

# Accelerating Preschoolers' Early Literacy Development Through Classroom-Based Teacher–Child Storybook Reading and Explicit Print Referencing

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**C**urrent assessments of educational achievement among America's schoolchildren are discouraging, with more than one third of fourth graders failing to exhibit basic levels of reading skill and one tenth failing to exhibit basic levels of writing skill (National Assessment of Educational

Progress [NAEP], 2005). Of particular concern is the markedly disproportionate representation of children who are poor among those who fail to exhibit proficient reading and writing abilities. To illustrate, national data show that more than half of the children who qualify for free or reduced-price lunch within our nation's

**ABSTRACT: Purpose:** This study examined the impact of teacher use of a print referencing style during classroom-based storybook reading sessions conducted over an academic year. Impacts on preschoolers' early literacy development were examined, focusing specifically on the domain of print knowledge.

**Method:** This randomized, controlled trial examined the effects of a print referencing style on 106 preschool children attending 23 classrooms serving disadvantaged preschoolers. Following random assignment, teachers in 14 classrooms used a print referencing style during 120 large-group storybook reading sessions during a 30-week period. Teachers in 9 comparison classrooms read at the same frequency and with the same storybooks but used their normal style of reading.

**Results:** Children whose teachers used a print referencing style showed larger gains on 3 standardized measures of print knowledge: print concept knowledge, alphabet knowledge, and name writing, with medium-sized effects.

**Clinical Implications:** The convergence of the present findings with those of previous efficacy studies indicates that print referencing intervention can be used confidently as an approach for facilitating print knowledge in preschool-age children. Speech-language pathologists can serve an important role in supporting preschool educators as they use this evidence-based technique with pupils in their classrooms.

**KEY WORDS:** emergent literacy, preschool intervention, storybook reading

schools do not read proficiently in fourth grade (NAEP, 2005). Researchers, policymakers, and practitioners recognize that no single solution will solve this complicated problem, as literacy development, literacy instruction, and literacy failure are complex, multidimensional constructs. Nonetheless, there is consensus across these constituencies that a *preventive orientation* offers significant promise for reducing the number of children who fail to achieve skilled, fluent reading and writing in the elementary grades, particularly for our nation's most disadvantaged children (e.g., Snow, Burns, & Griffin, 1998). A preventive orientation advocates for broad implementation of systematic and explicit early literacy instruction delivered within early childhood programs so as to prevent early delays in literacy development from progressing into serious reading and writing disabilities that require intensive and expensive remediation (Torgesen, 1998).

Consistent with this shift toward a preventive orientation is the recent proliferation of state preschool content standards in which early literacy objectives are heavily emphasized (Schickedanz, 2004). To illustrate, the federal Head Start program, which funds preschool programs across the nation to serve children who are economically disadvantaged, specifies 22 explicit early literacy objectives for Head Start participants to achieve by graduation (Office of Head Start, 2002); an example is for children "to recognize a word as a unit of print...and that words are separated by spaces" (p. 5). Accompanying this rise in preschool standards is a concurrent emphasis on preschool teachers' use of scientifically validated techniques when delivering early literacy instruction in their classrooms (e.g., Dickinson & Caswell, 2007). Like other professionals who serve children within America's schools, preschool teachers are being mandated to use methods that have been shown to work (Meisels, 2006). Although there is a host of validated techniques available to guide early literacy instruction focused on *phonological awareness* (Troia, 1999), far fewer scientifically validated techniques are available to guide instruction in *print knowledge*.

Print knowledge is an important domain of children's early literacy development that describes one's emergent knowledge about the forms and functions of written language (Storch & Whitehurst, 2002; Whitehurst & Lonigan, 1998). Print knowledge is a multidimensional construct that refers to an array of understandings that emerge for many children before formal reading instruction (Justice & Ezell, 2001); it includes knowledge of the way print is organized in various texts and the functions it serves (print concept knowledge), the names and distinctive features of individual alphabet letters (alphabet knowledge), and the expression of meaning and orthography through writing (emergent writing). Measures of print knowledge collected in preschool and kindergarten are consistently associated with children's later achievements in word recognition and spelling (e.g., Hammill, 2004; National Early Literacy Panel, 2004), and print knowledge objectives are characteristically included as explicit instructional goals in preschool early learning standards. To address these standards effectively, preschool teachers and other professionals who work with young children in classroom-based interventions, including speech-language pathologists (SLPs), require access to techniques that have been shown empirically to have value to children.

Of particular import is ensuring the timely development of print knowledge among children from lower socioeconomic backgrounds, given current data showing that far too few of our nation's children in poverty succeed in reading (NAEP, 2005). Print knowledge

is a multidetermined aspect of development that is influenced by both genes and environment (Lemelin et al., 2007; Petrill, Deater-Deckard, Schatschneider, & Davis, 2005). Lemelin and colleagues' recent research on the school readiness of 840 children showed that alphabet knowledge was less heritable (i.e., genetically influenced) compared to other indicators of school readiness, such as mathematic ability. We can interpret such findings as showing that print knowledge is strongly influenced by the environments in which children are raised and, by extension, is an aspect of development that can be readily modified with changes to the environment.

Particularly influential features of children's environments that relate to their development of print knowledge include parental involvement in children's school work and children's enjoyment of reading activities (Petrill et al., 2005), parental beliefs concerning the importance and value of home literacy activities (Bennett, Weigel, & Martin, 2002; Skibbe, Justice, Zucker, & McGinty, 2008), the frequency with which children are read storybooks (Bus, van IJzendoorn, & Pellegrini, 1995; Sénéchal, LeFevre, Thomas, & Daley, 1998), and the quality of book-sharing interactions between parents and children (Scarborough & Dobrich, 1994). Generally, research findings show that it is not simply the frequency with which children engage with print—during writing, reading, and other activities, such as play—that matters most to their development of print knowledge, but the quality of these interactions (Roberts, Jurgens, & Burchinal, 2005; Skibbe et al., 2008). And, because of the inherent and systematic stresses associated with socioeconomic challenges, children who are reared in poor homes may have relatively fewer experiences with print compared to other children (Roberts et al., 2005). This offers at least a partial explanation as to why children who are reared in poverty tend to develop print knowledge much more slowly as compared to children who are reared in more advantaged homes (Justice, Bowles, & Skibbe, 2006).

In this study, we examined the effectiveness of teacher use of a print referencing style (Justice & Ezell, 2000, 2002) when reading storybooks as a possible technique for accelerating the development of print knowledge for children who are experiencing socioeconomic disadvantage. When reading with a print referencing style, teachers use verbal and nonverbal techniques to heighten children's attention to, and interest in, print within the storybook; these simple techniques include *asking questions about print* (e.g., "Do you see the letter S on this page?"), *commenting about print* (e.g., "That word says 'Splash!'"), and *tracking one's finger* along the text while reading (Justice & Ezell, 2004). The print referencing technique is based on the premise that if children show greater attention to, and interest in, print within storybook reading interactions, they will learn about print more quickly (Justice & Ezell, 2004). Reading with a print referencing style is therefore an approach that teachers, therapists, and parents may use to increase young children's attention toward, interest in, and developing knowledge about print. The intervention was designed specifically to help children who are learning about print more slowly than others due to infrequent experiences with print and/or developmental disabilities that make literacy learning more difficult (Justice & Ezell, 2004; Justice & Pullen, 2003). The first study of the effects of print referencing involved children with communication disorders and their parents (Ezell, Justice, & Parsons, 2000). Initial findings suggested that parents could readily adopt a print referencing style during reading interactions at home, that parents

perceived the technique as being beneficial to their children, and that repeated exposure to a print referencing style increased children's knowledge of print. Subsequent studies have shown that this style of reading also has positive effects on the literacy development of typically developing (TD) children (Justice & Ezell, 2000).

