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Variation in the effectiveness of instructional interactions across preschool classroom settings and learning activities☆

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ABSTRACT

This exploratory study examined the extent to which the effectiveness of instructional interactions varies among classroom social settings (i.e., large group, free choice, meals, and routines), learning activities (i.e., shared reading, literacy, math, science, social studies, and esthetics), or their combination. Participants were 314 preschool teachers primarily serving children from low-income backgrounds. Instructional interactions were measured in multiple cycles across one day of classroom observation as teachers engaged in a variety of settings and learning activities. Linear mixed models indicated that the effectiveness of teachers' instructional interactions was generally higher in the large group setting than in free choice, meals, and routine settings. When considering settings and learning activities in combination, teachers displayed the most effective global instructional interactions when leading science activities in large group or free choice settings, and the most effective literacy-focused interactions during large group literacy activities.

The preschool classroom provides opportunities to foster key skills and knowledge associated with young children's school readiness (Duncan, 2011). Teachers' instructional interactions appear particularly valuable for fostering children's gains in language, literacy, and math skills (Mashburn et al., 2008). Nevertheless, the level of instruction found in the average preschool classroom is quite low (Justice, Mashburn, Hamre, & Pianta, 2008; LoCasale-Crouch et al., 2007; Pianta et al., 2005). Although professional development for teachers can be effective for improving instructional interactions (Bierman et al., 2008; Pence, Justice, & Wiggins, 2008; Pianta, Mashburn, Downer, Hamre, & Justice, 2008; Piasta et al., 2012), it is possible that such behavioral interactions could be scaffolded by structural features of the classroom that could be optimized to enhance instruction.

Aspects of classroom experience generally overlooked by professional development include the social *settings* (e.g., large group, free choice, meals, and routines) and *learning activities* (e.g., shared reading, literacy, math, science, social studies, and esthetics) to which children are exposed throughout the day. Reports from large-scale studies indicate that teachers structure the daily preschool schedule in different ways and spend varying amounts of time engaging children in particular settings and learning activities (Chien et al., 2010; Early et al., 2010; Fuligni, Howes, Huang, Hong, & Lara-Cinisomo, 2012; Winton & Bussye, 2005). What remains unclear from this body of work is the extent to which the effectiveness of teachers' instructional interactions varies as a function of particular social settings or learning activities. Indeed, research suggests that some settings or activities may be more amenable than others to rich, cognitively stimulating interactions (Cote, 2001; Dickinson, Darrow, & Tinubu, 2008; Fuccillo, 2011; Massey, Pence, Justice, & Bowles, 2008). This exploratory study examined the extent to which the effectiveness of instructional interactions varies among classroom social settings, learning activities, and their combination. Understanding the possible connection between the effectiveness of instructional interactions and the setting or learning activity in which interaction takes place could provide a pathway for possible improvement of program quality and impact.

1. The importance of instructional interactions

Instructional effectiveness is a process-oriented classroom feature chiefly concerned with interactions between teachers and children that support children's academic development (Pianta

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& Hamre, 2009). According to the bioecological theory of human development, everyday interactions between adults and children are proximal processes that serve as primary mechanisms through which children develop (Bronfenbrenner & Morris, 2006). As teachers repeatedly engage preschool children in effective instructional interactions over time, these exchanges can positively impact children's academic learning.

In the present study, we focus on four dimensions of instructional interactions: concept development, quality of feedback, language modeling, and literacy focus. Concept development refers to the degree that teachers promote children's higher-order thinking skills. Quality of feedback concerns the extent to which teachers expand children's learning and understanding. Language modeling considers teachers' use of language-facilitation techniques with children, to include open-ended questions, repetitions, and expansions of children's talk. Literacy focus pertains to the extent to which teachers present code-related content (e.g., alphabet knowledge and phonological awareness) in an explicit and purposeful way. These four dimensions represent constructs that are both theoretically and empirically linked to children's academic learning (Chapman, 2000; Donovan & Bransford, 2005; Mashburn et al., 2008; National Early Literacy Panel, 2008; Wasik & Hindman, 2011).

The first three dimensions of interactions have been collectively conceptualized as global instructional support that is foundational for learning across many academic areas (Pianta & Hamre, 2009; Mashburn et al., 2008). These interactions are most effective when teachers are highly responsive to children's comments and ideas. The fourth dimension, literacy focus, is distinct from the other three in that it is content-specific and based on research indicating that children's literacy skills are best acquired through teacher-directed explicit instruction (Justice et al., 2008). For example, direct instruction with explicit use of literacy terminology may be necessary to help children optimally acquire knowledge about letter names and sounds, particularly for children at risk for later reading difficulties (Piasta & Wagner, 2010). We chose to include this content-specific dimension because of the national emphasis placed on preschool literacy instruction in recent years (Early Reading First Initiative; U.S. Department of Education, 2007). For both global and content-specific interactions, it is likely that instructional effectiveness is influenced by environmental factors including the variety of classroom social settings as well as the learning activities in which teachers and children engage. In the next sections, we review the research on instructional effectiveness across both settings and activities.

2. Instructional effectiveness across classroom settings

Reporting on data from two comprehensive studies of public preschool in the U.S. (NCEDL Multi-State Study of Pre-Kindergarten and the State-Wide Early Education Programs Study), Chien and colleagues (2010) identified four classroom settings that are most prevalent during a typical preschool day: (1) large group, (2) free choice, (3) meals, and (4) routines. These settings collectively comprise approximately 90% of the school day. Although children's daily experience may also include time in small groups (2–5 children) or individual settings, these are only a minor part of the experience of the average child.

Fuligni and colleagues (2012) identified two profiles characterizing how preschool teachers used settings to structure a typical day. Specifically, in "High Free Choice" classrooms, the majority of time during the day was spent in a free choice setting with relatively little time in large groups. In contrast, "Structured-Balanced" classrooms more evenly distributed the time between free choice and group settings. When examining whether the effectiveness of instructional interactions differed between these profiles, the researchers reported mixed findings. There was no difference between profiles in instructional effectiveness when measured at the classroom level. However, the effectiveness of interactions with individual children (measured at the child level) differed – children in Structured-Balanced classrooms were exposed to significantly more scaffolding techniques, such as asking open-ended questions. It is important to note that instructional effectiveness was operationalized as an aggregate of multiple classroom observations across various settings throughout a teacher's day, as is most often recommended (Pianta, La Paro, & Hamre, 2008). Although effectiveness, when operationalized in this fashion, provides a reliable estimate that links teacher practice to child outcomes (Mashburn et al., 2008), it may be useful to consider variation in instructional interactions across settings as more than random error. It is plausible that different settings may systematically foster different levels of teacher effectiveness.

