RESEARCH ARTICLE

Accelerating Preschoolers' Content Vocabulary: Designing a Shared Book Intervention in Collaboration with Teachers

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The purpose of this three-year investigation was to develop an 18-week shared book reading intervention guided by teacher feedback on instructional practices, including the design and delivery features from the shared book reading and vocabulary research that could be effectively implemented by preschool teachers to accelerate children's content vocabulary knowledge as researchers implemented a design experiment. To date, this methodology has been implemented in the design of few preschool vocabulary curricula. Thus, the results of this study contribute to the theoretical understanding of the feasibility of instructional practices that intensify typical shared book reading practices.

Vocabulary learning is one of the most important aspects of schooling and serves as a gatekeeper to success in the wider world. That is, as children learn more words, they learn more about the world and become better prepared to discuss academic content, make connections to life experiences, and comprehend text in later years (Catts, Fey, Zhang, & Tomblin, 1999; Hart & Risley, 1995). Although many children acquire general content knowledge and vocabulary concepts through conversation and typical school instruction, others, including children from highly impoverished backgrounds, arrive at school with gaps in vocabulary and connected world knowledge that negatively impact their ability to benefit from general instruction (Hart & Risley, 1995; Hirsch, 2003).

These knowledge differences have been attributed to children's limited exposure to daily "informal informational lessons" (Neuman, 2006, p. 25) transmitted at home via adult-child conversations. This limited exposure is especially evident in children from high poverty settings (Hart & Risley, 1995). Ultimately, these deficiencies negatively impact the acquisition of domain

knowledge and comprehension skills which are important to academic success (Anderson, Wang, & Gaffney, 2006; Hirsch, 2003).

Historically, the primary approach to accelerating vocabulary knowledge in young children has been shared book reading (Ezell & Justice, 2005; Hargrave & Sénéchal, 2000; Mol & Bus, 2011; Mol, Bus, & de Jong, 2009; What Works Clearinghouse [WWC], 2006; Whitehurst & Lonigan, 1998), an instructional practice that occurs between an adult and a child/children that has been studied for the past 25 years in Head Start and subsidized child care settings (Blok, 1999; Ezell & Justice, 2005; Hargrave & Sénéchal, 2000; Scarborough & Dobrich, 1994; Spycher, 2009; Wasik & Bond, 2001; Wasik, Bond, & Hindman, 2006; Whitehurst & Lonigan, 1998).

Book reading practices that integrate evocative or interactive adult-child strategies (e.g., extending children's oral responses to open-ended questions about a story or storybook pictures) have been the most widely investigated and seem to benefit children who enter school with low vocabulary knowledge (Ezell & Justice, 2005; Justice, 2002; Lonigan, Shanahan, & Cunningham, 2008; Mol, Bus, de Jong, & Smeets, 2008; National Early Literacy Panel [NELP], 2009; Valdez-Menchaca & Whitehurst, 1992; Zucker, Cabell, Justice, Pentimonti, & Kaderavek, 2012). In fact, emerging evidence suggests that interactive book reading styles that integrate explicit book discussions via varied text genres (informational texts + storybooks) may accelerate both content vocabulary learning and world knowledge (e.g., science concepts) (Collins, 2010; French, 2004; Leung, 2008; Spycher, 2009). Therefore, the ability to close the gap between young children with sufficient knowledge and those with limited knowledge may depend on evidence-based school practices that accelerate vocabulary learning early while building important content knowledge (Farkas & Beron, 2004; Hirsch, 2003; Walsh, 2003a, 2003b).

Despite the mounting evidence that children from low-income settings require a quality of vocabulary instruction that is able to close both early word and knowledge gaps, research indicates that typical book reading practices may not be intensive enough to support children's vocabulary and language development (Mol et al., 2009; Penno, Wilkinson, & Moore, 2002), and there is no clear understanding of which scientifically based book reading practices are usable and feasible for teachers in real classroom settings.

To better understand what design and delivery features from the shared book reading and vocabulary research can be effectively implemented by teachers in classroom settings, we proposed and implemented a design research methodology. The specific purpose was to develop an interactive, language-rich content-based shared book reading vocabulary intervention in collaboration with 27 preschool teachers to intensify typical book reading practices and to identify instructional obstacles when accelerating content vocabulary learning for children with limited prior exposure to vocabulary and concept knowledge.

Thus, a design research methodology in early childhood settings enables scientific research to be applied to curriculum development (Clements, 2007; Neuman & Dwyer, 2011) while trying to understand conditions that may hinder or facilitate the implementation of instructional innovations (Bradley & Reinking, 2012). However, few preschool shared book reading interventions have been developed using this systematic process or have incorporated teacher feedback to understand the usability and feasibility of instructional features.

This article first reviews the role of design experiments and teacher collaboration in educational research and then describes the instructional features of a content-based shared book reading intervention that was developed and refined via teacher feedback/collaboration as a way

to allow researchers to examine potential instructional features of usability and feasibility of a scientifically based preschool book reading approach.

THE ROLE OF DESIGN EXPERIMENTS AND TEACHER COLLABORATION

A design experiment is a systematic methodology used to develop and formatively refine an instructional intervention through purposeful observations and analysis of intervention implementation to determine under which conditions interventions function and are effective in educational settings (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003; Collins, Bielaczyc, & Joseph, 2001; Gersten & Baker, 1998; Gorard, Roberts, & Taylor, 2004; Neuman & Dwyer, 2011; Shavelson, Phillips, Towne, & Feuer, 2003). Although design experiments have been used in educational settings to develop and improve literacy instruction (Abbott, Reed, Abbott, & Berninger, 1997; DeCusati & Johnson, 2004; Mastropieri et al., 2010; Reinking & Watkins, 2000), to our knowledge, to date this methodology has been used in the design of few preschool vocabulary curricula (Bradley & Reinking, 2011, 2012; Neuman & Dwyer, 2011) or in the development of preschool vocabulary interventions in which teacher feedback played a decisive role.

Although teacher collaboration on interdisciplinary teams is considered crucial in the design of early childhood interventions (Horn & Jones, 2005), traditionally, teachers' insights have rarely been validated and used in meaningful ways in educational research (Nevárez-LaTorre, 1999), especially in the research of child development (Takanishi & Bogard, 2007). Within the shared book reading literature, the same holds true. That is, few book reading investigations with young children (e.g., French, 2004; Neuman & Dwyer, 2011; Schwanenflugel et al., 2010) have reported collaborations between teachers and researchers in the development of a shared book reading intervention, with only one design experiment study specifically focused on the development of vocabulary and conceptual knowledge in disadvantaged preschool children (Newman & Dwyer, 2011). In the current investigation, the design research methodology gave preschool teachers a voice and, in turn, reshaped our understanding of vocabulary teaching and learning.