Evidence from a range of research methodologies suggests, however, that this style of reading is not naturally used by adults when reading with children: rather, it often needs to be taught. Indeed, although it is often presumed that young children have considerable contact with print during adult-child shared book reading, this typically is not the case. Preschool children seldom ask questions about print (Yaden, Smolkin, & Conlon, 1989), make comments about print (Ezell & Justice, 2000), or look at print (Evans & Saint-Aubin, 2005; Justice, Skibbe, Canning, & Lankford, 2005) when they are read storybooks by adults. In fact, research using eye-gaze methodologies has shown that in typical reading situations, preschool-age children look at print infrequently, corresponding to less than 5% of visual fixations (Evans & Saint-Aubin, 2005; Justice, Pullen, & Pence, 2008). The lack of attention to print that is displayed by young children—whether measured by looking at verbal or visual behaviors—applies to both TD children and those with disabilities (Ezell & Justice, 1998, 2000), and seems to reflect children's tendency to follow the adults' lead during reading interactions (Hammett, van Kleeck, & Huberty, 2003; Phillips & McNaughton, 1990). Adults who do not typically incorporate print references into their reading interactions with young children can readily be taught to do so (Ezell & Justice, 2000). Justice and Ezell (2002) used video training to promote parents' use of a print referencing style during storybook reading, whereas others have used more traditional workshop training featuring direct instruction and role play (Ezell et al., 2000; Girolametto, Weitzman, Lefebvre, & Greenberg, 2007). When children are read to with a print referencing style, they look at print substantially more often (Justice et al., 2008) and talk about print more frequently (Ezell & Justice, 2000) than during typical reading interactions.

An important consideration is whether an increase in the amount of time spent looking at print and/or talking about print in storybooks actually boosts young children's early literacy skills. The results of several small-scale efficacy studies suggest that it does. Children's emergent literacy skills were significantly accelerated when (a) parents of middle-class status used print referencing for 4 weeks at home during 16 one-on-one reading sessions with their preschool-age children (Justice & Ezell, 2000), (b) an educator used print referencing for 8 weeks for 24 small-group reading sessions with preschoolers attending a rural Head Start program (Justice & Ezell, 2002), and (c) a therapist used print referencing for 13 weeks in a preschool classroom for 26 one-on-one reading sessions with children with speech-language disabilities (Lovelace & Stewart, 2007). Yet, an important limitation of the available efficacy findings on print referencing is that all implementations have featured one-on-one or small-group reading sessions; likewise, those studies conducted in school-based settings (Justice & Ezell, 2002; Lovelace & Stewart, 2007) were delivered by carefully trained research personnel. No studies to date have asked whether print referencing intervention offers net positive impacts when it is implemented in naturalistic classroom settings by teachers reading to large groups of children. The present work addresses this important gap in the literature.

Specifically, we conducted this study to determine the effectiveness of print referencing intervention when it is implemented by preschool teachers working in a range of classroom settings (e.g., Head Start, early childhood special education, public prekindergarten) for improving the print knowledge of children who are considered at risk. We asked whether teachers' use of a print referencing style would accelerate the early literacy skills of children in their classrooms *above and beyond* that which occurs with teachers' normal "business as usual" reading style. In designing this study, which required conceptualizing how print referencing intervention might be used by teachers within classroom settings, an important consideration was ensuring that teacher implementation would feature adequate levels of systematicity and explicitness, both of which are considered critical elements of high-quality early literacy instruction (Connor, Morrison, & Slominski, 2006; Justice, Chow, Capellini, Flanigan, & Colton, 2003; Justice, Mashburn, Hamre, & Pianta, 2008; O'Connor, Notari-Syverson, & Vadasy, 1996). From our perspective, print referencing intervention that is systematic involves delivery of well-planned and deliberately sequenced book reading experiences that develop in children a broad set of understandings about the code-based units of print (e.g., letters, words). Print referencing intervention that is explicit features adult use of an explicit print terminology that clearly focuses children on what it is they are to learn. In the present study, we developed a manualized program of print referencing intervention featuring a specific scope of instructional targets related to print knowledge addressed over a 30-week period using 30 storybooks, as presented in Appendices A and B. By manualizing this instructional technique, our intent was to achieve acceptable levels of systematicity and explicitness in teacher implementation so that the intervention could be reliably taken to scale if it was found to be effective. Our research question was: To what extent does preschool teachers' use of a print referencing style increase the print knowledge of at-risk children over and beyond that which occurs with teachers' typical reading style? On the basis of prior evidence showing the positive impacts of print referencing on children's achievements in print knowledge (Justice & Ezell, 2000, 2002; Lovelace & Stewart, 2007), we hypothesized that children whose teachers used a print referencing style over the academic year would exhibit greater gains in print knowledge as compared to children whose teachers read using their normal reading style.

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## METHOD

### Research Design and Study Overview

This randomized, controlled trial (RCT) investigated whether teacher use of a print referencing style compared to teachers' normal approach to reading storybooks with their pupils would result in higher gains in print knowledge for preschoolers attending need-based preschool programs. This research was conducted as part of a multisite, multicohort, longitudinal RCT involving implementation of three different conditions. In the present study, we report findings for the first cohort of teachers ( $n = 23$ ) and preschool-age children ( $n = 106$ ) who participated in two contrasting conditions in the 2005–2006 academic year; in forthcoming reports, we will conduct replications of the present findings with a larger sample (in total, teachers and children in 84 preschool classrooms

participated). The two conditions described in this study represent planned variations in the way teachers conducted 120 large-group storybook reading sessions in their classrooms over a 30-week period in an academic year. Teachers in a print referencing condition read with a print referencing style four times per week; these teachers embedded verbal and nonverbal references to two print targets (minimally) into each reading session. Teachers in an every-day shared reading condition read using their normal reading style four times per week. In this report, we detail results from intent-to-treat (ITT) analyses; ITT analyses within an RCT framework provide the most rigorous tests of causal impacts of an intervention, as they attempt to reduce or eliminate prejudicial biases that can affect results. For instance, bias could be introduced if analyses included only teachers in the experimental condition who maintained high levels of fidelity to the intervention protocol. In ITT analyses, all teachers assigned to a particular condition are maintained in analyses irrespective of compliance or deviations in implementation (Peduzzi, Detre, Wittes, & Holford, 1991). In future research, we may conduct as-treated analyses that examine child outcomes as a result of, for instance, differences in teacher fidelity to the intervention protocols. However, as-treated analyses were not the intent of the research reported here, as our research question implies.

## Participants

**Teachers.** The lead teachers of 23 classrooms affiliated with four early childhood programs in two states (Ohio, Virginia) served as participants. All programs were designed to provide early education services to children who were experiencing social, economic, or developmental risks, including district-supported early childhood special education classrooms (5 classrooms), district-supported prekindergarten classrooms (8 classrooms), and federally funded Head Start classrooms (9 classrooms); 1 classroom was located in a private preschool that served children who are at risk through vouchers. The number of classrooms participating per building/center was highly variable, ranging from 1 to 7, as is typical of preschool settings (McGinty, Justice, & Rimm-Kaufman, 2008). Most classrooms served 16 children and were staffed by a teacher and an aide/assistant, for a teacher-child ratio of 1:8. Teachers self-selected into this study; specifically, a series of information sessions was held in interested programs/districts describing general parameters of the study. Teachers then enrolled themselves into the study and provided informed consent as approved by the local institutional review board (IRB). All of the teachers enrolled in this study complied with the intervention protocols, including participation in professional development sessions, implementation of a 30-week book reading program, and submission of questionnaires and other data requirements (e.g., videotapes of classroom reading sessions).

Of the participating teachers, 22% held an advanced/graduate degree ( $n = 5$ ), 56% held a bachelor (43%,  $n = 10$ ) or associate degree (13%,  $n = 3$ ), and 22% held a high school diploma ( $n = 5$ ). The major of the highest degree for this sample of teachers was early childhood education ( $n = 8$ ) or elementary education ( $n = 5$ ); the remainder ( $n = 10$ ) majored in another area. The average teacher had 10.5 years of teaching experience ( $SD = 8.4$ ) and was 44 years of age ( $SD = 7.8$ ).

**Children.** We sampled children from classrooms following procedures used in recent large-scale descriptive studies of preschool program quality (e.g., Multi-State Study of Pre-Kindergarten

[Multi-State Study] and State-Wide Early Education Programs Study [SWEEP Study]; see Mashburn et al., 2008). First, caregiver consent was solicited from all children in the 23 classrooms. The parents/guardians of the children in these classrooms provided consent for inclusion as approved by the local IRB. Second, from among those children for whom consent was provided, a random sample of children was selected from each classroom based on the number of consents received; on average, 6 children were selected from each classroom (range of 3 to 9), for a total sample size of 142 children. (The actual number of children selected from each classroom was based on the actual number of consents received. The intended goal was 6 children per classroom, although in some instances, fewer consents were received and thus fewer children could be randomly selected. To arrive at an average of 6 children per classroom per cohort, larger numbers of children were selected in classrooms for which larger numbers of consents were received. The actual protocols used for selecting children are available from the first author.)

