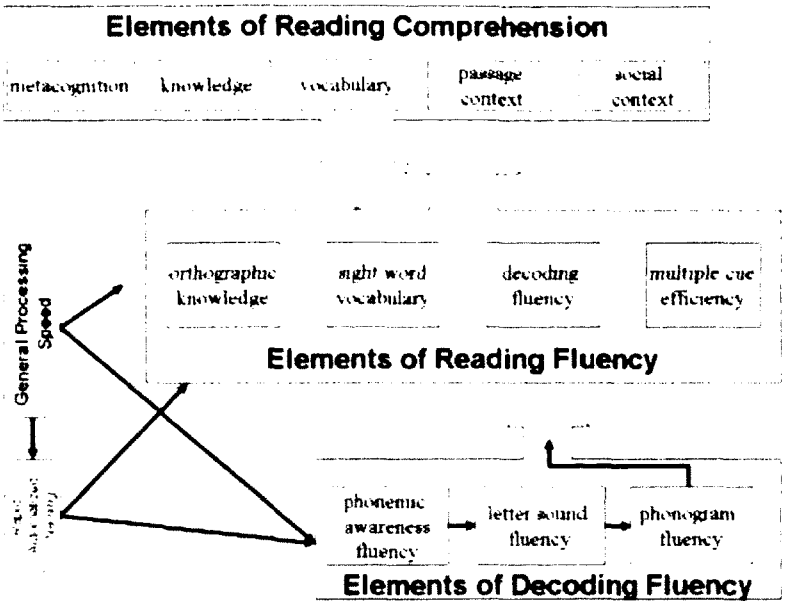

Figure 2. Conceptual model of reading fluency. Reprinted from "The Complex Nature of Reading Fluency: A Multidimensional View," by R. F. Hudson, P. C. Pullen, H. B. Lane, and J. K. Torgesen, 2009, *Reading & Writing Quarterly, 25,* p. 9. Copyright by Taylor & Francis Group, LLC.

Cognitive research indicates "the record of a lifetime's encounter with words is stored in long-term memory in a structured, well-organized way" (Kintsch & Mangalath, 2011, p. 348). Words must be committed to long-term memory in order to free our limited working memory. Hudson et al. (2009) make the assumption "that reading processes share limited-capacity processing resources often termed working memory." (p. 8). They add that Perfetti's (1985, quoted in Hudson et al.) verbal efficiency theory suggests more efficient and automatic processes use fewer of the working memory's resources thereby allowing other processes such as comprehension to occur. The National Reading Panel also found a close relationship between fluency and reading comprehension (NICHHD, 2000). Although the "black box" of reading is undoubtedly

complex, a strong sight word lexicon is essential to reading success (Ehri, 2005; Hiebert & Kamil; 2005).

Research on Improving Sight Word Recognition

Since students require a robust sight word lexicon in order to free working memory, one might ask what methods teachers currently employ to reach that end. Ehri (2005) contends that students learn to read sight words by forming connections. Ehri's research indicates those connections are created primarily due to students' knowledge of the alphabetic system. When children understand graphemes, phonemes, and spelling patterns they are able to commit familiar words to memory. Students who learn the grapheme *ph* represents the phoneme /f/ are able to retrieve and apply this knowledge in larger and larger chunks until the unit memorized is the word itself (Bhattacharya & Ehri, 2004).

Sight word recognition is a progression of knowledge for many learners (Ehri, 1998). They learn the aforementioned letter-sound correspondences thereby making connections that bond spellings and words into memory (Bhattacharya & Ehri, 2004; Chall, 1996; Ehri, 2005). However, some students stumble in this process and need additional instruction in sight word recognition. In these cases, alternative supports are provided to teach sight words. The expectation is that students with a larger lexicon will show improved fluency and comprehension (Erbey, McLaughlin, Derby, & Everson, 2011; Hong & Kemp, 2007; Oldrieve, 2012).

Browder and Xin's (1998) meta-analysis of 48 studies published in peer-reviewed journals reveals several important facts. First, the researchers found that interventions employed time delay, verbal praise, tangible reinforcement, peer tutoring, post-response

feedback and/or pre-response prompting. Secondly, "most studies on sight word instruction have been conducted with individuals with moderate mental retardation" (p. 147). Additionally, Browder and Xin determined that post-response interventions in the form of feedback ($p < .001$) combined with opportunities for students to revisit word lists ($p < .05$) created the largest gains in sight word knowledge. However, these researchers also note a limitation in sight word research. Students may develop a larger lexicon, but they are not required to demonstrate functional use of their new knowledge. Only 25 of the 48 studies Browder and Xin reviewed included data about functional use. Even then, the authors used a liberal definition of functional use. This definition included data reflecting students' improved ability to match pictures to words, identification of words in a grocery store, giving definitions, spelling target words, and completing word finds. However, there was no mention of fluency or comprehension in any of the studies.

Intervention for Struggling Readers

Our nation struggles with reading. Over one-third of our fourth graders and one-fourth of our eighth graders cannot read at a basic level (NCES, 2011). Left unaddressed, these difficulties carry on to adulthood. Research continues to evolve on how best to address the needs of struggling readers. The biggest debate has been over basic skill instruction in the form of phonics versus a whole language approach that concentrates on meaning. Chall's (1967) seminal work laid the foundation for modern phonics instruction. Additional research confirmed the importance of direct instruction for early literacy development (NICHHD, 2000; NELP, 2008; Snow, Burns, & Griffin, 1998).

A recent focus on response to intervention (RTI) models has led to a better understanding of programs that meet the needs of underachieving students. These

students fail to demonstrate the growth of their typically developing peers when given only the universal instruction provided in the general education classroom (McAlenney & Coyne, 2011). Hecht and Close (2002) examined the benefits of direct, intensive phonemic instruction. They found relationships between phonemic awareness instruction and individual students' prior letter knowledge, invented spelling, vocabulary knowledge, and print concepts. However, 12 of their 42 participants showed insignificant gains on a phonemic blending task and 4 did not show significant gains on a blending task. These results suggest that students may need individualized remediation programs that respond to their specific needs.

A Constellation of Problems

Simos et al. (2007) confirm Hecht and Close's (2002) findings. Their research shows a constellation of possible difficulties including deficits in phonological processing, rapid naming, and the processing of rapidly changing visual or auditory stimuli. Bear, Negrete, and Cathey (2012) add that some students grapple with concept of word, articulation, and within word patterns. Each of these basic skill failures requires targeted remediation.

Phonological processing refers to the ability to hear and manipulate the basic sounds in spoken language (McArthur & Castles, 2011). Rapid naming skills describe a student's ability to automatically recognize and name upper and lower case letters (Wolf & Bowers, 2000). Processing rapidly changing visual and auditory stimuli builds from rapid naming skills. This processing is necessary for the accurate encoding of letter positions and their associated sounds (Witton et al., 1998). Students who lack concept of word confuse individual syllables with words (Morris, 1993). Those exhibiting

articulation errors fail to make the physical connection between how a word sounds and the way it "feels" in the mouth (Templeton, 2011). Students trapped at a within word pattern reading level experience difficulty surmounting the transitional phase of reading (Bear et al., 2012). This dizzying array of miscues, misconceptions, and mistakes leaves educators with an equally perplexing choice of remedial solutions.

A plethora of commercial programs claim proven success. Four Blocks®, Words their Way®, Leveled Literacy Instruction®, IntelliTools Reading®, Making Connections®, HELPS® (Helping Early Literacy with Practice Strategies), Reading Reels®, and Success for All® are just a few of the many packages available to school districts. Respective websites cite research supporting the efficacy of their approach. Yet districts, administrators, teachers, and interventionists continue to search for ways to make each student a successful reader. How do these critical stakeholders decide which programs to adopt? How does one determine which approach will truly create the greatest gains in reading?

The National Reading Panel analyzed effective instructional reading approaches in general and also made recommendations for struggling readers in particular (NICHHD, 2000). However, those suggestions were broad, including instruction in phonics, partner reading, and repeated oral reading. The panel did not answer the questions of which programs to choose and how much gain could be expected. Socioeconomic status and minority status exacerbate the issue of literacy (Arnold & Doctoroff, 2003; Crowe, Connor, & Petscher, 2009; Hart & Risley, 1995). Students from lower socioeconomic backgrounds often begin their school careers with weaker language and literacy skills than their advantaged peers. Additionally, Rank and Hirschl (1999) found that 68% of

African American students experienced poverty compared to 26% of white students. If schools choose remedial programs that lack interesting subjects, these disadvantaged, minority students will fall further and further behind their classmates (Arnold & Doctoroff, 2003; Stanovich, 1986).

The perfect storm of institutional need, student underperformance, and lack of direction sets the stage for this research. A body of knowledge exists. Researchers, government agencies, and educators recognize that a significant percentage of elementary students struggle with reading (Arnold & Doctoroff, 2003; Hecht & Close, 2002; NCES, 2011). The National Reading Panel has identified "the big five" (NICHHD, 2000). Schools have moved away from a discrepancy model and embraced response to intervention (Vellutino, Scanlon, Small, & Fanuele, 2006). Yet amidst this storm, one truth remains: schools search for solutions. In Central School District, one of those solutions is Project iRead. Its efficacy is addressed in subsequent chapters. However, its foundations lay in the research conducted by authorities in the field of reading instruction.

Summary

This literature review indicates a body of evidence supporting the importance of word recognition, reading fluency and comprehension. It has grounded that verification in extant research on how students learn to read and the inter-relationships between phonemic awareness, phonics, fluency, vocabulary, and comprehension. These five components comprise the complicated act of reading. In order for the end goal—comprehension—to occur, the research shows that students need a broad personal

lexicon. If too much energy is spent determining what *a word is*, the student will not have the capacity to grasp what *the words* mean.

Studies have examined how to improve sight word vocabulary. However, there is a dearth of information about how improved word recognition in isolation impacts a student's ability to read fluently and to comprehend a passage. Additionally, the majority of studies were conducted with students who are intellectually disabled or have specific learning disabilities. Research indicates that struggling readers need supplementary instruction. Questions remain as to the best avenues for providing that instruction. Evaluating Project iRead can add to the existing body of knowledge because it is a sight word program that is used with general education students and slow learners in addition being used with students receiving exceptional education services.

Chapter Three

Methodology

The purpose of this chapter is to describe the methodology utilized for this study. The chapter begins with the purpose of the study and its design. The next section provides information about the participants. Information regarding data sources, data collection, and applicability to the questions follows. The chapter concludes with a discussion of the data analysis procedures.