TEACHING CONTENT VOCABULARY VIA A SHARED BOOK READING INTERVENTION

As we sought to better understand how teachers can feasibly intensify typical preschool shared book reading practices for children with limited prior exposure to words and world knowledge, we hypothesized that young children from low-income settings would require high-quality shared book reading instruction on important concepts to close existing language disparities. Further, we hypothesized that to accelerate learning our shared book reading intervention and materials must accelerate meaning-based skills such as oral language, vocabulary, and world knowledge (Whitehurst & Lonigan, 1998) through an instructional design process that allows teachers to (a) focus on priority skills (content knowledge), (b) communicate information with clarity, (c) provide systematic feedback about a task or content, and (d) scaffold vocabulary task difficulty (Simmons, Pollard-Durodola, Gonzalez, Davis & Simmons, 2008; Carnine, Silbert, & Kame'enui, 1997; Engelmann & Carnine, 1991).

The critical elements for intervention design enabled preschool teachers to (a) implement content organized by science and social studies themes, (b) provide daily 20-minute group vocabulary instruction, (c) explicitly introduce and review six semantically related words per week (three per book) via pictures (book illustrations, picture concept cards, theme cards), and (d) be supported in their teaching with the use of instructional scaffolds embedded in highly specified daily lessons. In order to implement this pedagogical approach, all books and researcher-developed lesson plans and materials were provided to teachers. Some of the features of instructional design and delivery that were implemented in our final 18-week book reading approach are described below.

Distributed thematic instruction. In this shared book reading routine, preschool teachers dedicated 20 minutes of their language/literacy time to daily content vocabulary instruction in which weekly researcher-developed "lesson units" were organized around a science (e.g., living things) or social studies theme (e.g., places where we live and go) and a smaller topic that was developed and discussed through the book reading sessions.

Within this routine, content vocabulary instruction was distributed before, during, and after reading the text to provide multiple exposures to both new words and connected concepts. Before reading the text, teachers primed students' background knowledge and previewed vocabulary in a discussion using engaging picture concept cards to provide a concrete representation of the word and important word-world connections. Further, while reading the book, teachers provided brief in-context explanations of the target words by pointing to a related book picture/illustration to clarify word meaning and to connect vocabulary learning to real-world knowledge and life experiences (e.g., *This is a root. A root is the part of the plant that grows in the ground. Here we see the roots spreading out in the soil. Why do you think this happens?).* Finally, after reading the book, content-related words were reviewed, and children deeply processed words and connected science and/or social studies concepts and life experiences by discussing both contextualized (e.g., Teacher points to a picture in the book: *What do we call dirt that plants grow in*?) and decontextualized comprehension questions (e.g., *Tell me about soil you have seen*.). See Figure 1 for an example of how book reading content was organized by themes and Figure 2 for how thematic instruction was distributed across the shared book reading lesson.

Theme 4: LIVING THINGS (eat, grow, and use air)

13 Plants	Mr. Greg's Garden	62: Garden	A place where people have plants
		63: Plant	The middle part of the plant that is
	How a Seed Grows	64: Seed	The thing that plants grow from
		65: Soil	Dirt is something that plants grow in
		66: Root	The part of a plant that grows in the ground
14 Plants	Planting a Rainbow	67: Ground	A root is part of the plant that grows in the ground
		68: Sprout	To grow a new part of a plant
		69: Bulb	Round part of a plant under the ground like a seed
	Leaves	70: Vine	A long, curvy stem
		71: Bud	Part of the plant that turns into a leaf or flower

Figure 1. Overview of preliminary themes, topics, vocabulary, and twin texts.

Lesson Content Map
Week 13: *Mr. Greg's Garden / How a Seed Grows*
Theme 4: Living Things
Topic: Plants

	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
Title	*Mr. Greg's Garden*		*How a Seed Grows*		*Mr. Greg's Garden & How a Seed Grows*
Text Structure	Story		Information Book		Story & Information Book
Before Reading	⏱ 5 minutes ❶ Talk about the Theme ❷ Magic Word Preview ❸ Text Structure and Prediction	⏱ 3 minutes ❶ Talk about Magic Words	⏱ 5 minutes ❶ Magic Word Preview ❷ Text Structure and Prediction	⏱ 3 minutes ❶ Talk about Magic Words	⏱ 15 minutes ❶ Discuss Magic Words Pages (both books) ❷ Same Game ❸ Ready, Set, Go! ❹ Magic Mirror ❺ Talk about the Theme ❻ Wrap-up
While Reading	⏱ 5 minutes ❶ Summarize Listening Goals ❷ Introduce Magic Words within the book. Read the book.	⏱ 6 minutes ❶ Summarize Listening Goals ❷ Read the book	⏱ 5 minutes ❶ Summarize Listening Goals ❷ Introduce Magic Words within the book. Read the book.	⏱ 6 minutes ❶ Summarize Listening Goals ❷ Read the book	
After Reading	⏱ 5 minutes ❶ Magic Word Review ❷ Book Questions with Magic Words ❸ Wrap-up	⏱ 6 minutes ❶ Ready, Set, Go! ❷ Challenge Questions with Magic Words ❸ Magic Mirror ❹ Wrap-up	⏱ 5 minutes ❶ Magic Word Review ❷ Book Questions with Magic Words ❸ Wrap-up	⏱ 6 minutes ❶ Ready, Set, Go! ❷ Challenge Questions with Magic Words ❸ Magic Mirror ❹ Wrap-up	
Cards	Theme Card D: Living Things 123: Garden 124: Plant	125: Garden 126: Plant 101-126: Ready, Set, Go!	127: Seed 128: Soil 129: Root	130: Seed 131: Soil 132: Root 101-132: Ready, Set, Go!	Theme Card D: Living Things Vocabulary Cards: 101-132: Ready, Set, Go! 1-100: Ready, Set, Remember! *After today, move cards 101-110 to the Remember pile.
Total Time	⏱ 15 Minutes	⏱ 15 Minutes	⏱ 15 Minutes	⏱ 15 Minutes	⏱ 15 Minutes

Figure 2. Lesson Content Map for Week 13, Theme: *Living Things*.

Five-day instructional sequence.   In sum, within a weekly thematic unit, Day 1 was used to introduce (a) a storybook and important background information on an important theme/concept (e.g*., Living things are plants, animals, and people. They are special because they need water, air, and sunlight. Today we will learn about plants.*); (b) three semantically related vocabulary (e.g., *seed, soil, root*); and (c) eight comprehension questions (e.g., one related to text genre, one related to the main idea in storybooks and information about a topic in informational texts, two questions about each target word and connected concept). Day 2 included a second reading/discussion of the book, reviewed vocabulary (*Ready, Set, Go!; Magic Mirror)*, and extended opportunities to make connections between words, concepts, and life experiences via an activity requiring analytical higher level thinking (*Challenge Game).* Days 3 and 4 accomplished the same goals but introduced and reviewed/extended new information via a thematically linked informational text and three new semantically related words (e.g., *What was the big thing that you learned about seeds, soil, and roots in our information book?*). Day 5 was used to cumulatively review and integrate all words ($N = 6$) and knowledge learned in that week across thematically linked twin texts (Storybook + Informational Text) with opportunities to integrate words and connected science concepts from the present and previous weeks. (See Figure 2 for an overview of the weekly scope and sequence). The following are examples of shared book reading instructional features implemented using this pedagogical approach:

• Repeated text reading and distributed instruction/discussions to increase the number of exposures to words and concepts;

> • Varied text genre (informational text + storybook paired by theme);
> • Brief in-context definitions on semantically related words;
> • Priming of background knowledge via content-related pictures; and
> • Interactive adult-child dialogues.

