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# Fidelity of Implementation, Teacher Perspectives and Child Outcomes of a Literacy Intervention in a Head Start Program: A Mixed Methods Study

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FIDELITY OF IMPLEMENTATION, TEACHER PERCEPTIONS AND CHILD  
OUTCOMES OF A LITERACY CURRICULUM IN A HEAD START PROGRAM:

A MIXED METHODS STUDY

by

Dawn L. Davis

A DISSERTATION

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The Graduate College at the University of Nebraska

In Partial Fulfillment of Requirements

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Under the Supervision of Professor Helen H. Raikes

Lincoln, Nebraska

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FIDELITY OF IMPLEMENTATION, TEACHER PERCEPTIONS AND CHILD  
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University of Nebraska, 2014

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The success of early childhood interventions have been influenced by the degree to which they were implemented with fidelity (e.g., Davidson, Fields & Yang, 2009; Dusenbury, Brannigan, Falco, & Hansen, 2003; Elliot & Mihalic, 2004), meaning “the degree to which teachers and other program providers implement programs as intended by the program developers” (Mellard & Johnson, 2008, p. 240). This study examines relations among implementation fidelity, teacher characteristics, their perceptions, and child literacy outcomes within a preschool literacy intervention using a mixed methods design.

This study examines child literacy outcome data from 247 preschool children and fidelity, perceptions and demographic characteristics from 11 lead preschool classroom teachers. Teachers implemented a literacy curriculum in their classrooms and were observed in fall and spring with measures of classroom quality measures and fidelity. Six teachers participated in a semi-structured interview in the spring. Children were assessed in fall and spring using three literacy assessments targeting expressive vocabulary, uppercase letter identification and early literacy skills.

Findings from the quantitative data revealed no relationship between fidelity and child literacy outcomes. Qualitative data from the teacher interviews indicated teachers

felt their implementation was supported by the use of coaching, material support, positive experiences with child engagement and growth and positive parent feedback. Teachers felt implementation barriers were time, inappropriateness of some activities, negative experiences with the curriculum and incongruence between their own beliefs about how children learn best and the curriculum. When the data were mixed, both teachers with high fidelity and high child outcomes and teachers with low fidelity and low child outcomes were most positive about the curriculum. Teachers with high fidelity but low child outcomes reported the most negative perceptions of the curriculum.

The current study provides insights into teacher perceptions of a curriculum, how those perceptions may influence implementation as well as child outcomes and offers some implications to early childhood programs and implementation science.

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## DEDICATION

To my incredible husband, Cliff. You have supported me in this journey since the beginning. Without you, this would not have been possible.

To Madeline and Natalie, my wonderful girls. I am so happy to be your mother. You inspire me to do this work.

For my mother.

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## CHAPTER 1: INTRODUCTION

### Statement of the Problem

What has become clear through decades of early literacy research is that: 1) early literacy skills predict later academic success (Dickinson & Neuman, 2006; Barnett & Belfield, 2006; Barnett, Lamy, & Jung, 2005), 2) literacy skills are closely tied to positive societal outcomes such as employment and participation in society (Heckman & Masterov, 2007; Kirsch, Jungeblut, Jenkins, & Kolstad, 1993), 3) there are gaps in literacy skills and achievement between at-risk children and their peers (Dickinson & Neuman; Barnett & Belfield; Barnett et al.; Hart & Risley, 2003; Heckman & Masterov; Kirsch et al.; NELP, 2008; Reynolds, 2012), and 4) these achievement gaps appear early and, without intervention, persist. But with effective, early intervention, this gap can be narrowed, and early childhood literacy “is regarded as the single best investment for enabling children to develop skills that will likely benefit them for a lifetime” (Dickinson & Neuman, p.1; Heckman & Masterov).

Embedded within the concept of effective, early intervention is the idea that the role of the teacher is critical in ensuring both the quality of the program and the degree to which interventions are implemented as designed. Effective, successful early childhood programs do not implement themselves; they are carried out by teachers, administrators, and support staff in the field. “It is the teachers in these programs who bear the greatest responsibility for supporting children’s social and academic development on a daily basis” (Hamre, Downer, Jamil, & Pianta, 2012, p. 507). Teachers are not just passive implementers of interventions. They have their own beliefs about how children learn best and they vary in their classroom practices, their ability and willingness to implement

interventions and in child outcomes. The voice of the teacher is another aspect of intervention programs that may shed light on the experiences of the child and teacher during the process. These perceptions and experiences help us interpret the resulting child outcomes we observe.

Along with our knowledge about key literacy skills, we have abundant evidence as to intervention programs that work at increasing these skills among children. The NELP report (2008) examined effective intervention designs that support the development of these skills. The program types or interventions identified as having the highest impact were code-focused interventions, shared-reading interventions, parent and home programs, preschool and kindergarten programs, and language-enhancement interventions. Several large intervention programs, such as Early Reading First, target these skills—specifically print knowledge, alphabet knowledge, phonological awareness, and oral language—in their interventions and have shown success (NELP).

However, fundamental to the success of an intervention is that it is actually implemented as designed. This concept of implementation as designed, is known as fidelity of implementation or implementation fidelity and will be referred to by both these terms. Fidelity of implementation refers to how closely the procedures and components of a given program are followed by those delivering it (Mellard & Johnson, 2008). It is “the degree to which teachers and other program providers implement programs as intended by the program developers” (Mellard & Johnson, 2008, p. 240). It is a key component in intervention programs and it “acts as a potential moderator of the relationship between interventions and their intended outcomes” (Carroll et al., 2007). Implementation fidelity in the field of early childhood education can, and has, included

different terms (such as treatment fidelity) and operational definitions ranging from broad studies of implementation of a full program model including dosage (e.g., Love et. al, 2005; Zvoch, Letourneau, & Parker, 2007; Yazejian & Bryant, 2010) to more narrowly-defined studies of implementation of a curricula as designed (e.g., Bruce & Ross, 2008; Greenberg, Domitrovich, Graczyk, & Zins, 2001; Rimm-Kaufman & Sawyer, 2004; Justice, Mashburn, Hamre, & Pianta, 2007).

With billions of dollars annually spent on early childhood interventions (Administration for Children and Families [ACF], 2008), it becomes essential that we understand more about why these programs succeed, fail, only work for some children or only in some classrooms or are not replicated. The root of this variability may be better informed by understanding implementation fidelity. Carroll et al. (2007) state, “It is only by making an appropriate evaluation of this fidelity with which an intervention has been implemented that a viable assessment can be made of its contribution to outcomes...Unless such an evaluation is made, it cannot be determined whether a lack of impact is due to poor implementation or inadequacies inherent in the programme itself...It would also be unclear whether any positive outcome produced by an intervention might be improved still further, if it were found that it had not been implemented fully” (p. 40).

A challenge of evaluating intervention programs is both capturing the multiple contributors to the program (i.e., individual teacher characteristics, implementation fidelity, child differences) and understanding how these components work together to contribute to the overall success (measured by child outcomes) of the intervention. The mixed methods design approach has been used to address some of these issues. Mixed



methods involve the use of both quantitative and qualitative data in exploring research questions (Creswell & Plano Clark, 2011). A more detailed review and description of mixed methods designs is included in the literature review. However, for the purposes of highlighting the problem being explored, and given the complexity of the research questions within the field of education, it is appropriate to employ mixed methods to help explore solutions. Schools, teachers, children and interventions are multifaceted, intricate “systems.” By taking advantage of the strengths of mixed methods, a more complete story can be told, quantitative findings may be enlightened by qualitative measures, and participants may contribute their own experiences to the picture that is developed. Johnson and Onwuegbuzie’s (2004) vision for mixed methods research is that “by narrowing the divide between quantitative and qualitative researchers, mixed methods research has a great potential to promote a shared responsibility in the quest for attaining accountability for educational quality” (p. 24).

Based on the problem overview provided above and further detailed in the literature review, there exists a strong need for intervention research that explores the relation of literacy interventions, teacher perceptions, fidelity of implementation and child outcomes within a mixed methods design.

### **Purpose of the Study**

The focus of the study is to explore the relationship of the four concepts introduced in the statement of the problem: 1) the development of early literacy skills in young, at-risk children is essential, 2) the role of the teacher is critical in determining the success of a literacy intervention program, 3) the inclusion of implementation fidelity within the study design can demonstrate the extent to which the intervention was

implemented and help us understand some of the differences in child outcomes and 4) a mixed methods approach offers an appropriate means of exploring these issues.

This study uses a mixed methods design to examine these crucial components of a literacy intervention, in order to better understand the relation of implementation fidelity to child outcomes and to gain knowledge to improve future intervention programs. Teacher characteristics and perceptions about the curriculum and how those relate to child outcomes are explored. The study looks at data related to implementation of a literacy intervention by teachers in Head Start classrooms participating in an Early Reading First project. The study explores teacher characteristics and perceptions, teacher fidelity of implementation, and how implementation fidelity and teacher characteristics relate to child literacy outcomes.

This mixed-methods study addresses the relationships between teacher perceptions, fidelity of implementation and child literacy outcomes. A convergent parallel mixed methods design is used, in which quantitative and qualitative data were collected concurrently, analyzed separately and merged during the interpretation phase. The rationale for the use of this mixed-methods approach is to combine data from qualitative and quantitative sources to provide a comprehensive description of teacher perceptions and how they relate to implementation of the curriculum and child literacy outcomes that would not be available using only one type of data. A better understanding of implementation fidelity will be achieved by including the rich qualitative data from teacher interviews.

### **Importance of the Study**

The study is important because it explores a crucial aspect of early literacy intervention, that of implementation fidelity and the inclusion of teacher perspectives in study design. As will be highlighted in the literature review, early literacy skills play an essential role in academic and social achievement. Effective interventions have the opportunity to help support children's development in this area. Understanding the role of implementation fidelity and teacher perceptions may inform future study designs and contribute to more effective interventions.

The proposed study is *significant* because it is a study of implementation fidelity and because it also includes the voice of the Head Start teacher and her perceptions of the curriculum in a model that seeks to understand the relation of these factors with child outcomes. It is also significant because it uses a mixed-methods design to explore these relationships by including crucial variables of teacher perceptions and congruency between teacher beliefs and curriculum.

The *implications* of this research include: 1) strengthening intervention design and improving curriculum fidelity of implementation in early childhood programs by including consideration of multiple factors and conditions, 2) providing further evidence on the importance of implementation fidelity, 3) by increasing implementation fidelity, potential impacts of interventions may be maximized, 4) maximizing benefits to child literacy outcomes by identifying what works and in what conditions, 5) providing support to preschool classroom teachers for curriculum implementation that meets the teachers' needs and encourages increased fidelity.

As highlighted in the Head Start Impact Study (U.S. Department of Health and Human Services, 2010), Head Start makes a positive impact on child cognitive development. However, this effect varies for different groups of children and variations among programs are suspected to explain some of the reasons why the overall impact on cognitive development is not stronger. The strength and focus of Head Start is in providing effective services and best practices for children. Findings from this study may help to inform program practices related to selecting and implementing literacy curricula in collaboration with Head Start teachers.

By shedding new light on these important factors in intervention programs, Head Start and other programs can further engage in practices to support high fidelity of implementation.

Including measures of implementation fidelity and using these as part of the program model can better measure the effects of the intervention, as well as provide a framework for supporting higher fidelity of implementation within preschool intervention programs. When implementation fidelity is included in program design, a cycle of benefits can be created between fidelity of implementation, increased program credibility, consistent positive student outcomes, and increased staff motivation (Mellard, 2009).

We have strong evidence as to what high quality, effective preschool intervention programs look like, and it is widely accepted that early education can provide substantial developmental benefits (e.g., NELP, 2008; Barnett & Belfield, 2006; Preschool Curriculum Evaluation Research Consortium, 2008). Decades of research have demonstrated that quality early childhood classrooms matter and that those classrooms are rich with environmental print, extensive language supports, developmentally

appropriate materials and activities, routines and caring, professional staff (Mashburn et. al, 2008; Curby et. al, 2009). Participation in these programs contributes to improved child and family outcomes during the period of program participation and the benefits achieved in these programs have lasting effects and contribute to success in later life (Vogel et al., 2010; Heckman & Masterov, 2007).

### **Definitions & Terms**

**Congruent Parallel Mixed Methods Design:** a mixed methods research design in which quantitative and qualitative data are collected concurrently, analyzed separately and then merged during the interpretation phase. The goal of this design is to bring together quantitative and qualitative data around the same topic to best address the research problem and to maximize the strengths and minimize the weaknesses of single data designs (Creswell & Plano Clark, 2011).

**Early Literacy Skills:** skills that are precursors to later reading abilities, which begin to develop in early childhood, such as alphabet knowledge and pre-writing. Early literacy skills are also referred to as emergent literacy or pre-literacy skills (NELP, 2008). Definitions of specific early literacy skills are presented in the literature review and the targeted skills of alphabet knowledge, print awareness, phonological awareness and oral language are further described.

**Early Reading First (ERF):** Early Reading First was part of the “Good Start, Grow Smart” initiative authorized under Title I, Part B, of the *No Child Left Behind Act* (NCLB, 2002). Early Reading First projects were funded for three-year periods from 2002 through 2009 with an average of 30 awards funded per year for amounts ranging between \$250,000 and \$3 million. The goal of these projects was to promote the

development of early literacy skills within high quality programs for at-risk children (U. S. Department of Education).

**Fidelity of Implementation:** “the degree to which teachers and other program providers implement programs as intended by the program developers” (Mellard & Johnson, 2008, p. 240). Also referred to as implementation fidelity, it has several components, the focus of which, for this study, is on adherence to a curriculum design.

**Rural Language and Literacy Connections (Rural LLC):** an Early Reading First project from which the current study draws upon. Consistent with the goals of ERF projects, the focus was on promoting key early literacy skills in high quality preschool classrooms through the use of an evidence-based curriculum and additional intervention components. The design of the Rural LLC will be further described in the Background section of the Methodology chapter.

### **Research Questions & Hypotheses**

This mixed methods study seeks to explore three research questions using three different approaches. The research questions are centered on a quantitative, qualitative and mixed methods approach in order to explore the concepts in a holistic way. The **research questions** and related **hypothesized results** of the study are:

**Research Question #1:** How does fidelity of implementation relate to child literacy outcomes? (Quantitative)

**Hypothesis #1:** Child outcomes will be significantly higher for children in classrooms with higher rates of curriculum implementation fidelity than for children in classrooms with lower rates of implementation fidelity.

**Research Question #2:** What do teachers report as influences to curriculum implementation in Head Start classrooms? (Qualitative)

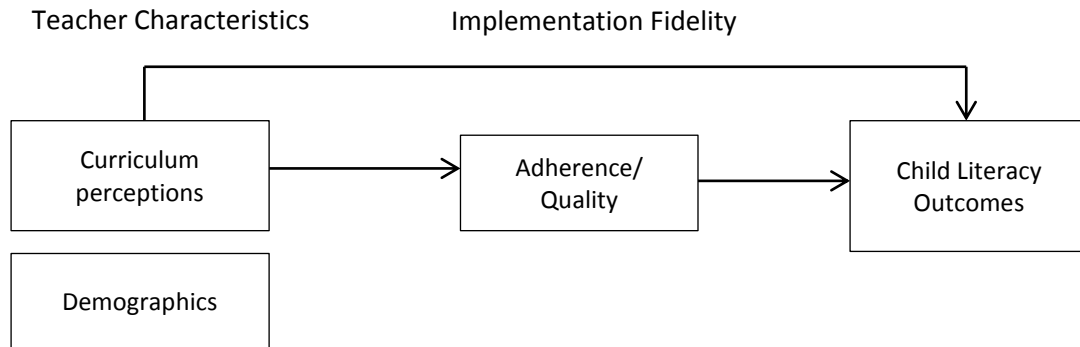
**Hypothesis #2:** Teachers will report both positive and negative perceptions of the curriculum and provide multiple factors that influenced their implementation, both supporting fidelity and creating barriers that may decrease the likelihood that the curriculum was implemented with fidelity.

**Research Question #3:** What are the relations among teacher demographics, perceptions, fidelity of implementation and child literacy outcomes? (Mixed Methods)

**Hypothesis #3:** More positive teacher perceptions of the curriculum will be related to higher fidelity of implementation and better child literacy outcomes than more negative perceptions. As in previous research, teacher demographic characteristics will not be related to perceptions, fidelity or child outcomes.

As presented Figure 1, it was hypothesized that teacher perception variables (perceptions about the curriculum, believed effectiveness of the curriculum, and congruency between teachers' perceptions of the ideal preschool literacy curriculum and the current intervention, as measured by the interviews) would be related to rates of curriculum fidelity of implementation (measured by a fidelity checklist) and that, in turn, these variables would be related to child literacy outcomes (measured by pre and post child assessment change). Additionally, teacher perceptions were hypothesized to relate to child outcomes. In the model below, teacher demographic characteristics were hypothesized not to relate to implementation fidelity or child literacy outcomes, as reported by previous research (e.g., Justice, Mashburn, Hamre, & Pianta, 2007).

**Figure 1. Conceptual model of relations among teacher variables, fidelity of implementation components and child outcomes.**



### Summary

Addressing the literacy development needs of young children is vital to their later success, yet finding effective interventions to do so can be challenging, given the multitude of factors that come into play. The strength of an intervention program is based on its design, the ability of teachers to implement the program and the ability of the study design to capture the relations between these factors.

The study seeks to address the needs presented in the literature around developing effective early literacy interventions by including measures of fidelity of implementation and the teacher perspective as a potential factor in fidelity and child outcomes, and exploring these complex relationships within a mixed methods, convergent parallel design. By doing so, the current study has the potential to contribute to the areas of early literacy intervention, implementation fidelity and mixed methods research.



## **CHAPTER 2: REVIEW OF SELECTED LITERATURE**

This literature review seeks to explore the areas of early literacy and effective early literacy interventions, and to review the literature on fidelity of implementation and provide a background on mixed methods research, in order to offer a foundation for the current study. It uses the funnel approach to literature reviews by first addressing the larger area of early literacy and language skills, key literacy and language skills, and program characteristics found to impact those skills. Next, a review of the fidelity of implementation includes defining, providing models and arguing for the importance of this construct in intervention design and evaluation. As it relates to the current study, a specific focus on the role of the teacher and research on teacher characteristics, beliefs and practices will be highlighted. Finally, as support for the current study, a history of mixed methods research and its use in education research is detailed as the foundation for the current study design. Throughout the review of literature, evidence of the need for additional research in this area and arguments for the study approach and potential contributions of the current study are offered.

### **Importance of Early Literacy Skills**

The first section of this review summarizes research highlighting the importance of early literacy skills, relevant research and intervention work. Following this overview is a more detailed synthesis of research on specific literacy skills and interventions. Early literacy and language skills are related and support each other. In addition, several articles reviewed include both literacy and language skills. The current study limits its scope and identifies these skills as early literacy skills and includes oral language (and specifically receptive vocabulary), uppercase letter identification, print awareness,

concepts of print and phonological awareness, as outlined in the key literacy skills section.

Numerous longitudinal studies have shown pre-literacy and language skills are among the strongest predictors of later academic success (e.g., La Paro & Pianta, 2000; Kurdek & Sinclair, 2000; Reynolds, 1998). Literacy and language skills provide the foundation for learning and social interaction and participation (Farran, Aydogan, Kang, & Lipsey, 2006). Literacy skills at kindergarten entry predicted grade retention, referral to special education services and achievement test scores (Pianta & McCoy, 1997).

Dickinson and Tabors (2001) pivotal book, *Beginning Literacy with Language*, thoroughly documents the importance of early literacy and language experiences at home and school on later academic achievement. Children in the Home-School Study received home visits at ages 4, 5, 7, 9 and 12, and school visits every year from preschool through eleventh grade (except for fifth and eighth grades). During these visits, data were collected on home and classroom environments, language interactions, and a battery of tests called SHELL (the School-Home Early Language and Literacy Battery; Snow, Tabors, Nicholson, & Kurland, 1995). The tasks varied from year to year but several tasks were repeated across multiple years. Scores on the kindergarten language and literacy measures and fourth and seventh grade outcomes showed the strongest correlations between kindergarten receptive vocabulary and fourth (.76) and seventh (.63) grade receptive vocabulary and seventh grade reading comprehension (.71), kindergarten emergent literacy (writing concepts, letter recognition, print concepts) and fourth grade reading comprehension (.62) and seventh grade reading comprehension (.63) and receptive vocabulary (.61).

Byrne, Fielding-Barnsley and Ashley (2000) examined the impact of a preschool phoneme training intervention on word reading in fifth grade. In the initial phase, 126 preschool children were randomly assigned to receive a 12-week phoneme training intervention or to receive instruction that did not include identifying phonemes. Findings from the intervention evaluation showed that children in the treatment condition had great gains in phonemic awareness, including those phonemes that were not included in the intervention, and performed better on a measure of decoding than children in the control group. A follow-up at the end of kindergarten revealed that treatment children performed better than control children on decoding pseudowords but not on spelling or real-word identification. In fifth grade, 56 out of 64 treatment children and 47 out of 62 control children remained in the study. The preschool treatment condition had modest effects on fifth grade reading abilities.

Throughout Hart and Risley's work, the achievement gap between at-risk, low-income children and their middle-class peers has been shown repeatedly, as has its persistence (Hart & Risley, 1992; Hart & Risley, 1995; Hart & Risley, 2003). After two and a half years of monthly one-hour observations of 42 children from diverse backgrounds—both in race/ethnicity and socio-economic status (SES)—findings showed that children from families on welfare had smaller vocabularies and slower rates of adding new words than children from professional families (Hart & Risley, 2003). Growth trajectories showed an ever-widening gap between these groups and a 30-million-word difference in the language heard by age 4 between these groups. In fact, even the researchers “were astonished at the differences the data revealed” (Hart &

Risley, 2003, p. 6). A follow up study of 29 of these families found that language scores at age 3 predicted scores at age 9-10 years (Hart & Risley, 2003).

Other work in this area has demonstrated consistent findings. Lee and Burkam's (2002) large-scale study of children entering kindergarten showed a 60% difference in cognitive skills between children with high socioeconomic status and those with low socioeconomic status. By the end of third grade, children with reading difficulties are much less likely to respond to interventions (e.g., Good, Simmons, & Smith, 1998; McGill-Franzen & Allington, 1991).

Children who read well also read more compared to children who do not read well. Because of that exposure, good readers attain more knowledge across a variety of domains (Cunningham & Stanovich, 1998; Echols, West, Stanovich, & Zehr, 1996). Stanovich (1986) termed this as the "Matthew effect," in which poor readers fall further behind their more literate peers in all academic areas. A child who is a poor reader at the end of first grade has a .88 probability of remaining a poor reader at the end of fourth grade (Juel, Griffith, & Gough, 1986).

Despite a multitude of risk factors children may have, and the bleak data presented above, longitudinal studies have shown that high-quality preschool interventions can have lasting effects on a broad range of developmental areas (e.g., Barnett & Belfield, 2006; Barnett, Lamy, & Jung, 2005; Hart & Risley, 2003; Heckman & Masterov, 2007; Kirsch, Jungeblut, Jenkins, & Kolstad, 1993; NELP, 2008; Reynolds, 2012). High quality preschool programs can make a difference for children's literacy skills and have been linked to future academic success and many other benefits (Heckman & Masterov; Barnett, Lamy, & Jung; NELP; Barnett & Belfield).

In addition to academic success, literacy and language skills contribute to positive social outcomes (Heckman & Masterov, 2007). The next section provides a more detailed review of key literacy skills and is followed by an overview of effective early literacy interventions. Findings from the literacy interventions literature present a more optimistic view of these children's futures and evidence that the pattern of poor early skills leading to later difficulties can be broken.

### **Key Early Literacy Skills**

A meta-analysis of early childhood literacy research in the National Early Literacy Panel (NELP) report (2008) identified key literacy skills shown to predict later academic success. They explored multiple literacy skills and were challenged by various definitions of skills, measures and methods used across the nearly 500 articles reviewed. The skills found to have medium to large predictive relationships with later literacy achievement in decoding, reading comprehension or spelling are: alphabet knowledge, phonological awareness, rapid automatic naming of letters or digits, rapid automatic naming of colors or objects, name writing, and phonological memory. These skills had correlations with later literacy achievement of .3 or higher and maintained their predictive relationships even when controlling for other factors, such as socioeconomic status. In addition, the researchers list five early literacy skills with moderate predictive relationships (correlations of .3 to .49) to at least one later skill and identify them as "potentially important variables" (see Table 1). These are concepts about print, print knowledge, reading readiness, oral language, and visual processing. Table 1 displays each literacy skill, a definition, and examples of links to later academic achievement.