Purpose

This program evaluation examined the outcomes of Project iRead, an iPod-based sight word program, which was created and is used in a single Virginia school district. The Central School District utilizes Project iRead in order to improve students' sight word vocabulary. One of the district's exceptional education teachers developed Project iRead. The coordinator of Federal Programs then made the program available at additional schools in the district. It is presently funded by the school district's Department of Federal Programs. Expansion continues into additional schools with the expectation that 22 of the county's 45 elementary schools will employ the program by the 2013-2014 fiscal year. The program's creator wished to document the effect of Project iRead on student outcomes. Elucidating the reasons for a program evaluation of Project iRead ensures the design methodology does, indeed, match the desired outcome of the analysis. This clarification meets the Joint Committee on Standards for Education Evaluation's (JCSEE's) (2013) standards of identifying the purpose of the research, serving the stakeholders' needs, and negotiating agreements in order to account for clients' needs and expectations.

Throughout this program evaluation the researcher served as the primary agent for the study. While other evaluations are executed using additional internal personnel or an outside evaluation agency, such measures were not feasible in this case. This research served as partial fulfillment of the requirements for a doctoral degree and the schools provided no funding. Thus, both time and money were constraints. Central School District's Department of Research and Planning provided PALS data. The researcher completed all statistical analyses. The use of the Department of Research and Planning provided a buffer between the researcher and the subjects thus lessening possible biases in the results.

This research had two overarching goals. The first was to determine the relationship between participation in Project iRead and student growth in reading, as measured by PALS. The second goal was to ascertain whether a relationship existed between long term participation in Project iRead and student growth, as measured by PALS. This research utilized Stufflebeam's CIPP model to reach its goals (2000). The CIPP model encompasses context, inputs, process, and product. The CIPP's model flexibility renders it applicable to this study. That flexibility allows CIPP to be utilized in its entirety or in part, and it may also be used formatively and/or summatively. The evaluation of Project iRead focused very narrowly on a summative product evaluation. Thus, the CIPP model provided the frame for determining the relationship between Project iRead's stated goal of improving students' reading performance and actual results during the 2012-13 school year.

The following research questions guided this study:

1. What is the relationship between participation in Project iRead and student word recognition as identified by student growth on the PALS test?
2. What is the relationship between participation in Project iRead and student fluency as identified by student growth on the PALS test?
3. What is the relationship between participation in Project iRead and student comprehension as identified by student growth on the PALS test?
4. What is the relationship between participation in Project iRead and student word recognition at early adopting schools as identified by student growth on the PALS test?
5. What is the relationship between participation in Project iRead and student fluency at early adopting schools as identified by student growth on the PALS test?
6. What is the relationship between participation in Project iRead and student comprehension at early adopting schools as identified by student growth on the PALS test?

Identifying Stakeholders

Gall, Gall, and Borg (2007) maintain the success of a program evaluation relies on identification and involvement of key stakeholders. They suggest that leaving out stakeholders can lead to sabotage or discredited results. The researchers also argue that involvement does not have to be in-depth for all affected by the program or the evaluation. This component of the program evaluation required determining those members.

Those responsible for the supporting the Project iRead comprise one group. This includes the program's creator and administrator as well as the coordinator in charge of funding, the reading specialist and the directors of elementary education. These individuals have a keen interest in understanding Project iRead's implementation and its effects are on student achievement. Comprehending implementation came through a discussion with Project iRead's creator after analysis of the results. However, a summative examination of student gains remained as the primary goal of this program evaluation.

The second identified group includes those who utilize Project iRead. The educators actually in charge of classroom practices and their school administrators will profit by learning about the results of this study. In addition to Project iRead, Central School District employs Earobics©, Making Connections©, and Leveled Literacy Intervention© (LLI). The results of this program evaluation may help these stakeholders to determine whether to include Project iRead in their intervention programming.

Design

This program evaluation utilized a quantitative research design. Fitzpatrick et al. (2012) maintain that quantitative methods represent an appropriate approach in program evaluation when the researcher seeks to determine whether an existing theory applies to that program. In this case, one asks whether Project iRead improves students' reading ability as established by the National Reading Panel's research (NICHHD, 2000). The use of quantifiable constructs has been a preferred method in research and aligns to the CIPP model (Fitzpatrick et al., 2012).

The data consist of students' scores on the PALS test for the 2012-13 school year which provides information about word recognition in isolation, fluency, and comprehension. Classroom teachers collected data. Central School District's Department of Research and Planning then aggregated at the district level. The Department of Research and Planning removed identifying student information before providing the data to the researcher.

Ethical Considerations

This research was conducted in compliance with all policies and procedures required by The College of William and Mary and Central School District. Completing a series of tasks ensured ethical treatment requirements were met. First, the researcher received permission to conduct research from the county. Central School District has stringent guidelines on research and their central office only accepts requests four times—September 1, December 1, March 1, and June 1yearly. To ensure data availability for the dissertation proposal it was vital to submit a request by June 1, 2013, well in advance of the August 2013 proposal defense date. Additionally, permission to conduct research was sought from The College of William and Mary's Institutional Review Board. The Education Internal Review Board of William and Mary reviewed protocol EDIRC-20123-09-06-8925-mfdida and exempted it from formal review due to the fact that the research would be "conducted in established or commonly accepted educational settings, involving normal educational practices, such as research on regular and special education instructional strategies" (Protection of Human Subjects, 2009, p. 3). Upon receipt of permission from both of these agencies, the researcher worked through Central School District's Department of Research and Planning to obtain data.

That department provided access to Phonological Awareness Literacy Screening (PALS) data for all first and second grade students in the district. Approval from the district confirmed that no sub-group of students received preferential treatments due to the study and that confidentiality was maintained. Upon securing the appropriate permissions to conduct the study, this research began.

Participants and Setting

Virginia students attend one of its 132 school districts. Enrollment in these districts varies from 209 to 183,417 students. This research occurred in a single school district comprised of urban, suburban and rural communities. The Central School District serves over 49,000 students. The district's student population consists of 44% white, 37% African American, 8% Asian, 7% Hispanic, and 4% two or more races (VADOE, nd). Approximately 38% of students qualify for free or reduced lunch, thereby identifying them as economically disadvantaged. Students with disabilities account for 15% of the district's population (VADOE, 2009).

The Department of Research and Planning gathered quantitative data from participating elementary schools in the district. In the 2012-13 school year, 17 of the county's 45 elementary schools used Project iRead as an intervention tool in kindergarten, first grade, and second grade. One of the schools served only grades three through five and did not have a K-2 program. The analysis of PALS data included the remaining 44 schools.

Procedures

The county maintains historical data on students' fall and spring scores for PALS. The PALS test results indicate student performance levels on concept of word, word

recognition in isolation, developmental spelling, oral reading, and comprehension (Invernizzi & Meier, 2003). These data sets will allow the researcher to compare groups to determine the relationship between participation in Project iRead and student growth in these areas.

Data Collection

Central School District's Department of Research and Planning provided the researcher with 2012-13 PALS data. These data sets were grouped based on use of Project iRead as illustrated in Table 4. One hundred fifty-four students were removed from the data set. These students spent partial years at 2 or more schools. Therefore, it would have been impossible to determine their primary grouping. The number of students enrolled at schools participating in Project iRead is significantly smaller than those not enrolled in non-participating schools. Therefore, the Statistical Package for the Social Sciences (SPSS) was used to randomly select 2,570 of the 4,445 cases from students at non-participating schools in order to create a matched data set.

Table 4

PALS data groups

Number of Participants	Schools	Students
iRead Adoption Sites	17	2,570
Sites without iRead	27	4,445

A similar examination was conducted for early and late adopting Project iRead schools. This information is displayed in Table 5. The students removed during the initial sort of the files remained out of the data set for these analyses as well. No adjustments were made to the size of the data sets for early and late adopting schools due to the small difference in the number of participants.

Table 5

Early and Late Adoption Sites

Number of Participants	Schools	Students
Early Adopters	7	552
Late Adopters	10	675

Instrumentation

The Phonological Awareness Literacy Screening (PALS) test served as the data source for this research. The PALS test was created at the University of Virginia as a statewide tool for identifying students at risk of reading difficulties and delays (Invernizzi et al., 2003). Presently, 99% of all Virginia schools use the PALS test (Virginia Department of Education, 2011). The dependent variables of word recognition in isolation, fluency, and comprehension are all measured with this test.

Administration

Central School District administers the PALS test three times per year. Each testing window lasts two weeks. The PALS test consists of several sub-tests: word recognition, spelling, oral reading in context, fluency, and comprehension. Although the spelling test is given to the class as a whole group, the remainder of the PALS test is one-on-one. Benchmark scores have been established for all portions of the test. A series of pilot studies by the test's creators established these benchmarks as critical levels of knowledge for students who are working on grade level (Invernizzi et al., 2003). If students in grades 1 and 2 are identified below those benchmarks, teachers administer additional components to assess for alphabet recognition, letter sounds, and concept of word. These elements pinpoint a student's instructional level.

Three components of the PALS test provide the data necessary for this program evaluation. The word recognition in isolation task provides information about students' sight word knowledge. Each grade level list includes 20 words. This portion, once administered by hand, is now delivered electronically. Students see each word for a controlled amount of time and then must name the word. If a student correctly reads 15 or more words on a grade level list, the teacher proceeds to the next list. Likewise, when starting on a grade level list, if the student reads fewer than 15 words correctly, the teacher moves down a grade level to assess the student's knowledge of sight words. This information determines which oral reading passage each student receives.

The oral reading in context passage serves for several purposes. Teachers time students to assess both their accuracy and speed. These data help determine fluency. Fluency scores range from 1 to 3 on each grade level with the highest rating defining a student who reads fluently and expressively. This portion of the test ends with a comprehension check. The teacher reads six questions and their answer choices aloud to students. There is only one right answer to each question and students must answer each question from memory without returning to the original passage (Invernizzi et al., 2003).

Scoring

Each teacher enters students' scores into the PALS electronic database. Students receive a "summed score" for the spelling and word recognition tasks. The summed score comprises only their knowledge of grade level specific material, and the scores for each task are added together. To clarify, a student who knows words on a sixth grade level would receive no higher summed score than a student who only knows words on a second grade level. The word recognition in isolation serves to assess instructional

reading level. The summed score identifies students who fall below the grade level benchmark and in need of intervention (Invernizzi et al., 2003).