PURPOSE OF THE STUDY

The purpose of this study was to describe the design and delivery features from the shared book reading and vocabulary research that could be effectively implemented by preschool teachers. The specific goal was to accelerate children's content vocabulary knowledge as researchers implemented a design experiment to develop a shared book reading approach guided by teacher feedback on the feasibility of instructional practices.

METHOD

To engineer and evaluate the feasibility of a content-based vocabulary shared book reading intervention, we relied on a progressive development and research methodology that began with the involvement of teachers while field testing instructional lessons in Year 01 and culminating in a randomized quasi-experimental study in Years 02 and 03, in which teacher participants implemented the intervention and provided feedback about its instructional feasibility and usability.

DESIGN AND CONTEXT OF THE STUDY

Design experiments use cycles of invention and revision to inform and improve products and practices (Cobb et al., 2003; Gorard et al., 2004; Shavelson et al., 2003). In these cycles, both qualitative and quantitative data and methodologies may be employed in an effort to understand the "underlying processes" that make an instructional innovation work (Reinking & Bradley, 2008, p. 44).

Qualitative methods allowed researchers to take field notes (Marshall & Rossman, 2006) during informal passive observations conducted in naturalistic settings (e.g., preschool classrooms) as well as focus group sessions (Stewart, Shamdasani, & Rook, 2007) with teachers to understand the feasibility of shared book reading practices. Quantitative methods, in turn, allowed researchers to evaluate the effectiveness of the shared book reading approach that had been developed and refined via teacher feedback and collaboration`. Using this methodological approach, results from qualitative and quantitative data form a more complete picture of the educational context being studied.

Our design experiment consisted of three identifiable phases that allowed researchers to better understand the design and delivery features from shared book reading and vocabulary research that could be effectively implemented in real preschool settings:

Phase I: Preliminary Intervention Design.   The primary objective in Phase I (Year 01) was to develop a preliminary teacher-delivered shared book reading intervention. The design

of the content-based intervention was based on findings from informal classroom observations of typical preschool shared book reading practices, an evaluation of existing preschool curricula for alignment with evidence-based shared book reading and vocabulary practices, and a review of the shared book reading literature to identify which features are required in order to positively influence the vocabulary learning of children with limited vocabulary knowledge.

Phase II: Field Testing, Teacher Feedback, and Curriculum Refinement.   The primary objective in Phase II (Year 01) was to field test and refine the preliminary shared book reading intervention with the assistance of four preschool teachers, who implemented the shared book reading lessons in two-week curricular units with a group of children ($N = 9$) in their classroom. Teachers provided feedback on the feasibility of the instructional tasks.

Phase III: Intervention Effects, Teacher Feedback, and Curriculum Refinement. In Phase III (Years 02 and 03), researchers evaluated the impact of the content-based shared book reading intervention on preschool children's vocabulary outcomes (researcher-developed and standardized measures) and refined the curricular intervention while investigating its features in terms of their potential usability and feasibility.

School districts.   Teachers and students in the study were enrolled in two ethnically diverse school districts in South Central Texas. By design, we chose schools that had a high percentage of students from low socioeconomic backgrounds who were likely to enter school with limited vocabulary and world knowledge, placing them at risk for future comprehension difficulties. In School District A, 69% of the student body qualified for free and reduced-cost lunch, including 85% of the preschool students. In School District B, 30% of the student body qualified for free and reduced-cost lunch, including 90% of the preschool students.

Teachers.   Across the three years of the design experiment, 25 preschool teachers (intervention teachers, $n = 16$; comparison teachers, $n = 9$) with similar educational and professional experiences participated in the study. Of the participating teachers, 82% held a bachelor's degree and 6% a master's degree. Further, 72% held elementary certification, 81% held early childhood certification, and 52% held English as a Second Language (ESL) certification. Overall, the teachers had a mean of 8.24 ($SD = 6.24$) years of teaching in pre-kindergarten/Head Start. See Table 1 for the number of teacher participants, new teachers and returning teachers, by school district in each phase of the study.

Students.   Across the three years of the design experiment, 309 students participated in the study (Phase II, $n = 36$, Phase III, $n = 273$). Because students were nested in classrooms, in Phase II (Year 01) we conducted research in four classrooms. In Phase III we conducted research in 18 classrooms in the first experiment (Year 02) and 28 classrooms in the second experiment (Year 03). Students were from low-SES families and from ethnically diverse backgrounds: 43.6% African American, 27.6% Hispanic, 22.1% White, 4.9% Asian, and 1.8% other ethnicities.

TABLE 1
Summary of Teacher Participants in Phases II and III of the Design Experiment

	Phase II: Field Testing of Curriculum and Materials (Year 01)	Phase III: Experiment I (Year 02)	Phase III: Experiment II (Year 03)
Intervention			
District A	4	3 returning, 2 new	3 returning, 3 new
District B	0	6 new	6 returning, 1 new
Practice-As-Usual			
District A	0	4 new	4 returning, 1 new
District B	0	3 new	2 returning, 1 new

DATA COLLECTION AND ANALYSIS PROCEDURES

Below are summarized the procedures for data collection and analysis across the three design experiment phases that allowed researchers to include both qualitative and quantitative data sources to better understand the feasibility of the shared book reading approach and materials.

Phase I Preliminary Intervention Design

Prior to intervention design, the three researchers worked to better understand practice-as-usual shared book reading preschool instruction through observations and by conducting a literature review of shared book reading interventions implemented in settings of children with limited vocabulary knowledge and/or from low-SES settings.

     Informal classroom observations.   Researchers collaborated with a principal from a preschool center (School District A) with a large percentage of students with free and reduced-cost lunch status, who allowed them to visit three classrooms and informally observe shared book reading lessons. Naturalistic observations (Bogdan & Biklen, 2003) were appropriate because they allowed researchers to understand typical preschool book reading practices in a natural setting without manipulating instruction.

     One researcher observed two preschool teachers, one time each, and took field notes. The other two researchers independently observed one teacher together. Although no formal observation protocol was used, researchers independently attended to length of the book reading session, target word instruction, adult-child interactions/conversations, organization of book reading content, instructional format, and text genre. Using investigator triangulation (Johnson, 1997), when multiple researchers cross-collect, -check and interpret data to increase the validity of a study, the three researchers later discussed the observations, noting specific themes or

"trends" (Bogdan & Biklen, 2003, p. 187) that emerged of typical book reading practices. The principle investigator summarized the themes in a narrative report.

The principal at the preschool center then recommended four "master teachers" based on their instructional expertise who might be interested in collaborating with researchers by implementing and providing feedback on future intervention lessons. These teachers consented to participate in the study and, subsequently, selected from their class enrollments a total of 36 children with parental consent to participate in field testing the content-based shared book reading intervention. On average, a group of nine children participated in each of the four classes.

