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Does context matter? Explicit print instruction during reading varies in its influence by child and classroom factors☆

Anita S. McGinty[a,*], Laura M. Justice[b], Shayne B. Piasta[b], Joan Kaderavek[c], Xitao Fan[d]

[a] Center for the Advanced Study of Teaching and Learning, University of Virginia, 2200 Old Ivy Way, Charlottesville, VA 22904, United States
[b] School of Teaching and Learning, The Ohio State University, United States
[c] Early Childhood, Special, and Physical Education, The University of Toledo, United States
[d] Faculty of Education, University of Macau, Av. Padre Tomas Pereira, Taipa, Macau, China

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ABSTRACT

This study examined preschool teachers' ($n = 59$) explicit print instruction during shared reading and considered whether the benefits of this practice to children's learning ($n = 379$) varied as a function of the classroom environment and children's developmental characteristics. Measures of explicit print instruction and the classroom environment (global classroom quality, literacy environment) were obtained by aggregating observations taken across the 30 weeks of the study. Child outcomes were measured as spring print knowledge performance, controlling for fall. Child developmental characteristics were measured directly (language ability) and indirectly (attentional skills) in fall and winter, respectively. Findings showed that explicit print instruction contributed to children's learning, but its benefits decreased as the quality of the classroom and children's attentional skills increased. Implications for research and practice are discussed.

In the past decade, research and U.S. educational policy have emphasized the critical role of prevention in reducing the high rate of reading failure in this country (Bradley, Danielson, & Hallahan, 2002; Donovan & Cross, 2002; Snow, Burns, & Griffin, 1998). Substantiating this perspective are two recent meta-analyses showing that young children's literacy and language achievements *prior to or at school entry* were among the strongest predictors of their later reading success (Duncan et al., 2007; NELP, 2008). As such, promotion of young children's language and literacy skills has been a central focus in state- and federally-funded early-education programs and numerous scientifically-based preschool literacy and language curricula are now available to guide teachers' instruction in these areas (e.g., see the report of the PCER, 2008).

The evidence-base for these language and literacy curricula generally reflect evaluations of curricular 'packages' on children's language and literacy development. Yet, most curricular interventions are complex efforts, promoting many instructional practices and, sometimes, addressing aspects of the classroom environment (e.g., Assel, Landry, Swank, & Gunnewig, 2007; Fischel et al., 2007). It is, therefore, difficult to know what aspects of such programs were central to observed intervention effects. Further, there is very little knowledge about how specific literacy instructional practices work as part of a broader ecological system – involving the classroom environment, the child, and the teacher – to promote young children's literacy achievement.

The emphasis on mechanisms of development within the classroom ecology is an emerging approach within the literature (e.g., Mashburn et al., 2008; Rimm-Kaufman, Curby, Grimm, Nathanson, & Brock, 2009) and is consistent with developmental ecological theory (Bronfenbrenner & Morris, 2006). Developmental ecological theory posits that any particular *process* between adults and children (e.g., any particular instructional practice) may vary in its benefit depending on a *child's characteristics* (e.g., language ability or attention) and/or the characteristics of the *environment* in which those interactions occur (e.g., global classroom quality; Bronfenbrenner & Morris, 2006). Placing instruction within the broader ecology of the classroom can, thus, foster a more precise understanding of how an instructional practice may support the learning and development of a particular child, in a particular environment. Taking an ecological view, this study considered how explicit print instruction delivered during shared reading (hereafter referred to as explicit print instruction) may support young children's print knowledge development, in light of other

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* Corresponding author. Tel.: +1 434 243 7757; fax: +1 434 243 0533.
E-mail address: as2g@virginia.edu (A.S. McGinty).

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relevant supports within the classroom (i.e., global classroom quality, literacy environment) and children's own developmental characteristics (i.e., language ability, attentional skills).

1. The importance of print knowledge development

In the broader context of reading development, print knowledge development has sometimes been described as a 'constrained' skill, or one limited in scope and influence and which almost all children master in a fairly brief period of time (Paris, 2005). Yet, for the young child, print knowledge varies widely and its development in preschool appears to be meaningfully, and causally, related to early reading success (NELP, 2008; Piasta et al., in pressPiasta, Justice, McGinty, & Kaderavek, in press). In fact, at this early point in a child's reading development, print knowledge acquisition can serve as a gateway to developing other, necessary, pre-requisite reading skills, such as phonological awareness and letter-sound correspondence (Burgess & Lonigan, 1998; Treimn, Tincoff, Rodriguez, Mouzaki, & Francis, 1998). As conceptualized in this study, print knowledge is a multi-dimensional ability reflecting: (a) children's global understanding that print is a meaningful, symbolic communication system (i.e., print concepts; Bialystok & Reece, 1996; Clay, 1977), and (b) children's specific knowledge of that system (i.e., alphabet knowledge; Lomax & McGee, 1987).

2. Explicit print instruction and print knowledge development

Children's naturalistic interactions with print and literacy in their everyday environments are considered, theoretically, central to their print knowledge development (e.g., Adams, 1990). Interestingly, however, studies examining young children's independent exploration of books show that children spend minimal time looking at the printed words on a page, unless cued by an adult (Evans & Saint-Aubin, 2005; Evans, Williamson, & Pursoo, 2008; Justice, Pullen, & Pence, 2008). Thus, a growing perspective in the field is that print-rich contexts, such as that afforded by books, may not be particularly valuable to young children's print knowledge development, without explicit adult support (e.g., Justice & Ezell, 2002).

Explicit print instruction is a technique by which adults may support young children's print knowledge development and involves periodic and brief interruptions of a storybook reading to discuss features of print (e.g., "I see two capital A's"; "Do I read the left or right page first?"; Justice & Ezell, 2002; Lovelace & Stewart, 2007). Until recently, very little research has directly examined the value of explicit print instruction during shared reading to children's literacy development. Instead, the evidence on this instructional practice has come, primarily, from studies evaluating an intervention called the Print Referencing program. The Print Referencing program structures adults' systematic use of explicit print instruction across 30 weeks of preschool and has been shown to have a significant and positive impact on children's preschool print knowledge learning and their kindergarten and first grade reading and spelling achievement (Justice & Ezell, 2002; Justice, McGinty, Piasta, Fan, & Kaderavek, 2010; Piasta et al., in press). Although explicit print instruction is central to the Print Referencing program, implementing teachers also receive a systematic scope and sequence, a schedule of reading, training in globally high-quality reading practices, and strategies for individualizing instruction to various learners. Yet, recent work suggested that the quantity with which teachers use explicit print instructional techniques (regardless of the quality of the shared reading or instructional episodes) may drive the program's effect. Examining only those classrooms randomly assigned to conduct the Print Referencing program, McGinty, Breit-Smith, Fan, Justice, and Kaderavek (2011) found that variation in the amount of explicit print instruction that implementing teachers provided, on average each lesson, related to the extent of children's print knowledge gains over the preschool year. These findings suggest a "dose-response" relationship between explicit print instruction and print knowledge development (see NICHD Early Child Care Research Network [ECCRN], 2003) and highlight the potential power of this classroom practice to promote young children's print knowledge development. The present study examined whether this relationship (between the quantity of explicit print instruction provided and children's print knowledge development) varied as a function of the classroom environment and children's developmental characteristics. Further, this study examined explicit print instruction when only half of the participating classrooms had the structure of the Print Referencing program in place (but where all classrooms were adhering to the same frequency and schedule of shared reading sessions using the same books), thus seeking to generalize the findings of previous work.