The large group setting (i.e., more than 6 children) comprises approximately one-third of the school day (Chien et al., 2010) and is often considered a teacher-directed instructional opportunity in which to build children's skills. Instructional interactions may be more likely, and possibly more effective, during this setting because teachers view the time as instructional in nature (Dickinson, 2001; Early et al., 2010; Winton & Bussye, 2005). For example, vocabulary use during large-group time may be richer than during other times as teachers use more rare or novel words, perhaps as a result of conducting formal lessons (Cote, 2001). Other research also indicates that teachers use open-ended questions and provide children with advanced language models more often in a teacher-directed setting (Turnbull, Anthony, Justice, & Bowles, 2009). With regard to literacy-focused interactions, teachers often integrate literacy instruction into large-group experiences. For example, circle time is a regular part of most preschool schedules and is a classroom component that consistently affords teachers the opportunity to explicitly engage children in alphabet instruction and phonological awareness activities.

Free choice, as a classroom setting, includes free play and center times in which children make selections from a variety of classroom materials or areas, often spending time with little direct input from the teacher. Although Winton and Bussye (2005) provide evidence that teachers do not consistently take advantage of this time to engage children in meaningful interaction, the free-choice setting has long been considered a central part of the preschool experience, typically comprising one-third of the day (Chien et al., 2010). This setting has the potential to support rich, one-on-one conversational interactions and provide opportunities for teachers to extend children's ideas and interests. For instance, teachers and children may engage in role-playing activities, fostering conversation during pretend play, while spending time in a dramatic play center (Gest, Holland-Coviello, Welsh, Eicher-Catt, & Gill, 2006). Free choice also has the potential to support explicit literacy-focused interactions, since preschool classrooms have long been encouraged to deliberately embed literacy tools – such as pencils, notepads, and signs – into classroom centers (Neuman & Roskos, 1992; Roskos & Neuman, 2001). Yet, recent research indicates that teachers are inconsistent in this regard, embedding these tools into some centers (e.g., writing) but not others (e.g., dramatic play and science; Gerde, Bingham, & Wasik, 2012). Moreover, the free choice setting lacks a curricular structure or focus and often requires the teacher to nimbly and skillfully engage a child in real time, a capacity that can be hard to develop.

Meals generally include breakfast, lunch, and snacks, with children often seated and served "family style" to promote interaction. This setting presents an opportunity for a different type of teacher talk than what is typically seen in other settings. During this time, teachers may naturally engage children in back-and-forth discussions, in contrast to the large-group setting, during which teachers present targeted lessons involving more didactic and unidirectional

talk (Cote, 2001; Early et al., 2010). The conversations during meals also contrast with the free choice setting, which features pretend talk. For example, Gest et al. (2006) found that mealtime included more decontextualized interactions (i.e., talk beyond the here and now) than either the large-group or free-choice settings. Because teachers are not presenting targeted lessons, it is unlikely that effective literacy-focused interactions would systematically take place in this setting.

Routines, as a classroom setting, include recurring procedures such as waiting for materials to be passed out, standing in line, cleaning up, and transitioning to a new activity. Teachers interact only minimally with children during classroom routines (Winton & Bussye, 2005), typically not using these times as opportunities to teach or foster skills. Although it is feasible that teachers could foster richer interactions during routines, we did not identify a single study that compared teacher–child interactions in routines with interactions in other settings. It is important to study interactions during these times since, coupled with mealtimes, they represent about one-third of children's daily preschool experience (Chien et al., 2010).

3. Instructional effectiveness across classroom learning activities

Teachers also engage with children in a variety of activities designed to promote learning, including shared reading, literacy, math, science, social studies (e.g., activities about their world and dramatic play) and esthetics (e.g., art and music). The NCEDL Multi-State Study of Pre-Kindergarten (Winton & Bussye, 2005), which included more than 900 children representative of 211,000 children across six states, comprehensively observed how children spent their classroom time over a two-day period. Researchers specifically examined the activities in which four randomly selected children per classroom engaged. According to these observations, there was substantial variation in the amount of time teachers engaged children in learning activities, with the greatest proportion of time devoted to social studies (13%). Children spent about 9% of time in shared reading and literacy activities (3% and 6%, respectively). Children spent a similar amount of time engaging in esthetics (9%), science (8%), and math activities (6%). Disconcertingly, there appeared to be large portions of the day in which teachers did not provide children with any type of learning activity (44%).

Variability in the effectiveness of teachers' interactions across learning activities has received much less research attention than variability across settings. Shared reading has been the focus of most of this work, likely due to the accumulation of research indicating this to be a potentially ideal activity in which to promote vocabulary, higher-order thinking, and literacy-related competencies (Cabell, Justice, Vukelich, Buell, & Han, 2008; Justice, Kaderavek, Fan, Sofka, & Hunt, 2009; Mol, Bus, & de Jong, 2009; Zucker, Cabell, Justice, Pentimonti, & Kaderavek, 2013). Yet, when examining instructional interactions, shared reading is typically contrasted with social settings (e.g., large group instruction) rather than other learning activities. Results do indicate that teachers tend to use richer extra-textual language and pose more cognitively challenging questions during shared reading when compared to time spent in large group, free choice, and meals (Gest et al., 2006; Massey et al., 2008; but see Cote, 2001). However, since settings and activities represent separate features of classroom structure, it is feasible that shared reading, as with other learning activities, could occur during multiple settings. That is, shared reading could be conducted in a large group, or at lunch, or might be embedded into a center-based activity. In the present study, shared reading is considered a learning activity in its own right, rather than a setting for activity.

Illustrating this approach to considering shared reading as an activity, Fuccillo (2011) compared teachers' instructional effectiveness across shared reading, math, science, and circle time activities (i.e., consisting largely of esthetics activities) within the large-group setting ($N = 24$ Head Start classrooms). Teachers demonstrated the most effective instructional interactions during science and shared reading activities. Specifically, teachers' ratings on concept development and the feedback provided to children during the science activity were higher than during shared reading, math, and circle time. Teachers' language modeling was notably higher during science activities than during math.

In summary, most studies examine differences in the effectiveness of instructional interactions only across settings (e.g., large group, free choice, and meals), often in ways that minimize variation of learning activities within these settings. When learning activities, such as shared reading, are included in comparisons, they have been treated as another classroom setting. Both large-group and free-choice settings can readily feature a range of activities, including shared reading, literacy, math, science, social studies, and esthetics. In the present study, we examine both settings and learning activities as they related to teachers' instructional effectiveness. We investigate instructional interactions across settings and learning activities separately, and in combination, building on Fuccillo's (2011) research by examining a broader range of learning activities within both large group and free choice settings. We also employ a larger, more diverse sample of teachers to enable us to better understand natural variation across settings and activities. Identifying settings and activities that are associated with more effective interactions could provide teachers with guidance on how to structure their day in ways that may serve to scaffold their instruction.