Fluency is assessed on a three-point scale, and videos on the PALS website illustrate the differences between fluency rates. Students receive 1 point for laborious, word-by-word reading delivered in a monotone. A rating of 2 points indicates reading that lacks prosody and expression. Three points are given for reading that is adequately paced and delivered in meaningful phrases. This reading is expressive and fluent. The PALS database creates output with fluency scores entered in columns corresponding to the grade level of the oral reading passage. No changes to the score of 1, 2, or 3 occur to allow for difficulty of the text.

Comprehension rates range from zero to six based on the number of questions answered correctly. Again, the PALS database reports this information in distinct categories, but there no increasing values awarded for advanced grade levels. For example, correctly answering 5 questions on a first grade reading passage is noted as a 5 in the first grade column. However, correctly answering 4 questions on a fifth grade passage carries no weight. Coding indicates a 4 in the fifth grade reporting column.

Reliability

Gall, Gall, and Borg (2007) define reliability as "the consistency, stability, and precision of test scores" (p. 151). Sanders and Sullins (2006) maintain that reliable tests will consistently produce the same results. The PALS test was field tested with more than 500,000 students. Modifications were made based on student and teacher feedback. The developers then conducted a second, smaller field test. The reliability of the PALS test was assessed for internal consistency of sub-tasks and accuracy of scoring (inter-rater

reliability). However, it must be noted that reliability research on sub-task consistency was conducted only on spelling and word recognition as these factors determine which students receive state funded remediation. The researchers reported a mean alpha coefficient of .80 for all sub-tasks and inter-rater reliability coefficients as high as .98 (Invernizzi et al., 2003). The reliability for word recognition in isolation appears in Table 6 and the inter-rater reliability is found in Table Seven.

Table 6

Reliability Coefficients for Word Recognition in Isolation

	Cronbach's alpha (*n*)			
Word List	Spring 2000	Spring 2001	Fall 2001	Spring 2004
Preprimer	—	.96 (*n* = 486)	.92 (*n* = 617)	.83 (*n* = 315)
Primer	.91 (*n* = 77)	.94 (*n* = 25)	.91 (*n* = 369	.86 (*n* = 699)
Grade 1	.93 (*n* = 224)	.90 (*n* = 54)	.88 (*n* = 409)	.79 (*n* = 1,188)
Grade 2	.91 (*n* = 223)	.87 (*n* = 93)	.91 (*n* = 223)	.86 (*n* = 1,674)
Grade 3	.87 (*n* = 222)	.81 (*n* = 109)	.86 (*n* = 295)	.86 (*n* = 1,747)
Grade 4	—	—	—	.88 (*n* = 1,379
Grade 5	—	—	—	.83 (*n* = 513)
Grade 6	—	—	—	.87 (*n* = 190)

Note. Adapted from *PALS: 1-3 Technical reference*, by M. Invernizzi, J. Meier, C. Juel, Viriginia State Department of Education, and University of Virginia's Curry School of Education, 2003, Charlottesville, Virginia, University of Virginia. Copyright 2003 by the Rector and The Board of Visitors of the University of Virginia. Adapted with permission.

Table 7

Inter-rater Reliability for Word Recognition in Isolation

	Cronbach's alpha (*n*)
Word List	Spring 2000
Preprimer	.99 (*n* = 51)
Primer	.99 (*n* = 52)
Grade 1	.98 (*n* = 45)
Grade 2	.98 (*n* = 63)
Grade 3	.98 (*n* = 46)

Note. Adapted from *PALS: 1-3 Technical reference*, by M. Invernizzi, J. Meier, C. Juel, Viriginia State Department of Education, and University of Virginia's Curry School of Education, 2003, Charlottesville, Virginia, University of Virginia. Copyright 2003 by the Rector and The Board of Visitors of the University of Virginia. Adapted with permission.

Teachers administer the reading tests and rate students based on their perceptions of those students' performance. Thus, inter-rater reliability is vital for this portion of the test. Those data are presented in Table Eight. It must be noted that higher inter-rater reliability exists at grades 1, 2, and three. These were the core of the data examined in this research. Test-retest reliability indicates the tasks are stable over a period of two weeks which is the usual test window. Tests with reliability coefficients of .80 or higher are considered sufficient for most research purposes (Gall, Gall, & Borg, 2007). Therefore, this instrument can be deemed reliable.

Table 8

Correlation Coefficients for Inter-rater Reliability

PALS Task	Date	Reading Level	Correlation (*n*)
Oral Reading in	Fall 2000	Primer	.94 (*n* = 36)
Context		Grade 1	.97 (*n* = 43)
		Grade 2	.96 (*n* = 50)
		Grade 3	.98 (*n* = 72)
	Fall 2002	Readiness	.74 (*n* = 33)
		Preprimer A	.77 (*n* = 32)
		Preprimer B	.63 (*n* = 29)
		Preprimer c	.83 (*n* = 29)
		Primer	.97 (*n* = 18)
		Grade 1	.97 (*n* = 21)
		Grade 2	.85 (*n* = 38)
		Grade 3	.81 (*n* = 78)

Note. Adapted from *PALS: 1-3 Technical reference*, by M. Invernizzi, J. Meier, C. Juel, Viriginia State Department of Education, and University of Virginia's Curry School of Education, 2003, Charlottesville, Virginia, University of Virginia. Copyright 2003 by the Rector and The Board of Visitors of the University of Virginia. Adapted with permission.

Validity

Validity is "the degree to which all of the evidence points to the intended interpretation of test scores for the proposed purpose" (Creswell, 2012, p. 159). In other words, does the assessment accurately reflect the content it was written to address? Validity can be ascertained through content evidence, criterion evidence, and construct evidence. The PALS developers have documented their adherence to each of these components of validity.

Content validity defines the way a test samples the learning outcomes (Sanders & Sullins, 2006). This can be conceptualized as the degree to which test items and tasks provide a relevant selection of the content (Gronlund, 1985). A content area expert may evaluate the test to determine its content validity. The presence of content validity provides evidence for construct validity. The creators of PALS utilized existing research by the National Reading Panel to select the tasks deemed essential for reading comprehension (Invernizzi et al., 2003). This includes blending phonemes, segmenting sounds, matching sounds to letters, and transferring phonemic awareness to letters.

The PALS test demonstrates criterion validity. The degree to which one assessment score—in this case, the PALS test—is related to another assessment score or similar outcome represents the test's criterion validity. There are two types of criterion validity: predictive—when an assessment predicts future performance and concurrent—when an assessment's results are compared to another assessment (Gall, Gall & Borg, 2007). During the 2000-01 school year, fall and spring PALS data were assessed. Spring PALS results were compared to Stanford-9 Reading scores and Virginia Standards of Learning (SOL) Reading Tests. These evaluations provided the data needed to assess concurrent and predictive validity. A regression analysis yielded $R^2 = .53$ for first grade on Stanford-9. The regression analysis for the SOL test resulted in R^2 value of .36. The researchers argue these data indicate significant predictive criterion validity for the PALS test (Invernizzi et al, 2003). The spring to fall comparison of PALS results yielded an R^2 of .76 suggesting that the fall scores could be predicted by using the previous year's spring data. The Qualitative Reading Inventory (QRI) and Developmental Reading Inventory (DRA) were used to determine concurrent criterion validity. A bivariate

correlation between a student's reading level as determined by PALs and by the QRI yielded a significant correlation ($r = .73, p < .01$). A correlation between reading level as identified by PALS and by the DRA was also significant ($r = .82, p < .01$).

Construct validity stands as the final component of test validity. Construct validity refers to an assessment's ability to accurately measure what it purports to measure (Gronlund & Waugh, 2009). Content and criterion validity directly affect construct validity. The assessment's correlation to the intended learning outcomes comprises an important component of construct validity. In this case, the outcome equates to a student's reading level. The relationship of graphemes and phonemes to reading provided the basis upon which the PALS test was constructed. In order to test their theory, the creators of PALS conducted discriminant analyses and principal component analyses on PALS data to determine whether PALS subtask scores could accurately predict whether a student would be identified as falling below benchmark. The most recently reported principal component analysis (PCA) was conducted in 2001 and "yielded a single factor with an eigenvalue of 5.20....The one-factor solution suggested that PALS was measuring a unitary trait: reading, or the marriage between sound and print" (Invernizzi et al., 2003, p. 38). That unitary factor accounted for 79% to 85% of the variance in the summed scores. Discriminant analyses allowed the program designers to determine the extent to which a particular combination of subtest scores predicted whether a student would be identified as below benchmark. These analyses have accurately classified 95% to 98% of students as below or not below benchmark. The PALS test can be considered a valid testing instrument due to significant supporting results for content, criterion, and construct validity.

Coding Data

Teachers and interventionists utilize the data gathered in PALS to determine students' instructional reading levels. Thus data categorization based on grade levels from pre-primer to sixth grade creates a silo effect. If a student successfully completes the word recognition or reading for one grade level, he or she moves up to the next grade level. Likewise, a student who cannot read 15 of the 20 grade level specific sight words will receive an easier set of words to identify and an easier text to read. However, there is no difference in coding the results based on grade levels. A data continuum had to be created in order to overcome the categorical data presentation in PALS. This adjustment allowed for data analysis.

Question 1

Research Question 1 asked, "What is the relationship between participation in Project iRead and student word recognition as identified by student growth on the PALS test?" Two data sets were needed to answer this question—fall PALS scores and spring PALS scores. Only students who had both scores from a single school were included in the study. Students received a Word Recognition in Isolation score specific to each grade level. In order to code for students who are either below or above grade level, the scores were changed from the categories of pre-primer, primer, first grade, second grade, third grade, fourth grade, fifth grade, and sixth grade levels each ranging from 0 to 20 to a continuous scale ranging from 0 to one hundred sixty. Gains from fall to spring were calculated.

Question 2

Research Question 2 asked, "What is the relationship between participation in Project iRead and student fluency as identified by student growth on the PALS test?" Data analysis was based on PALS fluency ratings. When students read a passage with 90% to 97% accuracy, they were considered on their instructional level. After teachers determined the student's instructional level, they gathered data on fluency and words per minute at each student's level. The reading levels range from primer to sixth grade. Teachers reported fluency on a scale from 1 to 3 at each of those categorical levels. Recoding the results into a continuous data set from 0 to 21 allowed for determination of fluency gains.