For the present study, only children who had both pre- and postmeasures of the outcome variables (i.e., measures of print concept, alphabet knowledge, and name writing) were included, reducing the sample size for the present set of analyses to 106 children. Various reasons (e.g., child withdrew during the study period due to family reasons, child absence on day of testing) resulted in reduction of the usable sample size for analyses, mainly due to missing data on the three posttests. The situation was made somewhat worse because the type of analysis we used for hypothesis testing (multivariate analysis of covariance) requires nonmissing values on *all* variables involved. In many research situations, it is possible that missing cases could be different from those with nonmissing data, and this could introduce bias into the analysis results. To make sure that the missing cases in our study were not different from those used in our analysis, we statistically tested the two groups (i.e., those not used in the analysis due to missing data vs. those used in the analysis) on demographic variables of child age and maternal education. The tests showed that the two groups did not differ on age,  $F(1, 139) = 1.854, p = .175$ , or maternal education,  $F(1, 114) = 0.005, p = .946$ . Furthermore, we compared the two groups on three measures of language collected at pretest (Sentence Structure, Word Structure, and Expressive Vocabulary subtests of the Clinical Evaluation of Language Fundamentals: Preschool—2 [CELF:P2; Wiig, Secord, & Semel, 2004], as well as three baseline measures of print knowledge [Print Concept Knowledge, Alphabet Knowledge, Name-Writing Ability]). These statistical comparisons showed that the two groups did not differ on the pretest measure of Sentence Structure,  $F(1, 133) = .706, p = .402$ ; Word Structure,  $F(1, 132) = .675, p = .413$ ; Expressive Vocabulary,  $F(1, 132) = .479, p = .490$ ; Print Concept Knowledge,  $F(1, 134) = .065, p = .799$ ; Alphabet Knowledge,  $F(1, 128) = .913, p = .341$ ; and Name-Writing Ability,  $F(1, 136) = .094, p = .760$ . The results of these statistical comparisons of the two groups (those children for whom data were not used in later analysis due to missing data vs. those with complete data) gave us considerable confidence that it is very unlikely that the missing data issue could have materially affected the results reported later.

Children who were eligible to enroll in these classrooms exhibited specific risk factors, which generally included poverty, documented family stress (e.g., unemployment, homelessness), or suspected/diagnosed developmental problems. We did not have

data on the specific risk factor(s) making individual children eligible to enroll. The sample included 59 boys and 47 girls. The average age of children in the fall of the year (October 1) was 4;4 (years;months) ( $SD = 4.28$ ). On the basis of parent report, 67 children were non-Hispanic White, 24 were Black, 9 were Hispanic White, 2 were Native American, and 2 were Asian (2 were Other). The majority of children spoke English at home (88%). Most (76%) of the children's mothers did not have a college or university degree, and approximately one third of the mothers (34%) had no education beyond high school. Approximately one half of the children's families had an annual household income in the range of \$5,000 to \$25,000, and the majority (75%) of families had annual incomes below \$40,000. Six children received special education services.

In the fall and spring of the year, children completed a battery of language and literacy assessments, to include the three subtests of the CELF:P2. These included the Sentence Structure, Word Structure, and Expressive Vocabulary subtests, which are used to derive a composite core language score. For the subtests, scores are based on a distribution whereby  $M = 10$ ,  $SD = 3$ ; the core language score is based on  $M = 100$ ,  $SD = 15$ . The data presented in Table 1 indicate that children performed, as a group, somewhat lower than normative references.

## Intervention Conditions

Stratified by site, classrooms were randomly assigned to conditions: 14 classrooms were assigned to a print referencing condition, and 9 were assigned to an everyday shared reading comparison condition. Regardless of assignment, teachers in these classrooms implemented a 30-week shared reading program in their classrooms using a set of 30 storybooks provided for this purpose (see Appendix C). These books were selected specifically because they contained print salient features such as speech bubbles, font changes, and accentuated words, and they are appropriate choices for 3- to 5-year-olds. The majority of titles were fictional, although poetry, informational, and alphabet books were also represented.

All of the teachers received the same schedule of reading specifying the order by which the storybooks were to be read over

the 30-week period. Teachers were asked to read the assigned storybook to his or her class on the Monday of each week and then read the book three additional times during that week for a total of four sessions per week and 120 reading sessions over the academic year. Teachers read the book as a large-group activity involving all children in the classroom, although the time at which it was read was free to vary. To ensure that books were read according to the specified schedule, teachers received all storybook titles at the start of the academic year, with each placed in a sealed manila envelope with the date it was to be first read written on the cover. Teachers in both conditions received modest stipends for completing training workshops and implementing the book reading program to which they were assigned; incentives were identical for both intervention conditions.

**Print referencing condition.** Teachers in this condition received instruction in how to use a print referencing style before beginning their 30-week book reading program. Four approaches were used to support teacher use of this technique. First, teachers participated in a 1-day workshop before the start of the academic year. This workshop described major achievements in print knowledge, the importance of early literacy instruction for young children, and the use of a print referencing reading style as a way to provide this instruction. Teachers had opportunities to practice use of a print referencing style with peers at this workshop. A follow-up 3-hr workshop was held midway through the 30-week reading program to review each teacher's implementation and to provide additional coaching on how to use a print referencing style in the classroom.

Second, teachers received a manual titled *Calling Attention to Print* (Justice & Sofka, 2005), which describes specific print targets, print referencing techniques, and a scope of objectives for using print referencing in a systematic way to build children's print knowledge over an academic year. The scope comprises four instructional domains and 15 objectives: *print organization* (5 objectives), *print meaning* (3 objectives), *letters* (3 objectives), and *words* (4 objectives), as shown in Appendix A. Examples of how to address each of these objectives during storybook reading interactions are presented in the manual. Teachers reviewed this manual at training and had it available as a reference guide for the duration of the study.

**Table 1.** Descriptive statistics for the children in the print referencing and comparison groups for early literacy and language measures.

Measure	Print referencing condition				Comparison condition			
	Fall		Spring		Fall		Spring	
	M	SD	M	SD	M	SD	M	SD
Print knowledge measure								
Print concept knowledge	91.06	18.45	109.33	20.68	95.32	17.73	104.90	14.88
Alphabet knowledge	5.74	7.74	16.57	8.98	11.34	9.69	18.23	9.54
Name-writing ability	3.03	2.19	5.76	1.70	3.37	2.29	5.30	1.72
Language measure <sup>a</sup>								
Sentence structure	8.73	2.92	9.15	3.11	8.80	3.17	8.90	2.73
Word structure	8.00	3.25	8.60	3.15	9.00	2.91	8.40	3.11
Expressive vocabulary	8.75	3.40	9.73	2.73	9.38	2.71	9.74	2.81
Core language composite	88.38	24.57	95.09	15.26	94.58	14.74	94.29	14.92

<sup>a</sup>The language measures represent mean performance on the Clinical Evaluation of Language Fundamentals—Primary, Second Edition (CELF:P2; Wiig, Secord, & Semel, 2004).

Third, two specific objectives were linked to each target storybook, thus providing teachers with an explicit instructional sequence to follow over the academic year as they embedded print instruction within their shared reading routines (see Appendix B). The objectives for each storybook were printed on a card that was placed within each book; this card also provided suggested techniques that teachers could use to address objectives for children with differing levels of ability. A sample card is presented in Appendix D.

Fourth, teachers received written feedback on their use of a print referencing style for several of their classroom-based readings. Specifically, teachers videotaped themselves conducting reading sessions every 2 weeks during the 30-week program, submitting to research staff a total of 15 videos. (Teachers were provided all materials for doing so, including a video camera and recording media.) At weeks 8 and 22, teachers received written feedback on their use of a print referencing style based on the research staff's review of the submitted videotapes.