**Table 1. Definitions of Key Literacy Skills and Predictive Relationships with Later Literacy Achievement<sup>1</sup>.**

<b>Literacy Skills</b>	<b>Definition (knowledge of or ability)</b>	<b>Demonstrated Predictive Relationships (Average size of correlation; r)</b>
Alphabet knowledge	Letter names and associated sounds	Decoding (.50) Reading Comprehension (.48) Spelling (.54)
Phonological awareness	Detecting and manipulating spoken language	Decoding (.40) Reading Comprehension (.44) Spelling (.40)
Rapid automatic naming of letters or digits	Quickly naming a random sequence of letters or numbers	Decoding (.40) Reading Comprehension (.43)
Rapid automatic naming of colors or objects	Quickly naming a random sequence of colors or objects	Decoding (.32) Reading Comprehension (.42) Spelling (.31)
Name writing	Writing letters or own name	Decoding (.49) Reading Comprehension (.33) Spelling (.36)
Phonological memory	Remembering spoken information for a brief period	Decoding (.31) Reading Comprehension (.39) Spelling (.31)
Concepts about print	Print conventions (left-to-right, top-to-bottom) and concepts (cover, title, author)	Decoding (.34) Reading Comprehension (.54) Spelling (.43)
Print knowledge	Combines alphabet knowledge, concepts about print, and early decoding	Decoding (.29) Reading Comprehension (.48)
Reading readiness	Combines alphabet knowledge, concepts about print, vocabulary, memory, and phonological awareness	Decoding (.50) Reading Comprehension (.59)
Oral language	Producing and understanding spoken language (includes vocabulary and grammar)	Decoding (.33) Reading Comprehension (.33) Spelling (.36)
Visual processing	Ability to process visually presented symbols	Decoding (.22) Reading Comprehension (.26) Spelling (.27)

<sup>1</sup>Summarized from the NELP report (2008).

Child outcomes in literacy skills such as these can serve to evaluate the efficacy of an intervention program and its components. The key skills that were emphasized by the Early Reading First Initiative are: alphabet knowledge, phonological awareness, print

knowledge, and oral language (U.S. Department of Education). As an Early Reading First project, the larger study sought to impact these skills in children, and the curriculum implemented had shown positive outcomes in these areas (Schickedanz & Dickinson, 2005). These skills serve as the focus of the current study as well. By exploring child gains in these skills over the year and analyzing teacher characteristics, features of a successful intervention program can be developed.

Along with the foundational skills listed above, a recent article by Hogan, Bridges, Justice, and Cain (2011), that reflects the work of the Language and Reading Research Consortium (LARRC), examines previous research on the influence of higher-level thinking skills (rather than lower-level skills such as alphabet knowledge, vocabulary) on the development of reading comprehension skills. The focus of the article was to examine skills that went beyond the preschool years (such as letter identification) which would carry a child through the transition from learning to read to reading to learn, from preschool through third grade. The authors outline three key higher-level language skills that support the development of reading comprehension: inference making, comprehension monitoring, and text structure knowledge. They also identify specific teaching strategies that have been shown to be effective at supporting these skills, including inferential questioning, content highlighting, error detection activities and graphic organizers. Current work by this consortium is examining a classroom literacy curriculum intervention that combines these key skills with proven teaching strategies in order to maximize impacts of this type of instruction. Their work includes measures of implementation fidelity and teacher perspectives.

As stated by Powell and Diamond (2012) “Early literacy and language skills occupy a predominant spot in these efforts because they are strongly predictive of later abilities in reading and writing. Fortunately, there is a growing evidence base to inform instructional decisions about how to promote early childhood precursors to conventional literacy” (p. 194). Powell and Diamond assert that knowing which skills are important can both inform program design and serve to measure its success.

### **Effective Preschool Literacy Interventions**

The importance of literacy skills and their contribution to academic achievement is unquestioned and an abundant number of programs, interventions and supports have been developed to target this area in young children. The preschool years seem to be a principally sensitive time to make these lifelong impacts. Dickinson, McCabe and Essex (2006) argue “evidence that preschool years are a time when literacy-specific aspects of development may be particularly responsive to intervention” (p. 14). Ramey and Ramey (2006) contend that “*No matter how much public schools improve their kindergarten through high school curricula and instruction, the irrefutable evidence indicates that a child’s entry level skills, and family’s ability to support a child’s literacy development, are paramount in early school success*” (p.445, italics in original). A review of studies looking at improving phonemic awareness skills showed double effect sizes for younger children as compared to older children (Ehri et al., 2001).

Findings from the well-known High/Scope Perry Preschool Study demonstrated that children who attended the preschool program entered kindergarten with higher language and cognitive abilities and required fewer special education services, had better classroom and personal behavior, and higher graduation rates than children who did not



attend (Schweinhart et al., 2005). Similar findings have come from the Abecedarian Project (Campbell et al., 2002) and the Chicago Parent-Child Center study (Reynolds, 2000).

Many Head Start programs include a special emphasis on early literacy skills. While many programs include general curricula, a number have also adopted more a more specialized literacy curriculum (Hulsey et al., 2011). Between Head Start and other early childhood programs, a number of studies of specialized literacy interventions have been conducted (e.g., Whitehurst, Epstein, Angell, Payne, Crone, & Fischel, 1994; Wasik, Bond, & Hindman, 2006).

We know that participation in Head Start, in particular, has a positive impact on children's cognitive, social-emotional and health outcomes (AFC, 2010) with the Head Start Impact Study finding statistically significant differences between groups (Head Start participants and non participants) on almost every measure included. Analyses of subgroups found differential impacts of Head Start across the groups of children, and the report states that further analyses as to what is driving these differences are needed. In addition, the study reports variation among Head Start programs in terms of instruction in literacy and language and mathematics. The statement notes, "The inclusion of programs across the full spectrum in this study's nationally representative sample may help to explain why impacts in the cognitive domain are not stronger" (p. xxxvii). The presence of variation among child outcomes and impacts—along with variations among Head Start programs—lends support to additional studies of fidelity of implementation of literacy curricula within these programs, as well as support for fidelity. Together, these efforts may bring about even larger effects of Head Start.

While we certainly have evidence as to what works and what makes a quality intervention program, more research in this field is being conducted and the use of measures of fidelity of implementation will help strengthen the evidence supporting these interventions and provide stronger intervention programs.

### **Early Childhood Workforce and the Role of the Classroom Teacher**

While early literacy skills have been linked to later academic success, high teacher quality has been shown to predict positive outcomes as well. These outcomes include children's school readiness and early literacy skills (NICHD Early Child Care Research Network, 2002; Phillipsen, Burchinal, Howes, & Cryer, 1997) and high-quality early learning programs (Bowman, Donovan, & Burns, 2000). Teacher quality and its impact have been defined and measured multiple ways, including teacher use of developmentally appropriate practices, teacher education, and interactions and environments that support child learning. Underlying this concept is that quality teaching and quality teachers positively impact child development. A thorough examination of intervention programs should involve an understanding of those teachers at the center of these programs.

A recent report by the National Survey of Early Care and Education Project Team (2013) surveyed a nationally representative sample of workers and describe the characteristics of the early childhood workforce. They estimate one million teachers and caregivers responsible for children ages zero through five years were employed in center-based programs in 2012. Of those, 447,000 are lead teachers. Most of these staff (59%) were working in programs that has no funding from public schools, public pre-k or Head Start. Fourteen percent worked in programs that received Head Start funding, 21 percent

worked in programs that received public pre-k funding and 6 percent worked in school-sponsored centers. Therefore, investments in these workers and impacts made by Head Start have the potential to have far-reaching effects.

Teachers had an average age of 10 years of early childhood education experience. Levels of education were somewhat higher than previously reported with 45 percent of teachers of children aged three to five years holding a Bachelor's degree or higher, 17 percent with an AA degree, 24 percent with some college but no degree and 13 percent with a high school diploma or less (National Survey of Early Care and Education Project Team, 2013). Level of education is an important indicator and potential predictor of classroom quality, as research indicates that the quality of care and instruction is higher when teachers hold a BA degree than when they do not (Burchinal, Cryer, Clifford, & Howes, 2002; Whitebrook & Ryan, 2011), though all studies are not in agreement (e.g., Early et al., 2007).

In the current study, participating teachers came from two different agencies, a Head Start program and a Head Start/public school district partner. Teacher education requirements varied between the agencies, with Head Start requiring an AA degree and the public school district a BA degree and state teaching endorsement. This provides an opportunity to examine the relationship between level of education, fidelity of implementation and child outcomes. As discussed later, based on previous research, teacher education is hypothesized not to be related to implementation or child outcomes.

### **Head Start Teacher Characteristics**

Through teacher interviews and teacher reports, the Head Start FACES study (Hulsey et al., 2011), collected data and provides a description of Head Start teachers and

trends from 2000-2009. The majority (99 percent) of Head Start teachers are female, 55 percent are between the ages of 30 and 49, 45 percent are White, 32 percent are African American and almost 20 percent are Hispanic/Latino. FACES used the Teacher Beliefs Scale (Burts et al., 1990) to measure teacher beliefs and attitudes. Findings from this data show teachers have positive attitudes towards developmentally appropriate practices (an average of 7.9 out of 10) and score high on child-initiated practices (4.5 out of 5).

Head Start teachers are experienced and educated, with an average of almost nine years of classroom experience; 81 percent have at least an associate's degree and 46 percent have at least a bachelor's degree. Many Head Start teachers also pursued specific training and education opportunities in early childhood. These characteristics have appeared to be stable from 2000-2009 with the exception the percent of teachers having at least an associate's degree, which increased from 57 percent in 2000 to 82 percent in 2009. This trend is consistent with Head Start's mandate to increase teachers' educational levels.

### **The Role and Potential Impact of the Preschool Classroom Teacher**

Teacher quality matters and has the potential to be one of the largest factors in determining the success of a classroom-based program and its impact on children in the program. A great deal is demanded of a workforce that varies on education, experience and settings and that typically provides low wages and compensation. "In short, effective teachers of early literacy must bring a substantial knowledge base, reflecting an understanding of child development, and the knowledge, skills, and dispositions necessary to shape appropriate learning experiences that are engaging to children" (Neuman & Cunningham, 2009, p. 533). Because of these high stakes, numerous efforts

have been made by agencies to develop resources, and researchers have explored professional development interventions to improve teacher quality, including training, college courses, credentialing programs, coaching, and other supports (Neuman & Cunningham).

### **Preschool Teacher Beliefs, Practices and Supports**

Much of the recent research on preschool teachers' beliefs and practices has centered on the principles of "developmentally appropriate practices" as outlined by publications from the National Association for the Education of Young Children (Copple & Bredekamp, 2009) and the Division for Early Childhood (DEC, 2005). Several measures of these constructs have been developed to examine teachers' adherence, agreement with, and use of developmentally appropriate practices (e.g., Charlesworth et al., 1993). Research findings on congruence between teachers' reported beliefs on scales such as this and their actual classroom practices have been mixed, with some reports of high congruence (McMullen et al., 2005) while others have shown incongruences (Charlesworth et al., 1993).

Benson McMullen and colleagues (2006) used a mixed methods approach to explore the relationship between teachers' self-reported beliefs and classroom practices with 57 preschool teachers. Teachers completed demographic surveys and quantitative measures about endorsement of and engagement in developmentally appropriate practices (Early Childhood Professional Questionnaire, McMullen, Buldu, Lash, & Alat, 2004; Teacher Belief Scale, Charlesworth, Hart, Burts, & Hernandez, 1991; and Instructional Activities Scale, Charlesworth et al., 1993). Qualitative measures were collected through classroom observations (Early Childhood Teacher Behavior Observations Scale, ECTBO,

Elicker, Huang, & Wen, 2003), photographs and other documents related to programming (such as newsletters and daily schedules). Researchers then analyzed the data using a collaborative assessment protocol developed for the study. These procedures involved reviewing the different types of data and summarizing them for the research team. Using the data, the research team then made determinations as to what each teacher valued or emphasized most and least in the classroom (in terms of beliefs, practices and curriculum content). From those determinations, 18 behaviors that were reliably identifiable were selected for inclusion. Teachers were then divided into two groups, those who scored above the median overall score on the Teacher's Belief Scale (labeled "DAP") and those who scored below the median overall score (labeled "traditional"). Findings revealed that "DAP" teachers were more likely to emphasize child-directed choice/play time and emergent literacy and language development activities, while "traditional" teachers were more likely to emphasize consistent routines, organized classrooms, preplanned curriculum and teacher-directed learning. Seven behaviors were equally likely to be emphasized by both types of teachers and five behaviors showed no pattern of relationship. Contrary to previous studies, they did see consistencies between teachers' reported beliefs and classroom practices. Their findings could serve to help identify classroom practices most characteristic of developmentally appropriate beliefs and create tools to assess classroom teachers.

Yoo (2005) used a mixed methods, explanatory sequential design to explore early childhood teachers' beliefs about children's literacy. Quantitative questionnaires were collected from 91 public and private early childhood teachers. Questions consisted of teacher demographics and characteristics and 35 Likert-type items related to teachers'

beliefs about teaching literacy. Higher ratings indicate beliefs consistent with the whole language approach. Yoo used those results to select 10 teachers (5 highest and 5 lowest scoring teachers) for qualitative interviews. Interview questions addressed teacher beliefs and classroom practices. Quantitative findings showed that teachers with higher scores were statistically significantly more likely to have higher levels of education (master's degree versus high school diploma) and, have more years of experience teaching (less than 2 years versus 9 or more years). Findings from the interview revealed that teachers with higher belief scores believed that children learn literacy skills through experiences in print rich environments, through enjoying books, and learning vocabulary through meaningful experiences, and these teachers talked about the relationship between listening, speaking, reading and writing. Teachers who scored low reported believing children learn literacy skills by memorizing and matching letters and letter sounds, building from simple to complex, words to sentences, and encouraged repetition.

Professional development opportunities have been shown to lead to changes in teaching knowledge and classroom practices and to positive impacts on child outcomes. Some examples of effective teacher interventions include a study by Wasik, Bond, and Hindman (2006) that found 70% of teachers trained on dialogic reading techniques significantly changed the way they talked and listened to children during book reading, and children showed improvements in vocabulary. Jackson and colleagues (2006) evaluated Head Start's HeadsUp! Reading distance education program and findings indicated improved classroom practices and later benefits for children's language and literacy skills. Statewide professional development programs have also been shown to be associated with gains in children's language and early literacy skills (Landry et al., 2006).

One example of professional development is the Literacy Environment Enrichment Program (LEEP) developed by Dickinson and Caswell (2007). LEEP was designed to improve preschool teachers' supports for children's literacy and language development and consists of 45 hours of coursework through a university for college credit. In their evaluation of LEEP using Head Start teachers, Dickinson and Caswell found that all measures of classroom environment improved significantly more for treatment teachers than for control teachers.

Coaching is another widely used form of professional development for early childhood educators. Coaching in the field of early childhood, either by using mentor or peer coaching models, has been accepted as an evidence-based professional development practice since the 1980s as a way to support early childhood professionals in the development and refinement of their skills (Hanft, Rush, & Sheldon, 2004). There are many different coaching models, but several evaluations of professional development intervention that included coaching in early childhood settings show that teacher participation in these interventions resulted in positive improvements in classroom environments, supports for literacy and language development, classroom practices, and child literacy outcomes (Landry, Anthony, Swank, & Monseque-Bailey, 2009; Neuman & Cunningham, 2009; Powell, Diamond, Burchinal, & Kohler, 2010).

The larger study included both systematic training on the curriculum and an ongoing coaching component. It is believed that this level of support helped provide the necessary skills and knowledge for all teachers to be able to implement the curriculum fully in their classrooms. Therefore, it is possible that differences in implementation of the curriculum may have been due to factors other than support or knowledge.



Ryan and Whitebook (2012) argue that “while the field of early childhood care and education continues to expand, minimal research attention has been given to those who work with young children or to help caregivers and leaders to become better at their work” (p.103). They advocate for more research focusing on the classroom teacher and other early childhood workers. This type of research could benefit the field, professionals, programs and children.

The growing focus and recognition of the importance of the role of the teacher and teacher beliefs on child outcomes has also highlighted the need for careful examination of teacher classroom practices in relation to intervention models. One major challenge is transferring evidence-based practices into the classroom. This review now turns to the broader area of implementation science to explore the process of executing evidence-based practices in classrooms.

### **Implementation Science**

Providing services in early childhood education programs is multifaceted and involves implementing a variety of services within a complex environment impacted by culture, community, policy, environment, relationships, materials, and people. Programs and researchers are challenged to bridge the gap between efficacy trials and “real world” classrooms. Understanding the process and conditions by which evidence-based practices are successfully scaled up can help move programs forward towards even greater benefits for children. Implementation science is “the study of how a practice that is evidence-based or evidence-informed gets translated to different, more diverse contexts in the “real world”” (Martinez-Beck, 2013, p. xix).

Although used in the mental health, health and education fields, few implementation science studies have been conducted for early childhood education. However, early childhood education research is quickly moving towards adapting a more comprehensive approach to understanding what works, for which children, in what conditions and how education systems can support the transition of an intervention from research to practice (Franks & Schroeder, 2013). This framework includes exploring many more factors outside the typical intervention research focus, such as contextual factors, implementation factors that influence outcomes, effects of adaptations, thresholds of fidelity, etc. The authors advocate that early childhood intervention research explore these implementation factors. They caution that, without this, “we may continue to invest resources in ECE programs that lead to poor outcomes and erroneously conclude that it is a result of a flawed intervention” and that, by using implementation frameworks, “we can assess the impact of ECE programs in community settings and make informed decisions about program outcomes and investment of limited resources” (Franks & Schroeder, 2013, p. 17).

Implementation science and issues around implementing intervention programs in early childhood education settings has been discussed in a recent series of briefs from the Office of Planning, Research and Education (OPRE). Downer and Yazejian (2013) discuss the benefits of collecting both quality and quantity implementation measures, not just to describe a program’s implementation, but as a means of exploring the interaction of these characteristics on child outcomes. In a review of recent articles from major journals, they found the majority of early childhood intervention studies were using only one measure (most frequently measures of quantity) and were not analyzing the

relationships in these data and child outcomes. Downer & Yazejian (2013) view early childhood studies as not using these data to “their full potential” and state that “variability in these measures holds great potential for identifying active ingredients or thresholds of implementation that contribute to positive intervention effects on target outcomes. In fact, it could be that the interactions among these quantity and quality variables offer the most explanatory power in terms of intervention effectiveness” (Downer & Yazejian, 2013, p. 14).

An in-depth review of one of the most often used implementation evaluation methods, fidelity of implementation, will now be offered. Fidelity of implementation serves as the focus of this study and highlights one component that has the potential to impact successful scaling up of research-based programs and practices.

### **Fidelity of Implementation**

Previously, researchers assumed that programs were carried out exactly as designed because implementers were viewed to be “rather passive acceptors of an innovation, rather than active modifiers of a new idea” (Rogers, 2003, p. 180). However, in the 1970s, researchers began to discover that participants were, in fact, modifying these innovations to meet their own needs and adapt them to their contexts (Rogers). Without a doubt, this was a concern for researchers and prompted studies of how programs, curricula, interventions and other research activities were truly being put into practice in the real world (Rogers).

Even the strongest, most effective early literacy interventions are limited by the extent to which they are delivered with implementation fidelity. A program is only as good as those who deliver it. Previous research has shown that fidelity of implementation

affects how well an intervention succeeds (e.g., Dusenbury et al., 2003; Dane & Schneider, 1998; Elliott & Mihalic, 2004; Mihalic, 2004). Goodwin (2011) highlights five gold-standard literacy research studies recently funded by the U.S. Department of Education that yielded disappointing results with little to no effects of the intervention on the targeted child outcomes. However, a closer look at what actually occurred in programs revealed that the intervention as designed (number of hours, length of time, components) was not implemented.

Measuring and understanding fidelity of implementation will allow us to answer the questions above concerning why an intervention didn't work or did not achieve the expected outcome, explore how larger impacts could have been achieved and help us focus our efforts on the most effective interventions.

### **Models and Measures of Fidelity of Implementation**

Fidelity of implementation examines key components of programs, such as: Are all pieces of the program being delivered? Are they being delivered using the prescribed materials? In high quality? In the correct sequence? For the planned length of time? Is drift occurring? Are participants engaged? Because of its unique nature, there are no standard measures of fidelity of implementation. However, several good models have been developed and could be adopted by programs to meet their individual needs and characteristics (e.g., the Fidelity of Implementation Rating System (FIMP) by Forgatch, Patterson & DeGarmo, 2005; Carroll et al., 2007; Goodwin, 2011; Dane & Schneider, 1998; Gresham et al., 1993; O'Donnell, 2008).

O'Donnell (2008) conducted a literature review of studies that examined the relationship between fidelity of implementation and outcomes of K-12 core curriculum

interventions. O'Donnell's review revealed, "fidelity of implementation has multiple but similar definitions" (p. 37-38) and that it "seems to be synonymous with adherence and integrity" (p. 39). However, differences in definitions make defining and measuring the construct of fidelity of implementation challenging.

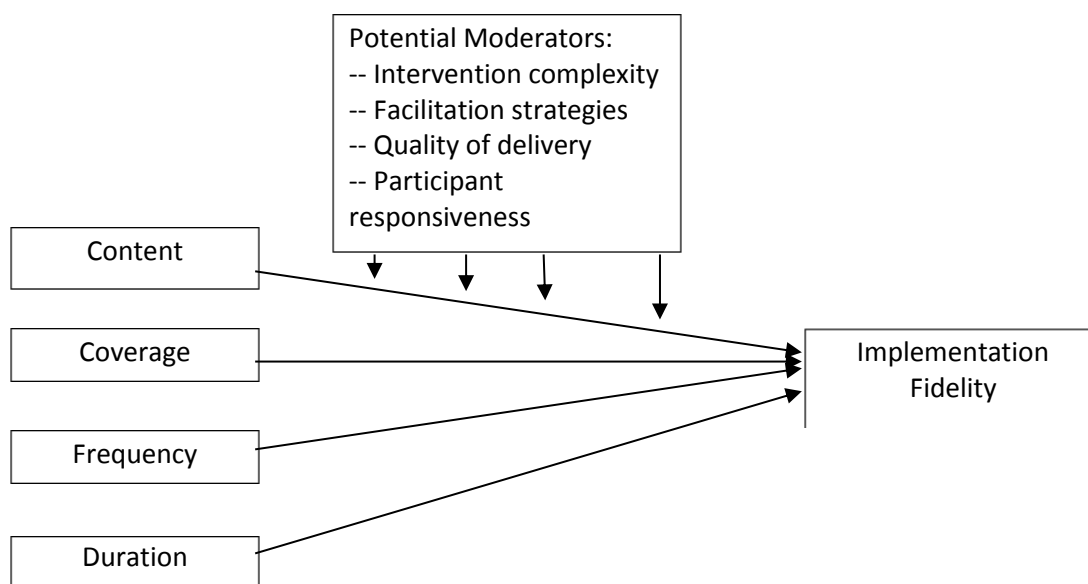
Mellard (2009) summarizes five key elements of fidelity and provides a model adapted from Dane and Schneider (1998), Gresham et al. (1993) and O'Donnell (2008). The elements are adherence, exposure/duration, quality of delivery, program differentiation (clear distinctions between interventions and without contamination), and student responsiveness/engagement. Adherence refers to following procedures as described, and implementing all pieces of the intervention in the correct order. Exposure/duration describes implementing the intervention for the prescribed length of time and frequency. Quality of delivery looks at the characteristics of the implementation, such as good teacher practices and quality of each component. For program differentiation, it is important to examine whether the intervention is clearly defined related to other program services or interventions, i.e., is there contamination from other programs, and is it clear which components are in each intervention. Student responsiveness/engagement measures how actively children participated in the intervention.

This model (Mellard, 2009) takes a wider view of fidelity, examining program factors and influences on fidelity of implementation, not just the teacher's role and related factors that may influence key elements of fidelity. Additional factors include professional development, organization, program, and teacher characteristics. Mellard also provides an outline of tools that can be developed and used to measure each of the

five key elements of fidelity and other factors related to fidelity. This comprehensive approach to fidelity provides guidance on developing measures for key factors and potential moderators and a system for maintaining high levels of implementation fidelity.

Carroll et al. (2007) provided another, similar framework for developing measures of fidelity that may be applied to various settings and programs with a narrower focus on delivery centered on the teacher. Figure 2 below highlights the key elements of implementation of fidelity as described by Carroll et al. Content refers to the “active ingredients” of the intervention and coverage, frequency and duration relate to “dose.” Their model also includes consideration of potential moderating factors including participant responsiveness, complexity of the intervention, quality of delivery and support strategies as shown in the model. Different from the Mellard (2009) framework, Carroll et al. places other factors, such as student responsiveness and quality of delivery, as potential moderating factors.

**Figure 2. Carroll et al. (2007) model of components for measuring implementation fidelity and moderators.**



### **Implementation Fidelity in the Field of Early Childhood**

Many intervention programs do not include measures of implementation fidelity in their designs (Dane & Schneider, 1998) therefore it is difficult to assess the level of fidelity of implementation for these programs. In fact, in large-scale education studies on the effectiveness of K-12 curricula, fidelity of implementation is rarely reported, especially with regard to how it might impact intervention outcomes (Dobson & Cook, 1980; NRC, 2004). Not only are measures of implementation fidelity not being included, but when they are a part of the study design, findings and impacts on intervention outcomes are not reported.