Question 3

Research Question 3 asked, "What is the relationship between participation in Project iRead and student comprehension as identified by student growth on the PALS test?" For each PALS reading passage, primer through sixth grade, there were 6 accompanying comprehension questions. As with Question 1, these were coded on a single, continuous scale in order to accurately indicate the differences in achievement from fall to spring when a student might progress from answering 6 questions on a first grade text to answering 4 questions on a third grade text. The continuous, recoded data ranged from 0 to forty-two.

Question 4

Research Question 4 asked, "What is the relationship between participation in Project iRead and student word recognition at early adopting schools as identified by student growth on the PALS test?" Rather than examining the entire school district, the

focus became only the early and late adopting Project iRead schools. This question and the following two questions sought to concentrate the effects of Project iRead by examining scores for second grade only. This question required the same data information as Question One. The Word Recognition in Isolation scores were examined only for students with data for fall and spring at a single school. Categorical results were rescaled to produce continuous data to allow for interpretation about growth during the year. The resulting scores ranged from 0 to one hundred sixty.

Question 5

Research Question 5 asked, "What is the relationship between participation in Project iRead and student fluency at early adopting schools as identified by student growth on the PALS test?" As with Question 2, the fluency rates for students were coded to produce a continuous data set. Only second grade students were included in the analysis. The resulting scores ran from 0 to twenty-one.

Question 6

Research Question 6 asked, "What is the relationship between participation in Project iRead and student comprehension at early adopting schools as identified by student growth on the PALS test?" This question mirrors Question 3 yet narrows the scope of participants to second graders at early and late adopting schools. The data were coded to convert categorical grade level information into continuous student data. The result was a scale of scores from 0 to forty-two.

Data Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 22. For Questions 1, 2, and 3, the independent variable of

interest was participation in Project iRead. Questions 4, 5, and 6, the independent variable of interest was early or late adoption of Project iRead. However, the independent variables of socioeconomic status, race, Hispanic heritage, and gender were also examined as possible predictors of performance for word recognition in isolation, fluency, and comprehension. Each research question had one variable of interest and 4 additional independent variables. Linear regressions permit researchers to investigate the relationship between a single continuous outcome variable and a set of predictor variables (Yan & Su, 2009). This program evaluation sought to determine the relationship between Project iRead and student gains in reading. Yet the models also included 4 additional predictor variables. Therefore, linear regressions were chosen as the statistical tool.

Descriptive statistics, including means, standard deviations, ranges, medians, and frequencies were calculated for each dependent variable. All data were then tested for the basic assumptions for linear regression: linearity, absence of multicollinearity, and constant variance of the random errors—homoscedasticity (Freund, Wilson, & Sa, 2006). Linearity assumes a straight line relationship between the predictor variables and the dependent variables. The absence of multicollinearity assumes predictor variables are not closely related to each other. Homoscedasticity is the normal distribution of errors about the regression line. The results of those tests are presented in Chapter Four.

Due to issues with heteroscedasticity in the dependent variables, two less common statistical tests were utilized. Both a nonparametric Levene's test and, when necessary, robust multiple regressions were utilized. Violations of normalcy may lead to an increase in Type I errors in the Levene's test (Shoemaker, 2003). Therefore, a nonparametric Levene's test with rank scores permitted analysis of the variance in skewed data sets

(Nordstokke, Zumbo, Cairns, & Saklofske, 2011). This test involved three steps: "(i) pooling the data and replacing the original scores by their ranks and then (ii) separating the data back into their groups and (iii) applying the conventional mean-based Levene test to the ranks" (Nordstokke et al., 2011, p. 3). The nonparametric Levene's test was utilized to determine whether there was equality of variance in each of the data sets. When the null hypothesis (equality of variance) was violated, a more robust linear regression was applied.

Transforming data is a common practice when issues of non-normality occur. A robust analysis is a similar method of dealing with the problems associated with heteroscedasticity. A heteroscedasticity-consistent standard error (HCSE) analysis was used to compute the regression statistics. This approach was first suggested by White (1980) and further expanded upon by Long and Ervin (2000). Hayes and Cai (2007) added to the body of knowledge by creating a macro for SPSS. This additional module allows researchers to analyze heteroscedastistic data sets with a more robust linear regression model.

All findings were evaluated at a confidence level of $p < .05$. R^2 calculations were examined to determine how much variance in the dependent variable is accounted for by the independent variables. The *t* test established the significance of each predictor variable, and beta coefficients were utilized to confirm the effect size for individual independent variables.

Chapter Four

Results

The purpose of this program evaluation was to determine the relationship between Project iRead and student outcomes in early literacy. PALS data were examined for growth in word recognition in isolation, fluency, and comprehension. This chapter presents the data analysis results for each of the six research questions.

Six research questions were employed to determine the outcomes of Project iRead. The first three questions examined data from students at participating schools as compared to students at non-participating schools. Those same three questions were applied to a targeted subset of schools. In particular, the researcher sought to find differences between early adopting and late adopting Project iRead schools. Early adopting schools were defined as schools utilizing Project iRead for two to four years. Late adopting schools were those with a year or less of implementation. In addition, the focus was narrowed to second grade students only to concentrate the possible effects of Project iRead. Students in second grade at early adopting schools could have either two or three years of iRead instruction thereby increasing the likelihood of having a teacher who used the program with fidelity and also increasing the time spent interacting with the program as opposed to students at late adopting schools who had a maximum of only one year's interaction with Project iRead.

Growth from fall to spring in the 2012-13 school year was examined. In addition to Project iRead participation, variables for gender, minority status, Hispanic heritage, and socioeconomic status were entered into the model. This was necessary due to the possibility these variables might have more impact on word recognition than the program

itself. Interpreting the results required comparison of categorical groups coded as zero and one. SPSS uses the latter category as its reference of comparison. Socioeconomic status, iRead participation, early iRead participation, Hispanic descent, minority status, and males were coded as one for all research questions.

Question One

Research Question 1 asked, "What is the relationship between participation in Project iRead and student word recognition as identified by student growth on the PALS test?" This question was tested with a robust linear regression. An evenly matched sample (N = 5,140) of first and second grade student scores were examined for growth in word recognition from fall to spring during the 2012-13 school year. The 22 students who had word recognition scores more than 3 standard deviations from the mean were removed from the data set before analyses began. Growth for students participating in Project iRead (N = 2,563, M = 38.15, SD = 18.35) was compared to those not participating in Project iRead (N = 2,555, M = 36.75, SD = 20.56).

Sample Characteristics

A Shapiro-Wilk's test ($p < .05$) and visual inspection of the histograms, normal Q-Q plots and box plots were conducted to determine the normality of the word recognition data. These tests all indicated a non-normal data set. Further examination indicated significant skewness of .265 (SE = .048) for data of Project iRead students and significant skewness of .332 (SE = .048) and kurtosis of −.248 (SE = .097) for data of students not participating in the program.

Creating and interpreting a scatterplot for linearity of the independent variables (Project iRead, socioeconomic status, Hispanic descent, minority status and gender) and

the dependent variable (word recognition in isolation) was not applicable in this instance because all predictor variables were categorical and had no associated linearity. A nonparametric Levene's test was used to determine the equality of variances in the samples—also known as homoscedasticity (Nordstokke et al., 2011). This test indicated a heteroscedastic data set ($p < .01$). The VIF statistic was calculated for collinearity of predictor variables. The null hypothesis—lack of collinearity—was not violated and results are reported in Table Nine.

Table 9

Collinearity Statistics for Project iRead Participation

Variable	VIF
Socioeconomic Status	1.07
Hispanic descent	1.03
Gender	1.00
Minority Status	1.15
iRead Participation	1.04

Analysis

A robust multiple regression analysis was used to test whether participation in Project iRead significantly predicted students' word recognition in isolation. The variables entered into the model included participation in Project iRead, socioeconomic status, Hispanic descent, minority status, and gender. The results of the regression indicated less than one percent of the total variability in word recognition in isolation is explained by the model ($R^2 = .006$). However, the model also indicated significant explanatory power ($F(5, 5111) = 6.27, p < .001$). Significant contributors to the model were socioeconomic status, $B = 1.71$, $t(5,007) = 2.73$, $p = .006$, minority status, $B = 2.51$,

$t(5,007) = 4.12, p < .001$, and participation in Project iRead, $B = -1.38$, $t(5,007) = 1.38, p = .02$. A second regression analysis was completed that omitted the insignificant independent variables. The results of this analysis are presented in Table 10. It must be noted that the robust linear regression analysis only calculates unstandardized coefficients. It does not report standardized beta weights. The results of the linear regression are presented in Table 11.

Table 10

Regression Analysis of Word Recognition in Isolation

	B	*SE*	*t*	*p*
Constant	33.68	1.07	31.59	.000
Socioeconomic Status	1.71	.62	2.73	.006
Hispanic Descent	.52	1.03	.51	.611
Minority Status	2.51	.61	4.12	.000
Gender	-.16	.54	-.29	.775
iRead Participation	1.38	.60	2.31	.021

Table 11

Regression Analysis of Word Recognition Omitting Insignificant Predictors

	B	*SE*	*t*	*p*
Constant	34.69	.58	59.75	.000
Socioeconomic Status	1.79	.60	3.00	.003
Minority Status	2.59	.58	4.46	.000
iRead Participation	1.39	.60	2.31	.021

$R^2 = .006$, $F(3, 5113) = 10.26, p < .001$

Socioeconomic status ($B = 1.79, p > .001$), minority status ($B = 2.59, p = .027$), and participation in Project iRead ($B = 1.39, p = .0207$) were all significant factors associated with word recognition in isolation. Students who were identified at a lower socioeconomic status made significantly greater gains than their peers. Minorities made greater gains in word recognition than white students. And, most importantly to this program evaluation, participation in Project iRead made a significant contribution to student growth in word recognition.

Question Two

Research Question 2 asked, "What is the relationship between participation in Project iRead and student fluency as identified by student growth on the PALS test?" An evenly matched sample (N = 5,140) of first and second grade student scores were examined for growth in fluency from fall to spring during the 2012-13 school year. The 29 students who had fluency scores more than 3 standard deviations from the mean were removed from the data set before analyses began. Growth for students participating in Project iRead (N = 2,555, M = 5.46, SD = 3.45) was compared to those not participating in Project iRead (N = 2,556, M = 5.54, SD = 3.45).

Sample Characteristics

A Shapiro-Wilk's test ($p < .05$) and visual inspection of the histograms, normal Q-Q plots and box plots were conducted to determine the normality of the fluency data. These tests all indicated a non-normal data set. Further examination indicated significant skewness of .264 (SE = .048) and kurtosis of −.494 (SE = .097) for data of Project iRead

students and significant skewness of .203 (SE = .048) and kurtosis of −.370 (SE = .097) for data of students not participating in the program.