3. The classroom environment and print knowledge development

Global classroom quality is reflected in the ways teachers and children interact in the classroom and is a powerful mechanism of young children's early cognitive and social development (Mashburn et al., 2008; NICHD ECCRN, 2002a, 2002b; Pianta, La Paro, & Hamre, 2008). Rather than reflect a teacher's emphasis on content or curricula, global classroom quality reflects the ways in which teachers interact with children across contexts and activities to promote higher order thinking, behavioral regulation and productivity, and emotional security and connection. Research shows that the level of emotional and behavioral support adults provide to children relates to their behavioral engagement within specific literacy activities (Bus, Belsky, van Ijzendoorn, & Crnic, 1997; Sonnenschein & Munsterman, 2002) and within in the classroom environment, more generally (Bulotsky-Shearer, Fantuzzo, & McDermott, 2008; McWilliam, Scarborough, & Kim, 2003; Rimm-Kaufman et al., 2009). Further, a recent analysis of 11 state-funded preschool programs ($n = 671$ classrooms, $n = 2439$ children) reported a direct link between globally high-quality instruction, supportive of children's higher-order thinking and language ability, and children's alphabet knowledge and phonological awareness (Mashburn et al., 2008; see also NICHD ECCRN, 2002a, 2002b). The present study's focus was to examine whether explicit print instruction was a distinct classroom support for children's print knowledge development when considered in light of a classroom's global quality. Further, this study considered whether explicit print instruction and global classroom quality may work synergistically to promote young children's print knowledge development.

Another dimension of the classroom theoretically important to children's print knowledge development is the literacy environment. The literacy environment is defined by the presence and accessibility of literacy materials in the classroom (e.g., books, labels; Smith, Dickinson, Sangeorge, & Anastasopoulos, 2002) and correlates with the time children spend in print-related activities (Christie & Enz, 1992; Neuman & Roskos, 1997). A number of studies, however, have failed to show a strong association between children's learning and the literacy environment in the absence of active adult facilitation (McGill-Franzen, Allington, Yokoi, & Brooks, 1999; Vukelich, 1994). These findings are consistent with a literature drawing theoretical distinctions between the structural supports in a classroom and active adult–child processes (e.g., NICHD ECCRN, 2002a). The present study considered the literacy environment as a structural feature of children's preschool classrooms. The intent was to evaluate explicit print instruction in relation to children's print knowledge development when controlling for this ambient, but print-related, facet of the classroom.

4. Explicit print instruction and child developmental characteristics

Reading instructional practices have historically been grouped as explicit code-related practices (i.e., emphasizing isolated skills related to text-decoding) or implicit meaning-related practices (i.e., emphasizing text comprehension skills and providing only implicit and/or incidental text-decoding instruction; Connor, Morrison, & Katch, 2004). A similar dichotomy exists at the preschool level, with research pointing to early literacy activities as meaning-related (i.e., supporting oral language skills) or code-related (i.e., supporting print knowledge and phonological awareness; Connor, Morrison, & Slominski, 2006; Sénéchal & LeFevre, 2002; Whitehurst & Lonigan, 1998). Across school-aged and preschool-aged children, optimal support for children's literacy development balances code-related and meaning-related instruction (National Institute of Child Health and Human Development [NICHD], 2000; Pressley, 2006; Snow et al., 1998). Work on child-by-instruction interactions in older children, however, points to the benefit of providing increasingly intense levels of explicit, code-related instruction as children's baseline reading-skill levels decrease (e.g., Connor et al., 2009; Foorman, Francis, Fletcher, & Schatschneider, 1998). Although it is not entirely clear how these findings may extend to younger, preschool-aged children, an emerging body of research does suggest the importance of using child characteristics to inform the nature or design of preschool literacy instruction.

Observational work by Connor et al. (2006) found that explicit code-related activities in preschool were particularly important to young children with weak initial skills. In fact, the data showed that code-related activities were necessary to promote code-related accomplishments in children with weak initial skills, whereas meaning-related and code-related literacy activities supported the code-related development of children with stronger initial skills (Connor et al., 2006).These findings are consistent with intervention studies that showed the benefit of highly-specified and explicit literacy interventions were strongest for socially- and/or developmentally-vulnerable children (e.g., Assel et al., 2007; Justice, Chow, Capellini, Flanigan, & Colton, 2003). This study adds to the small body of work considering the interaction of literacy instructional practices and child characteristics at the preschool-level. We focus on two child characteristics, language (vocabulary and grammar) and attentional skills (i.e., an aspect of behavioral regulation reflecting the ability to sustain attention and avoid distractions; Howse, Lange, Farran, & Boyles, 2003; McClelland et al., 2007). These skills consistently relate to young children's literacy accomplishments (Duncan et al., 2007; Lonigan et al., 1999; NELP, 2008), but little is known about how these characteristics may influence young children's response to explicit literacy instruction in preschool.

5. Research questions

This study addressed three research questions. First, to what degree did explicit print instruction, the classroom environment (global classroom quality, literacy environment), and child developmental characteristics (language ability, attentional skills), uniquely relate to children's print knowledge development? It was hypothesized that explicit print instruction would demonstrate a significant unique association with children's print knowledge development, given evidence of this technique's effects from prior intervention work (e.g., Justice et al., 2010; Lovelace & Stewart, 2007) and the proximal nature of this classroom process to children's print knowledge development.

Second, to what extent did the association between explicit print instruction and print knowledge development vary as a function of global classroom quality? It was hypothesized that global classroom quality would enhance the association between explicit print instruction and children's print knowledge development. This hypothesis is based on Justice and Ezell (2004) theoretical premise that explicit print instruction is best understood as a social exchange between adults and children. According to this view, adults' explicit print instruction orients children to key aspects of print, but children's learning is necessarily supported through warm, well-tuned exchanges in which adults also offer more global supports to children's learning.

Third, to what extent did the association between explicit print instruction and print knowledge development vary as a function of children's developmental characteristics (language ability and attentional skills)? It was hypothesized that explicit print instruction may be more strongly associated to children's print knowledge development for children with lower levels of language ability and attentional skills, given emerging findings from work exploring child-by-instruction interactions in preschool-aged children (e.g., Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008; Justice et al., 2003).

6. Method

6.1. Design

The teachers and children involved in the present study were participants in a larger multi-site, multi-cohort, and randomized-controlled trial investigating the effects of the Print Referencing program. Rather than consider children's outcomes in relation to their participation in an assigned treatment condition (but see Justice et al., 2010), this study combined teachers across randomized conditions to explore a potential 'active ingredient' of children's print knowledge development, namely teacher's explicit print instruction during book reading. In all classrooms, teachers were conducting four shared-reading sessions weekly, were given the same storybooks to read and were asked to read the books in the same order and according to the same schedule; however, the Print Referencing program was only in place in half the classrooms. To ensure that any observed association between explicit print instruction and children's print outcomes would not be confounded with an unobserved effect of assigned study condition, study condition was statistically controlled in all analyses.

6.2. Participants

The 59 teachers and 379 children participating in this study were affiliated with preschool programs across rural, suburban, and urban locales in Virginia or Ohio that were funded (primarily) through Head Start ($n = 23$), state preschool initiatives ($n = 24$), or private initiatives ($n = 12$). All participating programs prioritized enrollment of children with socio-demographic risk and all classrooms served primarily four-year-old children in the year prior to their kindergarten entry. This study included two cohorts of teachers and children who participated during the 2005–2006 school year ($n = 24$) or the 2006–2007 school year ($n = 35$).

6.2.1. Teachers

Teachers were informed, through their administrators, about study information sessions. Information sessions provided interested teachers a brief overview of the project and requirements, followed by the option of participating. As part of their agreement to participate, teachers provided written consent to participate in a study of children's early literacy development, consented to implement activities if asked, and agreed to random assignment of condition. All teachers who attended information sessions agreed to participate and were included in this study's sample.