For those studies in which measures of implementation fidelity were included, varying rates of fidelity have been found among staff (Weisz, Sandler, Durlak, & Anton, 2005). All five studies reviewed by O'Donnell (2008) consistently showed statistically significantly higher outcomes for programs implemented with higher implementation fidelity. For example, in a study by Kutash, Duchnowski, Sumi, Rudo, and Harris (2002) evaluating a school-based reading intervention, there were significant correlations (.49) between average fidelity of implementation scores and changes in reading scores. Forgatch, Patterson, and DeGarmo's (2005) evaluation of the impact of a parent management training showed that fidelity of implementation served as a predictor of parenting practices.

In studies where no effect for intervention has been found, a closer examination using fidelity of implementation as a predictor resulted in better child literacy outcomes in classrooms with higher intervention implementation fidelity (Davidson, Fields & Yang, 2009). Since higher rates of implementation often result in better outcomes for

children (Hansen, 2001), it is important to consider this within intervention designs and to work to maximize implementation fidelity.

Looking at only those early literacy intervention articles that included measures of implementation fidelity, we can further explore the effects of an intervention when taking implementation fidelity into account. Davidson, Fields, and Yang (2009) conducted a randomized trial comparing the efficacy of a technology-based literacy curriculum with a district curriculum. Initially they found no main effects for the treatment group, however, when fidelity of implementation was included in the analysis, they found that children in classrooms with high fidelity of implementation of the intervention significantly outperformed children in classrooms with low fidelity of implementation on two important phonological measures. Trends also showed these children outperforming low-fidelity groups on other key literacy skills (Davidson, Fields & Yang).

Lui (2008) examined elements of preschool classrooms participating in an Early Reading First project to determine what contributed to implementation fidelity and positive child literacy outcomes. Lui looked at successful classrooms, identified as those with high fidelity of implementation and highest gains in phonological awareness, oral language, and letter knowledge scores and the characteristics (both classroom and teacher) associated with them. Fidelity of program implementation was measured by an observational tool of instructional practices and environments, as well as by teacher attendance at trainings. Child outcomes were assessed using pre- and post-test measures of the Peabody Picture Vocabulary Test (PPVT), Get it, Got it, Go! (GGG), and Dynamic Indicators of Basic Early Literacy Skills (DIBELS). Potential elements that may have impacted the results were gathered through teacher interviews, observations, field notes



and communication documents. Classrooms with high implementation fidelity and the highest child gains were compared with classrooms that had high fidelity and the least child gains. This study did not include classrooms with low fidelity, even though it may be possible that some of these classrooms also produced high child outcome gains.

Findings from the preceding study indicate that program implementation was supported by teacher characteristics of participation in professional development activities, use of child assessment data in lesson planning and instruction, personal commitment to the program, and parent participation. Teacher characteristics unique to the classrooms with the highest levels of implementation fidelity and child gains were: 1) teachers were pursuing their BA degrees in Elementary Education (versus an AA degree), 2) teachers believed they were responsible for providing literacy instruction (versus a belief that teachers shared this responsibility with parents).

Carroll et al. (2007) and others (e.g. Goodwin, 2011; O'Donnell, 2008) recommend that all intervention programs include measures of implementation fidelity as outlined above. This study aims to offer support and evidence for this recommendation by providing an example of the use of fidelity of implementation in understanding the impacts of the intervention. It is clear that implementation fidelity is an important factor in intervention success and validity of results and, therefore, it should be measured in all intervention programs. As highlighted by O'Donnell, "there are too few studies to guide researchers on how fidelity of implementation to core curriculum interventions can be measured and related to outcomes, particularly within efficacy and effectiveness studies, where the requirements for fidelity measures differ" (p. 33). It is also apparent that central to this issue is to understand why some teachers implement with fidelity and

others do not, in what circumstances, and how these levels can be improved. There also exists overwhelming evidence that literacy interventions contain the potential to make huge impacts on children and families and quite literally change the course of their lives (e.g., Heckman & Masterov, 2007; Barnett, Lamy, & Jung, 2005; NELP, 2008; Barnett & Belfield, 2006). However, there remains a question of how much more of an impact could be made if all of these effective literacy interventions were consistently implemented with high fidelity to their design. It is essential that we examine the relationships between these key influences on implementation fidelity of literacy intervention programs.

### **Teacher Characteristics Related to Implementation Fidelity**

As described above, programs find different rates of fidelity for different interventions (Weisz, Sandler, Durlak, & Anton, 2005). These differences have been related to the intervention, community, organization, administration, teachers, families and children, and teacher characteristics. These factors are shown in the fidelity of implementation models from Carroll et al. (2007), Dane and Schneider (1998), Gresham et al. (1993) and O'Donnell (2008) described earlier. As outlined in the proposed model, one focus of the proposed study is on the role of the teacher and teacher characteristics that impact fidelity of implementation. A review of previous findings on these teacher variables is provided to support the model design and research hypotheses.

We understand the importance of implementation fidelity generally; now, more is needed to understand when and why it takes place and when and why it does not. Previous research has found little evidence linking intervention implementation fidelity and quality to teacher characteristics such as education, years of experience, and gender

(e.g., Justice, Mashburn, Hamre, & Pianta, 2007) but has found evidence linking teacher variables such as beliefs about the intervention effectiveness, satisfaction with the program and buy-in with fidelity of implementation (Bruce & Ross, 2008; Greenberg et al., 2001; Rimm-Kaufman & Sawyer, 2004).

One of the most powerful factors in classroom-based intervention programs is the teacher, therefore it is essential to understand the circumstances that promote or discourage teacher implementation fidelity. We know that teachers do not implement interventions with the same rates of fidelity. The reasons for this variation are numerous (Davidson, Fields & Yang, 2009; Goodwin, 2011).

The factors that appear to have little to no correlation to implementation fidelity include variables typically considered demographic, such as age, years of experience, or education (Justice, Mashburn, Hamre, & Pianta, 2008). A study by Justice, Mashburn, Hamre, and Pianta (2008) found no significant correlations between measures of teacher fidelity of implementation of a literacy curriculum and advanced degree, ECE majors, professional development, years of teaching, or self-efficacy. Even when looking at teacher characteristics associated with classroom quality (another key predictor of child impacts) in Head Start classrooms, Bryant, Burchinal, Lau and Sparling (1994) found that “teacher characteristics such as education, experience, and attitudes were not associated with classroom quality in this group of 32 Head Start classrooms” (page 289).

Those teacher variables that have been shown to be related to implementation fidelity include teacher/intervention alignment, teacher beliefs (efficacy), previous practices, and congruency between teacher and intervention priorities are related to implementation fidelity (Bruce & Ross, 2008; Greenberg et al., 2001; Rimm-Kaufman &

Sawyer, 2004). Durlak and DuPre's (2008) review of implementation influences and impacts identified four teacher characteristics consistently related to implementation. These were: a) perceived need for the intervention, b) belief that the intervention would succeed, c) confidence in their ability to carry out the intervention (self-efficacy), and d) possession of required skills to implement the intervention.

Wanless (2012) studied the predictors of implementation fidelity of a classroom intervention in a random controlled trial. Wanless tested a model of the relationship of setting-level influences (administration, coaches, other teachers, and students) and later revised to include teacher alignment and self-efficacy on fidelity of implementation. Results show a relationship with teacher initial alignment with the intervention and teacher rated efficacy on implementation fidelity mediated by engagement in initial intervention training. Teacher demographics (education and years of experience) were not related to observed intervention implementation fidelity.

The current study includes teacher variables of demographic factors (age, gender, SES, education, years of experience) as well as qualitative data related to beliefs about the intervention, its impact on child outcomes, how well the intervention matched what they believed to be the ideal preschool literacy program, the project's impact on their teaching practices, and how closely they felt they followed the curriculum design. With this design, the relationship between both types of variables can be explored.

It is no longer sufficient to assume interventions and curricula are being implemented with fidelity. And it is not enough to rely on factors such as administrative support, professional development and training, simplicity of intervention components or explicitness of intervention instructions and materials to ensure implementation fidelity.

Pierangelo and Giuliani (2008) highlight several practices that can promote fidelity of implementation including the need to 1) clearly describe the intervention program, components, procedures, and techniques; 2) clearly define roles and responsibilities; 3) create a system for measuring program implementation at all levels; 4) link implementation fidelity and improved outcomes data (providing support for the program) and 5) create accountability measures for instances of noncompliance. As stated in by Forgatch et al. (2005), “Using manuals, however, does not guarantee competent application of a method. Intervention delivery must be evaluated for implementation fidelity to the program content and processes or one cannot explain whether failure to replicate is a problem with the program or with its application” (p. 11).

Intervention programs may have many components and key players. It is important that they all work together to support the implementation of an intervention to help ensure maximum effect on its recipients. For preschool literacy interventions, teachers play a key role in determining the success of the intervention. As is often heard in preschool settings, “Teachers make all the difference.” Because of their pivotal contribution, it is essential that we understand more about the factors that influence teacher implementation fidelity. It is through studying these relationships that intervention, training and support can be targeted to ensure high fidelity of implementation. The proposed study aims to identify teacher factors related to implementation fidelity of literacy curricula.

### **Mixed Methods Approach**

Starting as early as 1959, researchers in diverse fields have advocated the ‘mixing’ of methods in studies (Creswell & Plano Clark, 2011). In the late 1980s, at

approximately the same time, a convergence upon the concept of mixed methods occurred across disciplines (sociology, evaluation, management, nursing and education) and countries (United States, United Kingdom, and Canada). A number of researchers began writing books, articles and book chapters on ways to link quantitative and qualitative data, how to integrate across designs and their rationale for it (Creswell & Plano Clark). The acceptance of qualitative research as a legitimate form of inquiry, the growing complexity of research problems, the need for answers from both quantitative and qualitative sides, and consumers of research (policy makers, practitioners) demand for multiple forms of evidence all contributed to the growth of this design (Creswell & Plano Clark).

An article by Johnson, Onwuegbuzie, and Turner (2007) in the first issue of *Journal of Mixed Methods Research* provides a definition for mixed methods research as “the type of research in which a researcher...combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the purposes of breadth and depth of understanding and corroboration” (p. 123). At its most basic, mixed methods research involves the use of both qualitative and quantitative data and methods. Creswell and Plano Clark (2011) outline six core characteristics of mixed methods research, in which the researcher: 1) meticulously collects and analyzes both qualitative and quantitative data, 2) integrates the two types of data in a specific way (either concurrent, sequentially or embedded throughout), 3) prioritizes either one data type or both equally based on the research questions, 4) carries out procedures in a single study or as multiple phases of a single study, 5) bases procedures on a stated theoretical and philosophical framework,

and 6) combines qualitative and quantitative procedures in the research plan.

### **Theoretical Framework**

Mixed methods research has been referred to as the “third research paradigm” (Johnson & Onwuegbuzie, 2004, p.14) and the “third methodological movement” (Teddlie & Tashakkori, 2003, p. 5). The mixed methods approach is often described in relation to how it differs from or creates an alternative to qualitative and quantitative approaches, and this is true when discussing the theoretical framework of mixed methods, as well (Creswell & Plano Clark, 2011; Johnson & Onwuegbuzie; Teddlie & Tashakkori, 2009).

Quantitative purists typically embrace a positivist philosophy, which holds that (a) research inquiry should be objective, (b) theory and findings derived deductively and (c) data are used to make general inferences (Johnson & Onwuegbuzie, 2004; Morgan, 2007). Qualitative purists subscribe to constructivism, idealism, relativism, humanism, or postmodernism, with the foundations that research inquiry is subjective and that multiple realities are created by individuals (Johnson & Onwuegbuzie). Purists from both viewpoints argue for the incompatibility thesis, which states that qualitative and quantitative research paradigms and methods cannot and should not be mixed (Howe, 1988).

Mixed methods researchers take an alternative view and advocate for a paradigm that incorporates both methods and holds different underlying assumptions. Mixed methods research views both qualitative and quantitative research as important and useful, with a goal “not to replace either of these approaches but rather to draw from the strengths and minimize the weaknesses of both in single research studies and across

studies” (Johnson & Onwuegbuzie, 2004, p. 14-15).

The predominate paradigm associated with mixed methods research is pragmatism (Creswell & Plano Clark, 2011; Johnson & Onwuegbuzie, 2004; Morgan, 2007; Teddlie & Tashakkori, 2009). In contrast to quantitative and qualitative purists, key characteristics of pragmatism include rejecting traditional dualisms, seeing knowledge as being based on the reality of the world and constructed by our experiences, and viewing current truth and meaning as tentative and changing over time with absolute Truth only known at the end of time (Johnson & Onwuegbuzie). Tashakkori and Teddlie (2003) offer this description of pragmatism: “a deconstructive paradigm that debunks concepts such as “truth” and “reality” and focuses instead on “what works” as the truth regarding the research questions under investigation. Pragmatism rejects the either/or choices associated with the paradigm wars, advocates for the use of mixed methods in research, and acknowledges that the values of the researcher play a large role in the interpretation of results” (p. 713).

### **Rationale and Challenges in Mixed Methods Research**

The research design chosen should be driven by the research questions (Creswell & Plano Clark, 2011). Some research questions are best answered by quantitative approaches and other questions by qualitative approaches. Mixed methods designs are not appropriate for all research questions but they do lend themselves to a wide variety of topics and fields and are best suited for research questions where the mixing of data serves as the best way to answer the research question or address the problem.

Creswell and Plano-Clark (2011) outline several reasons for selecting a mixed methods design and the advantages of using a mixed methods design. First, one type of



data source may be insufficient or unable to explain results fully. The quantitative and qualitative data only tell part of the story (for example, we can show quantitatively the correlations between implementation fidelity and child outcomes but don't necessarily know why or what else may contribute to this finding). Second, mixed methods designs provide strengths that can offset weakness of mono designs. The use of quantitative methods allows for studying a large group of people across a few variables, with the ability to generalize but not discover a great deal at the individual level. Qualitative approaches allow for in-depth study of individuals but are limited in their ability to generalize findings. Third, mixed methods offer a way to explain initial results, clarify quantitative findings or provide unique information by combining groups based on quantitative variables and exploring differences in qualitative data. For example, a quantitative phase of a study may provide a profile for participants of a program (such as graduate students enrolled in a specific field of study and factors that determine the persistence towards getting a degree) and a follow up qualitative phase could be conducted with select participants to gather data on specific contributors to their persistence (such as family support, reasons for entering the program, program factors, etc.) Fourth, the opposite sequence can be used in order to be able to generalize findings, with the qualitative phase conducted first to learn about key factors and a follow up quantitative phase conducted to gather data from a larger sample to confirm qualitative findings.

Collins, Onwuegbuzie and Sutton (2006) advocate for the use of mixed methods research in special education and other related fields. Collins and colleagues reviewed mixed methods articles published between 2000 and 2005 and completed a content

analysis on the articles that provided a rationale and purpose for their use of mixed methods. They found four themes for the purpose of mixed methods research: participant enrichment, instrument fidelity, treatment integrity, and significance enhancement. Studies with the purpose of participant enrichment aim to optimize the sample. They employ techniques such as snowballing (asking participants to provide names of other potential participants) to increase or diversify the sample. They may also assess suitability of participants through initial interviews, or gather information to aid in recruitment. Instrument fidelity studies seek to enhance the validity, reliability, or utility of a qualitative or quantitative measure. The goal of studies of treatment integrity is to assess the fidelity of treatments, interventions or programs quantitatively and qualitatively. Significance enhancement studies endeavor to enhance the interpretations of the findings through the use of both types of data exploring the same phenomenon.

The purposes of this study include treatment integrity (called fidelity of implementation in the current paper) and significance enhancement. The implementation fidelity of the literacy curriculum is measured by quantitative and qualitative measures, in order to provide perspectives from both an observer and the participants themselves with a specific focus on adherence to curriculum components. Significance enhancement is sought through this design by using the findings from both data types to provide more clarity on the research area. The reasons for selecting a mixed methods design draw on Creswell and Plano Clark's (2011) outlined advantages of using two data sources to tell the whole story, minimizing weaknesses and maximizing strengths of each type of method used, and using one type of data to more fully explain the other (in this case, using the qualitative data to shed light on quantitative findings).

The current study employs a convergent parallel design (Creswell & Plano Clark, 2011) in its approach to answering the research questions. The goal of the convergent design is to bring together two different types of data around the same topic to best address the research problem and to maximize the strengths and minimize the weaknesses of single data designs. In this design, quantitative and qualitative data are collected concurrently, analyzed separately and then merged during the interpretation phase. Three common variants of this design are parallel databases (two sets of independent results are compared during the discussion), data-transformation (priority is given to the quantitative data and qualitative findings are quantified and combined with the quantitative data), and data-validation (questionnaires with open and closed-ended questions are used and the results of the quantitative items are validated by the open-ended responses). Purposes for using this design include validating qualitative and quantitative findings, illustrating quantitative findings with qualitative findings, and synthesizing both types of data to achieve a richer understanding. Creswell and Plano Clark suggest using this design when it best fits the research question, there is limited time for data collection, both data types are viewed as equally important, and when the researcher is skilled in both types of research methods and is able to manage extensive data collection and analysis activities. This design is intuitive, efficient, and it lends itself to a team approach. The challenges of this design are that it requires more effort and expertise than other designs, since it involves implementing methods from both types, handling different sample sizes, merging findings in a meaningful way, and addressing what to do if the findings are contradictory. The design was selected because it best matched the research focus and larger study design, took advantage of the strengths each data type presented and will

serve to provide the most comprehensive understanding of the research problem. A summary of recent research in the field of education that utilized mixed methods designs is presented below.

### **Conclusion**

This literature review sought to provide a review of early literacy research, overview of key literacy skills and effective interventions, synthesis of research on fidelity of implementation, summary of findings related to early childhood educator characteristics and practices, and background on mixed methods. The aim of the review is to provide a framework for the current study which is based on these assumptions: 1) early literacy experiences and skills impact later academic and social outcomes (Dickinson & Neuman, 2006; Barnett & Belfield, 2006; Barnett, Lamy, & Jung, 2005, Heckman & Masterov, 2007), 2) literacy interventions have positive immediate and long-lasting impacts on child outcomes (Barnett & Belfield; Barnett, Lamy, & Jung; Reynolds, 2012), 3) teachers play a crucial role in determining the success of programs and child outcomes (Bowman et al., 2000; NICHD Early Child Care Research Network, 2002; Phillipsen et al., 1997), 4) fidelity of implementation serves as an important factor in exploring intervention efficacy and its measurement, along with factors that influence it, should be studied (Dusenbury et al., 2003; Elliot & Mihalic, 2004; Mihalic, 2004, Goodwin, 2011; O'Donnell, 2008), and 5) mixed methods research provides an opportunity to explore the complex relationships within these settings and potential for greater understanding (Creswell & Plano Clark, 2011). Throughout the literature review, key findings and needs were highlighted. In addition, connections with previous research and the current study were drawn.

### CHAPTER 3: METHODOLOGY

This chapter details the overall study, reasoning for the study design and analysis plan. It describes the context of the study and an overview of the participants, setting and measures. Following that are descriptions of the methodology, mixed methods design and data analyses.

#### **Background: Overview of the Rural Language & Literacy Connections Project**

The current study was part of the Rural Language and Literacy Connections (Rural LLC), an Early Reading First (ERF) project funded by the U.S. Department of Education. In partnership with rural Head Start classrooms, Rural LLC provided an intensive literacy intervention focused on increasing child literacy and language skills, specifically oral language, phonological awareness, print awareness, and alphabet knowledge. Literacy coaches provided support for the intervention. Additional pieces of the intervention program included a focus on improving classroom environments, improving family-home connections, home interventions, and interventions with family child care partners.

Participants were enrolled in an ERF intervention project. The current study activities took place during the third year of the project. They participated in the research activities as described and implemented the project curriculum in their classrooms daily. All classrooms received Head Start funding and, as such, adhered to Head Start standards and procedures related to activities, daily schedules, materials and classroom practices. Two classrooms operated full-day, full-year schedules and nine classrooms operated half-day, two sessions per day, part-year programs. Prior to the study, the agencies used High/Scope framework for lesson planning.

Classrooms were large, had high quality environments (as measured by the ECERS-R, ELLCO and CLASS, see below), were well equipped with a variety of materials, and had dedicated areas for book reading, manipulatives, small group time and other activities. Materials were rotated and new materials and displays were brought in throughout the year to support the current unit theme. Classroom placement of children was conducted to ensure no more than 18 children per classroom and a fairly equal distribution of gender, home language, and age.

Central to the current study are the literacy intervention and supports provided by the Rural LLC project. The project selected a scientifically based preschool literacy curriculum, *Opening the World of Learning* (OWL; Pearson) that targeted the key literacy skills (alphabet knowledge, phonological awareness, print awareness and oral language) and was consistent with the Head Start standards. The curriculum had also shown to have positive child impacts in previous studies (Schickedanz & Dickinson; 2005). The curriculum is theme-based, with 6 units per year. OWL uses children's books, poems, music and small group activities to develop literacy skills in preschool children. The curriculum also includes teacher resources and a teacher's guide with detailed information about each lesson. The OWL daily schedule included a morning meeting, center time, group read alouds with multiple readings of books over several days, small group activities, songs and word play and activities designed to build upon children's background knowledge or address social and emotional topics.

The literacy curriculum was implemented daily in each classroom according to the curriculum-suggested schedule and a pacing calendar developed by the research team to accommodate the school calendar. Teachers and teaching staff were trained on

implementing the curriculum over an initial two-day workshop; refresher half-day workshops were provided each year. Teachers were provided with all materials to implement the curriculum including all supplies and preparation of materials (i.e., laminated materials, copies for each student, materials prepared for lessons, etc.).

Four literacy coaches provided support for the project and for teachers. They were all female, white and spoke English as a first language. Literacy coaches were well qualified and experienced in early childhood education. All coaches had a Bachelor's degree in Education, three had a Master's degree in education. They had between three and over 35 years of classroom teaching experience (mean of 20.75 years). One coach had worked for Head Start prior to the start of the ERF project in a support role and conducted classroom observations and teacher trainings. Literacy coaches were trained on all project requirements with refresher trainings completed each year. They were trained on the curriculum and provided training and support to teaching staff. Weekly meetings took place with the coaches and project staff to provide updates, plan, answer questions and provide support.

The literacy coaches worked with 1-3 teachers each week. Literacy coaches completed at least two hours of classroom observations each week. During the observations, literacy coaches made notes about teaching strategies and practices, modeled teaching practices, worked with individual children, collected data (implementation fidelity data and child assessments) and provided general support to teaching staff. Literacy coaches met with teaching staff for 30-60 minutes a week. During these coaching sessions, staff worked together to set goals, document progress towards

goals, plan for lessons, discuss individualizing instruction, review data from observations and child assessments and discuss topics determined by the group.

### **Mixed Methods Studies in Education**

Mixed methods research has gained popularity over the last two decades in various fields, such as education, health, business, and psychology. This is illustrated by journal articles, conference presentations, books, specialized journals and issues and specialist interest groups (Creswell & Plano Clark, 2011). Creswell and Plano Clark attribute its popularity to the fact that mixed methods designs are “an intuitive way of doing research that is constantly being displayed through our everyday lives” (p. 1). Johnson and Onwuegbuzie (2004) contend that “mixed research actually has a long history in [education] research practice because practicing researchers frequently ignore what is written by methodologists when they feel a mixed approach will best help them to answer their research questions” (p. 22).

Several recent studies in education have used mixed methods designs to explore intervention effectiveness (Siraj-Blatchford et al., 2006), teacher’s attitudes (Halvorsen, Lee, & Andrade, 2009) and compare teachers’ self-reported beliefs and classroom practices (Benson McMullen, et al., 2006) as described earlier in this paper.