**Everyday shared reading condition.** Teachers in the comparison condition read the same set of storybooks according to the same reading schedule as the teachers in the print referencing group; however, these teachers were asked to use their typical reading style when reading the target storybooks. Descriptions of what may constitute "typical" reading behaviors of preschool teachers are available in Reese and Cox (1999). Implementation supports over the course of the 30-week program were similar to those in the intervention group. Specifically, teachers participated in a fall training workshop before the start of the academic year to discuss the importance of shared reading in the preschool classroom and to receive general guidance on high-quality reading interactions. These teachers also submitted bimonthly videotapes of classroom reading sessions and received written feedback (of a general nature with no discussion of print focus) two times during the year. These teachers also participated in a brief winter workshop on storybook reading practices; this workshop discussed how to extend storybook content into play-center activities and how to encourage children's conversations during play.

## Fidelity to Intervention

Every 2 weeks, teachers submitted videotapes of their classroom-based reading sessions through which fidelity was carefully monitored. Each reading session was coded using a fidelity coding catalog (FCC) that was developed for this study. The FCC is an observational tool that is used to document whether the teacher addressed each of the specific print targets assigned to a particular reading session, coded as 1 = *yes* or 0 = *no* for each target. The FCC is

also used to code the raw frequency with which teachers verbally reference print during storybook reading interactions across four categories of print targets: (a) print organization (e.g., "Show me where to start reading on this page."), (2) print meaning (e.g., "What do you think the animal is saying here?"), (3) letters (e.g., "What letter is this?"), and (4) words (e.g., "Can you find a really long word on this page?"). Fidelity coding is completed by trained individuals who have completed a self-study module on use of the FCC that involves a series of practice coding of videotaped reading sessions. Coders can independently code reading sessions using the FCC once they reliably score five video reading sessions, each approximately 10 min in length, with 95% accuracy. Reliable coders, for which there were five at the time of this study, conduct FCC scoring while viewing videotapes of reading sessions; they may pause the video as often as needed to code reliably.

Fidelity to the print referencing condition was established by determining the percentage of teachers in this condition who addressed the two specified print targets in each of three reading sessions conducted over the academic year—namely, for a video submitted in fall (book/week 1), winter (book/week 14), and spring (book/week 30) of the academic year. By selecting videos for books 1, 14, and 30 for analysis, we were interested in determining whether fidelity was maintained over the length of the intervention. As shown in Table 1, the percentage of teachers who hit each of the two targets at the three time points was relatively high. Looking at potential individual differences among the intervention teachers, we calculated their general adherence to the intervention by determining how many print targets out of a possible six (two per each of three videos analyzed) were addressed within the reading sessions: 8 teachers hit 100% of the targets (6/6), 3 hit 83% (5/6), 2 hit 67% (4/6), and 1 hit 0 (0/6). In contrast, for the comparison teachers, 1 teacher hit 83% of the targets (5/6), 1 hit 50% (3/6), 1 hit 17% (1/6), and the majority ( $n = 6$ ) hit 0.

Looking more generally at both groups of teachers' attention to print within the reading sessions, we calculated the raw frequency with which teachers in both conditions verbally referenced print across the four FCC categories of print organization, print meaning, letters, and words at the fall, winter, and spring reading sessions; these comparisons are presented in Table 2. To examine whether differences in print attention were statistically significant across the two groups, scores across the four categories of print targets coded on the FCC were collapsed to form a single composite for each teacher that represents the sheer volume of the references to print. At the fall session, intervention teachers ( $M = 27.9$ ,  $SD = 19.8$ ) made more print references than comparison teachers ( $M = 10.7$ ,  $SD = 8.3$ ),  $F(1, 24) = 7.18$ ,  $p = .013$ ,  $d = 1.01$ ; likewise, intervention teachers ( $M = 36.7$ ,  $SD = 31.2$ ) made more print references than

**Table 2.** Percentage of teachers in the intervention condition ( $n = 14$ ) who hit the specified print targets at the fall, winter, and spring observations.

Time	Week	Print target 1	Teachers		Print target 2	Teachers	
			%	n		%	n
Fall	2	Print directionality	79	11	Concept of word in print	93	13
Winter	14	Top and bottom of page	86	12	Short words vs. long words	86	12
Spring	30	Concept of word in print	86	12	Letters vs. words	79	11

comparison teachers ( $M = 10.7$ ,  $SD = 13.2$ ) at the winter session,  $F(1, 24) = 6.65$ ,  $p = .017$ ,  $d = 0.97$ . At the spring session, the frequency with which intervention teachers referenced print ( $M = 39.0$ ,  $SD = 29.5$ ) did not significantly differ from that of the comparison teachers ( $M = 20.9$ ,  $SD = 17.4$ ),  $F(1, 24) = 3.24$ ,  $p = .085$ ,  $d = 0.71$ , although the effect size was large, suggesting that meaningful differences in teacher attention to print were present.

**Reliability of fidelity coding procedures.** As noted previously, fidelity coding was conducted by research assistants who had achieved a criterion level of agreement with five master-coded videos. As an additional check regarding the reliability of fidelity codes, we randomly selected 10% of the videos coded for this study for double-coding by a second trained FCC coder. Calculation of point-by-point interrater agreement was 91% and 94%, respectively, for identifying whether a teacher hit each of the two designated print targets per storybook; for the four categories of print targets examined in the FCC, point-by-point agreement was 83% for print organization, 83% for print meaning, 89% for letters, and 91% for words. These values are somewhat lower than the agreement scores reported in previous studies that have coded adult references to print during reading (e.g., Ezell & Justice, 2000; Justice & Ezell, 2000). However, an important distinction between this research and prior work is that we did not transcribe reading sessions when coding references to print.

## Measures

Two types of measures were used in this study: (a) child print knowledge outcomes and (b) classroom quality. The former served as the primary dependent measures in this study. The latter was used as a covariate in the main analyses, given that classroom quality varies substantially within preschool classroom settings and can influence children's learning within these settings (Justice et al., 2008; LoCasale-Crouch et al., 2007). Research findings have shown that children's early literacy achievements are directly influenced by general features of the classroom environment (Connor et al., 2006), making it important that classroom instructional quality be taken into consideration when attempting to determine the extent of growth in children's skills that can be attributed to the intervention. The use of classroom-level covariates within group-randomized studies is an important tool for promoting the precision of analyses (Bloom, Richburg-Hayes, & Black, 2005).

To measure children's print knowledge outcomes, three standardized criterion-referenced tools were used. All measures were administered in English. Each measure was individually administered to children in a private setting within their preschool programs by examiners who had been trained to a specific criterion of performance. All three measures have served as outcome measures for children in prior intervention research and have adequate psychometric properties (e.g., Justice et al., 2003). The first two measures were the Upper-Case Alphabet Knowledge and Name-Writing Ability subsets of the Phonological Awareness Literacy Screening: PreK (Invernizzi, Meier, & Sullivan, 2004). The alphabet measure is administered by asking children to produce the name of all 26 letters presented in random order on a large sheet of paper. Children receive one point for each correct name (range = 0–26 points). The name-writing measure is administered by asking children to produce a portrait of themselves and then to sign it. Children's name-writing representations are scored on a 7-point scale based on a developmental continuum of early writing development; a

score of 1 depicts writing that is indistinct from pictures; a score of 7 depicts writing that is legible and orthographically complete. The third measure was the Preschool Word and Print Awareness assessment (Justice & Ezell, 2001; Justice, Bowles, & Skibbe, 2006), which examines children's knowledge of 14 concepts about print and words. To implement this task, an examiner and child read a commercial storybook together and the examiner embeds a series of structured tasks into the reading routine (e.g., the examiner asks the child to show just one word on a page to demonstrate his or her ability to represent words as units of written language). Scores are converted to "trait estimates" (akin to standard scores, Justice et al., 2006) based on a mean of 100 and a standard deviation of 15.

To measure classroom quality, the Classroom Assessment Scoring System—PreK (CLASS—PreK; Pianta, La Paro, & Hamre, 2005) was administered in each classroom in the spring of the academic year by trained research assistants. The CLASS examines relational processes between teachers and children within preschool classrooms. Ten 7-point rating scales represent three constructs of classroom quality: instructional support, emotional support, and classroom management. For the present study, a composite score representing spring classroom quality was created by averaging the scores from the four CLASS scales most related to children's academic gains within preschool settings: the concept development, quality of feedback, and language modeling scales together comprise the instructional support construct, whereas the instructional learning formats scale is one of three that comprise the classroom management construct. CLASS ratings were completed by individuals who had undergone the conventional CLASS training program offered at the University of Virginia that involves workshop training, practice codings, and then achievement of a specified criterion of reliability against master-coded tapes. The process for certifying reliable CLASS coders is discussed in detail in LoCasale-Crouch et al. (2007).