4. Aims of this study

This study has two primary research aims. The first aim is to examine the extent to which the effectiveness of instructional interactions varies among classroom settings and learning activities. Because the range of instructional effectiveness is generally narrow and the overall quality low (LoCasale-Crouch et al., 2007), it is reasonable to anticipate that differences among settings and activities will also be small in magnitude (Fuccillo, 2011). Nevertheless, modest differences in instructional effectiveness have been shown to still be meaningful to children's outcomes (Burchinal, Vandergrift, Pianta, & Mashburn, 2010). We also investigate differences in instructional interactions that emphasize code-related aspects of literacy learning (i.e., print-related skills and phonological awareness), given that this is a key instructional goal. We anticipate that interaction patterns across contexts would be different for literacy instruction than for more global dimensions of instructional interaction (Connor, Morrison, & Slominski, 2006; Justice et al., 2008).

The second aim pertains to the extent to which any differences in instructional effectiveness based on setting depend on the learning activity. To investigate this interaction, we intentionally narrowed our focus to the large-group and free-choice settings because these are the two settings in which teachers and children spend most of their time (Chien et al., 2010). Within these two settings, we then examined differences in instructional effectiveness as a function of the learning activities in which teachers and children were engaged.

5. Methods

5.1. Sample

This research study represents secondary analyses of data from a multi-site, randomized controlled trial (i.e., National Center for

Research on Early Childhood Education [NCRECE] Professional Development Study; Downer et al., 2012; Hamre et al., 2012). The larger study involved 496 preschool teachers in an evaluation of two forms of professional development designed to improve teachers' interactions with children. The treatment consisted of a 14-week college-level course (Phase I) followed by a year-long, web-mediated coaching model (Phase II; Pianta, Mashburn, et al., 2008). Data for the present study were drawn from Phase II participants ($N = 402$).

Two sequential cohorts of participants were recruited from large community preschools and Head Start programs across ten sites in the United States. Cohort 1 consisted of five sites in that completed Phase II during the 2008–2009 academic year: New York, NY; Hartford, CT; Chicago, IL; Stockton, CA; and Dayton, OH. Cohort 2 consisted of five additional sites that completed Phase II during the 2009–2010 academic year: Columbus, OH; Memphis, TN; Charlotte, NC; Providence, RI; and a second set of programs in Chicago, IL. The recruitment process entailed negotiations with program administrators, the establishment of program agreements, and IRB approval at specific sites.

A liaison was identified at each site to help in the coordination of the recruitment process and study-related activities. Program administrators and potential study participants were invited to attend recruitment meetings in each location to learn about the study details. Additional follow up was done with liaisons and directors by phone and email. Participants were eligible for the larger study if they were the lead teacher in a publicly-funded classroom in which the majority of children were eligible for kindergarten the following school year, the majority of children did not have an IEP at the start of the current school year, classroom instruction was primarily in English, and high-speed internet access was available for teacher use at the program site.

For the present study, we analyzed data from 314 teachers for whom live observation data were available. Over half of the teachers taught in Head Start programs (52.5%) and one-third taught in public school programs (35.4%). There was an average of two classrooms per school or center (SD = 1.23; range = 1–8). The majority of teachers were African American (45.5%) or Caucasian (31.8%), while some were Hispanic/Latino (12.4%), Asian-American (2.9%), or multi-ethnic (3.8%) (3.5% unreported). The average total years of education was 15.86 years (SD = 1.61; $N = 304$), with 56.4% of teachers majoring in early childhood education or child development ($N = 298$). The average experience teaching pre-kindergarten was 10.95 years (SD = 8.13; $N = 300$). Most of the children in teachers' classrooms lived in poverty, with an 87.9% poverty rate (SD = 21%). The teachers for whom these data were not available did not significantly differ from the included sample with regard to racial/ethnic make-up [χ^2 (3, $N = 380$) = 7.37, $p = .06$], teacher major [χ^2 (1, $N = 374$) = .43, $p = .51$], or years of experience teaching preschool ($M = 10.94$ years, SD = 7.42; t (373) = .01, $p = .995$), but they had significantly less education ($M = 15.32$ years, SD = 1.77; t (379) = 2.53, $p = .01$).

5.2. General procedures and measures

One-day assessments were conducted for each of the 314 preschool classrooms in the middle of the academic year (January–March). Trained data collectors were used to assess teacher–child interactions. These data collectors completed multiple 25-min observation cycles (15 min of observation, 10 min of coding), with a goal of completing a minimum of three cycles per classroom. Observations typically lasted from 2.5 to 4 h, taking place from the beginning of the day until roughly lunch or naptime. Teacher–child interactions were measured across a variety of settings and activities as teachers adhered to their normal schedules.

5.3. Effectiveness of instructional interactions

The Classroom Assessment Scoring System – Pre-Kindergarten (CLASS Pre-K; Pianta, LaParo, et al., 2008) was used to measure the effectiveness of teacher–child interactions. The CLASS Pre-K includes 11 dimensions assessing teacher–child interactions. Factor analysis of the 10 standard CLASS dimensions yields three factors (Hamre, Pianta, Mashburn, & Downer, 2007). The first factor is Emotional Support, which includes the dimensions of Positive Climate, Negative Climate (reversed), Regard for Student Perspectives, and Teacher Sensitivity. The second is Classroom Organization, which includes the dimensions of Behavior Management, Instructional Learning Formats, and Productivity. The third is Instructional Support, which includes the dimensions of Concept Development, Quality of Feedback, and Language Modeling. The CLASS Pre-K also includes an 11th dimension, Literacy Focus, that is not associated with the three major factors. Each dimension is rated on a 7-point scale with behavioral indicators and anchor point descriptions provided for low (1–2), medium (3–5), and high (6–7) levels of that dimension.

For this study, the Instructional Support domain (comprising Concept Development, Quality of Feedback, and Language Modeling) and the Literacy Focus dimension represented *teacher–child instructional interactions*. Concept Development considers the strategies teachers employ to promote children's higher-order thinking skills. Quality of Feedback focuses on the verbal evaluation provided to children about their work, comments, and ideas. Language Modeling captures the effectiveness and amount of teachers' use of language-stimulation and facilitation techniques. Literacy Focus assesses the use of explicit and purposeful strategies that focus children's learning of phonological awareness and print-related skills. Because this latter dimension has been used in few studies to date (Justice et al., 2008) and is not included in the commercially available CLASS Pre-K manual, we provide a more detailed description of this scale. In high-scoring classrooms, teachers consistently engage in explicit teaching of literacy concepts, regularly using terms such as *letter, rhyme, sound*, and *word*. The use of explicit teaching focuses children's attention on particular aspects of reading and writing. Teachers also purposefully emphasize connections between code-based literacy activities and the broader purpose of written or spoken communication (e.g., telling children that the print in a book communicates a message, making meaningful connections between letters on an alphabet chart and the letters in children's names).