Literature review.   Researchers then reviewed the shared book reading literature from 1990 to 2006 to identify which features from prior shared book reading research are required to positively influence the vocabulary learning of young children with limited vocabulary knowledge. In the search of journal articles, book chapters, dissertations, and bibliographies, terms used included *preschool, pre-k, kindergarten, pre-kinder, elementary, early, primary,* and *day care,* combined with *reading* and *storybook, "story-book," story-telling, shared book, shared-book, oral book, dialogic,* or *aloud,* and *teacher, aide.* Researchers specifically reviewed the literature for features of effective shared book reading interventions conducted with young children from low-SES backgrounds and/or who exhibited vocabulary deficits.

Preschool curriculum review.   During this time, one researcher and a doctoral student also reviewed three commonly used preschool curricula and materials for alignment with evidence-based shared book reading and vocabulary practices. First, the researcher created a standard checklist of instructional features (explicit instruction, multiple exposures to words, vocabulary instruction distributed before, during, and after book reading, thematic instruction, etc.) emphasized in the shared book reading and vocabulary research. The two then discussed the characteristics of each feature to ensure they were in agreement on how a given feature might appear in a preschool curriculum. Finally both individuals reviewed the preschool curricula independently, indicating a yes or no by each checklist feature, and met to discuss whether the instructional features were present/absent in the curricula. Data were analyzed by creating a summary table of the three curricula to facilitate comparison by instructional feature.

Collectively, findings from these shared book reading studies and knowledge derived from the curricular review and informal observations of typical shared book reading practices were used to establish the empirical foundation for the interactive shared book reading pedagogical approach that was implemented by teachers in Head Start and preschool classrooms in the present study.

Phase II: Field Testing, Teacher Feedback, and Curriculum Refinement

In this year (01), the preliminary curriculum was field-tested and refined.

Professional development.   Teachers received three-hours of professional development (PD), in which researchers-developers introduced the goal of the vocabulary intervention, brief research findings on effective interactive book reading practices for children

with vocabulary deficits, and modeled Week 1 lessons, demonstrating how to read and talk about books, words, and a science topic. Teachers were paired for role-playing opportunities and implemented the instructional tasks while receiving feedback from researchers.

   Teacher feedback.   As researchers-developers created the shared book reading lessons in two-week curricular units, the four preschool teachers implemented the lessons with a group of nine children in their classrooms. During this time, they used a scale from very low to very high on a Teacher Feedback Form (see Appendix A) to provide feedback on the feasibility of the instructional tasks (appropriateness of activity sequence, level of student learning, etc.) and the usability of the materials (ease of using manipulatives, ease of teacher instructions, etc.). Documentation from this form was shared by teachers during two focus group sessions to discuss the usability and feasibility of the materials and shared book reading lessons. Focus groups were considered appropriate because they allow in-depth discussion of a topic, which helps researchers understand participant views on a particular issue (Bogdan & Biklen, 2003).
   The first focus group was held towards the middle of intervention implementation at the early childhood center in School District A to foster a conversation about the design and feasibility of the shared book reading process and materials that had been used so far. It was composed of the four preschool teachers. The discussion was guided by a semi-structured protocol which included the following questions by researchers: What do you see as strengths of the intervention? What do you see as the weaknesses of the intervention? Researchers took field notes independently about teacher recommendations and concerns. Teachers were able to discuss the usability of materials and the feasibility of each instructional task based on their documentation on the Teacher Feedback form. This focus group lasted for approximately four hours. Using investigator triangulation (Johnson, 1997), the researchers then met and discussed their summary of teacher recommendations and concerns to verify if they were in agreement. The principal investigator summarized in narrative form major themes or trends that emerged in the discussion (LeCompte & Schensul, 1999).
   The second focus group also held at the same early childhood center lasted three hours. The researchers used the same focus group procedures (the same semi-structured protocol to facilitate the discussion, all researchers took field notes independently, etc.) and used investigator triangulation (Johnson, 1997) to verify researcher agreement about emerging themes of teacher concerns. The principal investigator summarized these themes in narrative form (LeCompte & Schensul, 1999). Findings from both focus groups guided the development of a 12-week content-based (science themes) shared book reading intervention.

Phase III: Intervention Effects, Teacher Feedback, and Curriculum Refinement

The 12-week science intervention.   In the first randomized trial, we evaluated the impact of the 12-week content-based shared book reading intervention on both researcher-developed and standardized vocabulary outcomes for preschool children who entered school with low vocabulary knowledge in two school districts (School Districts A and B) in two ethnically diverse cities in South Central Texas. (See Pollard-Durodola, Gonzalez, Simmons, Kwok, Taylor, Davis, Kim, & Simmons, 2011, for further details.).
   Eighteen teachers were randomly assigned to either the intervention ($n = 11$) or the practice-as-usual (comparison) condition ($n = 7$). See Table 1 for summary of teacher

participants for this phase. We conducted research in 6 classrooms in one school district and in 12 Head Start classrooms in 7 schools in the second school district. As stated, schools and classrooms were in school districts where a high percentage of preschool students were from low-SES backgrounds. At the class level, 9 to 10 children who were at or below the 30th percentile on the Peabody Picture Vocabulary Test - III [PPVT], Forms A and B (Dunn & Dunn, 1997), indicating that they entered school with low vocabulary knowledge, were placed in the intervention and comparison group. The final sample consisted of 125 preschool children (intervention = 69, comparison = 56), who entered school with low vocabulary knowledge.

Both standardized and experimenter-developed vocabulary instruments were used to measure pre- to posttest growth in receptive and expressive vocabulary knowledge for both intervention children and those in the practice-as-usual condition. The experimenter-developed curriculum based measures were included because they are more sensitive to gains in vocabulary growth than standardized vocabulary measures; however, the latter provide valuable information for comparing student performance with national norms (Hargrave & Sénéchal, 2000; National Reading Panel [NRP], 2000; Whitehurst et al., 1994).

The receptive vocabulary measures included the PPVT-III, Forms A and B (Dunn & Dunn, 1997) and the proximal Researcher-Developed Receptive Picture Vocabulary Test (RDRPVT). The PPVT-III is a general measure of receptive vocabulary that allows the child to point to one of four pictures on a panel that represents an object or action that the examiner names. Alpha reliability coefficients reported in the manual for the current sample age group range from 0.94 to 0.95 for Forms A and B.

The proximal RDRPVT used a procedure, materials format, and response requirements that were similar to those of the PPVT-III but measured content vocabulary words taught in the shared book reading intervention. The researchers used a stratified, random sampling procedure and selected one vocabulary word from each of the 24 intervention books used so that 33% of the target words were tested to avoid an unduly lengthy assessment, which would be inappropriate for young children.

The expressive vocabulary measures included the Expressive One-Word Picture Vocabulary Test [EOWPVT] (Brownell, 2000) and the proximal Researcher-Developed Expressive One-Word Picture Vocabulary Test [RDEPVT]. The EOWPVT is a general measure of expressive vocabulary that asks the individual child to verbally provide the name of objects, actions, and concepts pictured in illustrations. Alpha coefficients reported in the manual for the current sample age group range from .95 to .96. The proximal RDEPVT used a procedure, materials format, and response requirements that were similar to those of the EOWPVT but measured content vocabulary knowledge specifically taught in the shared book reading intervention. The target vocabulary was the 24 words assessed on the RDRPVT. All measures were administered by trained graduate and undergraduate assistants two weeks before and two weeks after completion of the intervention.