Of the 59 participating teachers, 16.9% (n = 10) had an advanced/graduate degree, 33.9% (n = 20) had a Bachelor's degree, 28.8% (n = 17) had an Associate's degree or some college, and 20.3% (n = 12) had a high school degree as the highest level of educational attainment. Teacher-reported race/ethnicity indicated that 64.4% (n = 38) of the sample was White/Caucasian, 25.4% (n = 15) was Black/African American, and 10.2% (n = 6) was designated as Other. The teachers had, on average, 10.59 (SD = 8.97) years of experience teaching preschool. All participating teachers were the lead classroom teacher.

6.2.2. Children

Children in participating classrooms were recruited via a family flyer sent home in children's backpacks. Interested parents or guardians completed a child consent form and returned it to their child's classroom teacher within two weeks of it being sent home. From each classroom's pool of consented children, six (on average) were randomly selected to participate. The range of returned consents varied from 5 to 15 per classroom (out of an average class size of 16). All children for whom consent was received were considered eligible for study participation if they met the following criteria: (a) they were between 4 years 0 months and 4 years 6 months of age as of October 1 of their preschool year, (b) spoke English, and (c) did not have a severe disability which would impede their ability to complete testing.

For the 379 participating children, there were slightly more girls than boys (n = 203 girls, n = 176 boys) and the mean age upon study entry (calculated as of October 1) was 51.92 months (SD = 4.49). Children's race/ethnicity per parental report indicated that 42% (n = 159) of the children were identified as White/Caucasian, 36.7% (n = 139) were identified as Black/African American, and 19.5% (n = 74) were identified as Other. Children's race/ethnicity was not reported for 1.8% (n = 7) of the participating children. Although parental report indicated that the majority of children spoke English in the home (87.9%; n = 333), 2.4% (n = 9) of the children spoke a language other than English at home and data were not reported for 9.8% of the children (n = 37).

Consistent with preschool program eligibility criteria, family data from participating children suggest a fairly sociodemographically at-risk sample. Caregiver report of annual household income revealed that over half of families (56.3%) earned an annual household income less than or equal to \$30,000/year, 22.4% earned between \$30,000 and \$65,000/year, and 4.5% earned above \$65,000/year. Data were not reported for 16.9% of the sample. Mother-reported educational levels demonstrated that the highest level of education attained was eighth grade for 1.3% (n = 5) of mothers, a high school diploma for 61.2% (n = 232) of mothers, an Associates' degree or technical certification for 19.5% (n = 74) of mothers, a Bachelor's degree for 5.3% (n = 20) of the mothers, and an advanced graduate degree for 1.1% (n = 4) of the mothers.

6.3. Procedures

Teachers completed a one-day professional development training (on varying topics, depending on assigned condition) prior to the beginning of the school year. At the time of training, all teachers completed a set of questionnaires regarding their background, attitudes about teaching, beliefs about children, and classroom practices. A substantial amount of the training session involved providing teachers with details regarding the book-reading program they would implement. All teachers in this study were required to read a specified book four times each week for 30 weeks (the same books were used by all teachers), keep written logs of any additional readings, and collect bi-monthly videotapes of their classroom-based readings according to a pre-defined schedule. Half the teachers were required to provide explicit print instruction during these sessions, following the structure of the Print Referencing program. The other half of teachers were told to read the book "as you normally would." Videotapes of teachers' reading sessions were coded by trained, reliable coders for use of explicit print instruction. Of the 59 teachers, all submitted at least eight videos and 56 submitted 10 or more (maximum possible was 15; target number for fidelity was 10).

In the fall and spring of children's preschool year, research staff visited each classroom to conduct observations of classroom activities and to test selected children on a battery of language and emergent-literacy skills. The majority of testers were blinded to the classroom's assigned condition, although this was not always the case because key personnel occasionally assisted with assessments. All child testing was conducted on an individual basis in a quiet space within each child's preschool center or school in two or three 15–30 min testing sessions, for a total of 45–60 min of testing per child. Indirect measures of children's attentional skills, provided by children's teachers, were taken in the second half of children's preschool year, between February and May. In the fall and spring (at the same time as direct-child assessments), tapings of the classroom routine were collected, which served as the basis for coding teacher's global classroom quality.

6.4. Outcome measures: print knowledge

Print knowledge was measured as the standardized sum of children's performance on measures of alphabet knowledge and print concepts knowledge. The literature, generally, has taken a diverse approach to measuring print knowledge. Many large-scale prediction studies focus on alphabet recognition as a representation of print knowledge and early reading (see Duncan et al., 2007). Other studies focus on the multiple dimensions of print knowledge but draw a clear distinction between print concepts and alphabet knowledge (e.g., Lomax & McGee, 1987; Lonigan, Burgess, & Anthony, 2000). In our work, we have found empirical support for considering print concepts and alphabet knowledge as a single latent construct (see findings of a factor analysis in McGinty et al., 2011). Further, the combining of print concepts and alphabet knowledge into a single construct creates a dependent variable which is conceptually aligned with our key independent variable (i.e., explicit print instruction). The correlations between our measures of print concepts and alphabet knowledge in fall (r = .68) and spring (r = .62) further support the creation of a single print knowledge measure for this dataset.

This study's print knowledge composite was created by standardizing children's performance on each individual measure at each time point (i.e., fall, spring) and averaging across measures. This approach addresses the fact that raw scores on each measure were on different scales (i.e., that one point on the measure of alphabet knowledge is conceptually different than one point on the measure of print concepts) and allows each measure to contribute equally to the composite score at each time point. A description of the individual measures comprising the print knowledge composite follows.

The *Preschool Word and Print Awareness* test (PWPA; Justice, Bowles, & Skibbe, 2006; Justice & Ezell, 2001) assessed children's knowledge of 14 print concepts within the context of a shared book reading. The PWPA assessed children's knowledge of book parts (i.e., front of book, back of book, title), print directionality and conventions (i.e., where to begin reading, direction of reading within and across pages, first and last lines of text), letter knowledge (i.e., identify letter within word, capital letter, lowercase letter), and print meaning (i.e., distinguish print from pictures, words as representing character speech). Correct responses received either one or two points, with partial credit allowable on the two-point questions; there is a total possible raw score of 17 points. Based on item-response-theory (IRT) analysis, the total scores on the PWPA can be interpreted on an interval scale and represent a reliable measure of children's print knowledge (Justice, Bowles et al., 2006; Justice, Sofka, Sutton, & Zucker, 2006). Additionally, PWPA scores appear to be valid indicators of ability and can distinguish among children in various risk categories (Justice, Bowles et al., 2006; Justice, Sofka et al., 2006).

Children's alphabet knowledge was measured using the *Phonological Awareness Literacy Screening: Pre-Kindergarten* (PALS-PreK) *Upper-Case Alphabet Recognition* subtest (Invernizzi, Sullivan, Meier, & Swank, 2004). In this task, children were asked to name each of the 26 individual, upper-case letters that are presented in random order on a single printed sheet. One point was awarded for every letter correctly identified, for a total of 26 points. Inter-rater reliability of this measure has been established across numerous large-scale studies and was reported by the authors to be .99 (Invernizzi et al., 2004).

6.5. Child measures: child developmental characteristics

6.5.1. Attentional skills

Attentional skills were measured as the sum of two items from the 36-item Child Behavior Questionnaire (CBQ very short form; see Putnam & Rothbart, 2006). These items comprise part of the larger trait factor of effortful control on the very short form and are a subset of the items comprising the attention scale in the full-length CBQ. As a group, the two items demonstrated adequate internal consistency (α = .69), commensurate with alpha levels reported by Putnam and Rothbart (2006) when validating the scales and traits of the CBQ short and very short forms. The specific items used to measure attentional skills in this study included: "When drawing or coloring in a book, shows strong concentration" (question 3) and "When building or putting something together, becomes very involved in what s/he is doing and works for long periods" (question 15).