Prior to data collection, all assessors received a two-day training session on how to observe classrooms and children using the CLASS Pre-K. During this training session, assessors became reliable on the CLASS Pre-K instrument (which requires being within one point of the master code 80% of the time) and conducted a live coding session in a preschool classroom with a master trainer. Throughout the live observation data collection window, data collectors coded and received individualized feedback on a series of practice videos to ensure that they did not drift from the master codes. Double coding was obtained on 19% of all field observations, during which a highly trained CLASS observer accompanied the local data collectors to the classrooms they were assessing. During the double-coded observations, 90% of data collector responses were exactly the same or within one point of each other. The weighted kappas were .49, .71, .62, and .60 for Concept Development, Quality of Feedback, Language Modeling, and Literacy Focus, respectively. Although not ideal, the inter-rater reliability statistics are in keeping with those reported in a prior study (Mashburn et al., 2008), and the live-observation CLASS data analyzed in the present study significantly predict children's gains in achievement scores (Hamre, Hatfield, Pianta, & Jamil, in press). Cronbach's alpha for the Instructional Support domain was .87.

5.4. Setting

Settings were noted throughout each observation cycle. At the end of the observation cycle, data collectors indicated the primary setting as the one that occurred for the majority of the cycle. Setting categories were adapted from the Emerging Academics Snapshot (Ritchie, Howes, Kraft-Sayre, & Weiser, 2001) and included the following categories: large group, small group, free choice, meals, routines, recess, and individual time.

Extensive definitions of the settings were provided to assessors during training and in their coding manuals. *Large group* was considered an organized whole-class or large-group activity involving six or more children. Such structured activities could include stories, songs, calendar instruction, discussions, book reading, and demonstrations. *Small group* was an organized small-group activity of no more than five children. Such structured activities could include group art projects, writing stories, collective building, cooking projects, small-group instruction, science experiments, structured physical education activities, and playing house. During *free choice*, children were able to select what and where they would like to play or learn; the key here was that children chose their activities. During *meals*, children were eating lunch, breakfast, or snacks, or enjoying food that the class cooked during a cooking project. During *routines*, children were changing from one setting to another or performed routine classroom procedures (e.g., moving from centers to large group, toileting, standing in line, clean-up time, wait time between activities, and waiting for materials to be passed out). During *recess*, children were outside of the classroom and/or building either for free play or an organized gross-motor activity (e.g., a game of tag). Last, during *individual time*, children were assigned to work individually with or without teachers, on worksheets, independent projects, or computer work. Nineteen percent of primary setting codes were double coded, with exact agreement between coders for 95% of the cycles (195 of 206 cycles). The following primary settings occurred with enough frequency to be included in analyses: large group, free choice, meals, and routines. Small group, recess, and individual time were also observed but were considered primary settings for very few cycles.

5.5. Learning activity

At the end of the observation cycle, data collectors indicated the primary learning activity that occurred for the majority of the cycle. Adapted from the Emerging Academics Snapshot (Ritchie et al., 2001), categories for learning activity included: read to, pre-read/read, letter/sound learning, writing, math, science, social studies, and esthetics. If none of the activities were observed during a cycle, assessors noted that no learning activity was present.

Extensive definitions for learning activities were provided to assessors during training and in their coding manuals. *Read to* was coded when children were being read to by an adult. *Pre-read/read* was coded when children were reading as individuals or in groups, listening to a book on tape while looking at a book, involved in a sequencing activity, or engaged in recognition of whole words. *Letter/sound learning* was coded when children were practicing rhymes, talking about sound-letter relationships, identifying letters, sounding out words, or practicing vowel sounds. *Writing* was coded when children were writing, pretending to write, using a computer keyboard, using a calculator, doing letter or number puzzles, writing their names, or incorporating writing into play. *Math* was coded when children were rote counting, counting with 1:1 correspondence, skip counting, identifying written numerals, matching numbers to pictures, making graphs, playing counting games, keeping track of how many days until a special event, counting marbles in a jar, playing "Concentration" or "Memory" with numbers, identifying shapes, talking about the properties of shapes, finding shapes in the room, identifying same and different, opposites, quantitative comparing, sorting, discerning patterns, measuring for cooking or size, or anything dealing with time. *Science* was coded when children were identifying and exploring natural phenomena in their environment, working with sand or water, planting seeds, gathering rocks, hypothesizing, discussing, guessing, estimating, experimenting, problem-solving, exploring their senses, or reading books about science. *Social studies* was coded when children were talking, reading, or engaged in activities about their world. Esthetics was coded when children were engaging in art or music activities. *No learning activity* was coded when an activity was not present during any part of the observation cycle. Thirteen percent of primary activity codes were double coded, with 86% exact agreement (127 of 147 cycles). For this study, finer-grained codes were collapsed to form primary categories: shared reading (i.e., read to), literacy (i.e., pre-read/read, letter sound leaning, and writing), math, science, social studies, esthetics, and no learning activity.

5.6. Data analysis

The data consisted of multiple observation cycles (range = 2–6; mode = 4) nested within 314 teachers. To account for the non-independence of cycles, we employed linear mixed models, with setting or activity entered as a cycle-level predictor and teacher entered as a between-subjects random factor. The Instructional Support domain (i.e., Concept Development, Quality of Feedback, and Language Modeling) and the Literacy Focus dimension of the CLASS Pre-K served as dependent variables. Only three of 1102 cycles (.3%) were missing partial outcome data and were excluded from analyses when appropriate. Least significant difference (LSD) comparisons were used to explore any significant effects. We chose to use LSD comparisons instead of a more conservative correction for multiple tests because the purpose of these comparisons is to understand the nature of the significant effect rather than to test specific hypotheses. This necessarily makes our findings more exploratory than confirmatory, which should be taken into account when evaluating the results. All continuous variables were standardized prior to inclusion in these models to simplify the interpretations of the coefficients and to reduce the collinearity between the main effects and any interaction terms.