Professional development (PD) was provided to ensure high implementation of book reading practices that might be novel for most Head Start and preschool teachers. As in previous book reading studies, our PD module now included (a) modeling of shared book reading instructional tasks, (b) role-playing opportunities for teachers with feedback from researchers, (b) and the use of a video-taped book lesson followed by a discussion of ideal adult-child book reading practices (Arnold, Lonigan, Whitehurst, & Epstein, 1994; Lonigan & Whitehurst, 1998; Whitehurst et al., 1994).

Within the framework of daily constraints (e.g., limited time when teachers would be available for PD, not being able to use a coaching model), the PD module was now more extensive and included an initial four-hour session followed by three distributed 90-minute booster sessions (beginning, middle, and before the end of the intervention), in which a researcher met with a small group of teachers to discuss implementation practices (pacing, scaffolding, etc.) based on a fidelity observation.

In the initial four-hour session, first, researchers-developers introduced the goal of the vocabulary intervention, brief research findings on effective interactive book reading practices, and the architecture of the intervention (science themes and topics that organize book reading content, etc.). Second, teachers watched a video-taped vignette and identified instructional strategies that facilitate adult-child interactions before, while, and after reading a book. Third, one researcher modeled an entire Day 1, Week 1 lesson, modeling how to extend children's oral responses while distributing vocabulary instruction. This researcher also pointed out specific features of the five-day instructional sequence (parallel tasks for introducing and/or reviewing words and connected concepts across Days 1-4) and modeled strategies as they appeared in the five-day instructional cycle. Lastly, teachers were paired for role-playing opportunities using Week 1 lessons and materials, which allowed teachers to practice implementing important instructional features (distributing vocabulary instruction before, during, and after reading texts; teaching from thematically paired storybook and informational text, extending children's oral language responses, scaffolding for task difficulty, repeated reading of texts; etc.). Teachers switched roles between being the teacher and the student while being observed by researchers who provided feedback on lesson implementation and additional strategy modeling when required.

Treatment fidelity was measured three times to document the validity of instructional behaviors at the beginning, middle, and end of the intervention period. Teachers were video-taped by a graduate student, and observations were rated by researchers using a measure with a Likert-type scale with anchors ranging from a score of 0 (minimal implementation) to 3 (very high implementation) for each instructional dimension that corresponded to the five-day instructional cycle of the intervention. Results showed that the teacher fidelity of implementation scores ranged from .74 to .99 ($M =.89$). Although these implementation scores were acceptable, summaries of the three PD 90-minute booster sessions conducted in response to the fidelity observations to provide feedback to teachers in a small group format confirmed that there were frequent discussions between researchers and teachers on how to extend children's limited oral language abilities.

After intervention implementation, 9 of the 11 intervention teachers met with 2 researchers in a focus group held at the university approximately one month after the intervention period. One researcher facilitated the discussion, which was guided by a semi-structured protocol that included the following questions: What do you see as strengths of the intervention? What do you see as the weaknesses of the intervention? Additionally, each researcher took field notes independently by using a table consisting of three categories (general feedback on instructional activity, feedback on teacher talk during the activity, and feedback on student talk during the activity) for each instructional task for Days 1-5. Teachers then talked specifically about their implementation experience as the principal investigator took field notes. This focus group lasted for five hours.

After the focus group, investigator triangulation (Johnson, 1997) was used as the two researchers met to discuss their field notes and verify that they were in agreement on teachers'

concerns and recommendations. Field notes and discussions were subsequently analyzed by themes that emerged from the session. Finally, the principal investigator summarized the themes in narrative form (LeCompte & Schensul, 1999) and created a table summarizing individual teacher feedback/verbatim across the following categories: General Feedback, Parts You Liked Best, Modification/Weaknesses, Parts to Change.

Multi-level modeling (Hox, 2002) was used to analyze the impact of the intervention on vocabulary outcomes due to the nested structure of the study (125 students nested within 18 classrooms taught by 18 teachers). Together, qualitative and quantitative findings were used to guide curriculum refinement and to develop a more extensive 18-week intervention.

The expanded 18-week science/social studies intervention.   A randomized trial of the refined 18-week book reading intervention was conducted with smaller groups (5-7 children) to evaluate the impact of the intervention on vocabulary outcomes for preschool children (School Districts A and B) with initial low vocabulary knowledge as indicated on the PPVT. (See Gonzalez, Pollard-Durodola, Taylor, Simmons, Davis, & Simmons, for a detailed summary of the study.) Twenty-one teachers were randomly assigned to either the intervention ($n = 13$) or the practice-as-usual (comparison) condition ($n = 8$). From a total of 9 schools, 11 teachers taught in Head Start classrooms and 10 taught in preschool classrooms. See Table 1 for a summary of participating teachers, new and those returning to the study (e.g., returning teachers remained in the same condition), by school district. Teachers averaged 8.24 years of teaching in Head Start/preschool settings, and there was no statistically significant difference between intervention and comparison groups.

The participating 148 students ($n = 92$ treatment, $n = 56$ comparison) were from schools where 90% of the population qualified for free or reduced-cost lunch and entered preschool with low vocabulary knowledge as indicated by their scores on the PPVT-III (Dunn & Dunn, 1997). At the class level, two students were selected whose scores on the PPVT-III most closely approximated the 15th, 30th, and 50th percentiles on the PPVT-III for a goal of six students from each classroom.

The standardized assessment battery (receptive and expressive vocabulary measures) and procedures from Year 02 were used in Year 03 to evaluate the impact of the more extensive intervention on children's outcomes. The receptive and expressive researcher-developed measures reflected content vocabulary knowledge taught in the 18-week intervention. To construct these measures, researchers used a stratified sampling procedure selecting 18 target words used throughout the intervention to avoid an unduly lengthy assessment, which would be inappropriate for young children.

Fidelity of implementation was conducted three times (beginning, middle, towards the end of the intervention period) via video-taped sessions, and observations were rated by researchers using a measure with a Likert-type scale with anchors ranging from 0 (minimal implementation) to 3 (very high implementation) for each instructional dimension that corresponded to the five-day instructional cycle. Results showed that implementation scores were acceptable, with a mean score of 85% ($SD = 12\%$). Summaries of the three PD 90-minute booster sessions conducted in response to the fidelity observations indicated that there were frequent discussions on how to scaffold adult/child conversations during the Challenge Questions which required children to first recall vocabulary and conceptual knowledge and then to apply analytical or reasoning skills to respond to questions.

The PD module was more intensive in Year 03 with initial PD lasting for six hours. Researchers provided more research evidence on the benefit of and rationale supporting specific strategies (use of informational texts, repeated reading, stopping for brief in-context definitions, etc.) and had access to more video-taped vignettes of exemplary practices that could be used in discussions with teachers. These changes in PD were made to address teachers' needs based on Y02 feedback sessions and fidelity observations. As in Year 02, 90-minute PD booster sessions were provided by researchers to small groups of teachers after each fidelity observation to provide feedback on instructional implementation.