For this study, teachers rated each child's tendencies along a 7-point continuum (e.g., 1 = *extremely untrue of your child;* 3 = *slightly untrue*, 4 = *neither true nor untrue*, 5 = *slightly true*; 7 = *extremely true*). Teachers also had the option of marking an item as not-applicable and, in this case, data were considered as missing. The sum of teacher ratings on these two questions was used to measure attentional skills. Teacher report of attention and behavior skill has been demonstrated to be stable over time (Ladd & Profilet, 1996) and predictive of children's later academic performance (McClelland, Acock, & Morrison, 2006). Previous research has also used teacher report using the attentional items of the CBQ and found evidence of concurrent validity including significant positive correlation with parent report (r = .35). Further, patterns of prediction to child outcomes were evident when either teacher- or parent-report of attention was used (Eisenberg et al., 1997).

6.5.2. Language ability

The measure of language ability comprised three subtests of the standardized norm-referenced *Clinical Evaluation of Language Ability Fundamentals–Preschool: 2* (CELF-P: 2; Wiig, Secord, & Semel, 2004): *Sentence Structure, Word Structure, and Expressive Vocabulary*. Collectively, these subtests represented children's expressive- and receptive-language ability in the areas of vocabulary, syntax, and morphology; it required approximately 15 min to administer. Data analyses involved the combined composite of these three subtests, the Core Language ability score, which is based on a standard curve for which the mean is 100 and the standard deviation is 15. The decision to use a combined measure of language ability, rather than individual scales, was based on evidence that associations among emergent literacy and language ability are best reflected when complex measures of language ability are considered (NICHD ECCRN, 2005). Adequate reliability and construct, convergent, and predictive validity is well established for this measure (see Wiig et al., 2004).

6.6. Classroom measures: explicit print instruction and classroom environment

6.6.1. Explicit print instruction

Teachers' explicit print instruction was measured as the raw sum of teacher's talk about print during reading, which was captured through a coding scheme that counts every teacher-provided, print-related, extra-textual utterance related to four mutually exclusive and exhaustive print domains and is based on teacher's use of key words related to those domains (i.e., Print Meaning, Print and Book Organization, Letters, Words; Justice, Sofka et al., 2006). Key words related to Print Meaning include "read" or references to environmental print (e.g., the sign says). Key words related to Print and Book Organization include references to directionality of reading or text (e.g., "I read left to right"; "I start reading at the top of the page"), the title, the author, book genre, or book parts (e.g., front cover). Key words related to Letters include any letter name or letter sound. Key words related to the category of Words must use the term "word" in relation to text (e.g., "These are the words I read;" "How many words are there in the title"). The coding scheme requires that an utterance is only categorized into one domain and, thus, applies the following hierarchy: Word, Letter, Book and Print, Print Meaning. All coding was conducted by trained coders who had achieved 100% reliability with the gold-standard codes attached to five book-reading sessions. Additionally, inter-rater reliability conducted on 10% of all book-reading observations was 86.7% (based on exact agreement across all domains and 127 book-reading sessions). This study's measure of explicit print instruction was the average taken across six observations (book readings at weeks 4, 8, 12, 16, 20, and 24 of the study). In the case in which one of the six observation points were missing, the grand mean of explicit print instruction for that specific observation point (e.g., that specific book reading session) was used to replace the missing data point. Predictive validity of this measure was established previously (McGinty et al., 2011). Combining talk about print across the four domains was supported by measures of internal consistency (α = .86).

6.6.2. Global classroom quality

Teacher's global classroom quality was measured using the *Classroom Assessment Scoring System-PreK* (CLASS Pre-K; Pianta et al., 2008). CLASS Pre-K is an observational instrument assessing the global support afforded to children across three domains: emotional support (scales of positive/negative climate, teacher sensitivity, and regard for student perspective), instructional support (scales of concept development, quality of feedback, and language modeling), and organizational support (scales of behavior management, instructional learning format, and productivity). Each CLASS scale was rated on a 7-point Likert-type continuum (1, 2 = low levels of observed construct; 3, 4, 5 = moderate levels; 6, 7 = high levels) and all scales were averaged to create a total global classroom quality composite score. Validation of CLASS domains through factor analysis show loadings of scales are in the moderate to high range and domain scores show adequate internal consistency (α = .79–.90). In the present study, because there was significant multi-collinearity among the three domains of the CLASS (e.g., r = .66–.83), global classroom quality was conceptualized as a single composite. Global classroom quality was also averaged across fall and spring observation time points to enhance reliability of the measure (see Mashburn et al., 2008). Scoring was conducted by CLASS-reliable coders who had: (a) attended a two-day training workshop conducted by a certified CLASS master coder, and (b) passed a reliability test (i.e., achieving 90% agreement with six gold standard cases). It is also important to reiterate that measurement of the CLASS domains (instructional, organizational, emotional) are theoretically independent of teachers' literacy practices. In other words, a teacher could receive a high score on global classroom quality without engaging in any print or literacy instruction. In this study, the correlation among explicit print instruction and global classroom quality was moderate ($r = .36$).

6.6.3. Literacy environment

The 24-item *Literacy Environment Checklist* of the *Early Language Ability and Literacy Classroom Observation Toolkit* (ELLCO; Smith et al., 2002) rates the presence and diversity of literacy-relevant materials and makes ratings on the book area, book selection, book use, writing materials, and writing around the room. Each of the 24 items is scored as a yes/no (i.e., 1 or 0) or as a quantity judgment (i.e., scored on a 0–3 scale); all items can be summed for a total score of 41 points. For the present purposes, observations using the *Literacy Environment Checklist* were conducted in September/October and April/May of the academic year, at the same time that CLASS Pre-K observations were obtained. These observations were averaged across the fall and spring time points to provide a single measure of the classroom's use of literacy materials. Internal consistency for the items on the *Literacy Environment Checklist*, as measured on this sample, was high ($\alpha = .98$).

6.7. Analytical approach

The data for this study adhered to a two-level nested structure in which children (three to nine) were nested within classrooms. To account for the nested structure of the data, Hierarchical Linear Modeling (HLM; Raudenbush & Bryk, 2002) was employed as the analytical estimation technique. HLM accounts for the non-independence of observations within nested data structures, thus protecting against bias in estimated coefficients of model parameters. HLM also allows for an explicit partitioning of variance in children's outcomes into two sources: child-level (Level 1) and classroom-level (Level 2). Thus, HLM also provides a conceptual framework suited to the theoretical interests of this paper. All HLM models were specified within HLM software (Raudenbush, Liu, Spybrook, Martinez, & Congdon, 2006) using full-maximum-likelihood estimation procedures and using robust standard errors. In all cases, continuous variables were entered grand-mean centered. Grand-mean centering of all continuous variables was employed for ease of interpretation (i.e., so the intercept represented the average child in the average classroom). Fixed effects of the intercept and slopes were estimated; there was no statistical support to include random slope effects in the final models. In the case of significant interactions, simple slope and simple intercept tests were conducted according to Preacher, Curran, and Bauer (2006). Per the procedures detailed by Preacher and colleagues, simple slopes and intercepts are calculated from the model coefficients and assuming the value of covariates in the model unrelated to the interaction were zero (i.e., at their mean).