For research aim 1, we examined the main effects of setting and activity on instructional interactions. In these analyses, we considered four settings (large group, free choice, meals, and routines) and seven activities (shared reading, literacy, math, science, social studies, esthetics, and no learning activity). For research aim 2, we examined the setting-by-activity interaction effects on instructional interactions. In these analyses, we only considered two settings (large group and free choice) because children spend the majority of the day in these two settings and because children engaged in a range of activities during both settings. We still considered all seven of the original activities. The interaction effects were tested by adding terms to the model to detect whether the difference between these two settings varied across learning activities. To ensure that treatment status of the larger intervention study did not interact with context, we also examined the interaction between treatment condition and setting/activity for all outcomes but found that it was not significant. Consequently, we did not include this interaction in our final models.

In all statistical models, we selected covariates based on those that had appeared in prior studies of teacher–child interactions (Hamre et al., 2012; Mashburn et al., 2008; Pianta, Mashburn, et al., 2008), as well as those that we felt were conceptually important in this sample. These included: Head Start affiliation, public school affiliation, years of experience teaching preschool, teacher years of education, whether the teacher majored in early

Table 1
Observed frequency of primary settings and learning activities across teachers and cycles.

	# teachers	# cycles	% cycles
Setting			
Large group	266	407	36.9%
Free choice	255	352	31.9%
Meals	118	144	13.1%
Routines	107	136	12.3%
Small group	37	39	3.5%
Recess	12	13	1.2%
Individual time	9	9	.8%
No primary setting assigned	2	2	.2%
Activity			
Shared reading	141	176	16.0%
Literacy	135	165	15.0%
Math	66	75	6.8%
Science	58	67	6.1%
Social studies	141	205	18.6%
Esthetics	170	240	21.8%
No learning activity present	90	113	10.3%
No primary activity assigned	37	61	5.5%

Table 2
Estimated marginal means (standard errors) of instructional interactions by setting.

	Setting			
	Large group	Free choice	Meals	Routines
Instructional Support	2.49_A (.05)	2.38_A (.05)	2.17_B (.07)	1.96_C (.08)
Concept development	1.97_A (.05)	1.71_B (.05)	1.43_C (.08)	1.43_C (.08)
Quality of feedback	2.63_A (.06)	2.59_A (.06)	2.32_B (.09)	2.09_C (.09)
Language modeling	2.87_A (.06)	2.84_A (.07)	2.76_A (.10)	2.37_B (.10)
Literacy Focus	1.50_A (.04)	1.21_B (.04)	1.10_B (.06)	1.16_B (.06)

Note: Within a row, the subscripts on the means indicate the homogenous subset. The means of settings that are part of the same homogenous subset are not significantly different from each other ($p > .05$) based on pairwise comparisons. The means of settings that do not share any subscripts are significantly different from each other ($p \leq .05$).

childhood education/child development, classroom poverty level, percentage of three-year-olds in the classroom, total number of children in the classroom, and the level of classroom problem behaviors reported by the teacher. Approximately 5% of data on these variables was missing, and thus these data were imputed using the Expectation-Maximization algorithm.

6. Results

Table 1 displays the frequencies of primary settings and learning activities across all teachers and observation cycles. Cycles of large-group and free-choice settings were observed two to three times more often than meals and routines. Because small group, recess, and individual time settings collectively comprised a very small proportion of cycles, we did not include them in subsequent analyses. The majority of teachers were observed as having either two ($n = 162$) or three ($n = 108$) of the four main settings (i.e., large group, free choice, meals, and routines), although 18 teachers had all four settings and 26 teachers had only one setting represented during the observation.

The most prevalent activities across cycles were esthetics and social studies, which occurred almost one and a half times as often as shared reading and literacy activities and approximately three times as often as math and science activities. No learning activity was observed in one-tenth of the cycles, meaning that children were not engaged in any coded activity during this time. A primary activity code was not assigned for a small percentage of cycles, likely due to the observation of multiple activities, with no single activity occurring for the majority of the cycle.

Across observation cycles, teachers exhibited an overall low level of instructional interactions in all CLASS Pre-K dimensions: Concept Development ($M = 1.73$; SD = 1.03; range = 1–6), Quality of Feedback ($M = 2.50$; SD = 1.26; range = 1–6), Language Modeling ($M = 2.77$; SD = 1.33; range = 1–6), and Literacy Focus ($M = 1.30$; SD = .72; range = 1–7). It is important to note that while the range for each dimension spanned the continuum from low to high levels of effectiveness, none of the means reached the medium level.

6.1. Comparing effectiveness across settings and learning activities

Our first research aim concerned the extent to which the effectiveness of instructional interactions varied across settings and across learning activities. In other words, we wanted to determine whether teachers were more effective at interacting with children in particular settings or activities. Table 2 displays the estimated marginal means and homogenous subsets for each outcome broken down by setting. Setting was significantly associated with Instructional Support ($F[3,883] = 15.39$, $p < 001$) and Literacy Focus ($F[3,954] = 20.01$, $p < 001$). For Instructional Support, teachers were observed to demonstrate more effective interactions in the large-group and free-choice settings than when observed in meals and routines. For Literacy Focus, teachers were observed to demonstrate more effective interactions in the large-group setting than when observed in free choice, meals, and routines. Instructional Support was significantly different across most settings, while Literacy Focus was no better in the free choice setting than it was in meals or routines.

Examination of the individual Instructional Support dimensions also revealed significant differences across settings for Concept Development ($F[3,916] = 21.31$, $p < 001$), Quality of Feedback ($F[3,891] = 11.98$, $p < 001$), and Language Modeling ($F[3,890] = 7.46$, $p < 001$). Teachers exhibited similar levels of effectiveness during both large-group and free-choice settings in terms of their Quality of Feedback and Language Modeling, but were more effective during large group than during the free choice in terms of Concept Development. In addition, teachers' language modeling was as effective during meals as it was in the large group and free choice settings.

Table 3 displays the estimated marginal means and homogenous subsets for each outcome broken down by learning activity. Learning activity was significantly associated with Instructional Support ($F[6,950] = 16.03$, $p < 001$) and Literacy Focus ($F[6,1026] = 16.57$, $p < 001$). Teachers demonstrated the highest Instructional Support during science activities, with somewhat lower support during shared reading. Literacy, math, and social studies activities followed next, and were not significantly different from each other in levels of Instructional Support. Teachers' Instructional Support was lowest during esthetics and when no learning activity was present. The pattern differed for Literacy Focus, with the most explicit focus on literacy occurring when teachers were engaged in literacy-related activities (i.e., literacy and shared reading). There were no significant differences among the other activities.

When evaluating the individual dimensions of Instructional Support, we found that learning activity was significantly associated with Concept Development ($F[6,990] = 13.94$, $p < 001$), Quality of Feedback ($F[6,956] = 10.30$, $p < 001$), and Language Modeling ($F[6,962] = 11.39$, $p < 001$). In general, the pattern of results here largely mirrored those of the broader Instructional Support findings discussed above, favoring science activities. One notable difference was that, at the dimension level, teachers' concept development

Table 3
Estimated marginal means (standard errors) of instructional interactions by learning activity.