Again, multi-level modeling (Hox, 2002) was used to analyze the impact of the intervention on vocabulary outcomes due to the nested structure of the study (148 students nested within 28 classrooms taught by 21 teachers). A focus group was not conducted at the end of this year.

RESULTS

The following summarizes the qualitative and quantitative findings from the three phases of the design experiment that assisted researchers in designing the content based shared book reading intervention and understanding the feasibility of a content-based shared book reading approach.

Phase I: Preliminary Intervention Design

Informal classroom observations. The informal observations of typical shared book reading lessons in the preschool center (School District A) lasted about 20 minutes. Themes emerging in the discussion of the observations were that (a) typical book reading sessions were brief (averaging 5-7 minutes in length), (b) student engagement was minimal, (c) informational texts were not used, and (d) vocabulary selection was not systematic if word meanings were emphasized at all. Further, researchers' field notes revealed that little or no priming of students' background knowledge took place. (Background knowledge refers to explicit instruction in which the teacher guides children to retrieve information from personal experiences to better understand new knowledge; for example, new words and concepts in the shared book reading text; Baker, Simmons, & Kame'enui, 1998; Simmons et al. 2008). Overall, researchers found that the scope of typical preschool shared book reading vocabulary practices was limited.

Preschool curricula review. A review of the three commonly used preschool curricula and materials used in the participating districts indicated that vocabulary tasks were somewhat consistent with research-based practices but provided limited information on how to scaffold instruction for difficult tasks, develop background knowledge related to new words and connected information, and provide multiple exposures to target words. Overall, existing curricula did not guide preschool teachers towards a better understanding of how to teach vocabulary to young children (Beck & McKeown, 2007; Neuman & Dwyer, 2009; Neuman & Roskos, 2005).

Shared book reading literature review. Of the 3,337 works yielded by the literature review, 29 studies met relevance criteria. Of these, 12 specifically investigated the effects of

school-based shared book reading interventions on the vocabulary development of preschool children in Head Start or subsidized child-care setting, with 6 being more effective for children with low vocabulary knowledge. See Table 2 for a summary of the evidence-based book reading practices and instructional features that were identified in the literature review.

Based on the findings from this literature review, researchers developed the following preliminary pedagogical objectives: (a) world knowledge (science) would be developed by priming background knowledge (Hirsch, 2006; Justice, 2002; Neuman, 2006) through multiple exposures to thematic academic content via twin texts (storybook + informational text) connected by a theme and topic (Duke, 1999; Smolkin & Donovan, 2000); (b) word knowledge would be accelerated through the strategic selection of and explicit instruction in high-utility content-related words (six per week) across multiple contexts (Biemiller & Boote, 2006; Hirsch, 2003), integrating multiple exposures to words and connected concepts through repeated text readings (Justice, Weber, Ezell, & Bakeman, 2002); (c) interactive book reading practices would accelerate content-related word knowledge and connected concepts via varied text genres (Wasik et al., 2006; Whitehurst & Lonigan, 2003; Zevenbergen & Whitehurst, 2003).

Collectively, these instructional practices and recommendations from previous shared book reading studies were integrated into the design of a preliminary preschool shared book reading intervention that was field tested by teachers in a group format (9 children) to better understand the feasibility/usability of book reading practices and materials.

TABLE 2
Instructional Features of More Effective Shared-Book Reading Practices Implemented
With Children Predominantly From High-Poverty Settings and/or With Low Vocabulary
Knowledge

Investigation	Student Participants & Instructional Format	Instructional Design/Delivery Features	Intervention Outcomes
Wasik, Bond, & Hindman (2006)	Low-Income Pre-K Whole Group	Interactive Book Reading Distributed Vocabulary Instruction Thematic Content Repeated Reading (2 readings per text) Multiple Exposures Words Depicted in the Book Thematic Content 9 Months	Vocabulary d = .61
Coyne, Simmons, Kame'enui, & Stoolmiller (2004)	Low-Income Kinder Small Group (2-5)	Interactive Book Reading Multiple Exposures Repeated Reading (2 readings per text) 3 Target Words per Book	Vocabulary d = .44
Justice, Meier, & Walpole (2005)	Low-Income K Small Group (Unavailable)	Distributed Vocabulary Instruction Repeated Reading (2 readings per text) 6 Target Words Taught per Book Word Selection Criteria 10 Weeks	Vocabulary d = .78
Whitehurst et al. (1994)	Low-Income Pre-K Small Group	Interactive Book Reading	Vocabulary d =.24
Wasik & Bond (2001)	Low-Income Pre-K Whole Group	Interactive Book Reading Distributed Vocabulary Instruction Thematic Content Repeated Reading of Text (2 readings per text) Multiple Exposures 15 Weeks	Vocabulary d = 1.43
Sénéchal (1997)	Middle-Class Pre-K	Brief Explicit In-Context Definitions Words Depicted in Book Repeated Readings (3 readings per text) 1 Week	Vocabulary d = .43

Phase II: Field Testing, Teacher Feedback, and Curriculum Refinement

Teacher feedback.   Six themes emerged from field-testing the materials and book reading approach with four teachers:

1. Highly specified lessons – Lessons provided uniformity in explicit teaching practices (scaffolding oral responses, modeling responses, providing corrective feedback and confirmation), but were too scripted and complex to be used easily by teachers;

2. High-cognitive activities – These tasks required more teacher scaffolding due to the linguistic demand of the language structures for young children;

3. Individual child responses – More activities were needed to assist teachers in attending to and monitoring individual child responses and progress vs. group responses;

4. Lack of background knowledge – Teachers needed additional resources for building children's limited background knowledge so that children could understand critical science vocabulary and related concepts well enough to be able to participate in interactive discussions with the teacher and other children. Researchers acknowledged that in earlier interactive shared book reading studies, shared book reading sessions were not sufficient to accelerate vocabulary in children with limited prior knowledge (Wasik & Bond, 2001).

5. Complex informational texts – Some texts included lists of word taxonomies that detracted from learning the intervention target word. That is complex terminology and syntax threatened the ease of reading/discussing book content, and complex text features (e.g., too many concepts taught on one page or complicated plot structures) interfered with comprehension of important concepts.

6. Gradual increase of target words. The number of new words taught per book should be gradual so that children could become acclimated to the book reading process. Overall, teachers confirmed that students successfully learned the six words taught per week and reported instances when children used the words to describe life experiences beyond the book reading session (e.g., *I saw liquid at home.*).

Curriculum refinement.   See Table 3 for a summary of some of the extensive curricular modifications made in response to field testing materials to increase the feasibility of the book reading approach.