Creating and interpreting a scatterplot for linearity of the most of the independent variables (Project iRead, socioeconomic status, Hispanic descent, minority status and gender) and the dependent variable (word recognition in isolation) was not applicable in this instance because these predictor variables were categorical and had no associated linearity. However, a scatterplot was examined for word recognition in isolation. A nonparametric Levene's test was used to determine the equality of variances in the samples—also known as homoscedasticity (Nordstokke et al., 2011). This test was utilized due to the lack of normality in the data. This test supported the null hypothesis that the data had equality of variance (F (1, 5108) = .23, p = .63). The null hypothesis—lack of collinearity—was not violated and results were reported in Table 9.

Analysis

A stepwise multiple regression analysis was used to test whether participation in Project iRead significantly predicted students' growth in fluency rates. Socioeconomic status, Hispanic descent, minority status, gender, and participation in Project iRead were entered as independent variables for consideration. SPSS generated three models. The most statistically significant model accounted for a small amount of the variance in scores (R^2= .012). The model indicated significant explanatory power (F(3, 5106) = 20.55, p < .001). Significant contributors to the model were socioeconomic status, B = -.503, t(5,106) = −4.97, p < .001, minority status, B = .32, t(5,106) = 3.13, p = .002, and gender, B = −.36, t(5,106) = −3.70, p < .001. Hispanic descent and participation in iRead

were excluded from all models due to the lack of predictive association. Information on these statistics is presented in Table 12. The results from the best model are presented in Table 13.

Table 12

Variables Excluded from Fluency Analysis

Model	Excluded Variable	*Beta in*	*t*	*p*
1	iRead Participation	.008	.55	.581
	Minority Status	.045	3.05	.002
	Gender	−.051	−3.64	.000
	Hispanic Descent	−.011	−.79	.431
2	iRead Participation	.008	.53	.597
	Minority Status	.046	3.13	.002
	Hispanic Descent	−.011	−.74	.458
3	iRead Participation	.015	1.01	.313
	Hispanic Descent	−.024	−1.63	.104

Table 13

Best Fit Fluency Linear Regression Model

	B	*SE*	*β*	*t*	*P*
Constant	5.80	.10		56.50	.000
Socioeconomic Status	−.50	.10	−.70	−4.97	.000
Gender	−.36	.01	−.05	−3.70	.000
Minority Status	.32	.10	.05	3.13	.002

It is interesting to note that economically disadvantaged students made significantly greater gains in word recognition, yet failed to make concomitant gains in fluency. In fact, the largest predictor of scores was the negative standardized coefficient for low socioeconomic status. Females made more growth than males. Minority students made greater gains than their white peers. It is possible that additional factors have provided more opportunities for Central School District's minority students as compared to their white students. Indeed, the low R^2 value of the regression analysis indicates there are other, better predictors that were not included in the model.

Question Three

Research Question 3 asked, "What is the relationship between participation in Project iRead and student comprehension as identified by student growth on the PALS test?" An evenly matched sample (N = 5,140) of first and second grade student scores were examined for growth in comprehension from fall to spring during the 2012-13 school year. One hundred ninety-four students had comprehension scores more than 3 standard deviations from the mean. These outliers represented less than 5% of the data set and were eliminated before any analyses began. Growth for students participating in Project iRead (N = 2,477, M = 11.42, SD = 7.76) was compared to those not participating in Project iRead (N = 2,469, M = 12.18, SD = 9.25).

Sample Characteristics

A Shapiro-Wilk's test ($p < .05$) and visual inspection of the histograms, normal Q-Q plots and box plots were conducted to determine the normality of the fluency data. These tests all indicated a non-normal data set. Further examination indicated significant

skewness of .298 (SE = .049) and kurtosis of .604 (SE = .098) for data of Project iRead students and significant skewness of .482 (SE = .049) and kurtosis of .426 (SE = .098) for data of students not participating in the program.

Creating and interpreting a scatterplot for linearity of the independent variables (Project iRead, socioeconomic status, Hispanic descent, minority status and gender) and the dependent variable (word recognition in isolation) was not applicable in this instance because all predictor variables were categorical and had no associated linearity. A nonparametric Levene's test was used to determine the equality of variances in the samples—also known as homoscedasticity (Nordstokke et al., 2011). This test indicated a heteroscedastic data set ($p < .01$). The null hypothesis—lack of collinearity—was not violated and results were reported in Table 9.

Analysis

A robust multiple regression analysis was utilized to test whether participation in Project iRead significantly predicted students' comprehension scores. The variables entered into the model included participation in Project iRead, socioeconomic status, Hispanic descent, minority status, and gender. The results of the regression indicated less than one percent of the total variability in word recognition in isolation is explained by the model ($R^2 = .005$). However, the model also indicated significant explanatory power ($F(5, 4939) = 5.28, p < .001$). Gender, Hispanic descent, minority status, and participation in Project iRead, all failed to be significant predictors of comprehension performance. The only significant contributor to the model was socioeconomic status, $B = -.607$, $t(4,939) = -2.18, p = .03$. The results of the regression analysis are reported in

Table 14. A second regression analysis was completed that omitted the insignificant independent variables. The results are presented in Table 15. It must be noted that the robust linear regression analysis utilized for this study only calculates unstandardized coefficients. It does not report standardized beta weights.

Table 14

Comprehension Regression Analysis Results

	B	*SE*	*T*	*p*
Constant	12.32	.30	41.34	.000
Socioeconomic Status	−.61	.28	−2.18	.030
Hispanic Descent	−.68	.44	−1.54	.124
Minority Status	.43	.27	1.57	.118
Gender	−.33	.24	−1.37	.170
iRead Participation	−.43	.27	−1.61	.107

Table 15

Regression Analysis of Comprehension Omitting Insignificant Predictors

	B	*SE*	*T*	*p*
Constant	12.25	.17	71.01	.000
Socioeconomic Status	-.97	.24	-4.03	.000

$R^2 = .0032$, $F(1, 4944) = 16.25$, $p < .001$

The first three research questions examined district-wide data. The relationship of Project iRead to student learning outcomes in word recognition, fluency, and comprehension were the relationships of interest. Project iRead was significantly related to gains in word recognition, but participation in the program was not significantly

related to fluency or comprehension gains. Perhaps as significantly, minority students showed significant gains in word recognition and fluency, but they did not show significant gains in comprehension. In addition, students from low socioeconomic backgrounds made more significant gains in word recognition, but their economically advantaged peers made significantly greater gains in both fluency and comprehension.

Question Four

The purpose of Research Questions 4, 5, and 6 was to concentrate the effects of Project iRead. In order to better determine the efficacy of Project iRead, only data from second grade students was examined. The rationale for this decision was to concentrate the possible effects of Project iRead. There was a greater possibility that students in second grade at early adopting Project iRead schools might exhibit increased performance due to the length of time spent using the program. It is also possible that teachers at late adopting schools did not have enough experience or support to implement the program well in their first year. To further distill the effects of Project iRead, only second grade students' data was examined. This refinement resulted in data for students at early adopting schools who potentially participated in Project iRead for up to three years. Therefore, given all these constraints, Research Questions 4, 5, and 6 only targeted students at schools that participated in Project iRead.

Research Question 4 asked, "What is the relationship between participation in Project iRead and student word recognition at early adopting schools as identified by student growth on the PALS test?" Seven students had word recognition scores more than 3 standard deviations from the mean. These outliers were removed from the data set

before analyses began. Growth for students at early adopting Project iRead schools (N = 548, M = 28.50, SD = 14.85) was compared to growth for students at late adopting Project iRead schools (N = 672, M = 30.90, SD = 14.68).

Sample Characteristics

A Shapiro-Wilk's test ($p < .05$) and visual inspection of the histograms, normal Q-Q plots and box plots were conducted to determine the normality of the word recognition data. These tests all indicated a non-normal data set. Further examination indicated no significant skewness (skew =.084, SE = .104) or kurtosis (kurtosis = -.437, SE = .208) for data of students at early adopting Project iRead schools. There was no significant skewness (skew = -.038, SE = .094) for data of students at late adopting Project iRead schools. However, there was kurtosis of -.576 (SE = .188) at those schools.

Creating and interpreting a scatterplot for linearity of the independent variables (Project iRead, socioeconomic status, Hispanic descent, minority status and gender) and the dependent variable (word recognition in isolation) was not applicable in this instance because all predictor variables were categorical and had no associated linearity. A nonparametric Levene's test was used to determine the equality of variances in the samples—also known as homoscedasticity (Nordstokke et al., 2011). This test supported the null hypothesis that the data had equality of variance (F (1, 5108) = .001, p = .98). Collinearity was calculated for each predictor variable. The null hypothesis—lack of collinearity—was not violated and results are reported in Table 16.

Table 17

Variables Excluded from Word Recognition in Isolation at iRead Schools

Model	Excluded Variable	*Beta in*	*t*	*p*
1	Socioeconomic Status	.050	1.73	.085
	Hispanic Descent	.036	1.26	.208
	Minority Status	-.052	-1.77	.077
	Gender	.030	1.06	.288

Table 18

Stepwise Linear Regression Results for Word Regression at iRead Schools

Model 1	*B*	*SE*	*β*	*t*	*p*
Constant	30.90	.57		54.28	.000
Early iRead Adoption Status	-2.14	.85	-.07	-2.52	.012

This stepwise linear regression resulted in a single model with only one significant predictor variable—early participation in Project iRead. However, the relationship between early participation and word recognition in isolation is negative. That is, students at early adopting schools failed to make the same gains as students at late adopting schools.

Question Five

Research Question 5 asked, "What is the relationship between participation in Project iRead and student fluency at early adopting schools as identified by student growth on the PALS test?" Six students had fluency scores more than 3

standard deviations from the mean. These outliers were removed from the data set before analyses began. Growth for students at early adopting Project iRead schools (N = 552, M = 5.00, SD = 2.81) was compared to growth for students at late adopting Project iRead schools (N = 669, M = 5.56, SD = 3.33).

Sample Characteristics

A Shapiro-Wilk's test ($p < .05$) and visual inspection of the histograms, normal Q-Q plots and box plots were conducted to determine the normality of the word recognition data. These tests all indicated a non-normal data set. Further examination indicated significant skewness of .323 (SE = .104) for data of students at early adopting Project iRead schools, but the data were not kurtotis (kurtosis = −.033, SE = .208). There was also significant skewness of .276 (SE = .094) and significant kurtosis of −.400 (SE = .189) for data of students at late adopting Project iRead schools.