	Learning activity						
	Shared reading	Literacy	Math	Science	Social studies	Esthetics	No learning activity
Instructional Support	2.62_{B}	2.33_{C}	2.38_{C}	2.94_{A}	2.41_{C}	2.11_{D}	1.97_{D}
	(.07)	(.07)	(.10)	(.11)	(.07)	(.06)	(.08)
Concept development	2.07_{A}	1.68_{BC}	1.80_{B}	2.29_{A}	1.74_{B}	1.54_{CD}	1.38_{D}
	(.07)	(.07)	(.10)	(.11)	(.07)	(.06)	(.09)
Quality of feedback	2.73_{B}	2.54_{B}	2.59_{B}	3.08_{A}	2.60_{B}	2.33_{C}	2.07_{D}
	(.08)	(.08)	(.12)	(.13)	(.08)	(.07)	(.10)
Language modeling	3.08_{B}	2.77_{C}	2.75_{CD}	3.44_{A}	2.89_{BC}	2.47_{D}	2.46_{D}
	(.09)	(.09)	(.13)	(.14)	(.08)	(.08)	(.11)
Literacy Focus	1.45_{B}	1.71_{A}	1.15_{C}	1.17_{C}	1.24_{C}	1.19_{C}	1.08_{C}
	(.05)	(.05)	(.08)	(.08)	(.05)	(.04)	(.06)

Note: Within a row, the subscripts on the means indicate the homogenous subset. The means of activities that are part of the same homogenous subset are not significantly different from each other ($p > .05$) based on pairwise comparisons. The means of activities that do not share any subscripts are significantly different from each other ($p \leq .05$).

Table 4
Observed frequency of cycles and teachers within specific contexts.

	Large group		Free choice	
	# cycles	# teachers	# cycles	# teachers
Activity				
Shared reading	137	119	12	12
Literacy	56	54	39	35
Math	23	22	31	29
Science	28	26	30	28
Social studies	32	31	108	86
Esthetics	106	91	74	72
No learning activity present	15	15	21	18

appeared to be equally effective during science and shared reading activities.

6.2. The combination of settings and learning activities

To address our second research aim, we narrowed our lens to the two most common preschool settings: large group and free choice. Table 4 displays the frequencies of cycles that include both a particular setting and learning activity. In addition, we report the number of teachers represented by each pairing. Shared reading and esthetics activities occurred most often during large group, while social studies and esthetics activities occurred most often during free choice.

Table 5 provides the means for Instructional Support and Literacy Focus for specific combinations of setting and activity. The interaction between setting and activity was not significant for Instructional Support ($F[6,635] = 1.89$, $p = .08$). Although we present different homogenous subsets by setting in Table 5, these differences should be interpreted cautiously because the omnibus test is not significant. For both the large-group and free-choice settings, science emerged as the activity with the most effective instructional interactions. This pattern was somewhat less pronounced for the free-choice setting than for the large-group setting. In contrast, there was a significant interaction between setting and activity for Literacy Focus ($F[6,691] = 4.32$, $p < 001$). When in the large-group setting, teachers displayed the highest mean level of Literacy Focus during literacy activities, and the lowest during science activities. During the free choice setting, however, there were minimal differences in Literacy Focus among the activities. It is interesting to note that within this setting, literacy activities appeared to offer only a minimal advantage in Literacy Focus over other activities.

To further explore the interactions between setting and activity, we examined whether teachers were more effective within a learning activity in a large-group or free-choice setting. The shaded comparisons in Table 5 indicate significant differences in effectiveness between settings. During esthetics activities, teachers demonstrated greater Instructional Support during free choice than during large group, although this must be interpreted cautiously since the test of the overall interaction effect was not significant. Teachers demonstrated more effective literacy interactions during large-group literacy activities when compared with the free-choice setting.

7. Discussion

The purpose of this exploratory study was to examine the extent to which the effectiveness of instructional interactions varied across preschool classroom settings and learning activities. We examined the main effect of setting, the main effect of activity, and the setting by activity interaction to obtain a clear picture of variation in instructional effectiveness across contexts.

Table 5
Large group and free choice setting differences across learning activities.

	Learning activity						
	Shared reading	Literacy	Math	Science	Social studies	Esthetics	No learning activity
Instructional Support							
Large group	2.76_{B}	2.57_{BC}	2.59_{BC}	3.18_{A}	2.72_{BC}	2.05_{D}	2.28_{CD}
	(.08)	(.12)	(.18)	(.17)	(.16)	(.09)	(.22)
Free choice	2.54_{AB}	2.48_{AB}	2.55_{AB}	2.86_{A}	2.45_{B}	2.37_{B}	2.16_{B}
	(.25)	(.15)	(.16)	(.16)	(.09)	(.10)	(.19)
Literacy Focus							
Large group	1.52_{B}	2.37_{A}	1.31_{BCD}	1.11_{D}	1.48_{BC}	1.30_{CD}	1.21_{BCD}
	(.06)	(.09)	(.15)	(.13)	(.12)	(.07)	(.18)
Free choice	1.22_{AB}	1.47_{A}	1.14_{AB}	1.19_{AB}	1.20_{B}	1.22_{AB}	$.96_{B}$
	(.20)	(.11)	(.13)	(.13)	(.07)	(.08)	(.15)

Note: Within a row, the subscripts on the means indicate the homogenous subset. The means of activities that are part of the same homogenous subset are not significantly different from each other ($p > .05$) based on pairwise comparisons. The means of activities that do not share any subscripts are significantly different from each other ($p \leq .05$). Shading indicates a significant difference between the means for large group and free choice settings for that activity and outcome.

Importantly, these comparisons all controlled for an assortment of program and classroom-level factors that could potentially be associated with the predictors or outcomes in the model. Even with these adjustments, it was evident that teachers' instructional interactions, operationalized both in terms of global ratings (i.e., Instructional Support) and as specific behaviors (i.e., Literacy Focus), varied across settings and across activities. We also observed a significant difference in code-related literacy instructional interactions between the effect of activity in the large-group setting and the effect of activity in the free-choice setting. Thus the primary hypotheses of the study were supported, with the results having possible implications for further experimental studies and for program planning.

Before discussing our findings, we acknowledge that the overall level of instructional effectiveness across teachers was low. This is in keeping with prior reports of at-risk samples of children (Justice et al., 2008), who are often exposed to the least effective instructional interactions (LoCasale-Crouch et al., 2007). Consequently, the strengths in instructional effectiveness, reported across settings and activities, should be interpreted as relative, rather than absolute. We also remind readers that the findings of our study should be taken as exploratory, because we were not testing specific hypotheses but rather trying to understand the nature of the differences in instructional interactions across settings and activities.

