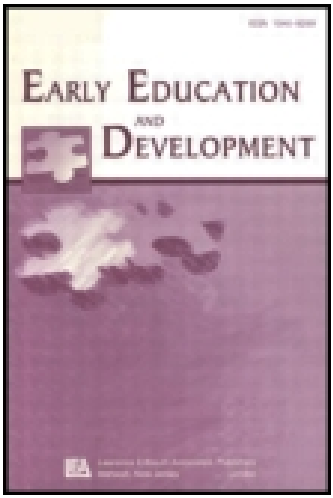

Early Education and Development

Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/heed20

Educators' Use of Cognitively Challenging Questions in Economically Disadvantaged Preschool Classroom Contexts

Susan L. Massey [a], Khara L. Pence [a], Laura M. Justice [a] & Ryan P. Bowles [b]

[a] Department of Curriculum, Instruction, and Special Education, Curry School of Education, University of Virginia

[b] Department of Psychology, Michigan State University

Published online: 23 Apr 2008.

To cite this article: Susan L. Massey, Khara L. Pence, Laura M. Justice & Ryan P. Bowles (2008) Educators' Use of Cognitively Challenging Questions in Economically Disadvantaged Preschool Classroom Contexts, Early Education and Development, 19:2, 340-360, DOI: 10.1080/10409280801964119

To link to this article: http://dx.doi.org/10.1080/10409280801964119

EARLY EDUCATION AND DEVELOPMENT, *19*(2), 340–360

ISSN: 1040-9289 print / 1556-6935 online
DOI: 10.1080/10409280801964119

Routledge
Taylor & Francis Group

Educators' Use of Cognitively Challenging Questions in Economically Disadvantaged Preschool Classroom Contexts

Susan L. Massey, Khara L. Pence,* and Laura M. Justice**
Department of Curriculum, Instruction, and Special Education,
Curry School of Education
University of Virginia

Ryan P. Bowles
Department of Psychology
Michigan State University

Research Findings: This study investigated the complexity of teacher questions in 14 preschool classrooms serving economically disadvantaged 4-year-olds. The purposes were to explore the frequency and complexity of teacher questions and to determine the extent to which question types varied for different classroom contexts. Using teacher utterances from 24-min transcripts of videotaped classroom observations, we used a logistic regression framework to determine the frequency of teacher questioning and the extent to which this related to classroom context. Results indicated that questions characterized 33.5% of all teacher utterances, with management questions occurring most frequently (44.8%), followed by more cognitively challenging questions (32.5%) and less cognitively challenging questions (22.7%). The frequency of use for the different question types varied by classroom context; specifically, management questioning occurred most frequently in teacher-directed and child-directed contexts, whereas more cognitively challenging questions occurred most frequently during shared storybook reading. *Practice or Policy:* This study has implications for the professional development of early childhood educators, particularly with respect to the use of questions as a language stimulation technique for preschoolers at risk for language- and literacy-related difficulties.

*Khara Pence Turnbull now works as a research scientist in Washington, DC.
**Laura M. Justice is now with the School of Teaching and Learning at The Ohio State University.
Correspondence regarding this article should be addressed to Susan L. Massey, Curry School of Education, University of Virginia, 617 W. Main St., P. O. Box 400763, Charlottesville, VA 22904. E-mail: slmj@virginia.edu

The importance of preschool experiences for fostering children's short- and long-term educational success is increasingly emphasized in educational policies such as the No Child Left Behind Act of 2001. Within this broader policy context, of considerable interest is ensuring the quality of children's language experiences within the preschool classroom, including consideration of both classroom structures (e.g., use of a curriculum featuring explicit language goals) and processes (e.g., children's participation in quality conversations across the classroom day). In this research, we examined a specific process that has been linked to preschool children's early and later language achievements, namely children's exposure to abstract language (van Kleeck, Gillam, Hamilton, & McGrath, 1997). Experts contend that exposure to abstract language, which some refer to as *decontextualized language* (Curenton & Justice, 2004; Devescovi & Baumgartner, 1993), is an important mechanism for improving children's language skills. Accordingly, teachers have been encouraged to use a greater amount of abstract comments and questions within the preschool classroom to enhance children's experiences with the "language of learning"—that is, language that goes beyond the here and the now and that mediates children's ability to use language to hypothesize, predict, and reason (see van Kleeck, Vander Woude, & Hammett, 2006).