Creating and interpreting a scatterplot for linearity of the independent variables (Project iRead, socioeconomic status, Hispanic descent, minority status and gender) and the dependent variable (word recognition in isolation) was not applicable in this instance because all predictor variables were categorical and had no associated linearity. A nonparametric Levene's test was used to determine the equality of variances in the samples—also known as homoscedasticity (Nordstokke et al., 2011). This test indicated a heteroscedastic data set ($p < .01$). Collinearity was calculated for each predictor variable. The null hypothesis—lack of collinearity—was not violated and results were reported in Table 16.

Analysis

A robust multiple regression analysis was utilized to test whether participation in an early adopting Project iRead school significantly predicted students' growth in fluency rates. Socioeconomic status, Hispanic descent, minority status, gender, and early participation in Project iRead were entered as independent variables for consideration. The results of the regression indicated less than one percent of the total variability in fluency is explained by the model ($R^2 = .0095$). However, the model also indicated significant explanatory power (F (5, 1215) = 2.45, $p = .03$). Socioeconomic status, gender, Hispanic descent, and minority status all failed to be significant predictors of fluency performance. The only significant contributor to the model was early participation in Project iRead, $B = -.56$, $t(1,221) = -3.22$, $p = .002$. The results of the regression analysis are reported in Table 19. A second linear regression was created using only the significant predictor for fluency gains. Those results are presented in Table 20. It must be noted that the robust linear regression analysis utilized for this study only calculates unstandardized coefficients. It does not report standardized beta weights.

Table 19

Fluency Regression Analysis Isolated to iRead Schools

	B	*SE*	*T*	*p*
Constant	5.32	.23	23.59	.000
Socioeconomic Status	.16	.22	.76	.448
Hispanic Descent	-.04	.36	-.11	.913
Minority Status	.16	.22	.77	.461
Gender	.19	.18	1.04	.298
iRead Early Participation	-.56	.19	-3.02	.003

Table 20

Fluency Regression at iRead Schools Omitting Insignificant Predictors

	B	*SE*	*T*	*p*
Constant	5.56	.13	43.18	.000
iRead Early Participation	-.56	.18	-3.17	.002

$R^2 = .0079, F(1, 1219) = 10.03, p = .002$

The results of this linear regression analysis suggest that students who attend early adopting Project iRead schools were statistically less successful in making gains in fluency than their peers at late adopting schools. While the purpose of Project iRead is to improve sight word recognition, it was expected that fluency gains would be positively impacted as well. In fact, the results of analyses in questions four and five support the opposite effect for both word recognition and fluency.

Question Six

Research Question 6 asked, "What is the relationship between participation in Project iRead and student comprehension at early adopting schools as identified by student growth on the PALS test?" Twenty-two students had comprehension scores more than 3 standard deviations from the mean. These outliers were removed from the data set before analyses began. Growth for students at early adopting Project iRead schools (N= 551, M = 9.40, SD = 6.14) was compared to growth for students at late adopting Project iRead schools (N = 659, M = 11.29, SD = 7.23).

Sample Characteristics

A Shapiro-Wilk's test ($p < .05$) and visual inspection of the histograms, normal Q-Q plots and box plots were conducted to determine the normality of the word recognition data. These tests all indicated a non-normal data set. Further examination indicated significant skewness of .523 (SE = .104) for data of students at early adopting Project iRead schools. The data were not kurtotic (kurtosis = .801, SE = .208). There was no significant skewness (skewness = .118, SE = .190) or kurtosis (kurtosis = −.344, SE = .19) for data of students at late adopting Project iRead schools.

Creating and interpreting a scatterplot for linearity of the independent variables (Project iRead, socioeconomic status, Hispanic descent, minority status and gender) and the dependent variable (word recognition in isolation) was not applicable in this instance because all predictor variables were categorical and had no associated linearity. A nonparametric Levene's test was used to determine the equality of variances in the samples—also known as homoscedasticity (Nordstokke et al., 2011). This test indicated

a heteroscedastic data set ($p < .01$). Collinearity was calculated for each predictor variable. The null hypothesis—lack of collinearity—was not violated and results were reported in Table 16.

Analysis

A robust multiple regression analysis was utilized to test whether participation in an early adopting Project iRead school significantly predicted students' growth in comprehension rates. Socioeconomic status, Hispanic descent, minority status, gender, and early participation in Project iRead were entered as independent variables for consideration. The results of the regression indicated just over three percent of the total variability in comprehension is explained by the model ($R^2 = .0316$). However, the model also indicated significant explanatory power (F (5, 1204) = 8.64, $p < .001$). The only significant contributors to the model were socioeconomic status, $B = 1.57$, $t(1,204) = 3.41$, $p < .001$, and early participation in Project iRead, $B = -1.56$, $t(1,204) = -3.86$, $p < .001$. The results of the regression analysis are reported in Table 21. A second regression analysis was run utilizing only significant predictors. The results of this test are presented in Table 22. It must be noted that the robust linear regression analysis utilized for this study only calculates unstandardized coefficients. It does not report standardized beta weights.

Table 21

Comprehension Regression Analysis Isolated to iRead Schools

	B	*SE*	*t*	*p*
Constant	10.44	.50	20.86	.000
Socioeconomic Status	1.31	.45	2.94	.003
Hispanic Descent	.36	.67	.54	.589
Minority Status	−.36	.48	−.75	.456
Gender	−.18	.38	−.49	.627
iRead Participation	−1.69	.40	−.75	.000

Table 22

Comprehension Regression at iRead Schools Omitting Insignificant Predictors

	B	*SE*	*t*	*p*
Constant	10.10	.42	24.22	.000
Socioeconomic Status	1.62	.41	3.95	.000
iRead Early Participation	−1.59	.39	−4.03	.000

$R^2 = .0315, F(2, 1207) = 21.42, p < .001$

This final research question sought to define the relationship between Project iRead use at early adopting schools and gains in comprehension as measured by the PALS test. Two variables proved to be significant—socioeconomic status and iRead participation. Students with an economically deprived background made greater gains in comprehension than their more advantaged peers. However, as with word recognition and fluency, students at early adopting schools achieved significantly less growth than their peers.

Summary

Several important findings resulted from the analysis of Project iRead. At the district level, Project iRead had a significantly positive relationship to only gains in word recognition. Students identified with low socioeconomic status made statistically greater gains in word recognition, but went on to make statistically less gains in both fluency and comprehension. Minority students realized greater gains in word recognition and fluency than white students, but minority status had no significant relationship to comprehension gains. Females displayed better fluency than males, but no other differences were noted.

The same questions about word recognition, fluency, and comprehension were assessed for students at early and late adopting Project iRead schools. In all cases Project iRead exhibited a significant relationship to gains. However, in all cases those relationships were negative. To be specific, students at late adopting schools outperformed their peers at early adopting schools. Socioeconomic status is the only other factor associated with gains. These students made statistically greater gains in comprehension. This stands in contrast to the overall results for the school district indicating that students from economically advantaged schools made greater growth in comprehension.

Chapter Five

Discussion and Implications

Reading is an essential skill in today's society. The United States has spent an enormous amount of money and effort to improve the reading ability of its students. Since 1969, the National Assessment of Educational Progress (NAEP) has served as our only national gauge of student achievement. Campbell, Hombo, and Mazzeo (2000) reported on trends in NAEP achievement over three decades. Their analysis of NAEP scores indicated a consistent divide between white, African American, and Hispanic students. Phillips and Chin (2004) noted that "the average black fourth-grader scores about .80 standard deviations below the average white fourth-grader in reading .... Latino-white gaps are slightly smaller....These gaps change little between fourth and eighth grade or between eighth and twelfth grade" (p. 468). Results from the 2011 NAEP indicate that *all* students are failing to make expected improvements. In fact, the national average for fourth grade students is only two points higher than in 2002. In addition, the significant differences in achievement rates of minorities, economically disadvantaged, and males persist.

The National Reading Panel (NICHHD, 2000) has documented the complexity associated with reading. The panel specifically identified the importance of "the big five" components: phonemic awareness, phonics, fluency, vocabulary, and comprehension. The panel maintained these components must be explicitly taught to students and no single component can be viewed as less important than the others. Students who cannot hear and manipulate phonemes have been shown to struggle with their written representations (Ehri & McCormick, 1998). Phonics instruction is equally

critical. Smith, Simmons, and Kameenui (1998) argue "phonological awareness is a hallmark characteristic of good readers while its absence is a consistent characteristic of poor readers" (p. 61). Fluency allows students to move from the realm of learning words to comprehending the meaning of text. Research indicates a high correlation ($r = .74$) between curriculum based measures of fluency and comprehension (Shinn, Good, Knutson, & Tilly, 1992). Vocabulary is so intricately linked to comprehension that the National Reading Panel reported no studies were available to indicate vocabulary causes increased comprehension (NICHHD, 2000). The panel argued that vocabulary and comprehension both define the meaning of the text, merely at different levels. The final element of "the big five" is comprehension. Ultimately, this is the purpose for reading (Durkin, 1993, Starrett, 2006). These five factors work together as the basis of reading.

The purpose of this particular study was to evaluate Project iRead. The program's primary goal is to increase word recognition in isolation. How does this goal support the National Reading Panel's recommendations? How does it draw from extant research about best practices? Lexical automaticity is essential for reading (Ehri, 2005; Hudson et al., 2009; Pikulski & Chard, 2005). This automaticity relies on a vast sight word vocabulary that, in turn, frees students' attention for the task of comprehension (Samuels & Kamil, 1984). Simply put, decoding and context clues are cumbersome tools for students. Far too much working memory is consumed to permit comprehension. Students without a robust personal lexicon face a lifelong struggle with reading (Snow, Burns, & Griffin, 1998). Vellutino (2003) posits "reader differences in the acquisition of fluent word recognition skills are the primary and most common source of variability in reading comprehension in elementary school children" (p. 53). Project iRead allows

teachers to employ their knowledge of individual student needs in order to differentiate for instruction, remediation, or enrichment. Research supports sight word instruction. Project iRead's foundation is strong.