## RESULTS

### Preliminary Findings

Table 3 provides the basic descriptive statistics for the two groups (print referencing condition and comparison condition) on the three measures of print knowledge (print concept knowledge, alphabet knowledge, and name-writing ability) and four language measures (sentence structure, word structure, expressive vocabulary, and the composite score of the three subscales). To examine any potential statistical difference between the two groups on the baseline print knowledge measures, a multivariate analysis of variance (MANOVA) with three fall print knowledge measures as the dependent variables and condition (intervention vs. comparison) as the independent variable was conducted. The MANOVA test statistic was statistically significant, Wilk's  $\Lambda = 0.90$ ,  $F(3, 102) = 4.12$ ,  $p = .008$ , indicating there to be group differences on the baseline measures of print knowledge. Follow-up analysis of variance (ANOVA) for each of the three variables, print concept knowledge,  $F(1, 102) = .939$ ,  $p = .335$ , alphabet knowledge,  $F(1, 103) = 10.452$ ,  $p = .002$ , and name-writing ability,  $F(1, 103) = .679$ ,  $p = .412$ , revealed that the groups statistically differed only on alphabet knowledge, in favor of the comparison group. Thus, children in the comparison group started the study with higher levels of alphabet

**Table 3.** Mean frequency and standard deviation of verbal print references for the two groups of teachers.

Condition	Time	Print organization		Print meaning		Letters		Words	
		M	SD	M	SD	M	SD	M	SD
Print referencing	Fall	8.8	7.6	1.5	2.4	4.4	6.9	13.1	10.9
Comparison	Fall	5.3	4.3	2.1	2.7	1.5	2.3	1.9	4.4
Print referencing	Winter	11.3	10.2	1.0	1.7	8.2	14.8	16.2	14.8
Comparison	Winter	4.3	5.2	0.9	1.0	2.7	7.4	2.8	5.3
Print referencing	Spring	5.2	3.7	3.5	4.3	15.2	19.1	15.1	12.0
Comparison	Spring	3.4	3.7	2.3	1.9	12.6	15.2	2.6	4.2

knowledge than those in the intervention group. Similar procedures were used to examine the two groups for the four baseline language measures (sentence structure, word structure, expressive vocabulary, composite); the multivariate test statistic was not significant, Wilk's  $\Lambda = 0.96$ ,  $F(3, 102) = 1.28$ ,  $p = .286$ . For the purposes of thoroughness, we conducted follow-up ANOVAs for each of the language measures, finding none to reveal significant differences between the two groups: Sentence Structure,  $F(1, 99) = .012$ ,  $p = .914$ ; Word Structure,  $F(1, 99) = 2.471$ ,  $p = .119$ ; Expressive Vocabulary,  $F(1, 99) = .950$ ,  $p = .332$ ; and Composite,  $F(1, 99) = 2.045$ ,  $p = .156$ .

Table 4 provides a comparison of the two groups of classrooms for the measures of classroom quality that were collected in the spring of the year. Although the data suggest that the comparison classrooms were slightly higher in quality, ANOVA results indicated that the two groups of classrooms were statistically similar for each measure of quality: Concept Development,  $F(1, 21) = .723$ ,  $p = .405$ ; Quality of Feedback,  $F(1, 21) = .623$ ,  $p = .439$ ; Language Modeling,  $F(1, 21) = .923$ ,  $p = .348$ ; and Instructional Learning Formats,  $F(1, 21) = .154$ ,  $p = .699$ . There was sufficient variability in the mean scores per group, however, to indicate that the classrooms varied in their quality.

### Testing the Hypothesized Intervention Effect

A multivariate analysis of covariance (MANCOVA, statistically controlling for classroom instructional quality) was conducted to

**Table 4.** Classroom quality scores for the two groups of classrooms.

Classroom quality measure	Condition			
	Print referencing		Comparison	
	M	SD	M	SD
Concept development	3.3	0.8	3.8	1.8
Quality of feedback	3.9	0.9	4.3	1.5
Language modeling	3.9	0.9	4.4	1.6
Instructional learning formats	5.1	1.4	5.4	1.2

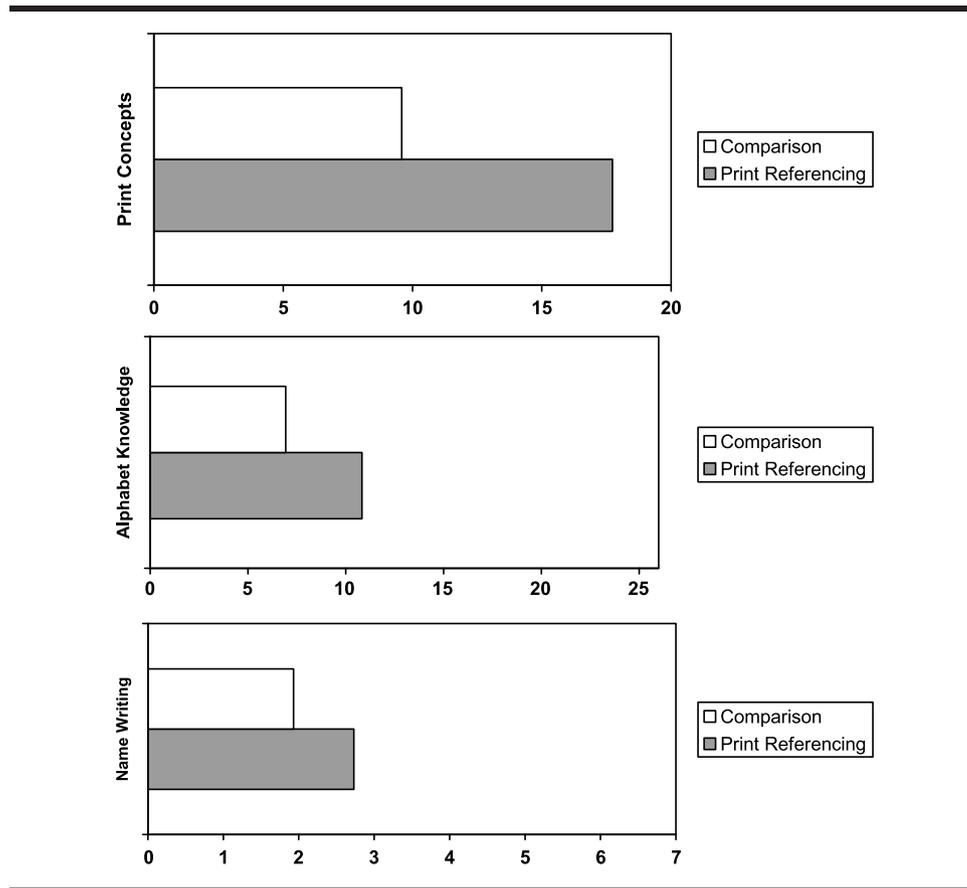
**Note.** Classroom quality measures represent constructs/scales of the Classroom Assessment Scoring System: PreK (Pianta, La Paro, & Hamre, 2005). Each construct is scored on a 7-point scale, where 1 is the lowest and 7 is the highest.

assess if sampling error (i.e., chance) could account for the observed larger print knowledge gains of the children in the intervention group. In this MANCOVA, the gain scores (gain score = posttest score – pretest score) of the three early literacy measures (print concept knowledge, alphabet knowledge, name-writing ability) served as the multivariate outcome variables. The classroom quality variable served as the covariate, and intervention and comparison group status was the independent variable of interest. If the intervention worked as hypothesized, we would expect that, after controlling for between-classroom effects (i.e., classroom instructional quality), the children in the intervention group would show statistically significant larger gains than those in the comparison group.