While the use of mixed methods in educational research studies has grown in recent years, there has been a call for more mixed methods research to be conducted (e.g., Collins et al., 2006; Greene, Caracelli, & Graham, 1989; Johnson & Onwuegbuzie, 2004; Morgan, 2007) and the majority of articles reviewed here provided statements advocating for the use of mixed methods in education. In the field of early childhood literacy intervention research, a recent ERIC search using the key words “mixed methods” or



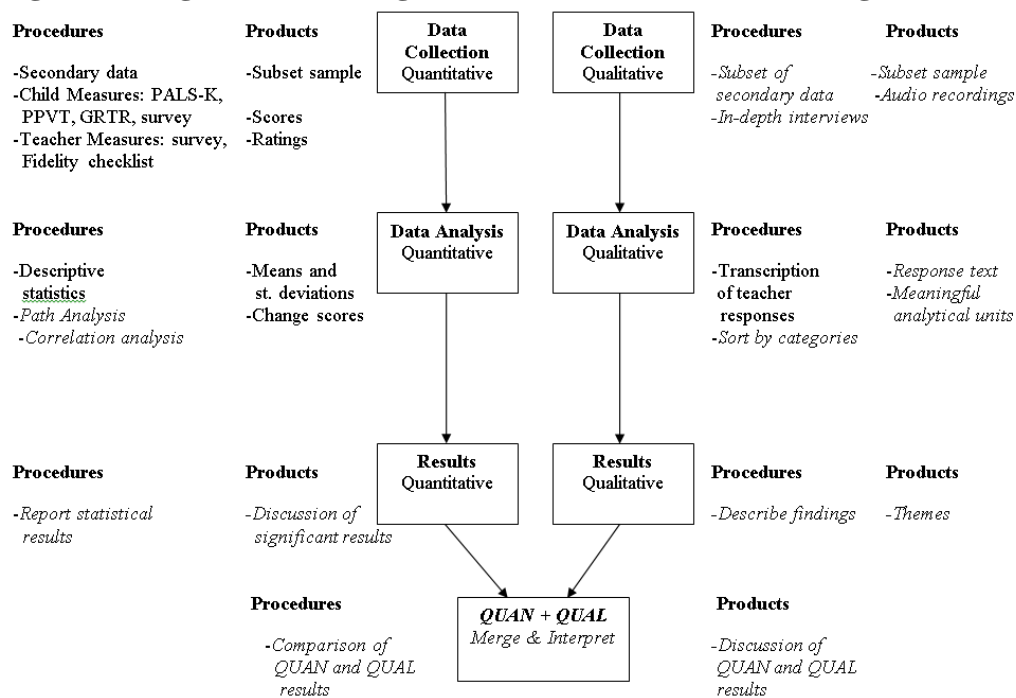
“qualitative and quantitative”, “early childhood or preschool” and “literacy intervention” resulted in 18 published documents between 1990 and 2012. When the terms “mixed methods” or “qualitative and quantitative” were removed 895 documents were found.

The clear need for the use of mixed methods design in education research and the fit of this design and the study research questions, larger study design and data supports the use of the congruent parallel design for this study.

### **Convergent Parallel Mixed Methods Design**

As described in the introduction, the study utilized a convergent parallel mixed methods design. In this design, qualitative and quantitative data analysis occurred concurrently and data were merged and interpreted (see Figure 3). The selection of the design was based on the research questions, study design and characteristics of the data. The inclusion of qualitative data provides a depth of understanding as to the factors that may have influenced teacher implementation. A key strength of mixed methods research is to reduce the weaknesses of a mono-method design. In this case, the quantitative data analysis is limited by the small sample size. By including the qualitative data, the findings can be strengthened. Figure 3 provides a diagram of the procedures.

**Figure 3. Diagram of Convergent Parallel Mixed Methods Design**



*Italicized = unique to the current study*

### Challenges and Limitations in Mixed Methods Design

Conducting mixed method research comes with its own challenges. The researcher must possess skill with both quantitative and qualitative methods, as the researcher must be able to conduct phases in both types and be mindful of potential bias towards one type of data (Creswell & Plano Clark, 2011). Additional time and resources are required for both data collection and analysis because mixed methods studies require time, resources and effort to organize and carry out (Teddlie & Tashakkori, 2003). Communicating and justifying the use of mixed methods to others is a challenge as mixed methods designs are less well known than mono-method designs (Creswell & Plano Clark). Mixed method teams may be challenged by conflicts that arise around methodological decisions and interpretation of findings (Collins et al., 2006).

## **Participants**

Participants were 11 lead preschool classroom teachers and 247 children in Head Start or public school/Head Start preschool classrooms in a rural area of a Midwestern state. Children attended a Head Start or public school/Head Start partner preschool program in either part-day/part-year or full-day/full-year classrooms in one of 16 sessions.

There were a total of 11 teachers who were employed during the study year, with 9 teachers employed at any one time. Two teachers quit; one was replaced by a current paraprofessional mid-year and the other was replaced by a new teacher late in the year. Table 2 below provides the demographic characteristics of the entire teaching sample. Teachers came from a convenience sample and, as can be seen, teachers were all female and white. Teachers varied by age with ages ranging from 23 to 49 years and a mean of 35.5 years. Twenty-seven percent of teachers had an AA degree, 72.7% had a BA degree or higher. Teachers were in their current position on average just under two years with an average of over 10 years of experience in the field, although both these variables varied greatly. Twenty-seven percent of teachers reported annual incomes of less than \$8,000, 36% reported incomes between \$16,000 and \$35,000 and 36% reported incomes above \$35,000.

Teachers at the public school district were more likely to have a BA degree (100% of public school teachers had a BA), as it was required for the position, whereas Head Start required only an AA degree (75% of teachers had an AA, 25% had a BA). However, teachers at the public school district were not more likely to have more years of

experience working in the field of early childhood education or to have held their current position longer. A summary of teacher demographics is presented in Table 2.

**Table 2. Teacher demographic characteristics (N = 11)**

	<b>Mean</b>	<b>Min</b>	<b>Max</b>	<b>Std</b>
<b>Age (in years)</b>	35.5	23	49	9.0
<b>Time in current position (in months)</b>	23.0	0	72	25.8
<b>Experience in early childhood (in years)</b>	10.3	0	25	8.0
	% yes			
<b>Female</b>	100			
<b>White</b>	100			
<b>English as primary language</b>	100			
<b>AA degree</b>	27.3			
<b>BA degree or higher</b>	72.7			

There were 247 children in the project. However, as shown in Table 3, every measure was not collected for every child. Demographic data reported below were gathered by the project, through parent survey or from the agency, which accounts for the variation in responses for each item. Data reported by family survey were completed by the primary caregiver of the child (99%) who was usually the child's mother (86.6%). The tables below report the demographic characteristics for the children and families.

Children were an average of just under 4 years of age at the time of the first assessment and evenly split between females (51%) and males (49%). About half the children (50.7%) were Hispanic, 37.2% White, 4.8% African American and 7.2% Other. Seventy-three percent of children had a home language of English, 24.7% Spanish and 2% Other. Fifteen percent of children had an identified disability as reported by parents. The majority of parents were working, either full-time (43.8%) or part-time (30.7%), 44.2% were married, 39.4% had less than a high school education, 26.1% had a high

school diploma or GED and 34.7% had education beyond high school. The majority of households (66.9%) reported annual household incomes of between \$8,000 and \$30,000.

**Table 3. Child demographic characteristics**

	<b>N</b>	<b>Mean</b>	<b>Min</b>	<b>Max</b>	<b>SD</b>
<b>Age at first assessment (in months)</b>	235	47.3	35.2	61.9	6.9
<b>Gender (n = 247 )</b>					
Female	51.0%				
Male	49.0%				
<b>Child's Race (n = 207)</b>					
White	37.2%				
Hispanic	50.7%				
African American	4.8%				
Other	7.2%				
<b>Child's Identified Disability reported by parent (n = 205)</b>					
Yes	15.1%				
No	84.9%				
<b>Home Language (n = 247)</b>					
English	73.3%				
Spanish	24.7%				
Other	2.0%				
<b>Parent Employment Status (n = 208)*</b>					
Working full-time	43.8%				
Working part-time	30.7%				
Unemployed	39.8%				
<b>Parent Marital Status (n = 208)</b>					
Married	44.2%				
Single, Never married	21.2%				
Divorced/separated	20.7%				
With partner/not married	13.9%				
<b>Parent Highest Level of Education (n = 207)</b>					
Less than a high school diploma/GED	39.4%				
High school diploma/GED	26.1%				
Some college/training beyond HS/1 or 2 year degree	27.5%				
4 year degree or higher	7.2%				
<b>Annual Household Income (n = 205)</b>					
Less than \$8,000	14.1%				
\$8,001 - \$29,999	66.9%				
Over \$30,000	12.7%				
Don't know	6.3%				

\*totals are above 100% because respondents could mark multiple responses

## Measures

**Quantitative measures.** Quantitative measures were collected to address research questions 1 (How does fidelity of implementation relate to child literacy outcomes?) and 3 (What are the relations among teacher demographics, perceptions, fidelity of implementation and child literacy outcomes?). Tables 4 and 5 provide an overview of the measures used, psychometric properties (where applicable) and frequency of administration.

**Table 4. Teacher Measures Overview**

<b>Measure</b>	<b>Concept(s) measured</b>	<b>Data Type</b>	<b>Psychometric properties</b>	<b>Frequency of Administration</b>
Staff Demographic survey	Demographic variables	QUAN	N/A. This measure was developed for the current study; no psychometric information is available.	Once in fall
OWL Implementation Checklist	Fidelity of Implementation	QUAN	Previously reported psychometrics for measure adapted: Cronbach's alpha = .57 - .77	Twice per year (fall/spring)
TLLB	Teacher language and literacy beliefs related to best practices	QUAN	Cronbach's alpha for reliability for scales ranging from .60-.87	Once in fall
ECERS	Global classroom quality	QUAN	inter-rater reliability was 86.1% , $r=.921$ , with an overall internal consistency of $r=.92$	Once in fall
ELLCO	Classroom quality related to language instruction and materials	QUAN	Cronbach's alphas ranging from .73 - .84. Concurrent and predictive validity demonstrated	Once in fall
CLASS	Quality of classroom interactions	QUAN	inter-rater agreement was 87%, coefficient alphas ranged across from $\alpha=0.76$ to $\alpha=0.94$	Once in spring
Teacher guided Interview	Teacher Perceptions	QUAL	N/A. This measure was developed for the current study; no psychometric information is available.	Once in spring

**Table 5. Child Measures Overview**

Measure	Concept(s) measured	Data Type	Psychometric properties	Frequency of Administration
PPVT-III	Receptive vocabulary	QUAN	Internal consistency Alpha = .92 to .98 (median: .95); Split-half = .86 to .97 (median = .94); Alternate-form = .88 to .96 (median = .94); Test-retest = .91 to .94 (median = .92); Concurrent validity demonstrated.	Pre and post (fall/spring)
PALS-PreK	Alphabet knowledge, Phonological awareness, Print awareness, Name Writing	QUAN	Cronbach's coefficient alpha for subtests = .77-.93; Test-retest reliability = .79 - .95; Inter-rater reliability - .96-.99; Concurrent and predictive validity demonstrated.	Pre and post (fall/spring)
GRTR	Print knowledge, Phonological awareness	QUAN	Cronbach's coefficient alpha = .88; Average Item-total correlation = .44; Item difficulty = .62 (range = .37 - .81); Demonstrated concurrent and predictive validity <sup>4</sup>	Three times (fall, winter, spring)
Family Demographic Survey	Child/family demographics	QUAN	Previously reported psychometrics for scales adapted: Family Involvement Questionnaire <sup>1</sup> : Internal consistency range = .81 - .85 Parent Reading Beliefs Inventory <sup>2</sup> : Internal consistency range = .50 - .85; test-rest = .79 Home Observation for Measurement of the Environment Inventory <sup>3</sup> : Split-half reliability = .53 - .83; test-retest = .05 - .70; inter-rater reliability = .90	Once

<sup>1</sup>Fantuzzo, Tighe, & Childs. (2000).<sup>2</sup>DeBaryshe & Binder. (1994).<sup>3</sup>Caldwell & Bradley. (1984).<sup>4</sup>Lonigan & Wilson. (2008).



*Teacher measures.* Quantitative data from teachers came from several sources including a teacher background questionnaire completed annually by teachers (see Appendix A), the OWL Implementation Checklist - an implementation fidelity checklist administered by the literacy coaches in the fall and spring (see Appendix B), the Preschool Teacher Language and Literacy Belief questionnaire (TLLB; Hindman & Wasik, 2008), the Early Childhood Environmental Rating Scale (ECERS-R; Harms, Clifford, & Cryer, 1998), Early Language and Literacy Classroom Observation – PreK, Revised (ELLCO-R; Smith, Brady, & Anastasopoulos, 2008) and the Classroom Assessment Scoring System – PreK (CLASS; Pianta, La Paro, & Stuhlman, 2008).

Staff demographic questionnaires were completed annually in English. Teachers were asked about their education, race/ethnicity, years of classroom experience, professional development activities and income. This measure was developed for the current study and no psychometric information is available.

Fidelity of implementation of the curriculum was collected twice per year, once in the fall and once in the spring. The fidelity of implementation measure, OWL Implementation Checklist – Revised (*Modified from Jonathan Fribley, Education Consulting St Cloud MN and Candi Foltz-Hall, Shannon County School District*), was used to assess the instructional strategies used during each part of the *OWL* classroom day. The OWL Implementation Checklist was designed to capture adherence of the teacher on the key components of the OWL curriculum, such as using the correct materials in centers, implementing morning meeting, conducting a read-aloud following the curriculum guidelines, etc. The measure assesses instructional quality, the availability

and accessibility of required materials, and the quality of interactions between teachers and children.

The OWL Implementation Checklist is organized by curriculum components or parts of the day (Morning Meeting, Story Time, Centers, Small Group Activities, Meals/Outside Time, Transitions). Key indicators of quality and implementation of each component are then described (i.e., “Teacher uses explicit and implicit vocabulary instruction techniques”, “Teacher encourages and supports children’s engagement in the story”, “All necessary materials are prepared and available at the small group location”) and rated on a scale of 0 (Does not do) to 2 (Fully implements). Data were used to create fidelity scores based on the percentage of items completed by component area. For example, if a teacher completed 3 out of the 4 items for the Morning Meeting component, she was given a score of 75% for that component. This resulted in percent fidelity scores for Morning Meeting, Story Time, Small Group Preview, Small Group, Songs, Word Play, and Letters, Let’s Find Out About It, Transitions, Meal/Outside, Quality of Materials, Organized Materials, Vocabulary, and Overall Mean Fidelity Percentage. Quality of interactions were rated on a scale of 1 (Basic) to 5 (Exemplary) for seven items including participation, use of vocabulary, engaging in conversation, encouraging child choice, providing instruction and monitoring. A Quality of Interactions mean score of those items was calculated for each teacher.

The OWL Implementation Checklist was revised from a version created and used for a different study (modified from *Jonathan Fribley, Education Consulting St Cloud MN and Candi Foltz-Hall, Shannon County School District*) to address specific foci and goals of the Rural LLC project. No psychometric information is available for the current

version, however, previously reported psychometrics are presented for the original measure. Content validity is high, as the measure items are based on the curriculum components. Qualitative findings presented in the results chapter demonstrated high social validity. Literacy coaches were also well qualified to administer the measure as they were very familiar with the classrooms and had over two hours of classroom observations per week.

The Preschool Teacher Language and Literacy Belief questionnaire (TLLB; Hindman & Wasik, 2008) is a 30-item, 5 point Likert scale (1 = strongly disagree to 5 = strong agree) questionnaire that asks teachers to rate how strongly they believe that “as a teacher, I believe that children...” The items address teachers’ beliefs about preschool children’s development in the areas of decoding (“I believe that children need plenty of drill and practice to learn the sounds of letters”), oral language (“I believe that children should not talk during meals”), book reading (“I believe that children should look at books to help the learn to read”) and writing (“I believe that children should write without worrying about spelling.”) Negative items are re-coded so that higher scores indicate more developmentally appropriate and evidence-based best practice beliefs. Mean scores are calculated for each area (decoding, oral language, book reading and writing) as well as an overall beliefs mean score with higher means indicating more developmentally appropriate beliefs. Acceptable reliability for the scale was found with Cronbach’s alpha for reliability for scales ranging from .60-.87. Variability was demonstrated and scales showed correlations between scales of between .3-.6 which indicates they were tapping into distinct constructs with oral language and booking reading scales correlated .77.

The ECERS-R is a widely used assessment of global classroom quality and includes subscales of Space and Furnishings, Personal Care, Language and Reasoning, Activities, Interaction, Program Structure, Parents and Staff. ECERS-R scores correlate well with measures of children's development. Each subscale is scored on a 1-7 point scale with 7 = high; a score of 5 or above is typically considered to be in the good range. Overall rating scales additionally have subscales specific to the instruments with scores ranging from 1-7; as is true for the overall scale; 5 is considered a critical cut point between good and less than good care for the subscales. A total score is also derived from the subscales. Reported inter-rater reliability across indicators was 86.1% and correlations between observers were generally high, including  $r=.921$ , with an overall internal consistency for the ECERS-R scale of  $r=.92$ .

The ELLCO-R was used to assess the literacy environment quality across the subscale of General Classroom Environment Subscale (classroom structure, curriculum) and Language and Literacy Subscale (the language environment, books and book reading, and print and early writing). It is a 19-item measure completed through a classroom observation, typically in conjunction with gathering ECERS-R data. Scores for items range from 1, which indicates "Deficient" to 5, which indicates "Exemplary." Good internal consistency has been demonstrated for this measure, with Cronbach's alphas ranging from .73-.84 for subscales and total scores. The developers have also demonstrated correlations with ELLCO-R scores and predicting child outcomes and correlations with other classroom observation measures.

The CLASS Pre-K includes three important domains of classroom quality: emotional support, classroom organization, and instructional support. Observers complete

observations in consecutive 20 minute cycles, completing between 4 and 6 cycles for each classroom in one observation, sampling different activities (e.g., whole group, small group, meals, etc.). Scores on each CLASS Pre-K domain range from 1 to 7, and are anchored by differing levels of quality, 1-2 (Low), 3-5 (Mid), and 6-7 (High). As reported by the developers, average inter-rater agreement was 87% and for studies in prekindergarten samples, coefficient alphas ranged across from  $\alpha=0.85$  to  $\alpha=0.94$  for emotional support,  $\alpha=0.81$  to  $\alpha=0.86$  for instructional support, and  $\alpha=0.76$  to  $\alpha=0.89$  for classroom organization.

*Child measures.* Child measures included pre and post-tests using the Peabody Picture Vocabulary Test-III (PPVT-III; Dunn & Dunn, 1997) as a standardized measure of receptive vocabulary. The PPVT-III has a mean standard score of 100 with a standard deviation of 15 points. As with many standardized assessments, children similar to those in the study (i.e., low SES, ELL, at-risk factors) tend to score below the mean on this measure but have also shown improvements over the course of an academic year when participating in intervention programs, such as the larger Early Reading First project (e.g., Davis et al., 2011; Wilson, Dickinson, & Wells Rowe, 2013). The goal for the Rural LLC project was to demonstrate growth of at least 4 points from pre- to post-test for each child. A standard score change score (post-test standard score minus pre-test standard score) was calculated for all children with scores at both time points. The PPVT-III is a widely used measure of receptive vocabulary with psychometric properties of internal consistency Alpha ranging from .92 to .98, split-half reliability ranging from .86 to .97, alternate-form reliability from .88 to .96, test-retest reliability ranging from .91 to .94 and concurrent validity demonstrated.

The Phonological Awareness Literacy Screening-Preschool, Uppercase Letter Identification subscale (PALS-PreK; Invernizzi, Sullivan, Meier, & Swank, 2004) was used to assess alphabet knowledge. Raw scores were generated (ranging from 0 to 26) and a change score (post-test raw score minus pre-test raw score) was calculated for all children with scores at both time points. Psychometric properties of the PALS-PreK include a Cronbach's coefficient alpha for subtests ranging from .77 to .93, test-retest reliability from .79 to .95, inter-rater reliability from .96 to .99 and concurrent and predictive validity demonstrated.

Teachers completed a progress monitoring measure, the Get Ready to Read! Screener (*GRTR*; Whitehurst & Lonigan, 2001) with children three times per year. The 20-item Get Ready to Read! Screener measures print knowledge, book knowledge, phonological awareness, phonics, and writing. Scores provide an indication of children's pre-literacy skills that are known to promote later reading success. Teachers were trained on this measure but no inter-rater reliability data was collected. The measure is designed to be easily and reliably implemented by teachers and parents (Lonigan & Wilson, 2008). Raw scores are generated for the GRTR and the measure developers provide 5 levels for scores within a given range (i.e., low skills, developing skills, strong skills, etc.). A change score (post-test raw score minus pre-test raw score) for each subscale was calculated for all children with scores at both time points. For reliability, the developers report Cronbach's coefficient alpha of .88, average Item-total correlation of .44, Item difficulty range of .37 to .81 and have demonstrated concurrent and predictive validity.

A family demographic survey was developed for the study to capture information about parent and child age, race/ethnicity of the child, home language, mother's level of education and household income. Demographic information will be included in data analyses, as needed, to examine effects of subsamples (such as ELL children, kindergarten bound children, or those with 2 years in the intervention) or to control for potential confounds in child change scores. The survey also included questions adapted from other measures to include selected items from Family Involvement Questionnaire (Fantuzzo, Tighe, & Childs, 2000), Parent Reading Beliefs Inventory (DeBaryshe & Binder, 1994), and Home Observation for Measurement of the Environment Inventory (HOME-EC; Caldwell, & Bradley, 2001). Data from these items was not included in the analyses. No psychometric information is available for the full survey, however, psychometrics are reported for original scales. These include: the Family Involvement Questionnaire with an internal consistency range of .81 to .85; Parent Reading Beliefs Inventory internal consistency range of .50 to .85 and test-retest reliability of .79; Home Observation for Measurement of the Environment Inventory split-half reliability of .53 to .83, test-retest reliability of .05 to .70 and inter-rater reliability of .90.

**Qualitative teacher measure.** A qualitative measure was included to address research questions 2 and 3 using a semi-structured guided interview conducted by a member of the research team in the spring (see Appendix C). The interview questions were designed by the researcher to tap into the teachers' feelings about literacy curricula in general, their perception of the effectiveness of the intervention on their students, and to allow them an opportunity to reflect on their own implementation and experiences. The focus of the interview questions was to promote reflection on their participation and the

impact of the project. There was also a particular emphasis on asking teachers to respond to questions about the curriculum and their own implementation. Prior to the questions, teachers were provided with a definition of fidelity (“Fidelity means implementing OWL as written in the curriculum guides, high fidelity would mean implementing OWL fully, completely, following all the requirements”). At the conclusion of the interview, teachers were asked to provide a rating from 1 (strongly disagree) to 5 (strongly agree) on nine items related to their own implementation of the literacy curriculum (“I implemented OWL with high fidelity.” “I felt comfortable implementing OWL.”), congruency between their beliefs about literacy curriculum and the intervention (“I agree with the philosophy of the OWL curriculum.” “OWL matches my beliefs about how children learn literacy and language skills best.”) and the impact of the intervention curriculum on child outcomes (“I believe our agency should continue using the OWL curriculum even after the ERF project has ended.” “I believe OWL made a positive impact on child outcomes.” “I believe a different curriculum would have made a bigger impact on child outcomes.” “I believe a different curriculum is more appropriate for the children in our program.”) Steps were taken during the qualitative data analysis to ensure validity of coded themes, as outlined in the data analysis section.

### **Data Collection Procedures**

**Data collection: teacher measures.** Staff demographic questionnaires were completed annually in English. Teachers received the questionnaire during the OWL pre-service training meetings in fall 2009. Teachers returned the questionnaires and responses were entered into a SPSS database.



The implementation of the OWL was assessed two times during the 2009-2010 academic year by literacy coaches in preschool classrooms using the OWL Implementation Checklist. The study uses data from the third year of the larger project, so the intervention curriculum was not new to the agencies, coaches or to many of the teachers. There may possibly have been less fluctuation in teacher implementation of OWL from fall to spring because of their previous experience (they weren't learning a new curriculum) and their familiarity with other program components (i.e., coaching activities, data collection, etc.)

Literacy coaches were trained to complete the checklist by members of the research team and discussed questions about items prior to collecting data and finalizing scores. Literacy coaches were very familiar with the classrooms, completed two hours of observations per week and fall OWL Implementation Checklists were completed several weeks into the school year so that teachers, literacy coaches and children were familiar with each other. Meetings with literacy coaches to discuss the fidelity checklist were used to help ensure reliability between coaches. All literacy coaches had experience using the measure in previous years of the project. Teachers were told about the checklist in advance of administration and observations were scheduled in advance. Literacy coaches used classroom observations to gather information to score items on the checklist. The checklist was completed over several observation sessions within an approximate two-week period. Literacy coaches took notes to support their scores on the observation checklist sheet and referred to them when scoring. As will be seen in the results section, teachers reported that the observations were an accurate reflection of their classroom

practices. Literacy coaches also felt comfortable and confident in completing these checklists.

Results of the checklist were shared with the teaching teams by the literacy coach during a weekly coaching session. Following the fidelity observation, literacy coaches met with teachers to review the findings, identify strengths and resources needed and create a plan for improving instruction. Given the high level of support, it is hypothesized that variations in fidelity would then be the result of individual teacher characteristics or practices rather than differences in training, support or understanding of how the curriculum should be implemented.

The Preschool Teacher Language and Literacy Belief questionnaire was administered in the fall. Teachers were asked to complete the paper questionnaire and return it to research staff.

Classroom observations, including the ECERS-R, ELLCO and CLASS, were completed by trained research staff. All staff attended training sessions for each measure and were trained to at least 85% inter-rater reliability. Classroom observations were scheduled with teachers. ECERS-R and ELLCO observations were completed in the fall during the same observation session and CLASS observations were completed in the spring. Teachers received their ECERS and ELLCO scores and CLASS summary reports and worked with literacy coaches and agency staff to set goals around areas identified as needing improvement.