Step 1: Estimating Variance. The unconditional model specified that the spring print knowledge outcome (Y) of a particular child (i) in a particular classroom (j) was a function of the mean level of the classroom (B_{0j}) and estimation error (r_{ij}). In turn, the mean level of the classroom (B_{0j}) was a function of the mean level of all classrooms (γ_{00}), plus classroom level estimation error (u_{0j}).

$$Y_{ij} = \beta_{0j} + r_{ij}$$
$$\beta_{0j} = \gamma_{00} + u_{0j} \quad \text{[Unconditional]}$$

Step 2: Estimating the Full Model (Research Question 1). The full two-level model included theorized child and classroom predictors as well as the covariates of age, study condition, and children's initial (fall) print knowledge. The random effects for all Level-1 predictors were found to be non-significant ($p > .10$) and were fixed in the final full model. A number of additional child covariates (i.e., child attendance, maternal education, gender) and classroom covariates (teacher educational attainment, preschool teaching experience, preschool program affiliation) were tested, but found to be non-significant and excluded from the final model. Level-1 and Level-2 equations represent the hypothesized full model of children's spring print knowledge.

$$\begin{aligned} Y_{ij} = {} & \beta_{0j} + \beta_{1j}(\text{language ability}) + \beta_{2j}(\text{attentional skills}) + \beta_{3j}(\text{age}) \\ & + \beta_{4j}(\text{fall print knowledge}) + \beta_{ij} \quad \text{[Level 1]} \end{aligned}$$

$$\begin{aligned} \beta_0 = {} & \gamma_{00} + \gamma_{01}(\text{global classroom quality}) + \gamma_{02}(\text{literacy environment}) \\ & + \gamma_{03}(\text{explicit print instruction}) + \gamma_{04}(\text{study condition}) \\ & + u_{0j} \quad \text{[Level 2]} \end{aligned}$$

Step 3. Estimating Moderator Models (Research Questions 2 & 3). To examine the interaction of global classroom quality and explicit print instruction (i.e., research question two), an interaction term was added to the Level-2 equation:

$$\begin{aligned} \beta_0 = {} & \gamma_{00} + \gamma_{01}(\text{global classroom quality}) + \gamma_{02}(\text{literacy environment}) \\ & + \gamma_{03}(\text{explicit print instruction}) + \gamma_{04}(\text{study condition}) \\ & + \gamma_{05}(\text{global classroom quality} \times \text{explicit print instruction}) \\ & + u_{0j} \quad \text{[Level 2b]} \end{aligned}$$

To examine the interaction of language or attentional skills and explicit print instruction, cross-level interactions were added to the Level-2 equation from the full model:

$$\begin{aligned} \beta_0 &= \gamma_{00} + \gamma_{01}(\text{global classroom quality}) + \gamma_{02}\,(\text{literacy environment}) \\ &\quad + \gamma_{03}(\text{explicit print instruction}) + \gamma_{04}(\text{study condition}) + u_{0j} \\ \beta_{1j} &= \gamma_{10} + \gamma_{11}\,(\text{explicit print instruction}) \\ \beta_{2j} &= \gamma_{20} \\ \beta_{3j} &= \gamma_{30} \\ \beta_{4j} &= \gamma_{40} \qquad \text{[Level 2c]} \end{aligned}$$

$$\begin{aligned} \beta_0 &= \gamma_{00} + \gamma_{01}(\text{global classroom quality}) + \gamma_{02}\,(\text{literacy environment}) \\ &\quad + \gamma_{03}(\text{explicit print instruction}) + \gamma_{04}(\text{study condition}) + u_{0j} \\ \beta_{1j} &= \gamma_{10} \\ \beta_{2j} &= \gamma_{20} + +\gamma_{21}\,(\text{explicit print instruction}) \\ \beta_{3j} &= \gamma_{30} \\ \beta_{4j} &= \gamma_{40} \qquad \text{[Level 2d]} \end{aligned}$$

Missing data. There were no missing data at the classroom level. At the child level, missing data occurred as a result of child absence, child relocation, or child refusal. The amount of missing data across variables ranged from 4.5% to 18.2% (see also Table 2). Patterns of missing data show that 35.6% of cases had at least one data point missing and that the majority of children had no more than two data points missing. To address missing data, multiple imputation procedures were used. Multiple imputation procedures are a recommended alternative over list-wise deletion for producing unbiased coefficient estimates when data are not missing completely at random (MCAR; Peugh & Enders, 2004; Schafer & Graham, 2002). Instead, multiple imputation depends upon the assumption that data are missing at random (MAR), meaning that patterns of missingness can be explained by observed variables, including those in the analytic model and those not included in the model but collected in the dataset (i.e., auxiliary variables; Collins, Schafer, & Kam, 2001; Schafer & Graham, 2002).

The relation between model variables and missingness was significant for a number of predictors (i.e., attentional skills, fall print knowledge). Additional auxiliary variables explored included gender, years of mother's education, days in attendance during preschool, whether the child was an ethnic minority (i.e., Black, Hispanic, Other vs. White), whether English was spoken in the home, and the data collection site (Ohio vs. Virginia). Of these, attendance, whether English was spoken in the home, and site were significantly associated to missingness and were included in the imputation procedures. Although these findings cannot definitely confirm the MAR assumption, inclusion of the predictor and auxiliary variables in imputation procedures provides some protection against any bias that may result from violating the MAR assumption (Collins et al., 2001). Multiple imputation procedures (using SAS software) were used to create 10 imputed datasets and these datasets were then analyzed, and results pooled, within the HLM software (Raudenbush et al., 2006).

7. Results

Tables 1 and 2 present descriptive data for classroom and child predictors; child descriptive data (Table 2) includes that from the original dataset and that calculated across imputed datasets. Prior to running the models of interest, an unconditional model of children's spring print knowledge was conducted to determine available child and classroom variance. The unconditional model indicated that approximately 25% of the variance in children's spring print knowledge was a function of classroom differences (intra-class correlation [ICC] = .25). When controlling for the covariates of age, condition, and fall print knowledge ability, there was a reduction in available child and classroom variance, resulting in an ICC of .20.

To address the first research question regarding child and classroom correlates of children's spring print knowledge, a full model of child outcomes was built. The full model included all hypothesized child and classroom predictors, as well as the covariates of age, fall print knowledge, and randomized condition. The full model of children's spring print knowledge explained 55% of the available variance at the child level (Level 1) and 83% of the available variance at the classroom-level (Level 2). Results showed that all child-level predictors had a significant relationship to children's spring print knowledge outcomes (all p values < .001). In contrast, global classroom quality was the only significant predictor at the classroom level ($p = .002$). Table 3 provides a summary of this model.

To address the second research question regarding whether explicit print instruction varied in its association with children's spring print knowledge as a function of the global quality of the classroom, a moderator model was explored. The interaction between explicit print instruction and global classroom quality was added to the full model and found to be statistically significant (coefficient = −.09; $p = .026$). Fig. 1 plots the association between print knowledge and explicit print instruction when global classroom quality was low [−1 *SD*], moderate [mean], and high [+ 1 *SD*]. The differing slopes of the three lines in Fig. 1 suggest that explicit print instruction was less related to child print knowledge outcomes as global classroom quality increased. To explore this interaction statistically, simple slopes and simple intercepts were calculated. Tests of the simple slopes showed that explicit print instruction had a significant and positive association with child print knowledge outcomes when global classroom quality was low (coefficient = .22; $p = .02$) and moderate (coefficient = .12; $p = .05$), but not high (coefficient = .03; $p = .66$). Further, calculations of simple intercepts show fairly comparable spring print knowledge performance across low-, average-, and high-quality classrooms (estimated Z-scores for spring print knowledge were .02, .04, .07, respectively) when children receive high amounts (+1 *SD*) of explicit print instruction. In contrast, spring print knowledge abilities showed more diversity across low-, average-, and high-quality classrooms (estimated Z-scores for spring print knowledge were −.34, −.16, .02, respectively), when children received low amounts (−1 *SD*) of explicit print instruction. Finally, to test whether this finding differed across experimental and control classrooms, a three-way interaction of classroom condition, explicit print instruction, and global classroom quality was added to the model. The three-way interaction was non-significant (coefficient = −.11; $p = .22$).