The MANCOVA test statistics showed that when controlling for classroom instructional quality, the two groups had statistically different gain scores on the three early literacy measures, Wilk's  $\Lambda = 0.88$ ,  $F(3, 101) = 4.73$ ,  $p = .003$ . A follow-up univariate analysis for each of the three outcome variables (controlling for classroom quality) was conducted; in these follow-up analyses, we took into account the potential clustering effect (i.e., children nested within classrooms) in the statistical analysis (e.g., underestimation of standard error and the resultant inflation of Type I error). We used SAS/PROC SURVEYREG procedure for such analysis. Using the Taylor expansion theory for estimating sampling errors of estimators based on complex sample designs, this analysis procedure is specifically designed for clustered samples as we have, and has corrected for the possible Type I error inflation in statistical analysis due to the violation of the assumption of independent observations. The results of these analyses showed that children in the print referencing classrooms had statistically higher gain scores on print concept knowledge ( $p = 0.025$ ) and alphabet knowledge ( $p = 0.007$ ). The difference between groups did not reach statistical significance for the name-writing ability measure ( $p = 0.079$ ). Figure 1 graphically depicts the early literacy growth patterns of the two groups (comparison vs. intervention) on the three outcome measures.

As argued by many quantitative researchers in education and psychology (e.g., Fan, 2001), in addition to reporting the results from statistical significance testing, some measure of effect size is essential for understanding and interpreting the research results from a particular study and for synthesizing findings from across studies. The reporting of confidence intervals for effect sizes is considered to be particularly informative and meaningful for understanding quantitative research results (Fan, 2001). We calculated effect sizes—standardized mean differences (i.e., Cohen's  $d$ )—to

**Figure 1.** Gains on print concept knowledge (norm-referenced measure for which  $M = 100$ ,  $SD = 15$ ), alphabet knowledge (criterion-referenced measure with a possible score range of 0–26), and name-writing ability (criterion-referenced measures with a possible score range of 0–7).



quantify the difference between the intervention and comparison groups in terms of their gain scores:

$$d = \frac{(\overline{\text{gain score}})_{\text{intervention}} - (\overline{\text{gain score}})_{\text{comparison}}}{\text{pooled } STD_{\text{gain score}}}$$

where  $\overline{\text{gain score}}$  is the average gain score of each group and  $\text{pooled } STD_{\text{gain score}}$  is the standard deviation of the gain scores pooled across the two groups (comparison and intervention).

As suggested by Cohen (1988), values for the standardized effect size measure  $d$  of 0.20, 0.50, and 0.80 can be considered as representing small, medium, and large effects, respectively, in the social and behavioral sciences. Although this guideline should not be interpreted rigidly for all disciplines, it provides some benchmark in evaluating the results of this study. All effect sizes in our study were positive, indicating that children in the intervention condition experienced larger early literacy gains from fall to spring as compared to those in the comparison condition. More specifically, for print concept knowledge,  $d = 0.50$  (95% confidence interval limits: 0.10 and 0.88); for alphabet knowledge,  $d = 0.56$  (95% confidence interval limits: 0.16 and 0.95); and for name-writing ability,  $d = 0.42$  (95% confidence interval limits: 0.02 and 0.80). Using the guidelines suggested by Cohen, these three effect sizes can be described as representing medium effects. The 95%

confidence intervals of these three effect sizes suggest that they are all statistically different from zero. Thus, we can be confident that children who experienced a print referencing style within their classrooms over the academic year exhibited educationally significant gains in three areas of early literacy development.

For exploratory purposes, we also examined children's gains in language scores (the three CELF-P:2 subtests and the Core Language composite) as a function of intervention received. We had posed no a priori hypothesis concerning the potential effects of a print referencing style on children's language growth. However, for exploratory purposes, we examined whether children in the two conditions showed any differences in language gains over the intervention period. The results of a MANCOVA (controlling for classroom quality) examining gains on four language measures (scores for Sentence Structure, Word Structure, Expressive Vocabulary, and Core Language composite) showed that the two groups did not statistically differ, Wilk's  $\Lambda = 0.98$ ,  $F(4, 92) = 0.79$ ,  $p = 0.79$ . Univariate ANCOVA tests (controlling for classroom quality) for each of the four measures showed that the two groups did not have statistically different gain scores on any of the four outcome measures: Sentence Structure,  $F(1, 95) = 0.00$ ,  $p = 0.97$ ; Word Structure,  $F(1, 95) = 3.23$ ,  $p = 0.75$ ; Expressive Vocabulary,  $F(1, 95) = 0.73$ ,  $p = 0.40$ ; and Core Language Composite,  $F(1, 95) = 3.12$ ,  $p = 0.81$ .

## DISCUSSION

The present work examined whether teacher use of a print referencing style delivered within everyday preschool settings in the context of large-group storybook reading interactions accelerated the early literacy skills of children attending need-based preschool programs. Findings showed that preschoolers' participation in print-focused reading sessions for an academic year resulted in educationally significant gains in children's print concept knowledge, alphabet knowledge, and name-writing ability as compared to preschoolers experiencing reading sessions in which teachers used their typical reading style; gains for the former two skill areas achieved statistical significance. In interpreting these findings, it is important to recognize that the effects for print referencing were seen *over and above effects* that can be attributed to "business as usual" storybook reading sessions featuring the same intensity of reading schedule and using the same storybook titles. In fact, the only difference between the experiences of children in the intervention and comparison classrooms was teachers' deliberate integration of verbal and nonverbal behaviors into their reading interactions to elicit children's increased attention to print. In the next sections, we focus on three topics that relate to the findings of the study reported here: (a) the importance of early literacy skills to later achievements in reading, (b) the significance of taking effective interventions to scale, and (c) strategies for building research-to-practice connections.

### Importance of Early Literacy Skills to Later Achievements in Reading

The focus of the work presented here was improving children's early accomplishments in early literacy, particularly in the domain of print knowledge. Research reports of the last decade have emphasized the longitudinal relationship between preschool-age children's performance on measures of print knowledge and their later achievements in skilled reading (National Early Literacy Panel, 2004; Storch & Whitehurst, 2002). We can presume that children who have developed sophisticated understandings about the rules that govern print, the names of individual print units, and the purposes that print serves in a literate society arrive at beginning reading instruction ready to assimilate understandings about the alphabetic principle. By contrast, children who have little knowledge about print may have difficulty with the rigors of formal reading instruction and by consequence will be "left behind." Indeed, longitudinal investigations have shown that children who arrive to beginning reading instruction with relatively little knowledge about print and sound (i.e., phonological awareness) are more likely than their more advanced peers to exhibit reading difficulties in the later elementary grades (Catts, Fey, Tomblin, & Zhang, 2002; Juel, 1988).

Although researchers have long been invested in identifying features of the home environment that influence children's achievements in early literacy, particularly the quality and quantity of parent-child shared storybook reading (e.g., Scarborough & Dobrich, 1994), the increased numbers of children who participate in preschool programs make it important to focus scrutiny on these out-of-home learning environments as well. The implementation of instructional techniques within the preschool classroom that effectively accelerate the early literacy skills of children who have been reared in homes in

which literacy supports are scarce may be an important mechanism for reducing the number of children who fail to achieve skilled reading in the elementary grades. Consequently, an important finding of the present work was the high degree of fidelity that was observed among the intervention teachers. The majority of intervention teachers showed consistent implementation of the print targets assigned to each storybook, and examination of their more general attention to print within the book reading context showed it to be consistently higher than that of the comparison teachers. This is an important finding, as recent research has shown that preschool teachers seldom embed explicit discussions about print within their large-group storybook reading sessions, even when they read books for which print is a salient feature (Zucker, Justice, & Piasta, in press). Yet, use of a print referencing style can foster children's early literacy growth, as shown in several prior studies (e.g., Justice & Ezell, 2002). The finding that many intervention teachers showed good adherence to the intervention is not surprising, however, as researchers have shown that both parents and educators can learn to embed explicit references to print into reading interactions with relatively little training (Ezell & Justice, 2000). We must note, however, that not all of the teachers in the intervention condition exhibited high levels of fidelity to the print referencing approach, and there was considerable variability in the extent to which teachers included attention to print. Understanding the ways in which specific characteristics of teachers (e.g., beliefs about children), classrooms (e.g., number of children with disabilities), and schools (e.g., school climate) may influence teachers' fidelity when implementing new interventions is an important direction for future research.