7.1. *Differences in instructional interactions across settings*

Our results indicated that teachers were most effective in their interactions with children during the large-group and free-choice settings when compared to interactions during meals and routines. Our findings are generally consistent with previous reports showing that teachers use richer vocabulary, ask more open-ended questions, and are more linguistically responsive to child talk during teacher-directed settings such as large group (Cote, 2001; Pence Turnbull, Anthony, Justice, & Bowles, 2009). Free choice is also a setting that may foster many chances for responsive one-on-one conversational exchanges (Gest et al., 2006). It follows, therefore, that both large group and free choice offer unique opportunities for teachers to interact with children. During content-specific literacy instruction, however, there was a more pronounced difference between large group and free choice, meals, and routines. One reason for this may be that teachers typically engage in large group circle-time each morning, which traditionally features print-related and phonological awareness activities. Although the overall level of instructional interactions across settings is expectedly low (LoCasale-Crouch et al., 2007), the significant differences in favor of large group may indicate that teachers view this setting as an important instructional time for which they are preparing formal lessons. This setting may also result in the highest level of interactions simply because teachers do not engage as consistently and frequently with children during other settings (Winton & Bussye, 2005).

Our results suggest that teachers had relatively greater difficulty engaging children in concept development within the free choice setting than within the large-group setting. More work is needed to unpack this finding, however, as previous evidence has shown that teachers pose a similar number of cognitively stimulating questions in both group and free choice settings (Massey et al., 2008). Nonetheless, when looking specifically at the quality of feedback and language modeling that teachers provided to children, we found that free choice appears to be equally conducive as large group for engaging children in conversational feedback loops and providing exposure to advanced linguistic models.

Meals and routine settings consistently featured the least effective instructional interactions. Given that these settings collectively comprise about a third of the preschool day, it is disconcerting that such a large portion of children's daily experience appears to be under utilized. While it is not surprising that teachers did not often use times of routine for meaningful instruction (Winton & Bussye, 2005), it is notable that language modeling interactions during meals were equally strong during this setting as for large group and free choice. Despite challenges specific to mealtime (e.g., the location, the amount of time allocated, and staffing), our findings are consistent with the extant literature showing that this setting could enable meaningful conversational exchanges between teachers and children (Cote, 2001; Gest et al., 2006).

With regard to the effectiveness of literacy-focused interactions, the lack of differences among free choice, meals, and routine settings is troubling. We expected that the free-choice setting would be characterized by more effective literacy interactions than meals and routines, particularly given that most preschool curricula encourage print-rich centers embedded with literacy tools (e.g., pencils, paper, and signs). Although children's spontaneous literacy play may increase with inclusion of these tools (Neuman & Roskos, 1992), literacy-focused teacher–child interactions during center time are not automatically strengthened. This is a missed opportunity, as research demonstrates that children benefit from explicit adult mediation of literacy experiences within a free choice setting (Roskos & Neuman, 2001). The lack of differences may also be due to the inconsistency with which teachers include literacy tools in centers, for example, including them only within the classroom writing center but not within the dramatic play center (Gerde et al., 2012)

7.2. *Jointly considering both settings and learning activities*

The most effective global instructional interactions (i.e., Instructional Support) took place within the large-group and free-choice settings during science activities. This was the only activity we observed during which the average score for teachers approached or exceeded the minimum threshold at which teacher–child interactions improve children's skills (3.25; Burchinal et al., 2010). We confirm and extend Fuccillo's (2011) finding that science activities can function as a context in which teachers naturally engage in higher quality instructional interactions, specifically as related to developing higher-order thinking skills, engaging in feedback loops, and modeling language. The large-group or free-choice science context may be suitable for effective interactions because it provides teachers with substantive content to discuss with children. Classroom science activities, such as observing plant growth and conducting simple experiments, provide a naturally stimulating context for teachers to discuss important concepts with children, ask challenging open-ended questions, and introduce new vocabulary.

Moreover, large-group science may be a good context for fostering effective instructional interactions because teachers often employ books as a vehicle for introducing science concepts to children. In our data, approximately 30% of all of the cycles coded as large-group science also included at least some book reading during the observation. Teachers' extra-textual talk during shared book-reading sessions, when it occurs, is typically focused on the content of the book rather than on the print (Hindman, Connor, Jewkes, & Morrison, 2008; Price, Bradley, & Smith, 2012; Zucker, Justice, & Piasta, 2009) and may be related to children's language and cognitive development (Zucker, Cabell, et al., 2013). In particular, information books allow teachers and children to engage more deeply in abstract thinking. For example, Price and colleagues (2012) found that when preschool teachers read science information books about animals, they engaged in more cognitively demanding talk than when they read narrative storybooks that also included science concepts.

Although other content areas apart from science may offer teachers opportunities for challenging discussion, we observed significantly less effective instructional interactions during other learning activities, particularly in the large-group setting. Notably, there were no significant differences in interaction quality among math, literacy, and social studies activities. Thus, all academic content areas do not appear to foster instructional interactions equally. For example, it cannot be assumed that math and science instruction naturally promote the same level of interaction between teachers and children. Teachers have a tendency toward rote instruction during math activities (Ginsburg, 2009) and read math information books sparingly (Pentimonti, Zucker, Justice, & Kaderavek, 2010). Disconcertingly, instructional interactions were no better in many of the academic content activities than they were when no learning activity was observed. This lack of difference reinforces findings from the NCEDL Multi-State Study of Pre-Kindergarten (Winton & Bussye, 2005) indicating that much of children's time is spent with little or no interaction with teachers, irrespective of the context. When teachers and children do interact, they generally engage in low-level exchanges.

The effectiveness of literacy-focused interactions differed substantially across contexts. Not surprisingly, the most effective literacy interactions took place when large-group literacy was the primary context. During this time, teacher instruction included phonological awareness, teaching of letter-sound correspondences, and writing. Apart from literacy activities, shared reading activities appeared to offer no advantage over social studies, math, or esthetics in large-group settings. We interpret this finding with caution given the small number of shared-reading cycles observed in the free-choice setting. However, these results are certainly plausible as teachers do not generally focus children's attention on print when reading books aloud to them, even though this is a promising context for literacy-focused interactions (Zucker et al., 2009). Interestingly, large-group science was among the weakest contexts for fostering literacy skills. While it is certainly possible to make science a viable context for including literacy elements (such as by incorporating journal writing), teachers do not seem to view this context as ideal for literacy instruction.