To address research question three regarding whether explicit print instruction varied in its association with children's spring print knowledge as a function of children's initial language ability or attentional skills, cross-level interactions were explored. The interaction between explicit print instruction and language ability was not statistically significant (coefficient = −.001; $p = .45$), nor was the three-way interaction between language, treatment condition, and explicit print instruction (coefficient = −.002; $p = .428$). The interaction involving attentional skills, however, showed a trend approaching significance (coefficient = −.03; $p = .052$). Fig. 2 plots the simple slopes for print knowledge regressed on explicit print instruction when children had low [−1 *SD*], average [mean], and above average [+1 *SD*] attentional skills. The differing slopes of the three lines in Fig. 2 suggested that explicit print instruction had a stronger association with children's spring print knowledge as attentional skills decreased. Tests of the simple slopes showed that explicit print instruction had a significant association with child print knowledge outcomes for children with low attentional skill (i.e., coefficients = .13, $p = .05$) and average attentional skill (coefficient = .12, $p = .05$), but not above-average attentional skill (coefficient = .08, $p = .59$). Further, calculations of simple intercepts showed approximately a tenth of a standard-deviation difference in spring print knowledge ability for children with low versus above-average attentional skills when children received high amounts (+1 *SD*) amounts of explicit print instruction (i.e., estimated Z-scores for spring print knowledge were −.07, −.01, .05. for low, average, above-average attentional skills, respectively). In contrast, estimated spring print knowledge abilities are more disparate between children with low, average and above-average attentional skills when children receive low amounts (−1 *SD*) of explicit print instruction (i.e., estimated Z-scores for spring print knowledge were −.31, −.16, .02, respectively). To test whether this interaction trend differed across experimental and control classroom, a three-way interaction of classroom condition, explicit print instruction, and attentional skills was added to the model. The three way interaction was non-significant (coefficient = −.04; $p = .11$).

8. Discussion

This study evaluated the instructional practice of explicit print instruction during shared-reading in relation to young children's print knowledge development. The key intent of this study was to consider whether the benefit of explicit print instruction during reading would vary as a function of the classroom environment and children's developmental characteristics. Before discussing the key

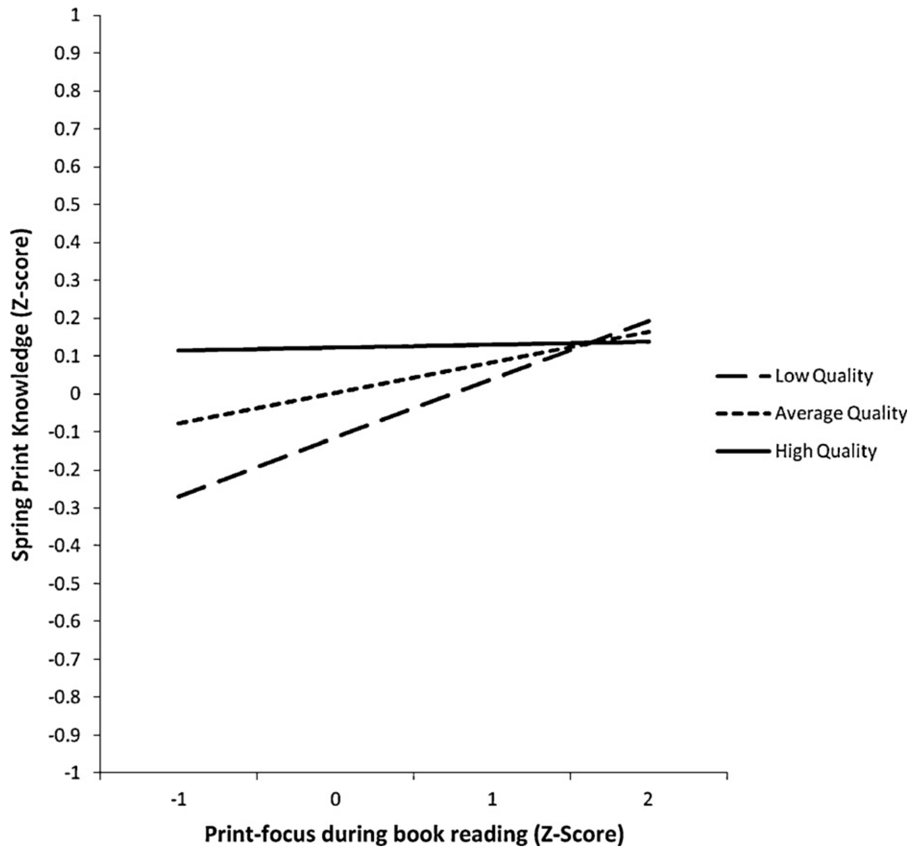

Fig. 1. Association between explicit print instruction and children's spring print knowledge for classrooms providing varying levels of global classroom quality.

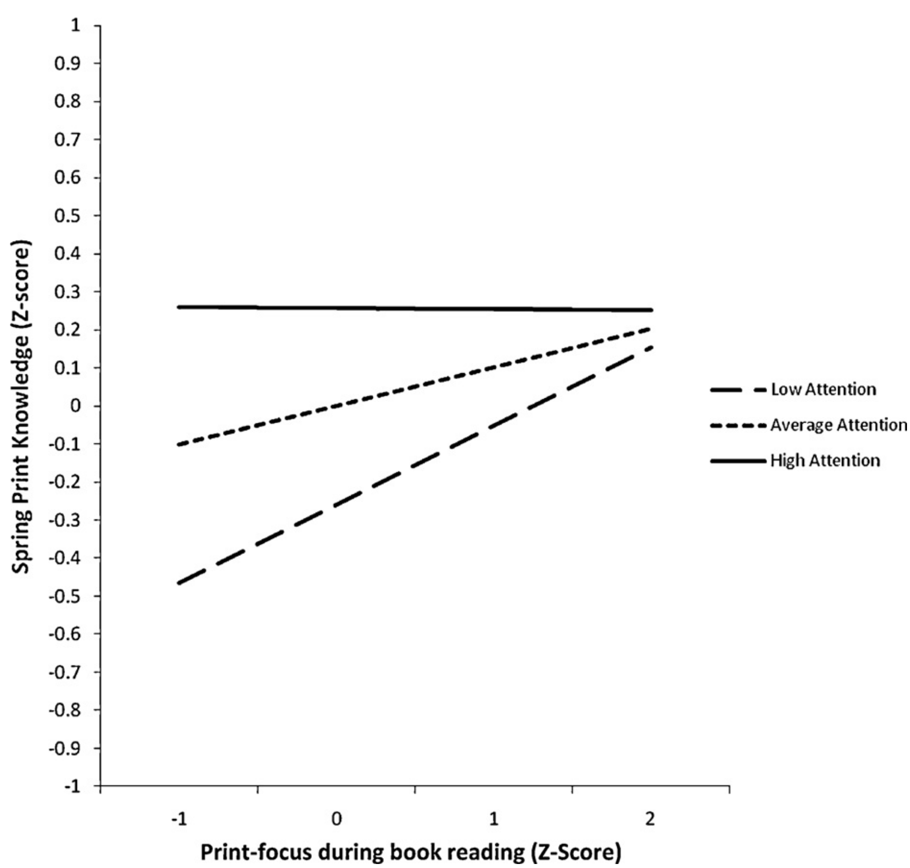

Fig. 2. Associations between explicit print instruction and children's spring print knowledge for children of varied attentional skills.

Table 1
Explicit print instruction in preschool classrooms.

Classrooms	Explicit print instruction (*Z*-score)		Explicit print instruction (Raw)		Global classroom quality		Literacy environment	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
All (n = 59)	.00	.91	20.04	16.83	4.39	.90	22.86	5.17
Low classroom quality (n = 26)	−.32	.65	13.52	14.28	3.54	.54	22.25	6.47
High classroom quality (n = 33)	.25	.87	25.17	17.10	5.05	.46	23.33	3.90

Note. Explicit print instruction (raw) was measured by the *FCC* and calculated as the average number of raw utterances about print per book reading session. Global classroom quality was measured as the average of the Instructional, Emotional, and Organizational scales of the *CLASS* and scores range from 1 (lowest quality) to 7 (highest quality). Use of literacy materials was measured from the *Literacy Environmental Checklist* of the *ELLCO* and scores range from 1 to 41.