### Taking Effective Interventions to Scale

In the present study, we focused our attention on determining whether the positive child impacts that resulted from an early literacy intervention approach used by parents in one-on-one reading sessions at home (Justice & Ezell, 2000) and by highly trained research personnel in school settings (Justice & Ezell, 2002; Lovelace & Stewart, 2007) could be implemented successfully within the everyday environments of preschool classrooms serving children who were experiencing risk. More specifically, in this work, we examined the effectiveness of an early literacy intervention technique for which there was considerable evidence available regarding its efficacy in other settings and with other implementers. Efficacy studies differ from effectiveness studies in that the former are designed to demonstrate causal impacts of an intervention under tightly controlled implementations, whereas the latter focus on whether an intervention has positive impacts when it is used in more naturalistic settings, typically characterized by less controlled implementations and the involvement of more heterogeneous implementers and recipients (Hogarty, Schooler, & Baker, 1997). When examining the effectiveness of potentially efficacious interventions, researchers are invested in determining whether impacts that were observed in prior trials are replicated in more diverse settings and populations (McDonald, Keesler, Kauffman, & Schneider, 2006). The importance of determining whether the positive effects of print referencing intervention are replicated in the naturalistic preschool classroom setting is a particularly important one given the substantial variability that is seen among preschool classrooms today. Within the typical preschool classroom, there is remarkable variability among children in terms of their prior

developmental and sociodemographic experiences; among teachers in their professional preparation experiences and credentials; and among classrooms in their pupil composition, approach to curriculum, and offering of learning supports (Brandon & Martinez-Beck, 2007; McGill-Franzen, Lanford, & Adams, 2002). Ensuring that practices that have been shown to have developmental value to children in carefully controlled trials can readily generalize to the complex milieu of the preschool classroom should be an important priority among educational researchers.

As the results of this study make clear, the present work extends prior findings concerning the positive impacts of print referencing intervention to the preschool classroom as applied by teachers working in a range of program types and as delivered within large-group, classroom-based reading sessions four times weekly. The results show the value-added benefits of teacher reading with a print referencing style to approximate  $.5 SD$  on measures of print concepts, alphabet knowledge, and emergent name writing above those we see with exposure to teachers' typical storybook reading practices. Importantly, children's performance on such measures is consistently linked to later outcomes on measures of word reading and spelling (National Early Literacy Panel, 2004), suggesting that print referencing may exert positive impacts on children's future reading performance. However, two important future lines of research are suggested by the present work.

First, this study focused exclusively on estimating children's short-term benefits in early literacy as a function of exposure to print referencing intervention. The extent to which this intervention has positive longitudinal impacts must be studied in order to understand whether children's gains are sustained over time. If they are not, more powerful approaches to supporting children's early literacy growth must be explored; this may include smaller groupings when providing interventions (e.g., one-on-one or small groups) or greater intensity of intervention (e.g., two readings per day). Second, the present research included some exploratory analyses regarding the effects of print referencing intervention on children's language development. The results of these exploratory analyses suggested that language gains were similar for children who received a print referencing style of book reading as compared to those who received their teachers' typical reading style. Future researchers should consider ways to boost the impacts of reading with a print referencing style to consider how this style might be used to increase children's language *and* early literacy achievements simultaneously. Perhaps, for instance, teachers could couple a dialogic reading style (Whitehurst et al., 1994) with print referencing to promote children's achievements in vocabulary as well as print knowledge.

## Strategies for Building Research-to-Practice Connections

SLPs can play a critical role in translating research findings to the everyday setting of schools. This role is particularly significant in the current context of evidence-based practice, in which educators are being asked to implement within the field setting those practices that have been shown to be effective. Given the results presented in this work and their consistency with prior reports on the efficacy of print referencing (Justice & Ezell, 2000, 2002; Lovelace & Stewart, 2007), we feel confident in proposing

that print referencing be used within preschool classrooms to promote the literacy achievements of young children. Within preschool settings, however, several inherent challenges make bridging the research-to-practice gap potentially more difficult than in other educational settings (e.g., elementary schools). These include, for instance, the remarkable variability of the preschool teacher workforce in terms of professional preparation, limited access to material resources, and inadequate access to quality professional development opportunities (Brandon & Martinez-Beck, 2007; Meisels, 2006). Print referencing intervention, as designed for the present study, was designed to overcome these barriers, making it amenable to at-scale implementation.

First, the intervention was designed to focus on one single and specific activity context (e.g., large-group storybook reading) versus a range of activity contexts that span the entire academic day. Experts have suggested that interventions that modify teacher behaviors within highly constrained or clearly identified settings (e.g., group storybook reading) may require relatively minimal training for effects to be apparent, in contrast to approaches that require teachers to modify their instruction or behaviors across a variety of activity settings or instructional contexts (Correnti & Rowan, 2007). Second, print referencing intervention focuses on a singular domain of development that is viewed as highly relevant in present-day discussions of school readiness. Teachers may be more likely to adopt new instructional practices when there is a very clear specification of the objectives being addressed by the practice and the objectives are tied to valued pupil outcomes (Correnti & Rowan, 2007). Third, print referencing intervention was designed to require very few material resources for its effective implementation. In total, 30 storybooks were used repeatedly for a 30-week period of intervention, at an estimated cost of approximately \$200. The cost effectiveness of print referencing intervention is strong compared to other recently studied approaches to early literacy intervention. DeBaryshe and Gorecki (2007), for instance, reported moderate effects on print knowledge ( $d = .37$ ) when implementing a language and literacy curriculum in preschool classrooms that involved substantial costs if purchased commercially; also, teachers were provided weekly and monthly individual coaching in its effective use (for similar effect size impacts, see Assel, Landry, Swank, & Gunnewig, 2007; Wasik, Bond, & Hindman, 2006). Print referencing intervention exceeded these effects when teachers used the 30-week sequence of intervention coupled with approximately \$200 worth of storybooks with little professional support beyond an initial 1-day workshop and a brief refresher. Dollar-for-dollar, the evidence suggests that print referencing intervention is a good investment, both in absolute terms with respect to fostering children's early literacy and for providing preschool educators with a useful instructional tool.

In a recent review of successful school reforms in the area of literacy, Correnti and Rowan (2007) identified characteristics of interventions that lead to increased rates of instructional change among teachers. Their discussion is relevant here, as we consider the role that SLPs might play in building research-to-practice connections that help teachers use print referencing successfully in their classrooms. Correnti and Rowan emphasized that instructional changes are fostered when "knowledgeable facilitators" work closely with teachers in implementing new practices and, in their interactions with teachers, emphasize the importance of achieving high levels of fidelity to the new practice. From our perspective,

SLPs can serve as these knowledgeable facilitators to preschool educators by fostering their understanding of the development of print knowledge in young children and supporting them as they learn to systematically integrate print-focused interactions into their large-group reading sessions. SLPs can help translate recent research findings showing that print referencing intervention comprises an efficient and effective technique for stimulating the early foundations of reading for young children who are at risk, and for potentially mitigating their risks for later reading difficulties. Additionally, SLPs can work with teachers to identify storybooks within their classroom collections or within school libraries that can promote use of a print referencing style.

As a summary, we present four important limitations to interpretation of this work. First, although the pupils in this study were attending preschool programs that were designed to serve children who are at risk, we had relatively little understanding regarding individual risk factors that may have influenced children's responsiveness to intervention. For instance, information about the literacy supports that were available to children at home may have provided important explanatory information regarding our participants. Although the pupils in this study who received print referencing intervention showed significantly larger gains in print knowledge over the academic year compared to those in the comparison classrooms, these gains were averaged across all children in the intervention classrooms and do not represent individual differences among children. In fact, we know very little about individual differences that may explain (or detract from) responsiveness to early literacy intervention for young children. Although an understanding of child variability in intervention responsiveness is being vigorously explored for elementary pupils (e.g., Al Otaiba & Fuchs, 2006), researchers who study early literacy interventions have yet to contend with the fact that a substantial number of children will not respond adequately to even well-designed and theoretically sound interventions. Second, a small number of children in this study were concurrently receiving special education services, 4 of whom were in the intervention classrooms. Because the number of children in this category was so small, it would not have been statistically meaningful to include this child characteristic as an additional variable in our analysis. However, it is unclear whether the results of this work can be appropriately generalized to children with disabilities. Third, we had little in-depth knowledge of other teacher behaviors that may have contributed to children's literacy growth outside of the book reading intervention. It is plausible, for instance, that teachers in the intervention group extended their print referencing behaviors to other classroom contexts, such as art and dramatic play, and that these more generalized experiences contributed to the early literacy gains that were observed for children in the intervention group. Indeed, to fully attribute our findings to the storybook reading context fails to appreciate the many settings and activities in which children's literacy skills and understandings emerge. Fourth, and perhaps most importantly, we must note that the teachers in this study were self-selected. Likewise, the children we studied represented those for whom caregiver consent was received. We cannot determine whether the intervention effects would generalize to classrooms in which teachers are less motivated to or interested in completing a 30-week book reading program or to a more general population of children. Further examination of print referencing intervention effects in truly "business as usual" settings is warranted.