All teachers were invited to participate in an interview during the spring of 2010 and received a \$25 gift card for participating. Six out of the nine currently employed teachers chose to participate in the optional interview portion. As with the overall sample,

teachers who participated in the interview also varied in fidelity, education, years of experience, and income. Interviews were conducted in English, by phone, lasted approximately one hour and were audio recorded following the interview protocol provided in Appendix C. The researcher, who was familiar with the project, curriculum and teachers, conducted all of the interviews. The interview audio recordings were transcribed verbatim by an independent agency. MaxQDA qualitative data analysis software was used to organize and retrieve data.

**Data collection: child measures.** Child assessment data were collected in both fall (pre-test) and spring (post-test) by a team of trained, reliable external evaluators in sessions lasting no longer than 45 minutes. Data collectors were trained to reliability with at least 85% exact agreement with each other. Assessments took place during the program day at the program site.

Research team members trained teachers to administer the GRTR (Whitehurst & Lonigan, 2001) progress monitoring measure. Teachers administered the measure to children in their classroom during the day, outside the classroom, three times per year. Teachers provided copies of the scored forms to the research team.

Classroom results for all assessments were summarized and shared with literacy coaches, teachers and parents. Literacy coaches and the teaching team worked together to review the results and plan for individualized instruction. Teachers were encouraged to use the assessment results in their daily planning for individual children and were asked to share prepared reports with parents during home visits or parent-teacher conferences.

## Data Analysis

As is typical of mixed methods research, three research questions are presented, each one with a different focus – one quantitative, one qualitatively and one mixed methods. The **research questions** and related **hypothesized results** of the study are:

**Research Question #1:** How does fidelity of implementation relate to child literacy outcomes? (Quantitative)

**Research Question #2:** What do teachers report as influences to curriculum implementation in Head Start classrooms? (Qualitative)

**Research Question #3:** What are the relations among teacher demographics, perceptions, fidelity of implementation and child literacy outcomes? (Mixed Methods)

The data analyses for each research question are presented below.

### **Quantitative Data Analysis: Research Question 1**

Prior to answering the first research question, teachers were grouped into high and low implementation fidelity based on their Fall Overall Mean Fidelity Percent score. This method of dividing teachers into groups was determined the most appropriate, as it would allow for group differences to be seen based on this characteristic and has been used in previous research. Analyses were run to examine differences between these groups on the fidelity measure, classroom observations, and the Teacher Learning and Language Beliefs questionnaire and correlations between these measures.

To answer research question 1 (“How does fidelity of implementation impact child literacy outcomes?”) three sets of analyses were run. A one-way ANOVA comparing the mean and mean change scores between the two groups (high and low fidelity) was conducted. Multi-leveling modeling analyses were performed for each

measure with Time (child assessments at each time point), Fall Overall Percent Fidelity, ELL status as predictors and time x fidelity and time X ELL status interaction.

The teacher background questionnaires provided demographic data (age, education, and years of experience). Descriptive data from these items are reported. As with the data from the interview, these data are used to determine if any of these variables are related to the level of fidelity of implementation. See the mixed methods analyses section for information on how these data were analyzed.

### **Qualitative Data Analysis**

For research question 2, (“What do teachers report as influences to curriculum implementation fidelity in Head Start classrooms?”) qualitative data analysis was performed as described below. The researcher performed all qualitative data analyses, however, there were multiple consultations with three other qualitative/mixed methods researchers to ensure that the procedures, findings and interpretations were representative of the data and appropriate.

The researcher sought to employ a constant comparative method approach in addressing the qualitative data (Merriam, 2009). Throughout the data collection process and following each interview, the researcher completed a research log and tentative findings and reflections were drafted. After each interview, these preliminary findings were revised and helped to provide the researcher with an overall picture of the data collected. These notes were consulted while analyzing the data to ensure that emerging themes were consistent with the data.

Following completion of all interviews, verbatim interview transcripts were created in a word processing software program. Participants were given pseudonyms and

their ID numbers were entered onto the interviews. Verbatim transcripts were then entered into MaxQDA qualitative data analysis software program for data storage, management, retrieval, coding and to facilitate analysis. Using MaxQDA better ensured the integrity of the qualitative dataset and allowed for more sophisticated data analysis.

Exploration of the data then occurred by the researcher reading through all transcripts and writing additional notes. Several interview questions were developed to capture teachers' perceptions about this research question and, as such, particular attention was paid to responses to items determined most relevant to the research question, including "Describe your implementation of OWL. What factors influenced you? Do you think some teachers implement OWL more so than others? Why or why not? What do you think parents thought about how/what their children were learning? Did that have any influence on your implementation? What support did you receive to implement OWL? What role did your coach play in how you implemented the curriculum? What barriers to implementation did you face?" However, responses to all questions are included in analysis.

The researcher labeled segments according to preliminary codes developed and themes were then created by aggregating similar codes together. The researcher then determined if teachers were positive, neutral or negative in their perceptions of the curriculum, noted teacher-reported congruency between their beliefs and the curriculum and teacher-reported fidelity of implementation of the curriculum. This process helped to create a profile for each teacher that could then be described and reported and compared against trends in the qualitative data (to be further detailed below in data integration, hypotheses testing and interpretation).

## Mixed Methods

To answer research question 3, (“What are the relations between teacher characteristics, perceptions, fidelity of implementation and child literacy outcomes?”) bivariate correlations were run between each teacher demographic variable and Fall Overall Percentage Fidelity scores. Then, along with grouping teachers as high or low based on fidelity scores, child change scores were used to identify teachers as having high or low child outcomes. Teachers whose mean classroom change scores are above the mean were placed in the high child outcomes group and those below the mean were in the low child outcomes group. This process allowed for examination of specific themes by fidelity and child outcome groupings.

Once teachers were identified as high/low fidelity and high/low child outcomes, their qualitative data was sorted to look for themes in each group and comparisons were made to see if there were differences in the themes between groups. Table 6 demonstrates how quantitative and qualitative data are shared using a joint data display. Data were then compared against the conceptual model presented previously in Figure 1.

**Table 6. Joint Data Display of Hypothesized Results**

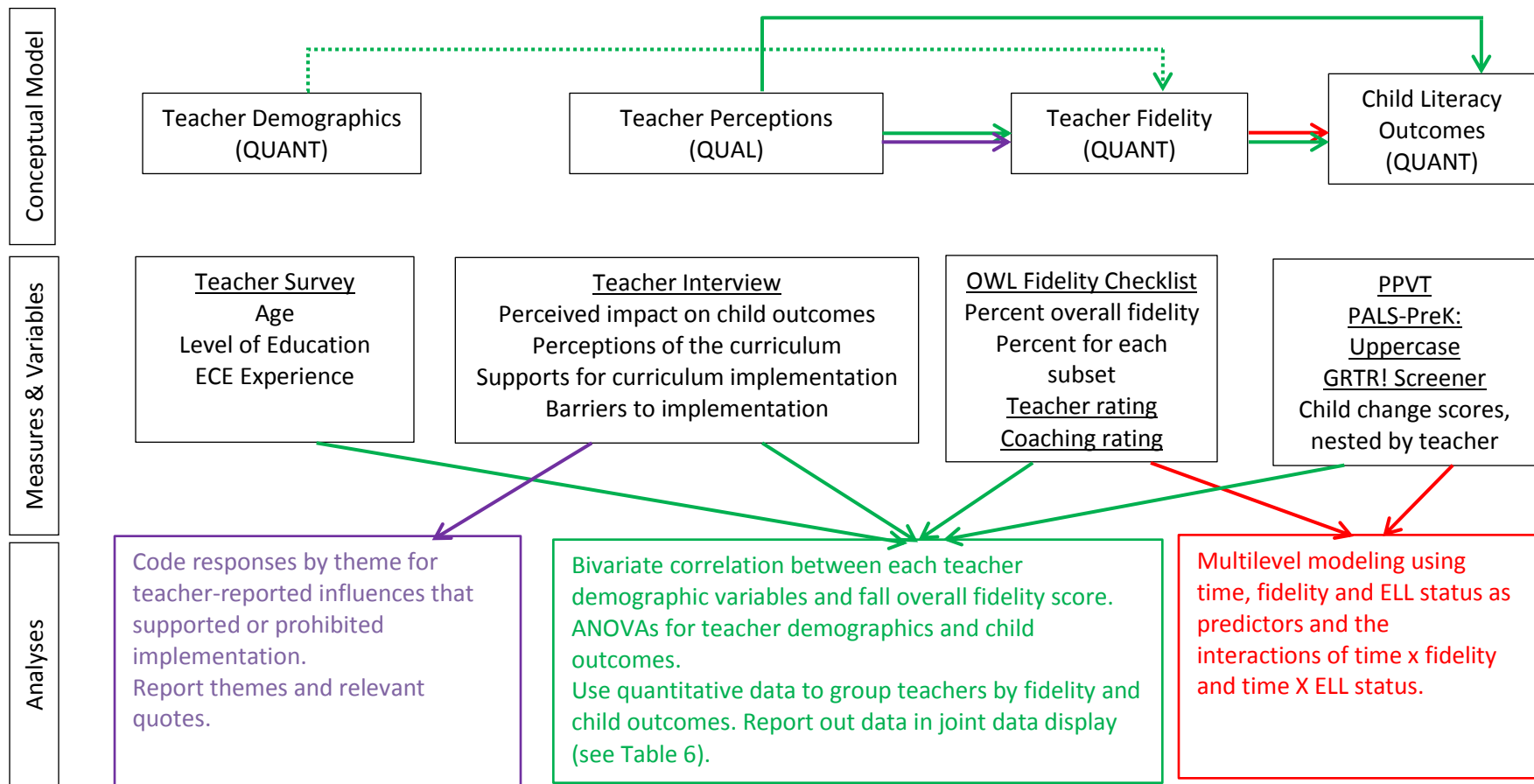
		Child literacy outcomes	
		Low	High
Fidelity	Low	<ul style="list-style-type: none"> <li>• Low congruency between teacher and curriculum philosophy</li> <li>• Barriers to implementing reported</li> <li>• Believe little impact on child outcomes</li> <li>• Self-reported low level of fidelity</li> </ul>	
	High		<ul style="list-style-type: none"> <li>• High congruency between teacher and curriculum philosophy</li> <li>• Few barriers to implementing reported</li> <li>• High levels of support reported</li> <li>• Believe high impact on child outcomes</li> <li>• Self-reported high level of fidelity</li> <li>• More positive statements about the curriculum in general</li> </ul>

## **Summary**

This chapter has provided an overview of the background, participants, methodology and data analysis for the study. See Figure 4 for a summary of the conceptual model, measures and statistical analyses. Findings are presented in the next chapter and are compared against the hypothesized results.



**Figure 4. Conceptual model with measures and statistical analyses.**



Research Question 1: How does fidelity of implementation relate to child literacy outcomes?

Research Question 2: What do teachers report as influences to curriculum implementation in Head Start classrooms?

Research Question 3: What are the relations among teacher characteristics, perceptions, fidelity of implementation and child literacy outcomes?

## CHAPTER 4: RESULTS

In this chapter, the results are presented based on the data analyses described in the previous chapter. Findings for each research question are detailed below. Quantitative results reported are from the full sample of 11 teachers and 247 children, while the qualitative and mixed methods findings reflect the participation of six teachers in the interview.

### **Findings for Quantitative Research Question 1: How does fidelity of implementation relate to child literacy outcomes?**

The quantitative variables of rates of fidelity, classroom measures, teacher beliefs and child outcomes were explored to address the first research question. Teachers were grouped into high (above the mean) and low (below the mean) fidelity based on their Overall Fidelity score. Since all teachers who were above the mean of Overall Fidelity in fall were also above the mean in Overall Fidelity in spring and vice versa, fidelity group did not vary as a function of time point and so a teacher's fidelity group was constant. Fidelity group was used to explore differences among teachers and Overall Fidelity in fall (a continuous variable) was used when looking at correlations between measures. An initial overview of the descriptive data was conducted, followed by an analysis of group differences in measures related to rates of fidelity and, finally analyses on the relation between fidelity and child outcomes were conducted. One-way analyses of variance (ANOVAs) were run to examine differences between teacher groups on the fidelity measure, classroom observations, and the Teacher Learning and Language Beliefs questionnaire, in order to determine if differences in these characteristics could be contributing to differences seen in child outcomes or fidelity. Next, a one-way ANOVA

comparing the mean change scores for each child outcome (PPVT-III, PALS and GRTR) between the two groups (high and low fidelity) was run. Multi-leveling modeling analyses were performed for each measure with time (child assessments at each time point) and fall overall percent fidelity as predictors and time x fidelity interaction. Regressions analyses were run to determine if fall fidelity scores predict child change scores in each of the child measures.

### **Fidelity, Classroom Quality and Teacher Language and Literacy Beliefs**

#### **Questionnaire Findings**

Fidelity checklists were completed on nine teachers in the fall and spring. Table 7 displays the fidelity percentages for each curriculum component and means for teacher quality of interactions at fall and spring.

**Table 7. Mean Percentage of Adherence to Curriculum Components and Teacher Quality Interactions from the Fidelity Checklist Measure (n = 9)**

	Mean	Min	Max	Std
<b>Fall</b>				
<b>Morning meeting</b>	79.0%	0%	100%	32.0%
<b>Story Time</b>	84.6%	66.7%	94.4%	10.3%
<b>Small Group Preview</b>	100.0%	100%	100%	0%
<b>Small Group</b>	86.4%	72.2%	94.4	6.3%
<b>Songs, Word Play and Letters</b>	89.8%	66.7%	100%	12.3%
<b>Let's Find Out About It</b>	51.9%	0%	100%	36.7%
<b>Transitions</b>	92.6%	66.7%	100%	12.1%
<b>Meal/Outside Time</b>	65.7%	41.7%	100%	21.4%
<b>Quality of Materials in Centers</b>	94.6%	85.7%	100%	7.4%
<b>Organized Materials in Centers</b>	85.7%	64.3%	100%	12.4%
<b>Vocabulary Cards in Centers</b>	41.3%	0%	85.7%	30.7%
<b>Overall Fidelity</b>	79.9%	59.8%	92.0%	9.5%
<b>Teacher Quality of Interactions<sup>a</sup></b>	4.0	1.7	4.9	.98
<b>Spring</b>				
<b>Morning meeting</b>	88.3%	38.9%	100%	19.7%
<b>Story Time</b>	95.4%	83.3%	100%	7.1%
<b>Small Group Preview</b>	100%	100%	100%	0%
<b>Small Group</b>	93.8%	89.9%	100%	5.9%
<b>Songs, Word Play and Letters</b>	91.7%	66.7%	100%	11.8%
<b>Let's Find Out About It</b>	63.0%	33.3%	100%	21.7%
<b>Transitions</b>	90.7%	50.0%	100%	18.8%
<b>Meal/Outside Time</b>	84.3%	50.0%	100%	18.8%
<b>Quality of Materials in Centers</b>	94.4%	64.3%	100%	12.3%
<b>Organized Materials in Centers</b>	93.7%	71.4%	100%	12.6%
<b>Vocabulary Cards in Centers</b>	90.5%	57.1%	100%	16.0%
<b>Overall Fidelity</b>	89.3%	76.3%	99.5%	7.5%
<b>Teacher Quality of Interactions<sup>a</sup></b>	4.5	3.9	5.0	.35

<sup>a</sup> Scale is 1 = Basic to 5 = Exemplary

As described above, teachers were categorized as high fidelity (Overall Fidelity mean was equal to or above the group mean of 79.9% at fall or 89.3% at spring) or low fidelity (below the group mean) based on their Overall Fidelity scores at fall and spring. Teachers who scored above the mean were coded as high fidelity and those below the mean were coded as low fidelity at each time point. Although placed in the low group,

these teachers still had a mean Overall Fidelity score of 72.3 at spring and 82.5 at fall, so the label 'low' is relative to the sample. All teachers improved from fall to spring, however, all teachers who were in the high group in fall were also in the high group in the spring and vice versa so teachers' fidelity group did not vary by time.

Classroom quality and teacher beliefs were examined using one-way ANOVAs to explore potential teacher/classroom differences that might confound child outcome and fidelity findings. This exploration included the fidelity observation measure, the Teacher Language and Literacy Beliefs questionnaire (TLLB), the Early Childhood Environmental Rating Scale (ECERS), Early Childhood Language and Literacy Classroom Observation (ELLCO) and the Classroom Assessment Scoring System (CLASS) scales. If measures of classroom quality are higher for some teachers than for others, then differences in child outcome scores may be being driven not by fidelity but by another measure of quality.

One-way ANOVAs were run separately on all of the classroom measures comparing teachers with high fidelity scores (those above the mean for fall and spring) with those with low fidelity scores (those below the mean) to see if there were any significant differences between groups on the quality measures. The one-way ANOVAs for fidelity group by classroom quality measure revealed no significant differences between high and low fidelity groups on the TLLB, ECERS, ELLCO or CLASS. The one-way ANOVA for fidelity group on Overall Fidelity did result in significant differences between the two fidelity groups (Fall fidelity  $F(1, 7) = 9.56, p = .018$ ; Spring fidelity  $F(1, 7) = 21.95, p = .002$ . a; other  $ps > .10$ ), with teachers in the high group having significantly higher Overall Fidelity scores than teachers in the low group, as

would be expected since groups were formed based on fidelity scores. These findings provide support for the assumption that the classrooms were very similar across measures of quality but differed significantly on the rates of fidelity. These findings also suggest that differences in child outcomes may be due to difference in fidelity.

Next, correlations were run between the classroom quality measures and fidelity scores. None of the classroom measures were significantly correlated with the Overall Fidelity scores in fall or spring (although Overall Fidelity in fall and spring were significantly correlated with each other). These findings suggest that teacher fidelity was not related to other measures of classroom quality or teacher beliefs. Table 8 below provides the means and standard deviations on each measure and Table 9 provides the correlations between measures.

**Table 8. Descriptive Data for Classroom Quality Measures Overall and by Teacher Fidelity Level**

Measure	Overall (n = 9)		High Fidelity (n = 5)		Low Fidelity (n =4)	
	Mean	Std	Mean	Std	Mean	Std
<b>Overall Fidelity percent: Fall</b>	79.9	9.5	86.0	4.7	72.3	8.6
<b>Overall Fidelity percent: Spring</b>	89.3	7.5	94.8	3.0	82.5	4.9
<b>Overall TLLB</b>	4.4	.2	4.5	.2	4.4	.3
<b>ECERS-R<sup>1</sup> total: Fall</b>	5.8	.4	5.9	.3	5.6	.5
<b>ECERS-R<sup>1</sup> total: Spring</b>	6.5	.4	6.4	.5	6.6	.3
<b>ELLCO<sup>2</sup> - General Environ: Fall</b>	4.6	.3	4.6	.3	4.5	.2
<b>ELLCO<sup>2</sup> - Language/Lit: Fall</b>	4.5	.3	4.5	.4	4.4	.2
<b>ELLCO<sup>2</sup> - General Environ: Sprng</b>	4.8	.1	4.8	.2	4.8	.1
<b>ELLCO<sup>2</sup> - Language/Lit: Spring</b>	4.5	.3	4.5	.3	4.6	.4
<b>Spring CLASS<sup>3</sup> - Emotional Suppt</b>	6.0	.6	6.1	.5	5.7	.8
<b>Spring CLASS<sup>3</sup> - Classroom Org</b>	5.5	.8	5.8	.4	5.1	1.1
<b>Spring CLASS<sup>3</sup> - Instructnl Suppt</b>	3.0	.8	3.2	.8	2.7	.8

<sup>1</sup>Scores of 5 or above indicate “good” quality

<sup>2</sup>Scores of 3 = “basic” and 5 = “exemplary”

<sup>3</sup>Scores of 1-2 = Low, 3-5 = Mid, 6-7 = High

**Table 9. Correlations Between Classroom Quality Measures and Overall Fidelity Scores at Fall and Spring**

	<b>Overall Fidelity Fall</b>	<b>Overall Fidelity Spring</b>
<b>Overall Fidelity Fall</b>	--	.724*
<b>Overall Fidelity Spring</b>	.724*	--
<b>Overall TLLB</b>	.072	.085
<b>ECERS-R total: Fall</b>	.495	.484
<b>ECERS-R total: Spring</b>	-.156	-.214
<b>ELLCO - General Classroom Environment: Fall</b>	-.248	-.043
<b>ELLCO - Language and Literacy: Fall</b>	-.109	-.157
<b>ELLCO - General Classroom Environment: Spring</b>	.107	-.074
<b>ELLCO - Language and Literacy: Spring</b>	-.326	-.270
<b>Spring CLASS - Emotional Support</b>	.659	.424
<b>Spring CLASS - Classroom Organization</b>	.544	.568
<b>Spring CLASS - Instructional Support</b>	.490	.379

The lack of significant differences between teacher fidelity groups on classroom measures and the absence of correlations between the fidelity checklist items, Overall Fidelity and classroom quality measures provides evidence that differences in child outcomes or fidelity did not result from classroom characteristics. It also indicates that the fidelity checklist was measuring components specific to the curriculum and not aspects of global classroom quality. This is helpful in understanding the classroom environments and interpreting the data, as it implies that teachers can have varying levels of fidelity and quality that are not related to each other. For data analysis, these classroom quality variables were not considered further or included in analyses as potential covariates or confounds. These data suggest that fidelity of implementation is not related

to global classroom quality or teachers' literacy and language beliefs. Therefore, differences in child outcomes or perceptions may interact independently with fidelity rather than mediated by classroom quality.

### Fidelity and Child Outcomes

Teachers were coded as high or low fidelity, as described above. Children were then coded as being in a high or low fidelity classroom based on their teacher's category.

The means and change scores by fidelity group are presented in Table 10.

**Table 10. Means and Standard Deviations of Child Outcome Measures by Teacher Fidelity Group (High n = 5, Low n = 4)**

Measure/ Fidelity	Fall				Spring				Change			
	Hi		Lo		Hi		Lo		Hi		Lo	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
PPVT-3	89.3 (n=112)	15.6	85.9 (n=81)	15.2	93.6 (n=112)	15.8	90.3 (n=81)	15.2	5.1 (n=107)	9.0	5.8 (n=76)	9.0
PALSPrek, Uppercase Letter ID	6.3 (n=126)	8.1	5.6 (n=101)	8.1	14.4 (n=124)	9.0	13.3 (n=98)	9.9	8.1 (n=120)	7.0	7.4 (n=96)	7.3
GRTR	9.5 (n=117)	4.1	8.8 (n=84)	4.4	15.2 (n=124)	3.9	14.1 (n=95)	4.8	5.9 (n=107)	3.5	5.6 (n=77)	3.8

Separate one-way ANOVAs using fidelity group as the independent variable and child outcome measures as the dependent variable, were run to compare the means at fall and spring and change scores for the child outcome measures between these two fidelity groups. The ANOVAs revealed no significant difference between the two groups for any of the child outcomes for fall, spring or change (all  $p$ s > .10).

Multilevel modeling was performed for each child outcome measure (PPVT, PALS, GRTR) to account for between student differences in the child outcome variables related to fidelity. Level 1 variables were unique to each child: fall pre-test scores and ELL status. Level 2 variables were those shared by children in the same classroom:



teacher fall overall fidelity scores. Time points (fall and spring) were nested within children and children were nested within classrooms. ELL status was treated as a control variable. Multi-leveling modeling analyses were done using time (child assessments scores at each time point), fall overall percent fidelity, and ELL status as predictors and the time x fidelity and time x ELL status interactions.

Results for the simple effect of time show child scores changed from pre-test to post-test for all child outcomes (PPVT-III,  $b = 4.81$ ,  $p < .0001$ ; PALS,  $b = 7.33$ ,  $p < .0001$ ; GRTR  $b = 5.62$ ,  $p < .0001$ ) indicating that all classrooms improved on those measures from fall to spring. The simple effect for fidelity was significant for the PPVT-III child outcome ( $b = .24$ ,  $p = .02$ ) but non-significant for the PALS and GRTR child outcomes (both  $ps > .10$ ), indicating that children's fall scores for PALS and GRTR did not depend upon the level of teacher fidelity but fall child scores for the PPVT-III did, with children in higher fidelity classrooms having higher fall PPVT scores. The time by fidelity interactions were non-significant for all child outcomes (all  $ps > .10$ ), indicating that children's scores from fall to spring did not change based on the fall fidelity scores. The simple effect for ELL status was significant for PPVT-III and GRTR only (PPVT-III  $b = -18.20$ ,  $p < .0001$ ; GRTR  $b = -1.32$ ,  $p = .02$ ), indicating that ELL children were predicted to have significantly lower scores than non-ELL children at fall. The interaction of ELL status and time was marginally significant for PALS only ( $b = 1.83$ ,  $p = .09$ ), signifying that ELL children's scores increased significantly more than non-ELL children from fall to spring. Overall, the models accounted for a large percentage of the variance in child scores (PPVT-III  $R^2 = .92$ ; PALS  $R^2 = .86$ ; GRTR  $R^2 = .86$ ), although this is due to the inclusion of ELL status in the model. See Tables 11 – 13.