Findings

Does Project iRead meet its potential? This summative program evaluation examined student growth in word recognition in isolation, fluency, and comprehension during the 2012-13 school year. The findings of the quantitative analysis of Project iRead's relationship to these outcomes are discussed below in two separate sections. The first will focus on differences between students at schools that participated in Project iRead as compared to those who did not. The second will concentrate on the differences between students at early adopting Project iRead schools as compared to students at late adopting schools.

District Data

Project iRead (B =1.39, p = .02) was positively related to growth in word recognition as were low socioeconomic status (B =1.79, p = .003) and minority status (B =2.59, $p < .001$). Increasing sight word recognition is the primary goal of Project iRead, thus these results indicate the program is reaching its desired outcome. In addition, the relationships for socioeconomic and minority status must also be addressed. Typically, these two sub-groups attain less growth than their peers. How might this significant relationship between low socioeconomic status and minority status be explained? There are two possibilities.

First, one must note that Hart and Risley (1995) conducted a two and a half year longitudinal study of forty-two families from various socioeconomic statuses. They

found children from with socioeconomic backgrounds typically heard 2,153 words per hour, children in working class families heard an average of 1,251 words per hour and children with low socioeconomic backgrounds heard an average of 616 words per hour. They extrapolated their research to suggest that, by age four, a child from an economically deprived background could hear 32 million fewer words than his or her economically advantaged peer. Perhaps this additional growth for economically disadvantaged students (who are often disproportionately minorities) in Central School District is indicative of the amount of ground they needed to make up to reach the achievement level of their peers.

Alternatively, one might argue the ceiling effect or regression to the mean prevented higher achieving students from showing their true ability (Kiess & Green, 2010). PALS charts growth from pre-primer to sixth grade. Students who were already at the top of the PALS continuum simply had no room for growth. At this point, there is no way of knowing demographic information about these high achieving students due to the way data were coded.

Word recognition is not end to itself. Rather, it is a tool that allows students to build their fluency and comprehension (Ehri, 2005). Because there is a positive relationship between Project iRead and students' word recognition, one would expect to see a corresponding increase in fluency gains. However, this prediction did not hold true. There *was* a relationship between gender and fluency with females making greater gains than males ($B = -.36, p < .001$). And while minorities and economically disadvantaged students made greater gains in word recognition than their peers, those gains did not continue for the fluency of students from low socioeconomic backgrounds ($B = -.503, p$

< .001). Arnold and Doctoroff (2003) posit "research in challenging because of major differences across and within each ethnic group. SES appears to be the primary force behind academic risk among minority children. Nevertheless, minority status likely adds at least some additional risk of educational underachievement" (p. 526). The additional gains for minority students may actually be indicative of how far behind these students were. It is also alarming to note that an examination of the data set itself revealed 327 of the 2,573 students, 12.7%, who started the school year with a fluency rate of zero also ended the school year with a fluency rate of zero.

The question of increased comprehension is perhaps furthest from Project iRead's stated goal of improving sight word recognition. And yet, comprehension is exactly the goal of reading instruction. Durkin (1993) argues that reading is an intentional process wherein the reader constructs meaning about the text. If students are not able to understand the text and put that understanding to use, then the fundamental purpose for reading is lost. Thus, improving comprehension rates is suggested as the true desired outcome for any reading intervention program. How has Project iRead fared in this respect? A robust linear regression revealed only one predictor of gains in performance—socioeconomic status ($B = -.97, p < .001$). This negative correlation indicates that students from economically advantaged homes made greater gains than their disadvantaged peers. Thus, when we come to the real purpose of reading—comprehension—the only statistically related difference in results is for students who did not come from disadvantaged homes.

The summarized district results are presented in Table 23. Project iRead met its stated goal of improving word recognition, but there were no related improvements in

fluency or comprehension. It is also important to recognize the relationship of low socioeconomic status and reading achievement. Crowe, Connor, and Petscher (2009) have documented the impact of poverty on poor academic outcomes. These researchers also note the influence of lessened family involvement, school resources, and language resources as contributing factors in students' failure to attain expected growth. The low R^2 value of all the models associated with this research indicate there were other factors—perhaps these—that were not accounted for.

Table 23

Summarized District Data

	Positive Relationship	Negative Relationship	No Significant Relationship
Word Recognition in Isolation	Project iRead Participation Socioeconomic Status Minority Status		Hispanic Descent Gender
Fluency	Minority Status	Socioeconomic Status Gender	Project iRead Participation Hispanic Descent
Comprehension		Socioeconomic Status	Project iRead Participation Minority Status Hispanic Descent Gender

Early and Late Adopting School Data

Second grade data from early and late adopting schools were analyzed in an attempt to concentrate the effects of Project iRead. The rationale for this was to maximize the number of years students were engaged in the program. First grade students received a maximum of two years of iRead instruction at early adopting schools, but second grade students had a maximum of three years instruction. By contrast, students at late adopting schools received a year or less of Project iRead instruction. The same questions and variables were employed as in the first three research questions.

There was only one variable significantly associated with word recognition in isolation—early participation in Project iRead ($B = -2.14, p = .012$). This is a negative association. In other words, students at late adopting schools performed significantly better than their early adopting peers. Ehri (2005) maintains that memorizing words with a look—say approach lacks the power necessary to explain how skilled readers can recognize thousands of words instantaneously. Instead, Ehri argues that connections in spelling and word families form a better description for how students learn sight words. It would follow that teaching word families and graphophonemic relations may be a better way to increase students' sight word knowledge. It is possible the existing interventions and supports at the late adopting schools were more advantageous for increasing sight word recognition.

There was only one variable significantly associated with fluency—early participation in Project iRead ($B = -.56, p = .002$). It must again be noted this is a negative relationship between early participation and fluency. The early and late adopting schools appeared to be very similar demographically. This seems to hold true in

the analysis of the data as there are no statistically significant findings for minorities, Hispanics, males, or socioeconomically disadvantaged students. Why, then, is participation in a program that teaches sight word recognition related to reduced gains in sight word recognition *and* fluency? Crowe et al. (2009) argue that a complication of using "curriculum as a component of reading reform lies in the possibility that the effectiveness of any one curriculum may depend on many factors, the most prominent of which may be characteristics of the students themselves" (p. 189). Therefore, some other factors, unaccounted for in this program evaluation, may play a larger role in student growth in both word recognition and fluency.

Theoretically, a goal of sight word recognition is to free working memory for the more complex tasks of fluency and comprehension (Hudson et al., 2009). When word recognition becomes effortless, the reader's attention can focus on understanding (Laberge & Samuels, as cited in Hudson et al., 2009). The final research question in this program evaluation sought to determine the relationship between comprehension and Project iRead. In this case there were two significant variables. Students who were economically disadvantaged made greater gains in comprehension skills than their advantaged peers ($B = 1.62$, $p < .001$). Possible explanations for such an outcome were examined in earlier paragraphs. However, Project iRead was negatively related to growth in comprehension skills ($B = -1.59$, $p < .001$). Hence, this research revealed a negative relationship between Project iRead and all outcome variables when comparing early and late adopting schools. There are two possible explanations for these results. Either Project iRead is not meeting its stated goal of improving sight word recognition or there

are unaccounted, confounding variables involved. First, I will examine the latter possibility.

Fifteen of the schools in this portion of the study were Title I schools. However, two early adopting schools were not Title I and had significantly lower numbers of minority and disadvantaged students. In fact, of the one hundred nine students at Tidewater Elementary School included in the study, just five were coded at low socioeconomic status and only two were African Americans. Research indicates that minorities and economically disadvantaged students do not achieve reading gains at national averages (Arnold & Doctoroff, 2003; Crowe et al., 2009; Snow, 2002). That same research indicates that whites and economically advantaged students achieve reading gains above the national averages. The PALS test only documents reading levels up to and including sixth grade. Therefore, if there were more students at Tidewater who experienced a ceiling effect, their scores may have biased the results of this program evaluation. An interview with the program's creator also revealed that Left Bank, an early adopting school, uses Project iRead exclusively in third grade. Their practices, therefore, likely skewed the results for early adopting schools in general.

There remains, however, the possibility that Project iRead does not have a significant relationship to student gains in reading. Certainly, the results of the comparison between early and late adopting schools seem to support the lack of effect. Stanovich (1986) famously identified Matthew effects in reading wherein he argues that our attempts to remediate struggling students "combined with the large skill differences in reading volume, could mean that a 'rich-get-richer' or cumulative advantage phenomenon is almost inextricably embedded within the developmental course of reading

progress" (p. 381). In other words, repeated practice with the same words results in a slower vocabulary development that, in turn, impedes fluency and comprehension. The results of this evaluation may support Stanovich's research.

To summarize the overall results of this study, Project iRead had a positive relationship to word recognition growth for participants as compared to non-participants, yet a negative relationship to word recognition, fluency, and comprehension for early adopting schools as compared to late adopting schools. And, although there were numerous statistically significant relationships between predictor and outcome variables, none of the results had practical significance due to the small amount of variability each of the models explained. The implications for these results will be discussed further in the next section of this research.

Standards of Program Evaluation

Throughout this summative evaluation of Project iRead, the researcher referred to the JCSEE's *Program Evaluation Standards* (Yarbrough et al., 2011). The utility standard was met through the dissemination of the evaluation's findings. The researcher contacted Project iRead's creator often, relating the results and requesting additional information to explicated those findings. The feasibility standards were met in several ways. First, there were no costs incurred by Central School District. Disruption was minimalized because existing PALS data were employed to appraise Project iRead's relationship on student outcomes. Use of the existing PALS data ensured negligible impact on teachers' and administrators' workloads. JCSEE's propriety standards were met multiple ways as well. First, the research did not begin until a formal, written agreement was reached with Central School District detailing its parameters and goals.

The rights of human subjects were guaranteed through the College of William and Mary's Institutional Review Board, which exempted it from formal review due to the fact that the research is "conducted in established or commonly accepted educational settings, involving normal educational practices" (Protection of Human Subjects, 2009, p. 3). The assessment itself was complete and fair, detailing both the strengths and weaknesses of Project iRead. Finally, all results were communicated to the program's creator and to stakeholders in Central Office. The accuracy standards were met through detailed description of Project iRead, the purpose and procedures for the program evaluation, and the validity and reliability of the PALS data.

Consideration was given to usefulness, context, resources, reliability, validity, and moral and ethical concerns. Balancing each of these components of the *Program Evaluation Standards* provided "the methodology used to increase and document evaluation quality" (Yarbrough et al., 2011, pp. xxviii). Yarbrough, Shulha and Caruthers (2004) contend that the growth in program evaluation requires attention to standards and that the "users' questions inform the choice of methodology in order to make an efficient, effective, and useful evaluation more likely" (p. 27). This program evaluation has met those goals.