Findings from this year resulted in a refined curriculum (12 weeks of content-based shared book reading lessons organized around two science themes: nature and living things) and PD module. Specifically, it was decided that the initial PD session in subsequent years would address not only the "how" but also the "why" supporting the shared book reading pedagogy because teachers did not always understand the rationale (e.g., why) or importance of research-based shared book reading practices (e.g., interactive dialogues, repeated readings, distributed teacher behaviors [e.g., brief in-context definitions], use of expository text) that were not characteristic of their typical book reading styles. Further, additional small-group PD booster sessions would be provided by researchers guided by results from fidelity observations to strengthen teachers' intervention practices and to better understand the feasibility of intervention practices and materials.

TABLE 3
Phase II: Focus Group Teacher Feedback and Curriculum Refinement

Teacher Recommendations	Curricular Modifications	Rationale
Use less highly specified language.	Streamlined teacher language in lesson script while maintaining instructional explicitness and consistency.	There was too much redundancy in teacher language and too many details provided in error-correction procedures and language scaffolds.
Simplify higher cognitive tasks.	Integrated instructional scaffolding to facilitate demanding language tasks.	Sequencing higher cognitive tasks into smaller instructional steps would allow students to successfully engage in discussions.
Provide additional information for children to understand complex concepts.	Integrated additional background knowledge on taught concepts prior to reading the book.	Additional background knowledge would allow students with limited life experiences to discuss important concepts and vocabulary prior to listening to the story.
Reconsider the use of informational texts with complex terminology and syntax structure.	Replaced books that presented many complex science ideas and extensive word taxonomies.	Informational texts that emphasized content with appropriate sentence structure, word usage, etc. were easier for children to comprehend and learn important knowledge and words.
Integrate more opportunities for individual child responses vs. group responses.	Integrated opportunities for paired-practices.	This would allow teachers opportunities to listen to individual children responses and to provide feedback confirmation.
Gradually increase quantity of target words.	Introduced two new words per book in Weeks 1 and 2 for a total of four words per week. Subsequent weeks introduced three new words per book for a total of six words per week.	Young children required time to become acclimated to the extensive book reading process that required them to attend, respond, and ask questions.

Phase III: Effects of the Intervention, Teacher Feedback, and Curriculum Refinement

Below we summarize the effects of the content-based shared book reading intervention and teachers' feedback on the feasibility and usability of the curriculum materials and process.

The 12-week science intervention. Overall, there were statistically significant main effects for the shared book reading intervention for proximal researcher-developed measures of receptive vocabulary (RDRPVT; $\gamma = 4.94$, $p < .001$) and expressive vocabulary (RDEPVT; $\gamma = 5.98$, $p < .001$) after controlling for the corresponding pretest scores, student demographic variables, school district, and years of teaching experience. However, there were no statistically significant main effects for condition on the PPVT-III ($\gamma = 0.52$, $p = .802$) or the EOWPVT ($\gamma = 0.64$, $p = .701$) after controlling for the covariates. We hypothesized that the brief intervention period (12 weeks) and large group size (9-10 children) may have contributed to insufficient opportunities for dialogue for preschool children with limited vocabulary and world knowledge.

Teacher feedback. Teacher verbatim as noted by the principal investigator in a summary table indicated that all 9 teachers were able to identify components of the intervention that they favored and that was easily implemented. Key words used most frequently by teachers to identify these instructional features were *Ready, Set, Go* (referring to an instructional task in which vocabulary picture/concept cards were used to review target words and concepts daily, weekly, and cumulatively), pictures (use of book pictures/illustrations to teach vocabulary and connected concepts), and vocabulary cards (picture concept cards with pictures depicting vocabulary, connected concepts, and themes). Two teachers specifically used the words "repetition to words/concepts as a useful instructional feature" (Teacher 5): "I could see …that a word we worked on before would come up, like when we were reading *Owl Babies* (Teacher 9)".

In terms of modifications/weaknesses, 33% referred to "length" of the session as being too long for young children, 33% referred to inappropriate group size (too many children in the group), 22% referred to the repetitive nature of instructional tasks that were used to increase exposure to words and concepts (e.g., "monotonous questions," "redundant questions," "second reading of the text"), 11% referred to difficulty of some words and/or concepts – "A little bit over kids heads" (Teacher 1).

Teacher verbatim also indicated that 67% of the teachers' general feedback on the intervention used key words such as "vocabulary exposure", "vocabulary rich", and vocabulary instruction being a key component of the intervention "because they were words children would not have been exposed to (Teacher 8)". Eighteen percent felt that children sometimes did not understand some of the vocabulary concepts (e.g., year – a period of time from one birthday to the next) due to difficulty of the target word (e.g., could not make a connection between *drain* as taught in the story and *drain* beyond the book) or did not feel that the themes corresponded to classroom themes (seasonal [pumpkins for October], holidays, etc.). One teacher's general feedback indicated that although rereading the books was effective, the lessons were too long (Teacher 5).

Results of the focus group discussion, as summarized by the principal investigator on the narrative report, indicated that teachers were satisfied with the following intervention design and delivery features, which they found feasible to implement: thematic science instruction,

vocabulary review tasks, and pictures, book illustrations, etc., used to teach and scaffold word and concept knowledge. However, the consensus was for shared book reading to occur in a smaller group size (5 or 6 students). Specifically, teachers shared that they found it difficult to manage the behavior of the large group of young children during the 20-minute book discussions although an instructional aide engaged the students in the class who were not participating in the shared book reading intervention with other activities (e.g., computer time, center-based activities).

Curriculum refinement.   In response to these findings, the shared book reading approach was refined to increase the feasibility of instructional practices, the instructional extensiveness of the intervention (i.e., 18 weeks of instruction; the addition of two social studies themes, Places Where We Live and Go and Earth – Land and Water, and six related topics, thematic posters to build additional background information), and to provide more opportunities for children to make explicit and deeper connections between taught words and their background knowledge. Specifically, we reduced the number of redundant lower cognitive labeling and identifying vocabulary tasks (e.g., *This is liquid. What is this?*) and replaced them with higher cognitive association tasks (e.g., New activity: *Challenge Questions*: *What is the difference between a vine and a seed? Is a vine a living thing? Why or why not?*). We worked from the premise that at-risk children would benefit from broader and deeper word-world connections as suggested by the knowledge hypothesis (Anderson & Freebody, 1981; Nagy, 2007), a theory that suggests that children accrue vocabulary knowledge by understanding relationships between new words and their connected concepts. Knowing a word's meaning, then, indicates that children understand the "network of concepts" that are connected with the word (Stahl & Nagy, 2006). These higher cognitive association tasks – connecting semantically-related words to networks of concepts - however, might require additional scaffolds and background knowledge to facilitate interactive discussions among children with limited conceptual knowledge.

The expanded 18-week science/social studies intervention.   Findings of children's vocabulary outcomes indicated moderate-to-strong positive effects of the shared book reading intervention on proximal measures of science and social studies modeled after the PPVT (RDRPVT; $\gamma = 2.75$, $p = .001$) and the EOWPVT (RDEPVT; $\gamma = 4.01$, $p = .023$) after controlling for all covariates. However, unlike in Year 02, statistically positive and significant results were found for the standardized receptive vocabulary measure (PPVT-III; $\gamma = 7.57$, $p = .029$), whereby children in the treatment group scored higher at posttest than children in the comparison group. Nevertheless, the intervention did not have a statistically significant effect on the expressive vocabulary measure (EOWPVT; $\gamma = -2.20$, $p = .63$), unlike previous interactive shared book reading studies. (For a review of these results, see Whitehurst and colleagues and Mol and colleagues.) It is possible that teachers required more individual coaching to be able to adequately scaffold challenging interactive discussion tasks.