**Table 11. Solution for Fixed Effects for PPVT-III (Children = 247, Teachers = 9)<sup>a</sup>**

Effect	Estimate	Standard Error	DF	t Value	Pr >  t
<b>Intercept</b>	91.66	1.36	244	80.72	<.0001
<b>Time</b>	4.81	0.75	184	6.39	<.0001
<b>Overall Fall Fidelity</b>	0.24	0.10	249	2.34	0.02
<b>Time*Over Fidelity</b>	-0.03	0.07	186	-0.41	0.68
<b>ELL status</b>	-18.20	2.25	255	-8.09	<.0001
<b>Time*ELL status</b>	1.66	1.51	186	1.10	0.27

<sup>a</sup>R<sup>2</sup> = .92**Table 12. Solution for Fixed Effects for PALS – Uppercase Letter ID (Children = 247, Teachers = 9)<sup>a</sup>**

Effect	Estimate	Standard Error	DF	t Value	Pr >  t
<b>Intercept</b>	6.25	0.67	322	9.33	<.0001
<b>Time</b>	7.33	0.56	223	13.17	<.0001
<b>Overall Fall Fidelity</b>	0.04	0.06	323	0.64	0.52
<b>Time*Over Fidelity</b>	-0.003	0.05	225	-0.05	0.96
<b>ELL status</b>	-1.03	1.28	326	-.080	0.43
<b>Time*ELL status</b>	1.83	1.07	225	1.71	0.09

<sup>a</sup>R<sup>2</sup> = .86**Table 13. Solution for Fixed Effects for GRTR (Children = 256, Teachers = 9)<sup>a</sup>**

Effect	Estimate	Standard Error	DF	t Value	Pr >  t
<b>Intercept</b>	9.40	0.45	16.1	20.90	<.0001
<b>Time</b>	5.62	0.31	201	18.24	<.0001
<b>Overall Fall Fidelity</b>	0.06	0.05	11.4	1.41	0.19
<b>Time*Over Fidelity</b>	0.0564	0.03	204	1.57	0.12
<b>ELL status</b>	-1.32	0.64	353	-2.07	0.04
<b>Time*ELL status</b>	0.19	0.60	204	0.32	0.75

<sup>a</sup>R<sup>2</sup> = .86

Sensitivity analyses were conducted and included child age and time in the intervention as additional predictors with little change to the model and the models

accounted for minimal (and non-significant) additional variance in the child outcome scores. Regression analyses were conducted to see if fall fidelity scores predicted child change scores for each of the child outcomes. Results were non-significant (for PPVT,  $R^2 = .001$ ;  $F(1, 181) = .243$ ,  $p > .10$ ; for PALS,  $R^2 = .000$ ;  $F(1, 214) = .001$ ,  $p > .10$ ; for GRTR,  $R^2 = .011$ ;  $F(1, 183) = 1.942$ ,  $p > .10$ ) and further confirm that fall fidelity scores did not predict child change scores on any child measure. Post-hoc analyses were run with select subgroups (ELL, children entering kindergarten the following year, children with two years of the intervention versus one year) using the above analyses and all resulted in non-significant findings.

Analyses for the first research question revealed two key findings: 1) teacher beliefs and classroom quality measures were similar across both groups of high and low fidelity teachers, although levels of fidelity between the two groups were statistically significantly different, and 2) examination of fidelity and child outcomes by several means revealed no relation between the two variables even with the inclusion of ELL status and with post hoc analyses of subgroups (ELL, children entering kindergarten the following year, children with two years of the intervention versus one year) further supporting the lack of relation.

### **Summary of Qualitative Themes for Research Question 2: What curriculum implementation influences do teachers report?**

During the interview, teachers were asked several questions related to potential influences on their implementation. These included: Describe your implementation of OWL. How fully do you feel you implemented the curriculum? Why did you implement OWL? What about you influenced your implementation? Do you think some teachers

implement OWL more so than others? Why or why not? What do you think were parents' thoughts about how/what their children were learning? Did that have any influence on your implementation? What role did your coach play in how you implemented the curriculum? Was there anything else that made a difference or influenced your implementation? Did any of the other components of the ERF project influence your implementation?

Teacher responses to these questions were closely examined during data analysis to inform the creation of codes and themes (see methods section for more information). In addition, teacher responses to any of the other interview questions were also coded for statements regarding potential influences on implementation.

Qualitative data analysis resulted in the identification of nine distinct themes that represent potential influences to implementation as reported by teachers. The themes are: 1) perceived OWL impact on child outcomes, 2) previous experiences with OWL, 3) experience, 4) perceived role, 5) supports, 6) barriers, 7) coaching, 8) parents and 9) agency. These themes were then grouped into two categories, internal and external factors, which reflected the source of the influence. During the interview, teachers were asked about potential influences and how things may or may not have influenced their implementation fidelity. For example, fidelity of implementation influences could have had a positive effect on implementation (i.e., influences may have increased a teacher's likelihood of implementing or motivated teachers to continue to do what they were already doing,) a negative effect (i.e., made them less likely to implement) or had no effect. The initial step was to look at what factors were reported as potential influences by teachers and then to examine whether the factor had a positive, negative or no impact on

implementation. For example, some teachers may have noted that parents had a positive perception of the curriculum, but that parent opinion did not influence what they did in the classroom. Table 14 displays the definitions and organization of themes as developed by the qualitative coding scheme used in data analysis.

**Table 14. Themes that Emerged from Coding and Analysis.**

Source of influence	Theme	Code	Code definition	Illustrative quotes	Impact
Internal factors	Perceived OWL impact on child outcomes	Saw changes in behavior attributed to OWL	Changes in child behavior attributed to the curriculum, such as improvement on literacy skills	<i>There were definitely some activities that made them excited about learning.</i>	Positive
		Saw improvement on assessments	Changes in child scores on assessments attributed to the curriculum	<i>...looking at everybody's scores and how well they improved...showed me how it was working and the things that we did were working...</i>	Positive
	Previous experiences with OWL	Experience with lesson(s) in previous year(s)	Experiences in previous years with specific lessons that lead to changes/impacts on current year's implementation	<i>Some of them wouldn't understand anything that I was trying to present...So we just didn't [do it].</i>	Positive and Negative
		General experience with OWL	General experience or impressions from previous years	<i>...as the years have progressed, now that I know the curriculum more, it was a lot easier. I think having another year under my belt understanding OWL better myself helped.</i>	Positive and Negative
	Experience	Position in career	Number of years teaching, first year teacher	<i>...it was my first year when we started the curriculum. So, I feel like for me it was a lot easier for me to follow it, and you know, do more fidelity with it...</i>	Positive and Negative
		Other curricula	Experience with or knowledge of other curricula	<i>They're doing it for so long and they have another curriculum they feel strongly about.</i>	Positive and Negative
		General experience with children	Experience with children	<i>Once you've been teaching for so long, you build your own ideas about what's important to kids.</i>	Positive and Negative
	Perceived role	Role in program	Role as implementer, to do curriculum as written or to adapt	<i>I feel like I totally implemented the curriculum because I was told to, that's what I was given.</i>	Positive and Negative
		Choice in implementation	Perceived autonomy, ability to adapt		Positive and Negative

**Table 14. Themes that Emerged from Coding and Analysis (continued).**

Source of influence	Theme	Code	Code definition	Illustrative quotes	Impact
External factors	Supports	Material preparation	Having materials prepared (copies, lamination) for lessons		Positive
		Materials supplied	Having materials to implement	<i>That took a lot of work off of us, which was good.</i>	Positive
		Coaching	Support, encouragement, help from the coach, role of the coach, impact on practices	<i>It's nice to have somebody one-on-one with you who you can just talk with and share your ideas. I just enjoyed always being able to reflect on the strengths and weaknesses.</i>	Positive and Neutral
			Coaching session impact		
			Impact of fidelity checks, perceived accuracy; usefulness		
	Professional development	Coursework, meetings, trainings	<i>It was a great reflection tool to kind of fine tune or tweak some of the things that we were already doing</i>	Positive	
	Barriers	Lack of planning and preparation time	Limited time to prepare for lessons	<i>It makes it easier to implement when you can kind of think through those things</i>	Negative
		Lack of time to collaborate with peers	Limited time to talk to other teachers	<i>Definitely team planning would have been a huge, huge support.</i>	Negative
		Schedule	Difficulty fitting all components into daily schedule	<i>Our large groups sometimes felt like it was so long ...that I felt like some of my small group time was taken.</i>	Negative
		Child engagement	Children's engagement, interest or ability to complete activities	<i>Some of the activities did not keep the interest in some of the kids</i>	Positive Negative
	Parents	Parent influence	Parent perceptions of curriculum, communication, involvement	<i>The fact that they [the parents] were positive about it, and saw the growth, also helped me believe that it was really working and it is benefitting the kids to follow it.</i> <i>It [parent perceptions] doesn't have any influence on how I implemented it.</i>	Positive and Neutral
	Agency	Components of the program/project	Other parts of the intervention, FLEs, PD, coursework	<i>It was nice to take those classes because it not only helps me grow as a teacher and everything, but with the curriculum because they were based on the curriculum.</i>	Positive and Neutral
		Program structure	Part day/full day, schedule, location	<i>I think the curriculum is intended to be used for a full day.</i>	Positive Negative

### **Internal Factors Related to Implementation**

Teachers reported multiple internal factors that played a role in determining the extent to which they implemented the curriculum. Such factors include perceived OWL impact on child outcomes, previous experiences with OWL, perceptions of OWL, perceived role of the teacher, and belief match between OWL and the teacher's philosophy. Each of these factors will be defined and supported with illustrative quotes.

**Perceived child outcome impact of OWL.** One reported factor that provided teachers with support for implementation of the curriculum in the classroom was the perception that the curriculum was making a positive change in children. All teachers commented on seeing improvement in children's language and literacy skills over the year, with several teachers referring specifically to changes in oral language and alphabet knowledge and to changes in ELL students' language abilities. Teachers felt that these changes were due in part to the curriculum but also because of their role in helping these skills develop.

Teachers reported changes in classroom behavior or results of the child assessments as support for their perceptions that the curriculum was effective. Teachers who perceived a positive child outcome and attributed the outcome to the curriculum reported that this increased the likelihood that they would implement the curriculum. Perceived positive child outcomes acted to support and provide positive reinforcement for previous implementation, evidence that the curriculum was effective and motivated teachers to continue implementing.

*I followed the [curriculum] probably almost as close as I could. I kept track, I kept on, you know, the right days at the right time. I think that just from me looking at everybody's scores and how well they improved,*



*especially after a child who had been here two years with it, just seeing their progress just showed me how it was working and the things that we did were working, so I think that that probably just pushed me to keep implementing it the correct way to make sure that they were getting the fullest out of what we were doing.*

**Previous experience with the curriculum.** Five out of the six teachers interviewed had at least one school year of experience implementing the curriculum in their classroom. Teachers drew on these experiences in describing possible influences on implementation. Previous experiences influenced teachers to either implement as they had in the past or caused them to reflect and adjust their implementation the following year. Sandra often spoke about the differences between the first year of implementing the curriculum and later years, describing her initial concerns and struggles, then how she grew comfortable and more adept at implementing. Other teachers, who had implemented the curriculum for several years, echoed these comments.

*Well, the first year, honestly, I thought, 'Oh, gosh, how are they going to keep their attention reading a book four times...' But over the years, it really went well. You think the kids aren't listening and paying attention. And by the time you get to that third and fourth reading, especially the fourth reading when they are retelling the story themselves. Boy, those kiddos knew the book. They didn't lose interest. So I was really happy and glad with that. Some of the activities, the very first time we did them, it may have been way over their head and so we had to modify it to their learning levels like the next year. The first year was kind of trial and error in how we learned -- we learned how to make it work for the kiddos the next year.*

**Experience.** Teacher responses were coded as 'experience' when they referred to their general level of experience, such as number of years teaching or their impressions of what kids would do based on their experience; the code experience was not related to their experience with the curriculum. The theme of experience came up most frequently when teachers were asked why other teachers may or may not have implemented the

curriculum fully. Experience seemed to play a large role in teachers' implementation, with teachers reporting that they or other teachers in their first year of teaching would be much more likely to implement the curriculum fully because they did not have previous experience or other resources to draw upon.

*I'm a little different than most of the other teachers because it was my first year when we started the curriculum. So, I feel like for me it was a lot easier for me to follow it, and you know, do more fidelity with it...*

The curriculum seemed easier to implement for those teachers who were in their first few years of teaching, because of their lack of experience with other curricula or developing their own curricula. In addition, those teachers with less experience at the start of the project expressed that the curriculum was easier to implement as the years went by and they had more experience with it.

*I just think as the years have progressed, now that I know the curriculum more, it was a lot easier.*

Also within the comments regarding the effect of experience is the implication that teachers with more experience would have a greater challenge in implementing the curriculum with high fidelity, because it was different than what they were used to or because they had other ideas about what would work better, based on their own experience. Teachers with more experience at the start of the project or when they began implementing the curriculum reported adapting more as the years went on and, therefore, implementing with less fidelity.

*I think a lot of it was, some people have just, you know, they're doing it for so long and they have another curriculum they feel strongly about. Or, once you've been teaching for so long, you build your own ideas about what's important to kids.*

**Perceived role.** Responses were coded as ‘perceived role’ when teachers talked about how they saw themselves, their responsibilities and expectations. Teachers touched on issues related to how they saw their role and their responsibility for children’s development. Some teachers were more likely to attribute child success (changes in child outcomes) more to their own activities than solely to the curriculum.

*So, I think as teachers we take that curriculum and find the best possible way to deliver that to the kids so that they can learn. So, I think it's, of course, been successful because teachers see growth in lots of areas and so I think that part of it's been successful. But as far, from a teacher's aspect I guess, maybe there would be more successful ways in assisting us in that implementation than OWL was. But I think it's been successful in kids' language and literacy growth.*

Also related to the role theme was the idea of what the teacher was expected to do in her job. Even though Alyssa outlined many aspects of the curriculum she did not agree with, she still reported implementing the curriculum fully in her classroom, saying “*I feel like I totally implemented the curriculum because I was told to, that's what I was given.*”

### **External Factors Related to Implementation**

Teachers reported external factors that played a role in determining the extent to which they implemented the curriculum. These factors were influences outside the teachers themselves and include: 1) supports, 2) barriers, 3) coaching, 4) parents and 5) agency. Each of these factors will be defined and supported with illustrative quotes.

**Supports.** By definition, supports were things that helped teachers implement the curriculum. There were many supports for the curriculum provided by the program as described earlier, but did these supports actually increase the likelihood that the curriculum was implemented? Teachers reflected on what supports were most helpful for them and made implementing easier. The implication was that these supports also made it

more likely for them to implement the curriculum than if they had not had these supports. Helpful supports mentioned by teachers included materials being provided and prepared for them, the support of the coach, and professional development opportunities (i.e., workshops, coursework and project meetings).

**Coaching.** All teachers were positive about their experiences with the literacy coaches and coaching. Coaches were seen as a resource, support and someone to share ideas with. The teachers expressed that coaches were able to see things in their classroom that they might not have been aware of. Several teachers enjoyed the ability to collaborate and share experiences with other teachers during group coaching sessions. Teachers did not feel as though the coaches had an impact on their instructional strategies, but noted that coaches did impact other classroom practices including curriculum implementation. Coaches impacted implementation through modeling, problem-solving with teachers, offering suggestions and through the use of the fidelity checklist.

*She was great in helping out in anything that we needed to make implementation successful. Ideas to meet any of the needs our kids had. Giving us any support that we needed as teachers in instruction or preparing for instruction.*

*I thought it was good that we got to see how consistently we were doing things. Sometimes you feel like you're doing it, or you feel like you're not doing it very well and I think it was nice to have her [the coach] share that with us.*

**Barriers.** Factors that were barriers to implementation included insufficient planning time, children not being engaged in the activity, and material preparation demands. No teacher explicitly stated that she did not implement the curriculum because it conflicted with her beliefs about teaching or that conflicting beliefs were barriers to

implementation. However, teachers did report this conflict as a possible reason why *some* teachers may not have implemented the curriculum fully. Teachers talked frequently about how they adapted an activity or substituted something that met the same goal as the curriculum activity, but which they believed was more developmentally appropriate or relevant for their children.

*There were teachers who haven't done another curriculum who don't really have those special ideas and thought about things already would probably implement it more fully than people who just maybe didn't even agree with everything.*

*...sometimes they had things they [the curriculum] wanted [us] to talk about that the kids, often there was other things that came up in the classroom that the kids would say, you know, this happened and this happened, so we would go with what the kids were talking about...in the curriculum, it might be talking about raining or thunderstorms when we're having snow storms outside. So, we wanted it to fit with where we are in our climate, our weather pattern. And out of the blue, you just can't, you know, with that being so abstract, you can't just pop that out with these little three and four year olds and expect anything to be very beneficial with it.*

Another factor not stated by teachers as a reason why they themselves did not implement was a lack of knowledge about how to implement; however, they did mention this as a possible reason why other teachers may not have implemented the curriculum fully. All teachers were fully trained on the curriculum; they completed a two-day initial training and half day refresher course each subsequent year. Weekly coaching sessions served to support teachers. Additionally, all but one teacher had over one year of classroom experience. Therefore the suggestion that teachers did not implement because lacked knowledge appears unlikely. If nothing else, it seems it would have been resolved by the end of the school year, when these interviews took place. However, it provides one

explanation to why teachers in other settings, with less experience and support, may not be able to fully implement a curriculum.

**Parents' role.** Parent perception of the curriculum was anticipated to be a factor in implementation by the researcher, but was only mentioned by one teacher as having an influence over what she did in the classroom. Three of the teachers reported some parents had positive perceptions of the curriculum but that most parents weren't aware of what went on in the classroom and that parent involvement had very little impact on what they did in the classroom. One teacher stated that it did not make a difference to her at all, saying, "You know, I would say no, it [parent perceptions] doesn't have any influence on how I implemented it. They seem so removed that, I mean, they really wouldn't, I hate to say, they really wouldn't care."

For the teacher who said it did make a difference in her implementation, parent perceptions were viewed as validation of the importance of the curriculum and its impact and as encouragement to continue implementing it. She stated that some of her parents were involved and reported positive changes they had seen in their children.

*The fact that they [the parents] were positive about it and saw the growth also helped me believe that it was really working and it is benefitting the kids to follow it.*

**Program/agency structure and other project components.** The program component that was reported as having an impact on implementation was the session type – part-day/part-time instruction versus full-day, full year instruction. Two teachers from the full year program reported feeling better able to implement all components of the curriculum because of the daily schedule. Teachers who were from part-day classrooms

referenced the challenges of implementing all parts of the curriculum within the time available each day.

*I think the curriculum is intended to be used for a full day.*

*I think having a full day, even though it's long for the kids and they get tired, they're still learning those vocabulary words because we use them throughout the day. So they have more hours to learn the vocabulary words than just the kiddos in the part day. But it was a long day for them.*

**Teacher perceptions of the fidelity checklist.** All but one teacher had fidelity checklists completed on their classrooms twice during the year. The remaining teacher began after the spring fidelity checklist had been completed for the year. Teachers were asked to reflect on the accuracy of the checklist and how it influenced their implementation. All teachers reported that they felt the fidelity checklist was an accurate reflection of what occurred in their classroom and that they used the results to improve classroom practices. Several teachers discussed how the results helped them focus on specific curriculum components.

*I felt like it was accurate, for sure, of what we were doing. Of course, helpful because anytime someone evaluates you or reflects with you what you're doing it's helpful. It makes you reflect on yourself and what you're doing...it was a great reflection tool to kind of fine tune or tweak some of the things that we were already doing.*

*I thought it was good that we got to see how consistently we were doing things. Sometimes you feel like you're doing it, or you feel like you're not doing it very well and I think it was nice to have her share that with us. I know one of the main things that we tried to work on this year was like I talked about meeting the purposes in the small groups and then for planning time in the morning meeting, making sure that we talked about all the areas and things like that. I know the first fidelity checklist for the morning meeting, I guess I had a low score. I know the second time we scored a lot better on it and it was because we went through all of the areas and talked about all of the areas...I think the fidelity checklist just showed us what we were doing well and what we could improve on and just taking those ideas and doing it.*

In summary, teachers reported the likelihood that they or other teachers would fully implement the curriculum would be higher because they 1) saw positive impacts of the curriculum on child outcomes, 2) had little previous experience to draw from, 3) had several supports for implementing the curriculum including a supportive coach, 4) had few implementation barriers, 5) had parents who voiced positive perceptions of the curriculum, and 6) taught in a full-day classroom. Teachers reported that they or other teachers would fully implement the curriculum would be lower because they 1) had more classroom teaching experience, 2) had fewer supports and more barriers to implementation, and 3) taught in a part-day classroom.

None of the teachers reported directly that her teaching beliefs played a role in her implementation. Further investigation into this idea is presented in the findings for research question 3. In that discussion, the themes above are also examined in relation to teachers' measured fidelity.

**Findings for Mixed Methods Research Question 3: What are the relations among teacher demographics, perceptions, fidelity of implementation and child literacy outcomes?**

Several approaches were used to examine the qualitative and quantitative data to answer the third research question regarding the relations among the variables. First, to explore the relationship between teacher demographic variables and fidelity, a bivariate correlation was run for all fidelity checklist subscales and overall means and teacher demographic variables of age, length of time employed in current position, years of experience in the field of early childhood education, highest level of education, in person



training hours completed in the last 12 months and hours of video or internet training completed in the last 12 months. As expected, there were very few correlations between fidelity subscales and teacher demographic characteristics. Overall Fidelity and mean Teacher Quality of Interaction ratings for fall and spring were not significantly correlated with any of the demographic variables. Within the subscales, only three significant correlations were found. For the fidelity subscale “vocabulary cards were in the centers” in fall, scores on this subscale were negatively correlated with both length of time in current position ( $r = -.67, p < .05$ ) and years of experience in the field of early childhood education ( $r = -.72, p < .05$ ). For the fidelity subscale “Let’s Find Out About It” in spring, years of experience in the field of early childhood education was negatively correlated ( $r = -.74, p < .05$ ).

Next, bivariate correlations we used to examine the teacher demographic variables outlined above and child outcome measures of mean classroom change scores on the PPVT-III, PALS-PreK Uppercase Letter Identification and GRTR. There were no significant correlations between teacher demographic variables and changes in child outcome measure scores (all  $ps > .05$ ).

Finally, qualitative data from the teacher interviews and the quantitative measures of fidelity and child outcomes were integrated. To do this, teachers were identified as being high or low on fidelity using the mean scores, as described in the section above detailing the findings for research question 1. Teachers were then identified as having high or low child outcomes by using the mean change scores on the three child measures (PPVT-III, PALS PreK Uppercase Letter Identification and the GRTR). Teachers with classroom change score means above the average on at least two of the measures were

placed in the high child outcomes group, while those with classroom means below the overall means on at least two measures were placed in the low child outcomes group. The mean split was used to group teachers into these categories as a way to create groups that would potentially have the greatest differences, in both levels of fidelity and changes in child outcomes. By doing so, differences in perceptions of these groups can be compared. As was seen in the previous ANOVA analyses, teachers in the high and low fidelity group did differ significantly in these scores, however, child outcome scores did not differ between the high fidelity and low fidelity group. Teachers are, therefore, split into these high and low child outcome groups for the purpose of exploring reported themes.

Using these criteria, teachers were identified as being hi/hi (high on both fidelity and child outcomes), hi/lo (high on fidelity but low on child outcomes), lo/hi (low on fidelity but high on child outcomes) and lo/lo (low on both fidelity and child outcomes). This resulted in three teachers in the hi/hi group, three teachers in the hi/lo group, two teachers in the lo/hi group and three teachers in the lo/lo group. Six of the eleven teachers participated in the interview, which resulted in qualitative data from one teacher in the hi/hi group, three in the hi/lo group, none in the lo/hi group and two in the lo/lo group (see Table 15 for a breakdown). While teachers were placed in high/low groups for fidelity and child outcomes, it is important to note that all classrooms saw positive changes in child outcomes from fall to spring and that teachers were, in general, following the curriculum. The purpose of grouping them in this way is to explore potential differences in perceptions that may, in combination with other factors, play a role in fidelity and child outcomes.

**Table 15. Teacher Sample by Fidelity and Child Outcome Grouping**

		Child literacy outcomes			
		Lo		Hi	
		Total n	Participated in Interview n	Total n	Participated in Interview n
Fidelity	Lo	3	2	2	0
	Hi	3	3	3	1

The codes identified for the second research question were sorted by these groups. Codes are reported, rather than themes, because while all groups reported out similar themes, the specific codes for each theme differed (e.g., all groups reported barriers to implementing, but groups reported different types of barriers and at some more often than others). For each group, the nature and occurrences of the codes were used to examine possible relationships between teacher perceptions as they related to levels of fidelity and child outcomes. Similarities and differences in the presence of codes reported by teachers in each of these groups were explored (except the lo/hi group, as the researcher did not have interview data from the two teachers in that group). In addition to reviewing the codes, the interviews were re-read for the general tone of the interview, such as, did the teacher speak more positively or negatively about the curriculum, did she spend time talking about the barriers to implementation, or other comments that provided a sense of the teacher's impression of the curriculum overall. These codes and overall impressions are presented for these teachers by group in Table 16. They reveal differences and similarities in perceptions among these groups.