## ACKNOWLEDGMENTS

We thank the many administrators, teachers, and students who contributed to this project. We are grateful to the many research assistants who helped to collect and code data, with special mention for Elizabeth Cottone, Tricia Zucker, and Anita McGinty, among others. Funding was provided by the U.S. Department of Education, Institute of Education Sciences, Grant R305G050057. The content of this publication does not necessarily reflect the views or policies of the Institute of Education Sciences, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Department of Education.

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Received December 18, 2007

Revision received February 12, 2008

Accepted March 18, 2008

DOI: 10.1044/0161-1461(2008/07-0098)

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## APPENDIX A. SCOPE AND OBJECTIVES OF THE PRINT REFERENCING INTERVENTION

Instructional Domain 1: Print Organization	
Objectives	Sample Print Reference
1. <b>Page Order:</b> Knows the order in which pages are read in a book.	I am going to read this page first and then this page over here next.
2. <b>Author:</b> Knows the role of the author.	The author, Eric Carle, wrote all the words in this book.
3. <b>Page Organization:</b> Knows that reading occurs from the top of the page to the bottom of the page.	This is the top of the page. This is where I begin reading.
4. <b>Title of Book:</b> Knows the role of the title of the book.	This is the title of the book. It tells us the name of the book.
5. <b>Print Direction:</b> Knows that reading must occur from left to right.	I start reading here and I read this way.
Instructional Domain 2: Print Meaning	
Objectives	Sample Print Reference
1. <b>Print Function:</b> Understands the relationship between meaning and print.	Here are the penguin's words. He says, "thank you."
2. <b>Environmental Print:</b> Knows the purpose of print embedded within the environment.	This is a box of cereal. It says, "Corn Flakes."
3. <b>Metalinguistic Concept of Reading:</b> Understands the meaning behind reading and the contexts in which reading occurs.	We're going to read these words; what will these words tell us?
Instructional Domain 3: Letters	
Objectives	Sample Print Reference
1. <b>Upper-and Lower-Case Letters:</b> Knows that letters come in two forms, one of which is the uppercase letter.	This M in the red block is an uppercase letter. See how this uppercase letter is bigger than these lowercase letters?
2. <b>Names of Letters:</b> Knows the names of the majority of uppercase letters.	What is this letter?
3. <b>Metalinguistic Concept of Letter:</b> Knows that letters are a symbol used in written language.	Do you see a letter that is in your own name?
Instructional Domain 4: Words	
Objectives	Sample Print Reference
1. <b>Word Identification:</b> Identifies some written words in familiar contexts.	This word is "the." This word is in this book all the time, can you help me find it?
2. <b>Short vs. Long Words:</b> Knows that the number of letters in words can vary from many to few	This word is lollapaloosh. It is a long word. It has a lot of letters in it! Let's count all the letters.
3. <b>Letters vs. Words:</b> Knows that letters are different than words.	This is the letter K. K is in the words kangaroo and kick.
4. <b>Concept of Word in Print:</b> Represents the systematic relationship between spoken words and written words.	Let's point to each word as I read it. Ready?

**APPENDIX B (P. 1 OF 2). THE ORDER AND TITLE OF THE STORYBOOKS WITH THE SPECIFIED PRINT TARGETS**

<b>Week</b>	<b>Book title</b>	<b>Print targets</b>
1	My First Day of School	Environmental print Metalinguistic concept of reading
2	There's a Dragon at my School	Print direction Concept of word in print
3	I Like it When ...	Author Print function
4	The Dandelion Seed	Uppercase vs. lowercase letters Top and bottom of page
5	Down by the Cool of the Pool	Title of book Word identification
6	"More, More, More," said the Baby	Metalinguistic concept of letter Top and bottom of page
7	Jamboree Day	Page order Names of letters
8	Rumble in the Jungle	Word identification Metalinguistic concept of letter
9	David Gets in Trouble	Author Letters vs. words
10	The Way I Feel	Short words vs. long words Print function
11	Spot Bakes a Cake	Metalinguistic concept of letter Environmental print
12	We're Going on a Bear Hunt	Uppercase vs. lowercase letters Page order
13	Dear Mr. Blueberry	Title of book Print function
14	Growing Vegetable Soup	Top and bottom of page Short words vs. long words
15	Froggy Gets Dressed	Names of letters Metalinguistic concept of reading
16	I Stink!	Metalinguistic concept of letter Page order
17	Animal Action ABC	Letters vs. words Names of letters
18	My Backpack	Uppercase vs. lowercase letters Concept of word in print
19	Baghead	Short words vs. long words Print direction
20	Somebody and the Three Blairs	Top and bottom of page Metalinguistic concept of reading
21	To Market, To Market	Word identification Print direction
22	Hey, Little Ant!	Title of book Uppercase vs. lowercase letters
23	Mouse Mess	Environmental print Page order
24	In the Small, Small Pond	Concept of print in word Print direction

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**APPENDIX B (P. 2 OF 2). THE ORDER AND TITLE OF THE STORYBOOKS WITH THE SPECIFIED PRINT TARGETS**

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<b>Week</b>	<b>Book title</b>	<b>Print targets</b>
25	The Grumpy Morning	Names of letters Metalinguistic concept of reading
26	The Noisy Airplane Ride	Letters vs. words Print function
27	How to Speak Moo!	Title of book Word identification
28	Never Spit on Your Shoes	Author Environmental print
29	The Recess Queen	Short words vs. long words Author
30	Miss Bindergarten Gets Ready for Kindergarten	Concept of word in print Letters vs. words

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## APPENDIX C. BOOKS USED IN THE INTERVENTION

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- Andreae, D. (1996). *Rumble in the jungle*. London: Little Tiger Press.
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## In the Small, Small Pond

### TARGET: Concept of Word in Print

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#### ★ High Support Examples

**1) TECHNIQUE: CO-PARTICIPATION**

Teacher: Shannon, come on up here and point to all the words on this page with me.

**2) TECHNIQUE: MODELING THE ANSWER**

Teacher: I'm going to count all the words on this page (counts the words while pointing). Now, Demetrius, you come up and count all the words on this page.

#### ★ Low Support Examples

**1) TECHNIQUE: ENCOURAGEMENT**

Teacher: We have been talking about words for a long time now. I bet you all can tell me how many words are on this page. Look carefully!

Children: (Call out the number of words.)

Teacher: Very good! I heard everyone call out "2" and that is correct!

**2) TECHNIQUE: EXPLANATION**

Teacher: Who can tell me how many words are on this page?

Child: Two!

Teacher: Yep, two words on this page. We know this since we see the words here (points to words) and the rest of the page has a picture of fish on it.

### TARGET: Print Direction

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#### ★ High Support Examples

**1) TECHNIQUE: CO-PARTICIPATION**

Teacher: Okay, let's get ready to read this page ("herons plunge"). Cameron, please come up here with me and let's point to where we'll start reading.

**2) TECHNIQUE: REDUCE ALTERNATIVES/GIVE CHOICES**

Teacher: This is the beginning of our story. Do I start reading here (points to "pond"), or do I start here (points to "In")?

#### ★ Low Support Examples

**1) TECHNIQUE: RELATING TO THE CHILD'S EXPERIENCE**

Teacher: Tamara, you've looked at a lot of books lately. I'll bet you can show us where we should start reading. Will you come up and point to the place?

**2) TECHNIQUE: EXPLANATION**

Teacher: Where will I start reading on this page? This is a tricky one! Lakeesha, can you tell us where I'll start reading? Come up and show us.

Child: Right here (points to "wiggle")?

Teacher: Exactly right. This wasn't tricky for you. We start with "wiggle" because it is all the way over here. to the left. This word, "jiggle," starts further over. And we know we read left to right.

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STAR: Sit Together and Read