Finally, differences were less pronounced in instructional effectiveness across learning activities during the free-choice setting for both global instructional interactions or content-specific, literacy-focused interactions. This finding suggests that teachers may take a similar role during free choice regardless of the type of activity in which children are engaged. As aforementioned, the free-choice setting featured less effective interactions than the large-group setting, and prior research indicates that teacher–child interactions during free play are infrequent (Winton & Bussye, 2005). Esthetics was the only learning activity for which global interaction quality was significantly higher during free-choice settings than during large-group settings. It is likely that large-group esthetics time was largely comprised of singing songs and reciting poems, while free-choice esthetics activities featured art projects or manipulating play dough. The latter activities are more conducive to back-and-forth discussions (Girolametto & Weitzman, 2002), potentially explaining our findings.

8. Limitations

Before we discuss implications of this work, salient limitations warrant note. Due to the nature of our coding system, we cannot be certain that all children in a given classroom were engaged in the primary setting or learning activity at the time of the observation. While other studies have focused on engagement in settings and activities at the child level (Booren, Downer, & Vitiello, 2012; Powell, Burchinal, File, & Kontos, 2008; Vitiello, Booren, Downer, & Williford, 2012), we were mainly interested in measuring the average experience of children at the classroom level. Therefore, it is plausible that "free-choice" scores could have also reflected teachers' interactions with individuals or small groups. In addition, our findings do not offer any information about the quality of experiences provided to individual children in the classroom.

Relatedly, we were not able to include small group in our comparison among settings. Although teachers in our study had the opportunity to provide small-group instruction to the majority of children during observations (with the average observed child-to-teacher ratio of 6:1), they did so very infrequently. Instructional interactions may be most effective within the small-group setting, since interacting with fewer children allows teachers to provide instruction that is more responsive to children's needs and offers children increased opportunity for active participation (Powell et al., 2008; Zucker, Solari, Landry, & Swank, 2013). These factors may impact the ultimate dosage of instructional practices children receive. Not surprisingly, research suggests that children's learning may be accelerated when they spend more time in small groups rather than other settings (Smith, 2001).

An additional limitation is that we did not manipulate classroom schedules such that every teacher would have every setting or activity represented during the day of observation (Fuccillo, 2011). It is reasonable to assume that teachers self-select into settings and activities that are more comfortable for them. However, we did attempt to address this bias by including relevant covariates in our analyses. When considering the lack of a manipulation as a limitation, it is important to note that there was still an adequate distribution across primary settings and activities. It is also important to note the observational design provides a naturalistic lens on classroom instructional interactions across contexts, which could be desirable of itself. While it may be possible that the professional development included as part of the larger intervention study primed teachers for higher quality interactions within certain settings or activities, we do not feel that this is likely given that teacher training did not pinpoint specific contexts and treatment condition did not significantly interact with setting or learning activity.

9. Implications

The results of this study may have important implications for the design of professional development models for teachers. Most current approaches feature global training with little attention to the differences across settings and activities. This may be one reason why preschool interventions are often met with limited success in changing teacher practice (Dickinson, Freiburg, & Barnes, 2011). Teachers are often asked to modify features of their instruction simultaneously across contexts throughout the day, potentially resulting in minimal change in their performance, limiting the impact of intervention on children's skills (Cabell et al., 2011; Pence et al., 2008).

Since modifying instructional practices is challenging, some experts argue for more targeted approaches to teacher training (Dickinson et al., 2011). Our findings suggest that professional development efforts could be modified to take advantage of the natural variation in effectiveness that occurs across contexts. Conventional wisdom would suggest that training be focused on improving interactions within contexts in which teachers demonstrate the least effective interactions. Thus, missed opportunities could become intentional foci of professional development. Another promising avenue, however, might be to develop training strategies that would capitalize on teacher strengths by maximizing the effectiveness of interactions within settings that appear to be more conducive to teachers' use of instructional support strategies. Providing context-specific, targeted training prioritizing areas of relative teacher strength may result in greater teacher uptake of strategies.

On the basis of our findings, we would suggest that in addition to encouraging teachers to increase their time spent providing science instruction to children, interventions could be designed to strengthen global instructional interactions within the large-group or free-choice science context. This context appears to promote richer conversational exchanges, during which teachers can enhance children's higher-order thinking skills and language abilities. One simple way to lift the global quality of interactions is to encourage the use of science information texts in the classroom (Price et al., 2012). Teachers rarely read these types of books (Pentimonti et al., 2010), so efforts could be made to provide increased access to and training on the use of these texts. A recent randomized controlled trial improved preschool instructional effectiveness during the large-group science context using a comprehensive intervention approach (Lee, Kinzie, & Vick Whittaker, 2012), where teachers were trained to use open-ended questions to probe children's thinking and elicit child talk while using a science curriculum. Some of the training focused on developing high-quality questioning techniques within the large-group science context by encouraging shared reading of information text. Teachers who received supports on both questioning practices and curricular implementation asked more open-ended questions within science sessions than those who only received access to the curriculum. One note of caution is that teachers need training not only in high quality instructional interactions, but also in the science concepts they are teaching (Dickinson, 2011).

Optimal training contexts for literacy instruction may be different than contexts for improving global instructional interactions. To specifically improve interactions involving literacy, training teachers to deliver high-quality instruction during large-group literacy activities can be a starting point. This may be the context in which teachers feel most prepared to provide explicit literacy instruction. Large-group shared reading is another context in which explicit literacy instruction can be strengthened. For example, teachers can seamlessly embed questions, comments, and nonverbal references about print during shared book reading, without taking away from discussion about the content of the book (Justice & Sofka, 2010; Zucker et al., 2009). Numerous studies of print referencing, during which teachers systematically draw attention to the print in books, have demonstrated this technique to be easy for adults to implement with high fidelity, even when they receive minimal support (Justice & Piasta, 2011). Additionally, prior research has shown that modest doses of this intervention impact children's print knowledge (Justice et al., 2009; McGinty, Breit-Smith, Fan, Justice, & Kaderavek, 2011). Results from a randomized controlled trial indicated that with training, teachers were able to improve their print referencing and sustain this change in literacy instruction throughout the course of an academic year (Piasta et al., 2010).

Taking advantage of specific preschool classroom contexts in which teachers exhibit relative strength can be viewed as a starting point for improving the professional development offered to teachers. Clearly, one cannot assume that teacher learning within isolated contexts will automatically transfer to improvement within other contexts. Perhaps the general principles discussed here for improving instructional interactions using context-specific training can be transferred to other contexts with appropriate supports. This may be a promising step toward ensuring that all children have access to classrooms featuring highly effective instructional interactions.

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