Implications for Practice

The results of this program evaluation were puzzling. Students participating in Project iRead made greater gains in sight word recognition than their peers who did not participate. However, when early and late adopting participators were compared, students who spent *more* time in the program realized significantly *less* growth. There

are several implications for practice that may serve to enhance the possible benefits of Project iRead.

First, the iRead manual should be reviewed and updated to define implementation. A successful program begins with successful implementation. Fitzpatrick et al. (2012) maintain that implementation failure occurs when a program is not delivered as planned causing the program to fail to meet its goals. Central School District gives a great deal of autonomy to its building administrators. At this point, the Project iRead manual does not specify how often, how many minutes, or the duration of the program. In addition, there are no parameters for determining when a student should be evaluated and moved into a new, more challenging word set. A revision of the manual specifying these factors for Tier I, II, and III instruction would allow the program creator, central office staff, and building administrators to determine whether the program is being used with fidelity.

Second, research indicates that students benefit from programs featuring systematic and explicit associations of the phonemic patterns such as those found in word families (Ehri, & McCormick, 1998; NICHHD, 2000; Wolter & Apel, 2010). Project iRead would profit from additional word lists (in the form of VFCs) that utilize word families to enable students' recognition of spelling patterns. These lists would be assigned to students based on individual PALS scores defining reading levels. Again, specificity in delineating the usage of the program will add to the effectiveness of this program.

Next, emphasis should be placed on students with specific learning disabilities. Previous research on sight word instruction has focused on exceptional education

students (Browder & Xin, 1998; Mesmer et al., 2010; Van Norman & Wood, 2008). Some exceptional education students lack the basic decoding skills necessary for phonemic reading. A variety of underlying processing problems prevents these students from being able to generalize the phonemic patterns in the English language. Therefore, learning sight words has traditionally been a significant strategy used with this population. At this point, Project iRead has not specifically been targeted for use with exceptional education students or with autistic spectrum students. However, both of these groups may benefit from targeted instruction.

Finally, a plan needs to be created for students who are identified below benchmark in PALS. These students require the maximum support in order to ensure success. In 1997, the Virginia General Assembly established the ground works for PALS testing with the express purpose of identifying and remediating students at risk for early reading problems (Invernizzi et al., 2004). Students who are identified as "below benchmark" in kindergarten, first and second grades are required to receive additional instruction to help them reach on grade level performance by third grade. It is these students who are not exceptional education, but who are struggling with the phoneme to grapheme connections, who may also benefit from regular, defined participation in Project iRead. The U. S. Department of Education (Torgesen et al., 2006) concluded that effective reading intervention models must be provided 30 minutes per day and include fast paced, engaging instruction in a small group at the student's ability level. While one would not expect students to spend 30 minutes per day practicing sight words, this activity could certainly serve as an introduction to each daily lesson.

In summary, there are a number of ways Project iRead's implementation model could be improved. A focus on exceptional education students and students identified below benchmark on PALS would better define Project iRead's purpose in the district. That definition could be set forth explicitly with implementation guidelines in the program's handbook. However, in order for implementation to truly be successful, it is this evaluator's belief that a collaborative effort between Project iRead's creator, directors of elementary education, the reading specialist, and the coordinator for Response to Intervention must occur. A unified effort to promote best practices as they apply to Project iRead will best ensure that Central School District is getting best results from the resources in which they have invested.

Implications for Research

The data in this program evaluation were problematic. The lack of normalcy accompanied by the absence of equality of variance gives one pause when interpreting the results of the evaluation. In addition, the weakness in the predictive power for all the models suggested additional factors should be examined in future research. Some of these avenues are explored in the following paragraphs.

A qualitative study involving a case study, multiple site interviews, open-ended questionnaire items, or a combination of data points would reveal the depth to which Project iRead is actually being utilized at each site. This information could explain the negative relationship between early adopting schools and gains in word recognition, fluency, and comprehension. The contrast of positive association with Project iRead participation and word recognition gains at the district level might also be clarified in a qualitative study. Questions to ask educators might include:

- How do you select students to use Project iRead?
- How do you decide how many minutes per session students will use Project iRead?
- How do you determine how often students will use Project iRead?
- What does iRead add to your reading instruction?
- What do you think is important about iRead?
- Can you share a success story involving iRead?
- What obstacles do you have to overcome in order to use iRead?
- What would effective implementation of iRead look like?

By conducting a qualitative analysis, additional formative data could add to the summative information gathered in this program evaluation. Combining the formative and summative data could better enlighten Central School District and thereby provide for enhanced implementation of Project iRead.

A ceiling effect is a commonly recognized occurrence wherein results may be skewed because subjects at the top of the scale have nowhere to go. In the case of the PALS data, four hundred thirteen students were at the fifth or sixth grade word recognition level in the fall, leaving them with little or no room for growth in the spring. One hundred thirty-four students were at the fifth or sixth grade level for fluency in the fall and eighty-one of those students were at the absolute top rating with no possibility of scoring higher. One hundred one students had perfect or almost perfect (one point off) scores on the sixth grade comprehension questions in the fall. The only possibility for many of these students was a regression to the mean. Future research might better reveal the effects of Project iRead by removing these students from the data pool at both

participating and non-participating schools. Focusing on only grade level or below grade level readers may better explicate the effects of Project iRead on student gains in reading.

Rather than control for the ceiling effect, reducing the sample size might provide a clearer picture of the impact of Project iRead on student growth. In a normally distributed data set, approximately 95% of all scores lie within two standard deviations of its mean (Gall, Gall, & Borg, 2007). This study included scores within three standard deviations. While such a wide range allowed the inclusion of more data, it may also have skewed the results. Fifty-three of the fifty-eight students who either lost ground on their word recognition skills or made no gains were already recognizing words at or above grade level in the fall. Ninety-four of the five hundred ninety-nine students who either lost ground or made no gains in their fluency rates had perfect or nearly perfect prosody at the sixth grade level in the fall (scores of 20 or 21). One hundred three of eight hundred students who either lost ground or made no gains in comprehension rates had perfect or nearly perfect comprehension scores at the sixth grade level in the fall (scores of 41 or 42). Reducing the data set to two standard deviations would eliminate these students and control for the ceiling effect.

Research has shown the importance of teaching students the connections between graphemes and phonemes (Ehri, & McCormick, 1998; NICHHD, 2000; Wolter & Apel, 2010). If the Project iRead's creator opts to expand the VFCs and include word families, a study tracking their success would be needed. These data could reveal whether a new model for Project iRead increases its efficacy. This recommendation for research would be predicated on both changes to the types of VFCs available and refinement of the

program manual. The manual modifications should specify the duration of each session and other parameters as discussed in earlier in this paper.

A conversation with the Project iRead's creator revealed a great deal of variation in implementation methods throughout the school district. Another study utilizing nested data could reveal where Project iRead might have greater impact. A generalized linear mixed model would allow data nesting. Future research could examine data at multiple levels to determine whether particular schools or classes have an effect on student outcomes. By nesting the data from school to classroom to student, the variability of past implementation practices could be silenced thereby allowing an improved understanding of the relationship between Project iRead and student growth in reading.

Although some have cast a broad net in sight word research (Caldwell, 2013; MacQuarrie, 2012; Nelson, 2008), the majority of published work examines the efficacy of sight word instruction for exceptional education students (Bear, Negrete, & Cathey, 2012; Browder & Xin, 1998; Cullen, Keesey, Alber-Morgan, & Wheaton, 2013; Simos et al., 2007,;Vellutino et al., 1996). Another examination of 2012-13 data would provide insight into the relationship between Project iRead, disability status, and student growth in reading. Typically, PALS data includes information about student disabilities. However, those data were eliminated from the files the district provided. The researcher requested information regarding socioeconomic status and was unaware that receiving this information would preclude also having information about participation in exceptional education. Thus, another analysis of the same data with this additional predictor variable might reveal more information about the efficacy of Project iRead.

None of the models in this program evaluation significantly explained the outcome variables. In fact, R^2 ranged from .005 to .034 indicating little predictive power. The National Reading Panel has emphasized the inter-relatedness of "the big five"—phonemic awareness, phonics, fluency, vocabulary, and comprehension (NICHHD, 2000). Research indicates a significant achievement gap between socioeconomic classes and minorities (Arnold & Doctoroff, 2003; Crowe et al., 2009; Snow, 2002). Although the purpose of this research was to determine the relationship between Project iRead and student gains in reading, further exploration of existing national issues are warranted. Specifically, an analysis of the relationship between word recognition in isolation and fluency as predictive factors for comprehension should be examined. It would be informative to identify any possible differences in these relationships based on socioeconomic and/or minority status.

In summary, there are several avenues for research. A number of variables could be explored through either quantitative or qualitative analysis. Determining the fidelity of implementation, refining the sampling method, investigating new VFCs, and adding additional predictive factors the regression model all have the potential not only to elucidate the impact of Project iRead, but also to add to the body of knowledge about the complexities associated with reading achievement.

Final Thoughts

The stated purpose of this research was to explore the relationship of Project iRead to student outcomes in reading. However, several other notable issues arose both during conversations with the program's creator and in the analysis of other independent variables. The first concern was about the definition of the program. Teachers likely did

not make optimal use of this valuable tool due to lack of clear, definitive guidance on how often to utilize it or how often to move students up to more challenging word lists. One of the first lessons learned in a program evaluation class involves logic models. A program needs defined inputs, activities, outputs, and outcomes. Central School District prides itself on giving building level administrators autonomy in daily practices. However, the nebulous nature of Project iRead's parameters may well prevent it from being as effective as it can be. An issue strongly related to the definition of Project iRead is its implementation. Research indicates that first and second grades are the most applicable years for students to build basic sight vocabulary knowledge. If schools such as Left Bank completely exclude these students from participating, will Project iRead be able to meet its potential even with changes in its manual?

The leading areas of concern, however, went beyond the scope of Project iRead. These were the matters of race and socioeconomic class. The district results from 5,140 students indicated achievement gaps between minorities and whites and between students from low socioeconomic backgrounds and their more privileged peers. This is not new. And yet, it is disconcerting to see more evidence of disparities in student achievement. It is hoped this program evaluation will provide the information necessary to refine Project iRead. It is also hoped that Matthew effects can be diminished in Central School District in order to lessen these achievement gaps.

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