Our particular focus in this research was preschool educators' use of questioning. Teacher questioning has often been studied given the evocative role of questions: Unlike comments, questions explicitly entice children to take a turn in conversational interactions, potentially increasing their experience in extended discourse. Nonetheless, not all questions are equal in terms of what they recruit from children. For instance, yes/no questions (e.g., Is that a cat?) require a different type of response from children compared to *wh*-questions (e.g., What is the cat doing?); likewise, perceptually focused questions (e.g., What color is it?) recruit different types of responses compared to conceptually focused questions (e.g., What do you think will happen next?). Thus, although an increase in teacher use of questioning within teacher–child interactions may improve children's active participation in these interactions, variability in the types of questions used may mediate the complexity of children's responses. In the present research, we examined the types and complexity of teacher questions in the at-risk preschool classroom, with a specific focus on determining the extent to which these questions provide children with opportunities to engage in conceptually challenging conversations of a relatively abstract nature. An additional and related goal was to determine if teacher questioning, in terms of both frequency and type, varied across different classroom contexts.

TEACHER–CHILD CONVERSATION AND CHILDREN'S LANGUAGE DEVELOPMENT

A number of studies conducted in the past decade have examined the quality and quantity of preschool teachers' language use within the classroom (e.g., Dickin-

son, 2001a, 2001b; Vasilyeva, Huttenlocher, & Waterfall, 2006; Wilcox-Herzog & Kontos, 1998). Correlational studies have shown associations between quality and quantity of teacher language use and children's language skills (e.g., Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002; Reese & Cox, 1999; Weizman & Snow, 2001), and experimental studies have shown that increases in teacher use of specific language structures or functions impact aspects of children's language comprehension and expression (e.g., Han, Roskos, Christie, Mandzuk, & Vukelich, 2005; Justice, Meier, & Walpole, 2005). Of relevance to this research are studies showing that the conceptual complexity of teacher language directly relates to children's receptive and expressive language skills (Wasik & Bond, 2001; Wasik, Bond, & Hindman, 2006). Specifically, researchers have suggested that engaging children in cognitively challenging conversations that include decontextualized language and address concepts of an abstract nature is particularly beneficial to children's language development (Dickinson, 2001a, 2001b; Dickinson & Smith, 1994; van Kleeck et al., 1997, 2006). Two important features of teacher–child cognitively challenging conversation that have been identified in the literature are (a) the focus of the conversation and (b) the teacher's dialogic techniques for engaging the child.

Focus of Cognitively Challenging Conversations

Cognitively challenging conversation is typically focused on events away from the here and now, including events in the past, in the future, or of an imaginary or hypothesized nature (Blank, Rose, & Berlin, 1978; van Kleeck, 2003; van Kleeck et al., 1997). Being removed from the present, cognitively challenging conversation requires children to remember, reason, fantasize, imagine, problem solve, predict, and hypothesize. Terms used to describe the focus of conversations that elicit these relatively complex conversational functions from children include *non-immediate talk*, *representational talk*, and *decontextualized language*. DeTemple (2001) defined *immediate talk* as discourse referring to topics closely tied to illustrations in book reading and/or focusing on concepts immediately available to the conversational participants. In contrast, *non-immediate talk* uses the text or illustrations as a springboard for discourse involving personal experiences, comments, or questions about general knowledge and requires the conversational participants to draw inferences, analyze information, discuss vocabulary, and make predictions beyond the immediately available context (DeTemple & Snow, 2003). *Representational talk* communicates information requiring a higher level of abstract thought (Dickinson, 2001b; Sorsby & Martlew, 1991). *Decontextualized language* implies reference to nonpresent objects and to past and future events not accessible by the immediate context (Curenton & Justice, 2004; Devescovi & Baumgartner, 1993).