In addition, the teacher demographic characteristics and classroom make up were explored to see if any patterns existed between these factors, fidelity and child outcome grouping and codes present in the interview. As presented previously, classroom

placement was conducted to create comparable classrooms, however, there were some differences in potentially key child characteristics between classrooms including ELL status, age and years in the intervention. Table 17 presents these data by fidelity and child outcome group for all teachers. The implications of these differences are discussed within exploration of the codes present in the interviews for each group for teachers that participated in the interview.

**Table 16. Joint Data Display of Teacher Codes by Fidelity Group and Child Outcome Group**

		Child literacy outcomes	
		Lo	Hi
Fidelity	Lo	<ul style="list-style-type: none"> <li>• High congruency between teacher and curriculum philosophy</li> <li>• Few barriers</li> <li>• High levels of support</li> <li>• Believe high impact of curriculum on child outcomes</li> <li>• Self-reported high fidelity</li> <li>• More positive statements about the curriculum in general</li> <li>• Positive about coaches and coaching</li> <li>• Positive about parents perceptions</li> <li>• Less experienced with children and curriculum, less prepared to implement</li> <li>• n = 2</li> </ul>	[No qualitative data available]
	Hi	<ul style="list-style-type: none"> <li>• Lower congruency between teacher and curriculum philosophy</li> <li>• More barriers</li> <li>• Fewer supports</li> <li>• Fewer positive changes in child behaviors and assessment</li> <li>• Self-reported high fidelity</li> <li>• More negative statements</li> <li>• Fewer comments and less positive about coach and coaching</li> <li>• Less positive about parent perceptions</li> <li>• More negative comments about child engagement and appropriateness of curriculum activities</li> <li>• Varied levels of experience with children and curriculum</li> <li>• n = 3</li> </ul>	<ul style="list-style-type: none"> <li>• High congruency between teacher and curriculum philosophy</li> <li>• Few barriers</li> <li>• High levels of support</li> <li>• Believe high impact of curriculum on child outcomes</li> <li>• Self-reported high fidelity</li> <li>• More positive statements</li> <li>• Positive about coaches and coaching</li> <li>• Positive about parents perceptions</li> <li>• Positive previous experiences</li> <li>• Positive experience with child engagement and curriculum</li> <li>• More experience with children and curriculum, better prepared to implement</li> <li>• n = 1</li> </ul>

**Table 17. Description of Teachers and Classrooms by Fidelity and Child Outcome Groups**

		Child literacy outcomes	
		Lo	Hi
Fidelity	Lo	Teachers had: <ul style="list-style-type: none"> <li>• less experience with ECE and the curriculum (less than 1 year)</li> <li>• less education</li> </ul> Classrooms had: <ul style="list-style-type: none"> <li>• slightly above average percent of ELL students</li> <li>• mixed levels of children in their second year of the intervention, both above and below the overall mean</li> <li>• mixed mean ages</li> </ul>	Teachers had: <ul style="list-style-type: none"> <li>• more experience with ECE and the curriculum (more than 2 years)</li> <li>• more education</li> </ul> Classrooms had: <ul style="list-style-type: none"> <li>• at or below the average percentage of ELL students</li> <li>• average rates of children in their second year of the intervention</li> <li>• average mean ages</li> </ul>
	Hi	Teachers had: <ul style="list-style-type: none"> <li>• mixed experience with ECE and the curriculum (1 year to 2 or more years)</li> <li>• more education</li> </ul> Classrooms had: <ul style="list-style-type: none"> <li>• below average percent of ELL students</li> <li>• high levels of children in their second year of the intervention</li> <li>• average mean ages</li> </ul>	Teachers had: <ul style="list-style-type: none"> <li>• more experience with ECE and the curriculum (2 or more years)</li> <li>• mixed levels of education</li> </ul> Classrooms had: <ul style="list-style-type: none"> <li>• above average percent of ELL students</li> <li>• mixed levels of children in their second year of the intervention (at and above the mean)</li> <li>• above mean ages</li> </ul>

The limited size of each group (and lack of representation from the low fidelity/high outcome group) precludes strong assertions about the meaning of these findings. However, sample size is not considered a factor in qualitative data analysis, and these findings do shed light on some potential differences between groups. One of the strengths of mixed methods is being able to gain insight into the data that would not be possible by looking exclusively at one type of data. The pattern that begins to emerge from these data shows that all teachers reported high levels of self-reported fidelity. All teachers rated their implementation as high even though the fidelity measure showed differences. The data also show that teachers in the low fidelity/low outcome group and the high fidelity/high outcome group offered very similar responses and are more positive than teachers in the high fidelity/low outcome group.

Teachers in the low fidelity/low outcome group were less experienced and reported feeling less prepared to implement the curriculum, which may have contributed to their lower rates of fidelity and child outcomes, but doesn't appear to have resulted in negative perceptions of the curriculum. The teachers in this group were both in their first year of the project and had less preschool classroom experience and education. That may explain why they self-reported high levels of fidelity. They may not have been as aware of what they should or weren't doing, as their intentions were to fully implement the curriculum. They were also eager and excited about the curriculum and appreciated the support they received. They felt positive about both improving their fidelity as they became more experienced and seeing more positive outcomes in their children. These teachers had slightly more ELL children but classrooms had mixed rates of children in their second year of the intervention and mean ages were above and below the overall mean.

The teacher in the high fidelity/high outcome category reported feeling prepared and using her previous experience with the curriculum to help with in the subsequent years. She mentioned specific ways that her children had improved, evidenced both by behaviors in the classroom and through results from the child assessments. She was more likely to attribute these outcomes to the curriculum or a combination of the curriculum and her own practices than teachers in the high fidelity/low outcome group. Teachers in this group had more experience and mixed levels of education. Their classrooms had more ELL children, older children and a mixed level of children in their second year of the intervention.

Teachers in the low fidelity/low outcome and high fidelity/high outcome group spoke more positively about the curriculum in general, making statements such as, *“I really enjoyed it”* and *“It was good.”* They noted that it matched their beliefs about how children learn best. Both groups also reported several supports to implementation and fewer barriers. Teachers in the high fidelity/high outcome group listed all of the supports that were mentioned by other teachers, whereas low fidelity/low outcome teachers focused more on the material supports. Both groups report parents having positive perceptions about the curriculum, which in turn helped to support their implementation. *“I think they [the parents] were really happy with it... And a lot of parents said that they're happy with all the stuff that their kids are coming home with, all of the activities they have done. I know one family at the home visit, their little boy wasn't speaking much English, he spoke Spanish...But by the end of the year they were so happy because he was speaking more English and he was making more friends and stuff like that...It [parent perceptions] just kind of reinforced what I was doing and, you know, hearing them say the good things”.*

Both the low fidelity/low outcome and high fidelity/high outcome groups also talked a lot about the changes they saw in the children in their classroom, both in observed behaviors and changes on child assessments. They viewed the curriculum as having positive impacts. This was true even though the low fidelity/low outcome group had lower child improvements (classroom means four child outcomes were below the average for all children) than the high fidelity/high outcome group. *“Oh, I think it [the curriculum] has been very successful. I can see it when we do our [assessments], the difference from the beginning of the year to the end of the year. How their*

*phonological awareness, the letter recognition, the blending words together, the parts of a book.” “Oh, I think it's been very successful. I mean, I just picture my kids from the beginning of the year and then the end of the year and how much, especially my kids that spoke Spanish, I mean, I've got a couple of kids that they speak just as good English as the kids that knew English from birth. So, I just feel like, in that way, it's really helped the kids. And then also seeing the different, their testing scores and stuff like that and how much those have improved.”*

Differences in codes appear for the high fidelity/low outcome group and show more negative perceptions and experiences with the curriculum, even though they implemented with high fidelity. These teachers had at least one year of experience with the curriculum and had more education. Their classrooms had fewer ELL children, children around the mean age and more children in their second year of the intervention. Teachers in the high fidelity/low outcome group reported more negative perceptions and made more negative comments about the curriculum. They also attributed positive changes in child outcomes more to their efforts, rather than as a result of the curriculum. One teacher in this group stated, *“It's hard to say, I think, how successful a curriculum is, because a curriculum doesn't teach the kids. The teacher and the people in the classroom are the ones teaching and implementing the curriculum...So, I think as teachers we take that curriculum and find the best possible way to deliver that to the kids so that they can learn. So, I think it's, of course, been successful because teachers see growth in lots of areas and so I think that part of it's been successful. But as far, from a teacher's aspect I guess, maybe there would be more successful ways in assisting us in that.”*

In addition, high fidelity/low outcome teachers were less aware of parents'



perceptions and reported parent perceptions as having less impact on implementation. High fidelity/low outcome teachers also seemed to view their role in implementing the curriculum differently than the other two groups, with more emphasis on doing the curriculum because it was part of the program. *“I feel like I totally implemented the curriculum because I was told to, that's what I was given.”* They made comments related to the challenges of fitting the curriculum into their daily schedule and of the curriculum's appropriateness for children in their classrooms at much higher rates than the other two groups. *“I think the curriculum is intended to be used for a full day. I feel like a lot of the activities, especially for the kids that we're working with, are geared more towards kindergarten... Just kind of different experiences that they have, that almost, sometimes I feel like almost too much so and not enough focus on things on letters and colors and numbers and counting and stuff. I felt like those types of elements that I think would be in a preschool curriculum and be targeted especially early on, I don't feel like the curriculum covers really at all and definitely not intentionally or in like a systematic way.”* These teachers also reported less congruency between how they believed children learned best and the curriculum.

No findings for teachers in the low fidelity/high outcome group can be reported because the three teachers who fell into this group did not participate in the interview. These teachers had more experience and more education. Their classrooms had average rates of ELL children, children in their second year of the intervention and average ages.

To address the question of teacher demographic characteristics having potential impacts on codes, a review of the themes by demographic characteristics of teachers did

not result in any clear patterns across these groups. Themes were equally reported in teachers at differing levels of education and experience. Also, teachers with less experience and less education were in both the low and high fidelity groups and had both positive and negative perceptions of the curriculum.

Findings for the third research question show little to no relationship between teacher fidelity, child outcomes and teacher demographic characteristics. Exploration of the qualitative data from the teacher interviews group by fidelity and child outcome levels show differences in teachers with differing levels of fidelity and child outcomes, with both low fidelity/low outcome and high fidelity/high outcome groups reporting positive perceptions and high self-reported levels of fidelity. While these perceptions were hypothesized for the high fidelity/high outcome group, it was presumed that teachers in the low fidelity/low outcome group would report different perceptions. Teachers in the high fidelity/low outcome group were least positive about the curriculum and reported different codes in their interviews than the other two groups. Teacher demographic characteristics appear to have no impact on teacher perceptions or fidelity group. Classroom make up, including percent of ELL children, age and years in the intervention did not have clear connections with perceptions of fidelity/child outcome grouping and were mixed in most of the groups. Rates of ELL students were an exception. Teachers in both the low fidelity/low outcomes and high fidelity/high outcomes had higher rates of ELL children in their classrooms and more positive perceptions. It is possible that the increase of ELL children contributed to more positive experiences for teachers.

## Summary

The findings reported in the previous section help to answer the research questions and test the hypotheses put forth. This section reviews the research questions and hypotheses and summarizes the findings for each.

Research Question 1 is, How does fidelity of implementation relate to child literacy outcomes? It was hypothesized that child outcomes would be significantly higher for children in classrooms with higher rates of curriculum implementation fidelity than for children in classrooms with lower rates of curriculum implementation fidelity. However, this hypothesis was not supported and, instead, the data revealed that 1) the two groups (high and low fidelity) differed significantly on their Overall Fidelity scores (due to the fact that they were grouped according to these means) but not in child outcome scores, 2) all classrooms, regardless of fidelity, demonstrated similar levels of relatively high classroom quality on other classroom measures (TLLB, ECERS-R and ELLCO), 3) various measures of classroom quality were not correlated with each other, and 4) levels of fidelity were not related to any of the child outcomes.

Research Question 2 was, What do teachers report as influences to curriculum implementation in Head Start classrooms? The purpose of this research question was to explore teachers' perceptions and experiences related to implementing the curriculum and their reflections about factors that influenced curriculum implementation. It was hypothesized that teachers would report both positive and negative perceptions of the curriculum and provide multiple factors that influenced their implementation, both supporting fidelity and creating barriers that may decrease the likelihood that the curriculum was implemented with fidelity. That hypothesis was supported by the data, as

eight distinct themes emerged from the qualitative data related to external and internal factors that impacted curriculum fidelity. Teachers also reported positive and negative perceptions and experiences with the curriculum. All teachers, however, reported good-to-high levels of fidelity for themselves.

Research Question 3 was, What are the relations among teacher demographics, perceptions, fidelity of implementation and child literacy outcomes? It was hypothesized that more positive teacher perceptions of the curriculum would be related to higher fidelity of implementation and better child literacy outcomes than more negative perceptions, and that teacher demographic characteristics will not be related to perceptions, fidelity or child outcomes. The findings from the mixed-methods approach using quantitative data to group teachers and then sorting their qualitative interview data revealed positive perceptions in the high fidelity/high outcome group, as expected, but also similar perceptions in the low fidelity/low outcome group. Teachers in the high fidelity/low outcome group differed from the other two groups and reported more negative perceptions of the curriculum and experiences. Additionally, this hypothesis was further partially supported by the data, with little to no relationship found between teacher demographic variables and overall fidelity or child outcomes.

Overall, the findings provide insight into the relation between teacher perceptions, child outcomes and fidelity and the interactions that may take place as teachers implement curricula in their classrooms.

## CHAPTER 5: DISCUSSION

The purpose of this study was to explore the relations among teacher fidelity, teacher perceptions, teacher demographics and child literacy outcomes using a mixed methods approach. Goals of the study were to examine these crucial components of a literacy intervention to better understand the relation of intervention fidelity to child outcomes, and to gain knowledge to improve future intervention programs through the integration of variables from the multi-faceted classroom environment captured by both quantitative and qualitative data.

The main conclusions from the study are that: 1) fidelity did not appear to impact child outcomes, 2) teachers' perceptions of the curriculum provided additional information about the interactions between perceptions and fidelity and, 3) teachers who had high fidelity but low child outcomes expressed different and more negative perceptions about the curriculum than both those teachers who had high fidelity and high child outcomes, as well as low fidelity and low child outcomes. A more detailed discussion of these conclusions by research question follows.

Research Question 1 explored the relationship between fidelity and child outcomes and was investigated in two ways: by examining high and low levels of fidelity in relation to outcomes and as a continuous measure. No relations to child outcomes were found for the child outcome measures. These findings imply that fidelity had no impact on the early literacy skills measured. There were significant simple effects for time, fidelity and ELL status but additional analyses confirmed that fidelity scores could not predict child outcomes scores, even when additional variables and subsamples were included. Further exploration of these findings will be discussed below.

The possibility that fidelity interacted with other factors to predict child outcomes were explored as well. For example, classroom quality could moderate fidelity effects on child outcomes. Class comparisons of fidelity and several measures of classroom quality (ECERS-R, ELLCO, CLASS, TLLB) showed two things: 1) all classrooms were at high levels of quality with means above the indicators of high quality for all measures and, 2) all classrooms were at high levels of quality with means above the indicators of high quality for all measures. Correlations showed that fidelity was not correlated with other quality measures. These results imply that high levels of classroom quality can occur at various levels of fidelity.

It is possible that, within these high quality environments (as demonstrated by high means for classroom quality measures) fidelity does not have a significant impact. It's also possible that, within high quality classrooms, the curriculum does not add to the child outcome impacts beyond those contributed by overall quality. There may be a 'threshold' or acceptable level of fidelity to produce child impacts and, at this level, perhaps it is the case that all children improved as long as the curriculum is implemented with some fidelity or other quality activities took place, as was seen in this study. In all, the conclusion drawn from Research Question 1 was that fidelity did not affect child outcomes. All children improved over time but not as a function of fidelity.

While the quantitative study did not show positive results for fidelity for child outcomes, there are many lessons from the qualitative analysis for how to implement and support a literacy curriculum in a preschool program. The qualitative findings for Research Question 2 offer insights into teachers' experiences and perceptions. Themes from the interviews indicate teachers reported both internal and external factors related to

fidelity and their experiences. The data show that previous experience in teaching—and in particular with the curriculum—parent perceptions, teachers’ perceived role, coaching and agency contributed to their perceptions. Teachers provided information on supports and barriers to implementation and how they viewed the success of the curriculum and their perceived impact on child outcomes. The themes indicate teachers were more likely to implement when they saw positive child outcomes to the curriculum and attributed some of that to the curriculum, and when they felt supported through having materials prepared for them or by receiving feedback, encouragement and support from their literacy coach and when parents were positive about the curriculum. Teachers reported feeling less likely to implement when faced with barriers such as scheduling issues, negative experiences with the curriculum such as poor child engagement, negative perceptions about the curriculum such as the activities not being developmentally appropriate for their children or instruction in other skills being more needed. These data are meaningful in understanding preschool teachers’ experiences with implementing curricula and they offer suggestions for ways to support teachers’ implementation and improve implementation fidelity.

Conclusions drawn from Research Question 2 are that preschool teachers come into the classroom with a unique set of experiences and ideas about how children learn best, as well as their role in impacting child outcomes and determining what skills and activities are most appropriate. They use these beliefs, their experience with the curriculum, barriers and supports to form a perception about the curriculum and its effectiveness. The perceptions about the curriculum, as well as internal and external factors, may contribute to fidelity. Findings from this study can be used to support

fidelity in other early childhood programs. This study suggests that curriculum interventions may be aided by assessing teachers' own congruency with the curriculum and measuring how that impacts both their level of fidelity and child outcomes. The current study would suggest that teachers are most likely to be successful (at both fidelity and child outcomes) when they feel supported in implementing, have positive experiences with the curriculum, believe the curriculum is a good match for their own philosophy of how children learn best, see positive changes in children's abilities and experience increasing child assessments scores. Also, it appears that some teachers may be unable to accurately rate their level of fidelity (as seen in the interview responses of observed low fidelity teachers rating themselves as high fidelity) and may benefit from an observer and feedback on fidelity, such as through the use of a curriculum coach or peer reviews.

Research Question 3 mixed the quantitative data about fidelity and child outcome with the qualitative data on curriculum perceptions, in order to explore differences in perceptions between groups based on both these factors. Several conclusions can be drawn from these data. First, the low fidelity/low outcomes group self-reported high fidelity even though the fidelity observation measure showed they had lower fidelity. Second, teachers with both high fidelity and high child outcomes were positive about the curriculum. Third, teachers with high fidelity and low child outcomes were more negative about the curriculum than the other groups.

In regard to the first finding, it may be that teachers with less experience, both with the curriculum and in preschool classrooms, are not able to accurately measure their level of fidelity. This would support a conclusion that new teachers need more external



support in reflecting on their practices to increase their fidelity. In regard to the second finding, it may be that teachers with positive perceptions of the curriculum tend to implement it more fully, which may lead to positive child outcomes (that may be discernible with larger samples). With respect to the third finding, it may be that if teachers have negative perceptions, even though they implement a program with high fidelity, there may be a negative impact on child outcomes.

Data from the low fidelity/high outcomes group would have been useful in shedding more light onto the idea of fidelity or child outcomes being mediated by perceptions, especially if those teachers chose not to participate in the interview due to negative perceptions. The teachers in that group tended to be more experienced and have consistently high quality classrooms. Negative perceptions in a group with low fidelity but high child outcomes may lend support to the idea that a combination of negative perceptions of the curriculum and low fidelity, coupled with high quality classrooms, could lead to high positive outcomes because teachers were not implementing (or not implementing as much) of a curriculum they didn't fully support. Whereas, teachers with high fidelity, negative perceptions and lower child outcomes may have resulted from teachers implementing a curriculum they didn't fully support. In a sense, they did it but their hearts were not in it. This approach was markedly different from teachers that chose to do what they felt comfortable with.

By including the mixed methods analyses, we learned even more about the interactions between these variables. Teachers with high fidelity and high child outcomes reported very similar perceptions of the curriculum and experiences as teachers with low fidelity and low child outcomes. The differences between these groups were that the high

fidelity/high outcome group had more experience in preschool classrooms and with the curriculum. Teachers with high fidelity but low child outcomes reported the most negative perceptions of the curriculum. Their levels of experience varied. The qualitative and mixed methods analyses added unique findings and made significant impacts on the interpretations of the data. They broadened the somewhat limited and mostly insignificant quantitative findings to highlight the differences between teachers based on qualitative measures.

Putting the three questions together, some general conclusions drawn are that fidelity interacts with teacher perceptions, classroom environments and child outcomes, and teachers with different levels of fidelity and child outcomes report different perceptions about and experience with the curriculum. Additionally, as seen by mixing the data, potential influences on both fidelity and child outcomes may be brought to light. Despite non-significant findings, there may be additional benefits from fidelity beyond what was explored in the current study. Even though fidelity wasn't shown to directly contribute to child outcomes, increasing fidelity may provide other benefits to teachers and students such as creating positive classroom climates. We see glimpses of this with the high fidelity/low child outcomes group; they implemented the curriculum but were less positive about it, which may have had an impact on child outcomes through negative teacher perceptions rather than fidelity.

### **Significance of the Study**

The current study makes contributions by demonstrating that (1) direct relations between fidelity and child outcomes are not automatically identified, contrary to expectation; (2) teacher perceptions of fidelity are nuanced but these nuances make a

difference. These findings are likely to be useful to implementation science (Dunst, Trivette, & Raab, 2013; Franks & Schroeder, 2013), a science in its infancy. Third, the study contributes in its use of mixed methods, by demonstrating that relations between fidelity and child outcomes seem to vary in a complex way. Without the inclusion of qualitative and mixed methods analyses, the additional layers of the complex relations between fidelity, teacher perceptions and child outcomes would not have come to light. These results are consistent with rationale for and benefits of conducting mixed methods research. The design of the study, with qualitative and quantitative measures, along with the small sample size and focus of the research questions, suggested that a mixed methods approach was most appropriate and allowed for the most in-depth exploration of the data.

Altogether, the study is significant because of its inclusion of fidelity observations as a potential mediator for child outcomes in an intervention study, its exploration of teacher perceptions as a way to further understand the experience of the teacher, and its examination of potential relations between these perceptions and both fidelity and child outcomes.

### **Limitations**

There are several limitations to the current study. The small number of teachers limited the ability to explore trends and relations between the variables. Uneven participation in the interviews and quantitative data made a full mixed method analysis impossible. The two teachers who were in the low fidelity group with high child outcomes did not participate in the interviews, so their unique experiences and

perceptions—which may have yielded some useful information—could not be included in the analysis for the second and third research questions.

There were also challenges and a limited range within the fidelity and classroom measures. The measure of fidelity may have been flawed, as literacy coaches who were not trained to reliability collected it. It would have been strengthened by third party verification. Rates of fidelity for both high and low fidelity groups, although significantly different, were high (above 70%). This limited variability in teachers' fidelity may have affected the study's ability to explore differences in distinct groups and answer questions related to the impact of fidelity on child outcomes as well as its relation to teacher perceptions.

Lastly, as a secondary data analysis project, the original study was not designed to answer the current study's research questions. The measures selected served to answer the original project's research questions and, therefore, did not include additional (or more rigorous) measures of fidelity, unannounced fidelity visits or multiple time points for gathering qualitative data (such as videotaped observations or multiple interviews). Following the analysis of the interview questions, a follow up interview could have been included to further explore the themes that emerged.

### **Implications of Conclusions**

Findings for the first research question showed no relation between fidelity and child outcomes. The implication for this finding is that perhaps curriculum fidelity in high quality classrooms may not be as important or have an added benefit for child outcomes. However, because of the general high (means above 70%) levels of fidelity, it may also imply that teachers achieve a 'threshold' for fidelity and that, when coupled

with high quality classrooms, positive child outcomes result. In this case, teachers in high quality classrooms would be afforded some flexibility within a curriculum to implement most, but not all, of the key components and still find positive child outcomes. Doing so may alleviate some pressure on teachers, result in more positive perceptions and experiences and allow for more teacher autonomy.

The exploration of the relations between fidelity, teacher perceptions and child outcomes has important practical applications in the field of early childhood. Early childhood programs should be encouraged to consider and include teacher perceptions in curriculum-related decisions and also include measures of fidelity towards program services and instruction. The interview data show that teachers form perceptions about the curriculum and are able to identify supports and barriers to implementation. These include supports from material preparation, coaching, positive child engagement, positive parent feedback and barriers such as time constraints, perceived developmental appropriateness of activities and lack of child engagement. These findings may be useful in future intervention design and implementation and may contribute to the broader area of implementation science.