Table 2
Descriptive data on children's language ability, attentional skills, and print knowledge.

Child characteristic	Original dataset			Imputed dataset (n = 379)	
	n	*M* (*SD*)	*Range*	*M* (*SE*)	*Range*
Language ability	362	86.97 (16.34)	0–121	85.35 (.24)	0–100
Attentional skills	328	15.26 (3.52)	2–14	8.40 (.04)	2–10
Fall alphabet [a]	361	8.06 (8.76)	0–26	8.11 (.14)	0–26
Spring alphabet[b]	311	17.02 (9.30)	0–26	15.87 (.15)	0–26
Fall print concepts[a]	359	5.60 (3.28)	0–15	5.60 (.05)	1–15
Spring print concepts[b]	313	8.59 (3.91)	1–17	8.05 (.07)	1–17

Note. Language ability was measured as the Core Language ability score of the *CELF-P:2* based on M = 100, SD = 15; Attentional skills were measured as the sum of 2 items from the *CBQ* with scores ranging from 2 to 14; Fall and Spring Alphabet Knowledge was measured by the *PALS-PreK Uppercase* subtest with scores ranging from 0 to 26. Fall and Spring Print Concepts was measured by the *PWPA* with scores ranging from 0 to 17.

[a] Scores presented are raw scores. The standard *Z*-scores for these measures were averaged to create the Print Knowledge composite at time 1.

[b] Scores presented are raw scores. The standard *Z*-scores for these measures were averaged to create the Print Knowledge composite at time 2.

findings of this study, it is important to note that approximately 25% of children's print knowledge development was attributable to their classroom and that much of this (82%) was explained by the kinds of interactions that occurred between teachers and children (i.e., global classroom quality, explicit print instruction). In fact, it is worth mentioning that literacy environment, a structural aspect of the classroom, demonstrated no significant association with children's print knowledge. On the one hand, this finding was not surprising, given previous evidence indicating that structural components of a classroom setting may only relate to children's outcomes as far as they shape the kinds of interactions that occur (e.g., Abbott-Shim, Lambert, & McCarty, 2000; NICHD ECCRN, 2002a; Pianta et al., 2005). On the other hand, research on other settings (such as the home) suggests that the presence of literacy materials may influence the type and frequency of literacy interactions that occur (e.g., Frijters, Barron, & Brunello, 2000; Leseman & de Jong, 1998). Our findings suggest that classrooms with a superficial amount of literacy support (i.e., material support) are not necessarily using these materials in ways that effectively support children's literacy learning. Thus, these data reiterate the importance of enhancing the interactions between adults and children when building literacy-rich classrooms designed to promote literacy skills, such as print knowledge.

The first key finding of this study was that explicit print instruction varied in its association to children's print knowledge development as a function of classroom quality. Specifically, this study found that the relationship between explicit print instruction and children's print knowledge development decreased as the quality of the classroom increased. In other words, explicit print instruction appeared to serve as a protective factor to the print knowledge development of children experiencing classroom-based risk (i.e., low quality), but it did not appear to be a unique support in all contexts. As a protective factor, explicit print instruction was quite powerful. For example, the difference in child print knowl-

Table 3
Full model of children's sprint print knowledge.

Variable	Coefficient	*SE*	*df*	*p*-value
Spring print knowledge intercept (γ_{00})	−0.04	0.067	54	.584
Child-level variables				
Language ability (β_{1j})	0.01*	0.002	370	<.001
Attentional skills (β_{2j})	0.08*	0.019	29	<.001
Age (β_{3j})	0.03*	0.007	176	<.001
Fall print knowledge (β_{4j})	0.44*	0.045	370	<.001
Classroom-level variables				
Global classroom quality (γ_{01})	0.15*	0.044	54	.002
Literacy Environment (γ_{02})	0.01	0.007	54	.087
Explicit print instruction (γ_{03})	0.06	0.052	54	.260
Intervention condition (γ_{04})	0.06	0.094	54	.558

Random effects	Variance	χ^2	*df*	*p*-value
Classroom level (U_0)	0.03	106.61	54	<.001
Child level (R)	0.26			

Note. Model parameters were estimated by synthesizing findings across imputed datasets. All were within .03 of those estimated from original data.

* p < .05.

edge outcomes for children in high- versus low-quality classrooms was over a quarter of a *SD* (i.e., difference between *Z*-scores was .36) when children received low levels of explicit print instruction. When children received high levels of explicit print instruction during shared reading, the difference was marginal (i.e., difference between *Z*-scores was .03). What was surprising, however, was that global classroom quality and explicit print instruction did not work synergistically to enhance children's print knowledge development. In fact, explicit print instruction demonstrated significant associations to child print knowledge development in low- and average-quality classrooms, but not in high-quality classrooms.

One interpretation of this finding is that high-quality classrooms already provide significant amounts of explicit print instruction to children, through additional shared-reading sessions or in the context of other print-rich activities. Therefore, in high-quality classrooms, variation in the explicit print instruction that we observed may not have been meaningful to children's learning. Underlying this interpretation is an assumption that 'more' instruction does not always equate to 'more' learning. In fact, research has shown that increasing the amount of focused and explicit instruction children receive does not always benefit their learning (Proctor-Williams & Fey, 2007; Ukrainetz, Ross, & Harm, 2009). For example, McGinty and colleagues (in press) found that children receiving 60 Print-Referencing lessons (involving the use of explicit print instruction) over 30-weeks performed similarly to children receiving 120 Print-Referencing lessons over 30-weeks, as long as teachers provided a high amount of explicit print instruction per session. These data suggest that the benefit of explicit print instruction during reading may have been marginalized in high-quality classrooms, assuming that explicit print instruction was being provided to children in intense ways at other times during the classroom day. The key argument against this interpretation, however, is that our measure of explicit print instruction likely reflects a large proportion of the overall amount of explicit print instruction that children experienced. Based on the data in Table 1, children in high-quality classrooms were having, on average, 100 interactions with their teacher about print, each week, during these shared reading sessions. This is a substantial amount of instruction and reflects levels similar to that provided in other focused and effective instructional interventions (e.g., Ukrainetz et al., 2009). It is difficult to imagine that all high-quality teachers were providing such an intense focus on print during other points of the day that the amount of instruction we observed was rendered irrelevant to children's learning. This would be particularly surprising given that observations of preschool classrooms suggest only 3% of the time is spent in direct literacy instruction (Howes et al., 2008; see also Cunningham, Zibulsky, & Callahan, 2009; Early et al., 2005; Roskos, Rosemary, & Varner, 2006). Although our data cannot rule out the possibility that high quality classrooms provide high levels of explicit print instruction throughout the day, we also consider a second interpretation of this interaction.

A second possible view of the interaction between classroom quality and explicit print instruction is that high-quality classrooms provide other supports to children's print knowledge learning, thus making the contribution of explicit print instruction less salient. In other words, classrooms may look quite different in terms of their practices and still be equally facilitative of children's print knowledge development. This view is consistent with research pointing to the quality of young children's everyday environments as one of the strongest predictors of children's literacy achievement (e.g., Mashburn et al., 2008; NICHD ECCRN, 2002a). As conceptualized in this study, classrooms providing globally high-quality instruction are those which challenge children cognitively and build upon and expand their interests through deep and extended conversation (Pianta et al., 2008). Certainly, some, or much, of the content discussed between teachers and children in high-quality classrooms may be relevant to children's literacy and print knowledge development. Yet, the nature of this instructional support may be quite different from the practice of explicit print instruction. The implication is that explicit print instruction during shared reading is best regarded as *one way* to build literacy support in a classroom, with the benefits of this practice extending most strongly to classrooms where instruction is lacking in more global ways.