DISCUSSION

Several researchers have pioneered work in the use of school-based shared book reading as a tool for developing and extending young at-risk children's vocabulary (Lonigan, Anthony, Bloomfield, Dyor, & Samwell, 1999; Neuman & Dwyer, 2011; Wasik & Bond, 2001; Wasik et

al., 2006) or examined the effects of content-based book reading practices on children's receptive and expressive outcomes (French, 2004; Leung, 2008). However, few investigators have used cycles of curriculum development, field testing, and refinement in collaboration with preschool teachers to better understand the feasibility of empirically based book reading practices. Guided by teacher feedback, the researchers conducting the current study learned more about the features of instructional feasibility and usability of a content-based shared book reading intervention implemented with young children with initial low vocabulary knowledge.

Feasibility and Usability of Instructional Practices

Overall, teachers learned to implement many shared book reading instructional features with ease (e.g., repeated reading of texts, brief in-context definitions, and distribution of open-ended questions throughout the thematic book reading process). Specifically, they preferred implementing instructional tasks that relied on the use of visuals – pictures, book illustrations, and theme cards – or that required rapid pacing (e.g., *Ready, Set, Go!).* Teachers were also able to integrate instruction across varied text genres although, initially, they were more comfortable reading from storybooks than informational texts. Overall, teachers' proficiency in implementing the shared book reading vocabulary practices was evident in their treatment fidelity scores, indicating that their implementation practices were acceptable.

However, interactive dialogue activities remained challenging. Similar to previous studies (Dickinson, 2001; Dickinson & Tabors, 2001; Wasik et al., 2006), preschool and Head Start teachers in our intervention were not accustomed to talking in ways that progressively pushed children's conversations beyond their customary interactions or in ways that emphasized analytic dialogues. This became apparent in the implementation of Challenge Questions, an instructional task that requires higher level analytical thinking and discussion so that children can make important associations between words, concepts, and life experiences (e.g., *What is the difference between frozen water and liquid? Can you drink something that is frozen? Why or why not?*). However, in a separate observation study, researchers found that content related shared book reading instruction that emphasized analytical association-level talk, mostly found in the Challenge Questions, predicted growth in children's receptive vocabulary (Gonzalez, Pollard-Durodola, Simmons, Taylor, Davis, Fogarty, & Simmons, 2013). In the end, these higher level analytical discussions are dependent on the teacher's expertise in extending oral responses, modeling extensive vocabulary usage, and engaging children in high cognitive language tasks (e.g., rich explanations) (Dickinson, McCabe, & Clark-Chiarelli, 2004).

Effects of Content-based Shared Book Reading on Vocabulary Measures

Although there is no clear guidance on how much instruction (e.g., 12 vs. 18 weeks) is needed to positively impact expressive and receptive vocabulary outcomes of children who enter school with low vocabulary knowledge, evidence suggests that young children from at-risk settings benefit from book reading interventions that increase instructional extensiveness by providing frequent exposures to target vocabulary in multiple contexts (Wasik & Bond, 2001; Wasik et al., 2006). In this study, it is possible that standardized vocabulary measures were not sensitive

enough to children's curriculum-based vocabulary growth. Overall, findings from the content-related proximal vocabulary measures indicated that children who entered school with low content vocabulary knowledge benefited from instruction facilitated by the extensive knowledge network of words and concepts integrated into the book reading process (Anderson & Freebody, 1981; Nagy, 2007; Neuman, 2006; Neuman & Dwyer, 2009).

Limitations and Implications for Future Research and Practice

Limitations.   Our findings must be considered in the context of the following three limitations. First, an important limitation in Year 01 is that researchers relied on teacher feedback (focus group) about instructional feasibility instead of actual observations of teacher behaviors during the field testing of the curriculum and materials. Direct observations might have circumvented challenges encountered during the first implementation of the 12-week curriculum in the second year. A second limitation is that researchers were not able to provide more intensive PD with individualized feedback plus coaching to increase teachers' expertise in generating interactive discussions with children with low verbal abilities. This conclusion is supported by classroom observation research suggesting that adult-child interactions in at-risk settings can be improved by increasing teachers' awareness of their interactions via ongoing opportunities for personalized feedback and self-reflection (Pianta & Hamre, 2009). A third limitation is that researchers were not able to determine the impact of those instructional features that were more feasible (e.g., use of picture concept cards) on vocabulary outcomes. Clearly, it is difficult to disentangle the impact of a multi-dimensional book reading approach (e.g., multiple strategies) on children's vocabulary outcomes (Pollard-Durodola, et al. 2011).

Implications for future research and practice.   When designing interventions intended to improve children's literacy and language achievements in preschool settings, researchers must pay significant attention to the skills of the teachers delivering the curricula (Hamre et al., 2009). Thus, results from the present investigation suggest that enhancing the quality of the preschool environment not only requires engineering and use of high-quality empirically based instructional materials but also depends on pedagogical practices that are made more feasible through instructional support.

CONCLUSION

The conclusions drawn from this study reflect what researchers learned while using a design experiment methodology to engineer a content-based shared book reading intervention while examining features of feasibility and usability. First, feedback from teachers and classroom observations allowed researchers to bridge the gap between research and practice (Bradley & Reinking, 2010). Second, researchers learned that teachers can learn to implement novel research-based shared book reading vocabulary practices in ways that intensify typical book reading instruction and accelerate children's knowledge of taught vocabulary within the context of building important world knowledge. However, to fully take advantage of these findings, preschool teachers may require instructional supports that transform their instructional practices

in ways that enhance and stimulate the verbal abilities of young children during book discussions and beyond.

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Appendix A

Example of Teacher Feedback Form

Teacher:_____   Week 5- Seeds / How a Seed Grows   April 10-14, 2006

Teacher Feedback Form	Day 1						Day 2						Day 3						Day 4						Day 5					
	Very Low	Low	Medium-Low	Medium-High	High	Very High	Very Low	Low	Medium-Low	Medium-High	High	Very High	Very Low	Low	Medium-Low	Medium-High	High	Very High	Very Low	Low	Medium-Low	Medium-High	High	Very High	Very Low	Low	Medium-Low	Medium-High	High	Very High
Materials																														
1. Ease of teacher instructions																														
2. Ease of using the script																														
3. Appropriateness of book content																														
4. Ease of using manipulative(s)																														
5. Amount prep time needed	Minutes:___						Minutes:___						Minutes:___						Minutes:___						Minutes:___					
Instruction																														
6. Level of student engagement																														
7. Level of student learning																														
8. Quality of activities																														
9. Focus on important learning outcomes																														
10. Appropriateness of activity sequence																														
11. Probability of completing the lesson in 20 minutes																														