Programs can work with teachers to help alleviate barriers and increase supports. Even though this study did not show a strong relationship between fidelity and child outcomes, all teachers implemented with generally high levels of fidelity. Programs should use accurate measures of fidelity to ensure that teachers are implementing with fidelity and to increase fidelity. The measures of fidelity can also be used to control for differences in child outcomes between classrooms, as has been recommended by Carroll and colleagues (2007) and others (e.g. Goodwin, 2011; O'Donnell, 2008) and supported

by studies that found interventions have more positive child outcomes when implemented with fidelity (e.g. O'Donnell; Davidson et al., 2009; Hansen, 2001). As discussed above, programs will need to consider the tradeoffs for different levels of fidelity, teacher perceptions and child outcome benefits.

The findings of this study reinforce previous research that has shown that classroom quality, fidelity, and child outcomes cannot be predicted by teacher demographic characteristics (e.g. Justice, Mashburn, Hamre, & Pianta, 2007). While previous research has shown links between fidelity and beliefs about the intervention effectiveness, satisfaction with the program and buy-in (Bruce & Ross, 2008; Greenberg et al., 2001; Rimm-Kaufman & Sawyer, 2004), the current study did not see that for all teachers, as teachers with high fidelity expressed both positive and negative perceptions. Programs cannot predict which teachers will implement with fidelity based on demographic characteristics.

The findings from the teacher interviews demonstrate that teachers have varied views on the curriculum they implement and are able to provide insights into barriers and supports for implementing curricula. Programs may also benefit from interviewing teachers to determine if adaptations or specific curriculum components should be modified. Teachers may be able to reflect on the curriculum and determine what components are essential and which ones teachers may choose to adapt or replace, depending on personal preference, experience, class needs or priority.

The use of mixed methods in exploring the relation between fidelity, teacher perceptions and child outcomes also has implications for this area of study. If only the quantitative data had been analyzed, it would have presented a picture that showed

fidelity did not impact child outcomes. By including the qualitative data, unique findings were revealed. For example, the perceptions of parents about the curriculum was seen as something that encouraged some teachers to continue implanting with fidelity, while parental perceptions did not factor into other teachers' implementation. In a somewhat more complex example, positive behaviors and improved assessment scores were seen differently by teachers; some attributed those results to the curriculum, while others downplayed the potential role of the curriculum and put more weight/responsibility of those positive changes on their own role. Teachers used their previous experience, both with the curriculum and with other curricula, along with their personal beliefs about how children learned best, to evaluate the curriculum.

Teachers' ratings of their own fidelity did not vary as a function of their observed fidelity. All teachers rated their own fidelity as high, regardless of if they were in the high or low fidelity group. One caveat to this, however, is that all teachers who were interviewed did implement with relatively high level of fidelity (minimum Overall Fall Fidelity score of 74.1% versus the minimum score of 59.8% for the full sample). Those with some of the lowest fidelity scores did not participate in the interview, possibly because of negative perceptions, which may have influenced their implementation. It is also not clear whether teachers were able to accurately rate their own fidelity, either because they thought they implemented with high fidelity because they were unaware of elements they were not doing or because they believed they were doing components as intended or were overstating their fidelity. It is possible that the introduction of technology, such as reviewing videotaped lessons for reflection, could help teachers—

especially less experienced teachers—gain more realistic evaluations on their own fidelity and offer opportunities to further reflect on their practices.

Does this mean fidelity doesn't matter? These findings suggest that the answer is complicated. Fidelity did not guarantee high child outcomes, as seen by high fidelity teachers having both high and low outcomes and low fidelity teachers achieving high child outcomes. Previous research has shown that higher fidelity can produce higher child outcome (e.g., Dusenbury et al., 2003; O'Donnell, 2008; Dane & Schneider, 1998; Elliot & Mihalic, 2004; Mihalic, 2004). However, fidelity doesn't ensure positive child outcomes, as in the current study, there were teachers with both high and low fidelity that had high child outcomes. There is more going on that warrants exploration to understand the relation between fidelity and positive child outcomes. This 'more' involves looking at the interplay of teacher perceptions, experiences and classroom make up. Implementation science would expand this even further to include the entire process of implementing a curriculum in an early childhood program.

How can we predict fidelity? We may not be able to. This study supports previous research that fidelity is not directly linked to education level or experience (e.g. Justice, Mashburn, Hamre, & Pianta, 2007). Teachers with high and lower levels of education and experience had high and low levels of fidelity. In addition, there were teachers with high fidelity who had both negative and positive perceptions of the curriculum (reported in the interviews). This finding implies that teachers may have high fidelity because they believe in the curriculum or because they are told to implement it. It is those perceptions that may have an impact on child outcomes, as was seen. Teachers



with high fidelity but negative perceptions had low child outcomes (as seen when the data were mixed).

Perhaps we can't predict fidelity and we can't say that fidelity will result in positive child outcomes. We can only do our best to select appropriate curriculum, provide support for implementation and measure fidelity and child outcomes. Or perhaps we should work backwards and consider teacher beliefs, experiences, classroom make-up in choosing our curriculum that would most likely result in higher fidelity. Factors beyond the scope of this study are considering program factors, culture and individual curriculum demands on fidelity (i.e., implementation science).

We must also acknowledge that there will always be teachers who do not implement with high fidelity, either by choice because they don't agree with it or have other preferences or without intention, because they lack the skills, support or knowledge to complete the curriculum components. Individuals in each program must consider for themselves what an acceptable level of fidelity is. Deviations from the curriculum may still produce positive outcomes. What becomes challenging is that we cannot know, for these classrooms with low fidelity but high child outcomes, if the child outcomes could have made further gains with higher fidelity. The current study saw high child outcomes in both high and low fidelity groups but was not able to determine if children who had high child outcomes benefitted more in high fidelity classrooms than those in low fidelity classrooms. An important next step would be to determine what fidelity adds to high quality classrooms.

There is a cost associated with levels of fidelity, higher levels of fidelity may increase child outcomes or, if teachers are not empowered and in agreement with the

curriculum, it may have a negative impact on child outcomes. On the other hand, if fidelity is lower, child outcomes may be lower or teachers who have conflicts with the curriculum may still do well and have positive child outcomes.

### **Directions for Future Research**

Future research in this area could include exploring the relations between fidelity, teacher perceptions and child outcomes in lower quality classrooms with more diverse and variable rates of fidelity. Future studies should include a larger number of teachers with diverse backgrounds and experience. By being able to capture a larger range of experience and quality, teachers may demonstrate a larger range of levels of fidelity and perceptions. Having additional child outcomes measures would also allow for exploration of the potential impact of fidelity on various early literacy skills, beyond what was explored in the current study.

Next steps towards understanding these relations could include examining programs before and after a change in curriculum. Studies examining this topic should include several measures of fidelity that include verifying fidelity, classroom observations and pre- and post- teacher beliefs that could be that collected at the end of the year or after years of using the curriculum, in order to extend to teacher's beliefs and potential changes in perceptions. A fidelity measure could include additional components of fidelity, beyond the adherence dimension explored in the current study. The inclusion of different dimensions of fidelity may yield different results.

The qualitative findings offer insights into supports and barriers of implementing a curriculum and provide lesson on how programs can support fidelity within their staff by providing feedback and reflection opportunities, training, material support and

coaching. Additional supports for improving fidelity could include technology supports, such as video or audiotaping lessons for small group or self-analysis. These options could be done as part of ongoing professional development at the school or through distance education.

In addition, the preliminary and limited findings regarding differences in perceptions for teachers by fidelity and child outcomes warrant further investigation. This may involve exploring further the potential impact on fidelity and child outcomes of negative teacher perceptions of the curriculum. Future studies could explore changes in teacher perceptions, fidelity and child outcomes over time and within an intervention targeting improving fidelity.

### **Summary**

The purpose of this study was to explore the relations between fidelity, teacher perceptions and child outcomes in order to better understand the experience of preschool teachers implementing a literacy curriculum and how those variables interacted with each other. Qualitative findings provided insight into teacher's perceptions of the curriculum and various barriers and supports to curriculum implementation. These findings may be used by early childhood programs to support implementation fidelity. Although findings showed no relationship between fidelity and child outcomes, further exploration with various levels of fidelity and quality may yield significant results.

The inclusion of teacher perceptions and a mixed methods design served to better model the complexity of the factors that may contribute to child outcomes. The study suggests that, in intervention or program evaluations or when trying to predict child outcomes, teachers should not be viewed solely as mechanical implementers of a

curriculum, but rather as another participant whose own meaning system, experience and perceptions interact with fidelity and child outcomes in varying ways.

This study offers an example of some of the complexity that interacts to impact one aspect of implementation, fidelity. These relationships can be further explored within the broader scope of implementation science. By understanding the nature and interplay of these multiple factors, conditions and the implementation process itself, there is great promise for more effective interventions, positive child outcomes and an easier transition of evidence-based practices into early childhood classrooms.

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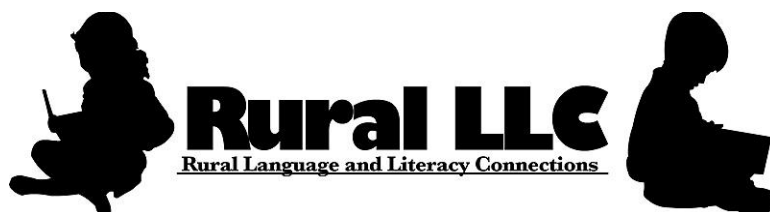
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## Appendix A

## Teacher Background Questionnaire

**EARLY CHILDHOOD PROFESSIONAL****INFORMATION FORM*****FALL 2009***

*Please answer the following questions. All information you provide will be kept confidential. There are no right or wrong answers to questions. The information you provide will help us better understand you and your profession. Any information provided on this form will be kept private.*

NAME \_\_\_\_\_

CENTER/ PROGRAM \_\_\_\_\_

ID# \_\_\_\_\_

DATE \_\_\_\_\_

1. What is your age? \_\_\_\_\_ years  
 1a. What is your birth date? \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_ (month/ day/ year)
2. What is your gender?      Male    or    Female
3. What do you consider your race/ethnicity? (please check one)
- \_\_\_\_ White, non-Hispanic  
 \_\_\_\_ Black/African American  
 \_\_\_\_ Hispanic or Latino  
 \_\_\_\_ American Indian/ Alaska Native  
 \_\_\_\_ Asian American  
 \_\_\_\_ Native Hawaiian or other Pacific Islander  
 \_\_\_\_ Other: Please specify \_\_\_\_\_
4. What is your primary language? \_\_\_\_\_
- 4a. Do you know other languages that are used in your work?    \_\_ Yes            \_\_ No  
 If **yes\***, please specify: \_\_\_\_\_
5. At which agency are you employed? (circle one)
- |                                    |                             |
|------------------------------------|-----------------------------|
| Head Start                         | Grand Island Public Schools |
| Child Care Center (not Head Start) | Family Child Care Home      |
- 5a. What is your current position in that agency? (please check one)
- |                    |                                   |
|--------------------|-----------------------------------|
| ____ Teacher       | ____ Family educator/home visitor |
| ____ Aide          | ____ Family Child Care provider   |
| ____ Administrator | ____ Other: Please specify _____  |
- 5b. For how long have you been employed in this position? \_\_\_years\_\_\_months
6. How many years of experience do you have teaching or delivering services in an early childhood setting (birth to age 5 years)?    \_\_\_\_years    \_\_\_\_months
7. What is the highest level of education you have completed? (please check only one)
- \_\_\_\_ a. less than high school  
 \_\_\_\_ b. high school diploma  
 \_\_\_\_ c. GED  
 \_\_\_\_ d. some training beyond high school but not a degree  
 \_\_\_\_ e. one year vocational training certificate  
 \_\_\_\_ f. two year college degree  
 \_\_\_\_ g. four year college degree  
 \_\_\_\_ h. some graduate college coursework  
 \_\_\_\_ i. graduate degree
- 7a. If you have a degree, was your field of study child-related?    \_\_ yes    \_\_ no

7b. Do you have an early childhood teaching endorsement or certificate?  
 \_\_\_ yes\* \_\_\_ no If **yes\***, State of endorsement: \_\_\_\_\_ Endorsement: \_\_\_\_\_

7c. Do you have another type teaching endorsement or certificate? \_\_\_ yes \_\_\_ no

8. Have you completed a Child Development Associate (CDA) credential? \_\_\_ yes \_\_\_ no

9. How many in-person training hours have you completed in the past 12-months?  
 (including in-service activities, but not video or internet training) \_\_\_\_\_ hours

10. How many training hours have you completed in the past 12-months via video or  
 internet training? \_\_\_\_\_ hours

11. Have you completed a multi-day training program in any of the following? (check all  
 that apply)

- \_\_\_\_\_ a. West Ed Training or Program for Infant Teachers (PITC)
- \_\_\_\_\_ b. High/Scope
- \_\_\_\_\_ c. Beautiful Beginnings
- \_\_\_\_\_ d. Montessori Training
- \_\_\_\_\_ e. Parents as Teachers
- \_\_\_\_\_ f. Creative Curriculum
- \_\_\_\_\_ g. Project Construct
- \_\_\_\_\_ h. Heads Up! Reading
- \_\_\_\_\_ i. First Connections
- \_\_\_\_\_ j. Early Childhood Care and Education Management
- \_\_\_\_\_ k. Other: Please specify: \_\_\_\_\_

12. Income is an important feature to understanding quality early childhood programs.  
 What was ***your personal annual income*** last year earned from your employment in early  
 childhood services, before taxes? (please check only one)

- |                                     |                                     |
|-------------------------------------|-------------------------------------|
| _____ Less than \$8,000             | _____ Between \$16,000 and \$19,999 |
| _____ Between \$8,000 and \$10,000  | _____ Between \$20,000 and \$29,999 |
| _____ Between \$10,000 and \$12,499 | _____ Between \$30,000 and \$35,000 |
| _____ Between \$12,500 and \$15,999 | _____ \$35,000 or more              |

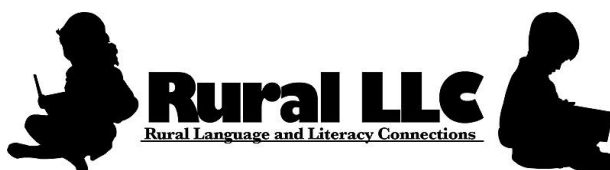
13. During a typical month how many ***families*** do you work with in your child care or  
 preschool classroom? (this includes contact outside of the center/school)

- \_\_\_\_\_ 1 to 3 families
- \_\_\_\_\_ 4 to 6 families
- \_\_\_\_\_ 7 to 9 families
- \_\_\_\_\_ 10 to 12 families
- \_\_\_\_\_ 13 to 15 families
- \_\_\_\_\_ f. 16 or more families
- \_\_\_\_\_ g. Not applicable

***Thank you for your time!***

## Appendix B

## OWL Curriculum Fidelity Checklist

*OWL Implementation Checklist-Revised –2010*

*Modified from Jonathan Fribley, Education Consulting St Cloud MN and Candi Foltz-Hall, Shannon County School District, SD*

Classroom \_\_\_\_\_

Date/ Time of Observation \_\_\_\_\_

<b>Morning Meeting</b>	0=Does not do 1=limited basis 2=Fully N/A	Observations
<b>Curriculum Fidelity</b> Teacher implements morning meeting in a manner consistent with the curriculum		
<b>Preparation</b> Materials for demonstrations are readily available at the morning meeting location		
<b>Length and timing</b> Morning meeting is brief, 7–15 minutes, happens right before center time		
<b>Demonstrates procedures</b> Teacher demonstrates how to use centers so that children understand proper procedures		
<b>Demonstrates exploration</b> Teacher demonstrates centers in a manner that sets the stage for children’s independent exploration		
<b>Clarity</b> Teacher demonstrations are easily visible and understandable to children		
<b>Vocabulary</b> Teacher introduces vocabulary related to the materials or use of a center in way that teaches meaning.		
<b>Connections</b> Teacher makes connections to the Unit (e.g. books read, prior activities)		
<b>Choice</b> Teacher names each of the centers to remind children of all the centers that are available for their choosing		

<b>Centers</b> Quality of Interactions 1 Basic to 5 Exemplary		<b>Teacher</b>	<b>Assist 1</b>	<b>Assist 2</b>	<b>Observtns</b>
<b>Participation</b> Is constantly participating in centers with children					
<b>Invites conversations</b> Seeks to engage children in conversation about their activity after observing					
<b>Sustains conversations</b> Engages in extended conversations that remain on a topic four or more turns.					
<b>Vocabulary</b> Models vocabulary use or talks about the meaning of words.					
<b>Child Choice</b> Promotes effective child choice by permitting choice, helping children be interested in and learn how to use materials purposefully, assisting with choices when needed, and making all centers “open” and available					
<b>Instruction</b> Provides direct instruction when appropriate					
<b>Monitoring</b> Effectively monitors the group; ensures children are not disengaged or wandering.					
<b>Quality of Centers</b>	<b>Curriculum fidelity</b> Correct materials for unit and week are present 0 = No 1 = Yes	<b>Materials quality</b> Materials are well organized, in good condition, and cognitively engaging 0=Not in place 1= Approx half of materials 2=Well organized	<b>Vocabulary</b> Vocabulary cards are posted 0 = No 1 = Yes	<b>Observations</b>	
<b>Art Area and Easel</b>					
<b>Blocks</b>					
<b>Book Area</b>					
<b>Dramatic Play</b>					
<b>Puzzles and Manipulative</b>					
<b>Sand and Water</b>					
<b>Writing</b>					
<b>Story Time</b> Title _____		0=Does not do 1=limited basis		Observations	

Book Reading 1 2 3 4 # children _____	2=Fully N/A	
<b>Curriculum Fidelity</b> Teacher reads and discusses the book in a manner consistent with the curriculum.		
<b>Introduction</b> Teacher introduces book in a manner that aids comprehension and engagement		
<b>Reading Expression</b> Teacher reads books with expression and energy and uses some variety. This might include changes in pitch, volume, speed, and use of facial expressions and gestures.		
<b>Vocabulary</b> Teacher uses explicit and implicit vocabulary instruction techniques		
<b>Engagement</b> Teacher encourages and supports children's engagement in the story		
<b>Comprehension</b> Teacher supports literal and/or inferential comprehension, as is appropriate for the "read" of the story, through methods such as "think-alouds," summarizing, and using prior knowledge		
<b>Conversations during Reading</b> Teacher responds to children's questions or to comments indicating confusion about the story, but does not get sidetracked by excessive talk.		
<b>Post Story Discussion</b> Teacher engages in thoughtful discussion after the story has been read.		
<b>Connections</b> Teacher refers to book (characters, plot, vocabulary, etc.) throughout the day, such as centers, outside time, meal times, etc.		
<b>Small Groups – Observation</b> 0=Does not do; 1=limited basis; 2=Fully; N/A	Teacher	Observations
All groups have the teacher and/or assistant supervision and support they require to function well.		
All necessary materials are prepared and available at the small group location		
Small group activities are provided in a manner consistent with the curriculum.		
Children are attentive and appear engaged.		
Teacher notes children whose attention is wandering, draws them in without stopping the flow of the event by using nonverbal techniques, questions, comments to focus observation, etc.		
Teacher provides clear explanations and information consistent with the curriculum		

Teacher modifies activities to meet the needs of individual children.		
Teacher uses curriculum vocabulary in ways that help children understand the meanings of the words.		
Teacher provides extension activities as needed		
<b>Songs, Word Play, and Letters</b>	0=Does not do 1=limited basis 2=Fully N/A	Observtns
<b>Curriculum Fidelity</b> Teacher leads SWPL activities in a manner consistent with the curriculum.		
<b>Engaging</b> Sings songs, reads poems, plays games, etc in an playful, animated, engaging manner		
<b>Enjoyment</b> Children are enjoying SWPL		
<b>Scanning</b> – notices children who are not engaged and brings them back into the activity in a non-obtrusive and non-punitive manner		
<b>Purpose</b> Teacher makes clear topic/skill that is the focus of group		
<b>Connections</b> Teacher connects activity to theme, book, or previous activity		
If routines focus on letters (letter pocket, BINGO), teacher points to & names letters or If counting activities, teacher says numbers clearly and actions make clear the number word meanings.		
Teacher encourages children to identify letters and/or numbers, say their names.		
For routines that focus on PA or other skills, teacher makes the skill explicit (“rhyme”, “first sound”) and emphasizes it in delivery.		
Teaches word meanings: points to object/picture, says words, defines words, gives clear hints meanings.		
Teacher encourages children (as a group or individuals) to say key words.		
Teacher presents activities specified by lesson plans or changes retain skills focus in curriculum.		
Teacher makes math content clear such as operations (adding, subtracting) and math concepts (e.g., last number counted = how many).		
Whenever possible, teacher points to print, and tracks left to right.		
<b>Let’s Talk About It/ Let’s Find Out About It</b>	0=Does not do 1=limited basis 2=Fully	Observations

	N/A	
Teacher uses classroom experiences to promote pro-social behavior		
Teacher uses non-fiction text to build children's background knowledge and vocabulary		
Teacher uses LFOAI to increase children's depth of experience/ comprehension of story time books, small group and center activities		

<b>Mealtime/Outside Time</b> # children _____	0=Does not do 1= limited basis 2=Fully N/A	Observations
<b>Interaction</b> Teacher and Assistants interact with children.		
<b>Actively</b> Teacher and Assistants actively draw children into conversations about personal experiences.		
<b>Actively</b> Teacher and Assistants actively draw children into conversation about classroom units or activities.		
<b>Engages</b> Teacher and Assistants engage in extended conversation that remains on a topic for five or more turns.		
<b>Vocabulary</b> Teacher uses explicit and implicit vocabulary instruction techniques.		
<b>Connections</b> Teacher refers to book (characters, plot, vocabulary, etc.) throughout the day, such as centers, outside time, meal times, etc.		



## Appendix C

### Teacher Guided Interview Questions and Procedures

#### **Detailed Interview Questions: Attitudes and Beliefs about Literacy and Language Development and Curriculum Implementation**

Thank you for participating in this interview. The purpose is to gain a better understanding of teachers' implementation of the OWL curriculum. During this interview, we will be talking about the curriculum – OWL and about issues of fidelity. Fidelity means implementing OWL as written in the curriculum guides, high fidelity would mean implementing OWL fully, completely, following all the requirements. The interview will be audio taped and transcribed verbatim. Your responses are confidential, no names will be used or reported and your individual responses will not be shared with the agencies. Following the interview, you may be contacted to clarify your responses or provide more information, if we have additional questions.

#### **Curriculum**

1. How do you feel children learn language and literacy skills best?
2. Describe the ideal preschool curriculum.
3. Tell me about your experience with the OWL curriculum. What do you think about it?
4. How would you describe the OWL curriculum to other teachers? To parents?
5. How does OWL match or not match your personal philosophy about how children learn best?
6. How successful do you think OWL has been?

#### **Implementation**

7. Describe your implementation of OWL. How fully do you feel you implemented the curriculum? Why? Why did you implement OWL? What about you influenced your implementation? What factors influenced you? If there were parts of the curriculum that you did not implement, why?
8. Do you think some teachers implement OWL more so than others? Why or Why not? For ones that implemented completely – why? For those that didn't – why not?
9. How likely are you to use OWL, if given the choice? Please be specific, what components or parts of it would you use. What would you exclude? What would you do in place of OWL?
10. How did the curriculum impact student learning?
11. What do you think parents thought about how/what their children were learning? Did that have any influence on your implementation?

**Supports for curriculum**

12. What support did you receive to implement OWL? What helped you the most/the least? What else would have helped?
13. How prepared did you feel to implement OWL?
14. What role did your coach play in how you implemented the curriculum?
15. How were your instructional strategies to support language and literacy affected by coaching?
16. What barriers to implementation did you face? What got in the way? Could any of these have been changed?
17. How do you feel about the implementation checklist completed by your coach?

**Beliefs and practices**

18. Describe your teaching beliefs/style.
19. What role do the teachers' beliefs and attitudes play in child outcomes?
20. What factors do you think contribute to child improvement?

**Other/overall project**

21. Was there anything else that made a difference or influenced your implementation?
22. Did any of the other components of the ERF project influence your implementation? How were they a factor in how you implemented OWL?
23. Did you use the child assessment information from the reports in your classroom (for planning, etc.)? How useful was this? How was sharing it with parents?
24. What efforts did you make to support the home-school connection?
25. Is there anything else about the project that you would like to comment on?

### Attitudes and Beliefs About Literacy and Language Development and Curriculum Implementation

Please circle how much do you agree or disagree with the following statements.

	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
1. I implemented OWL with high fidelity.	1	2	3	4	5
2. I agree with the philosophy of the OWL curriculum.	1	2	3	4	5
3. OWL matches my beliefs about how children learn literacy and language skills best.	1	2	3	4	5
4. I felt comfortable implementing OWL.	1	2	3	4	5
5. I felt supported implementing OWL.	1	2	3	4	5
6. I believe our agency should continue using the OWL curriculum even after the ERF project has ended.	1	2	3	4	5
7. I believe OWL made a positive impact on child outcomes.	1	2	3	4	5
8. I believe a different curriculum would have made a bigger impact in child outcomes.	1	2	3	4	5
9. I believe a different curriculum is more appropriate for the children in our program.	1	2	3	4	5