The second key finding of this study was that explicit print instruction varied in its influence on child outcomes as a function of children's developmental characteristics. Specifically, this study found that explicit print instruction appeared to be particularly supportive of the print knowledge learning of children with vulnerabilities in the area of attention, but not language. In fact, our data are inconsistent with studies showing explicit instruction may be more supportive of preschool children with weak literacy or language skills than it is of children with average or above average skills in these areas (Connor et al., 2006). One possible confound in our data is that explicit print instruction was delivered solely in a large-group context. It is possible that children with weak language skill have more difficulty benefitting from instruction, even explicit instruction, in a large-group setting. Although interactions between instructional methods, situational contexts, and child characteristics are beyond the scope of the study, they represent a potentially important direction for future research.

The finding that explicit print instruction increased in its relation to child print knowledge outcomes as children's attentional skills decreased was consistent with our hypothesis. Notably, this interaction pattern was found even though explicit print instruction was delivered in the context of a large-group instructional setting, which has typically been seen as a challenging context for children with weaker attentional skills (Bulotsky-Shearer et al., 2008). A possibility, then, is that explicit print instruction may have, unintentionally, provided a scaffold to the behavioral demands typically associated with large-group, structured instructional settings. This hypothesized explanation is consistent with a literature showing that adult behaviors may help children manage different learning contexts to facilitate their learning (Cameron, Connor, Morrison, & Jewkes, 2008). In fact, a recent study by Cameron and colleagues found that first-grade teachers' use of orienting and organizational strategies had a significant independent influence on children's end-of-the-year reading skill, above and beyond time spent in reading instruction and child reading and language abilities. Although Cameron and colleagues drew clear distinctions between instructional behaviors and organizing/orienting behaviors, it is possible that certain types of instruction can serve a dual purpose. From this perspective, explicit print instruction may have reduced the behavioral demands of the book reading context by providing a periodic means of orienting children to the book-reading activity. These findings also speak more broadly to the importance of considering children's behavioral skills in relation to preschool literacy instruction. As in this study, exploring such relations may provide a more thorough understanding about how and why particular instructional techniques may work best for particular children.

9. Applied implications

This study suggests a number of specific considerations for early educators. First, this study suggests that the infusion of very explicit and targeted instructional practices into lower-quality classrooms may be an effective, and potentially easy, way to enhance those classrooms' support for children's print knowledge development. In fact, it was surprising to see that high levels of explicit print instruction during shared reading could, essentially, compensate, for more global weaknesses in the classroom environment. An important caveat to this finding is that this study only considered one, very small, aspect of children's literacy development, namely print knowledge. Print knowledge, an arguably 'constrained' skill is considered fairly easy to influence through instruction (see Paris, 2005). Indeed, children's eventual reading success pulls from a host of specific literacy skills (e.g., phonological awareness) and broader developments (e.g., vocabulary, world knowledge; Snow et al., 1998). These different dimensions of literacy development may pull differently from instruction, classroom environment, child characteristics and their interactions. Thus, the finding that targeted explicit instruction may support children, even in light of global classroom quality weaknesses, must not be interpreted as a pattern that would hold for all aspects of reading development.

Second, this study suggests that a child's attention is of significance when selecting a literacy instructional practice or intervention. The fact that reading success depends upon children's behavioral and attentional skills, as well baseline language and literacy skill, is increasingly recognized (e.g., McClelland et al., 2007). Certainly, part of the reason that behavioral skills may relate to reading development is that children's attentional and regulatory abilities influence their capacity to navigate, and learn from, classroom activities. Although large-group activities, such as a large-group shared reading, often challenge children with weak attentional skills, this study found that explicit print instruction was supportive of their learning in this context. Understanding how instructional practices may support children generally (e.g., support behavior and attention) and specifically (e.g., specific skill acquisition, like print knowledge) is important to educators who are, increasingly, seeking to individualize instruction to children's diverse learning needs (e.g., Connor et al., 2009).

Finally, this study suggests that definitions of literacy-relevant practices within preschool classrooms be broadly, rather than narrowly, defined. In fact, the data from this study suggest that a teacher's use of any particular literacy practice in a classroom may not be a valid indicator, alone, of how well that classroom supports children's literacy learning. For example, our study showed that some high-quality classrooms provided children very little explicit print instruction during shared reading, whereas other high-quality classrooms provided children significant levels of explicit print instruction during shared reading. Yet, the difference in children's development was fairly negligible. This was a surprising finding, given evidence that explicit print instruction can be a very powerful practice in relation to children's print knowledge development (Justice et al., 2010; Lovelace & Stewart, 2007; McGinty et al., 2011; Piasta et al., in press). Yet, these data raise the possibility that classrooms which are well managed, supportive of children's cognitive exploration, and emotionally warm (i.e., high-quality classrooms) may be structured to build children's print knowledge in ways that are different, but equally supportive for some children, to the practice of explicit print instruction during shared reading. It is important to state that these data do not suggest that classrooms can support children's print knowledge and literacy learning effectively without any specific literacy practices. Certainly, it is likely that children in all classrooms were receiving some literacy instruction in contexts other than the one we observed. Rather, the message of this study's findings is that a classroom's contribution to children's literacy development may be best understood as a function of both the direct (e.g., explicit print instruction) and indirect (e.g., global classroom quality) supports it provides.

10. Limitations and future directions

As with all correlational data, an important limitation of this study is that patterns of observed association do not imply causal relationships. Additionally, a number of limitations to the generalizability of this study's findings are worth note. First, the teachers in this study were participants in a larger intervention study of print referencing (including experimental and comparison teachers). Thus, it is not clear that findings generalize to preschool teachers working in similar programs who did not, or would not, choose to participate in such an effort. In all analyses, however, intervention condition was controlled and relations observed can be considered independent of the influence of assigned intervention condition. Also, pooling experimental and comparison teachers suggest that our findings were not particular only to the group of teachers implementing the assigned Print Referencing program. Although these study features do not ensure generalizability, they do represent two attempts to minimize the threats to external validity present in this study. A second limitation of this study was that the approach to measuring teacher's literacy instructional practices was limited to explicit print instruction within the context of shared book reading. To more fully understand how instruction and classroom environment work, independently and collectively, to support children's learning, it is important for future studies to measure literacy instructional practices more broadly.

A third limitation of this study is the lack of direct observations of children's behavioral regulation in the context of the shared book reading. Thus, interpretations of the interaction between attentional skills and explicit print instruction rely, partially, on extrapolating what children's behavioral regulation would be, given our measure of their attentional skills. Further, it is also important to note that this study's measure of children's attentional skills was not ideal. Specifically, this study's measure of attentional skills only contained a subset of items typically used to measure attention more comprehensively.

11. Summary

Preschool is a potentially powerful mechanism for preventing reading disabilities. Certainly, the reach of preschool is larger than it has ever been. Recent studies indicate that at least 38 states fund public preschool programs for 4-year old children and approximately 1.5 million 4-year-old children across all states attend a state- or federally-funded preschool program (special education, Head Start, state funded; Barnett, Hustedt, Friedman, Boyd, & Ainsworth, 2008). In most of these preschool programs, policies are in place that put young children's literacy development as a priority of the preschool classroom. As preschool programs increasingly consider how to support young children's literacy development, questions of how to do so, or more aptly, how to do so *well*, are in the forefront (e.g., NELP, 2008; PCER, 2008).

This study demonstrated that a previously-established, efficacious instructional practice, namely explicit print instruction during shared reading, had a decreasing benefit to children's print knowledge development as the quality of the classroom and children's developmental skills increased. The findings of this study suggest that it is difficult to discuss effective instructional practices without knowledge of the context in which those practices will occur. Thus, effective instructional practice may begin first as a process, whereby classrooms or programs consider how to use techniques that are not only efficacious (i.e., have an evidence-base), but are intentionally suited to the need of the classroom and children within their program.

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