Teachers can infuse cognitively challenging talk in a variety of classroom contexts, including whole-class or "circle" activities, dramatic play, mealtime, and

book reading (Massey, 2004). The importance of doing so is consistent with several current and prominent theories of language development. From a social interactionist perspective, children acquire language through social interactions with teachers that provide them with frequent well-tuned models of vocabulary, grammar, and use of language (Chapman, 2000). From a constructivist perspective, teacher–child conversations provide a context in which shared experiences promote the construction of meaning (Halliday, 2004). When these conversations are focused on events or topics of a relatively abstract and decontextualized nature, they foster children's development of abstract language skills (van Kleeck et al., 1997).

The findings from several recent experimental studies provide support to these theoretical perspectives, specifically those studies that have implemented interventions designed specifically to improve the quality of teacher language use in preschool classrooms. For instance, in two related studies examining the effects of an interactive book-reading approach coupled with related dramatic play extension activities in Head Start classrooms (Wasik & Bond, 2001; Wasik et al., 2006), preschool teachers were trained to ask open-ended questions that would elicit multiword responses from children, to teach vocabulary using questions pertaining to object descriptions and object usage, and to promote book discussion using questions focusing on abstract language skills such as predicting, analyzing, and inferring. Wasik and colleagues reported that children participating in the interactive lessons engaged in more conversations with teachers and with other students and demonstrated increased vocabulary knowledge as a result of the reading and extension activities.

Similarly, another recent study also indicated that Head Start preschoolers benefit from improved quality of language input. This study featured child participation in one-on-one book-sharing sessions in which literal and inferential questions were embedded (van Kleeck et al., 2006). Research assistants were trained to ask the embedded questions and to provide prompts and responses as necessary to elicit responses from the children. Results indicated positive gains for the intervention students in both literal and inferential language skills following the 8-week intervention.

Dialogic Techniques for Engaging the Child

As the previous studies suggest, questioning is a prominent strategy in language interventions for preschool children, particularly when the goal is to improve children's engagement in cognitively challenging conversations. Although educators can use a range of strategies to evoke children's participation in such conversations (e.g., comments, requests), questioning is a prominent technique because it can be used to both scaffold and assess students' learning (Kintsch, 2005). Additionally, particular types of questions, including the open-ended question, have a relatively

strong summoning power for eliciting responses from children compared to other strategies, such as commenting (Justice, Weber, Ezell, & Bakeman, 2002). Of the different question types (e.g., tag questions, yes/no questions, what questions), open-ended questions seem particularly amenable to engaging children in extended cognitively challenging conversations, as they place relatively little constraint on children's responses (de Rivera, Girolametto, Greenberg, & Weitzman, 2005; van Kleeck et al., 2006). Accordingly, researchers refer to open-ended questions as low-constraint questions, and children's responses to these questions tend to be longer and more variable in their content than those to high-constraint questions such as yes/no questions (de Rivera et al., 2005).

One important series of research studies investigating the beneficial effects of cognitively challenging open-ended questions on children's language development is in the area of dialogic storybook reading (e.g., Arnold, Lonigan, Whitehurst, & Epstein, 1994; Dale, Crain-Thoreson, Notari-Syverson, & Cole, 1996; Hargrave & Sénéchal, 2000; Huebner & Meltzoff, 2005; Valdez-Menchaca & Whitehurst, 1992; Whitehurst et al., 1988). Although several dialogic storybook-reading studies have been conducted in the home environment (e.g., Arnold et al., 1994; Huebner & Meltzoff, 2005), of particular relevance to the current study is the implementation of dialogic techniques in a classroom setting with high-risk participants (e.g., Valdez-Menchaca & Whitehurst, 1992). The dialogic reading method emphasizes the use of open-ended questions in addition to other evocative techniques (e.g., recasting and extending children's responses) when adults read storybooks with young children, and studies of dialogic reading suggest that open-ended questions are an important mechanism for engaging children in sustained dialogues. With trained professionals, implementing dialogic reading enhanced the language skills of low-income 2-year-olds in a day care setting (Valdez-Menchaca & Whitehurst, 1992). Likewise, open-ended questions are also particularly effective for accelerating at-risk preschoolers' abstract language and vocabulary abilities (van Kleeck et al., 2006).

GOALS OF THIS STUDY

The first goal of this study was to characterize the frequency of teacher questioning in at-risk preschool classrooms and to investigate the extent to which preschool educators used cognitively challenging questions. Despite the likely importance of children's exposure to cognitively challenging talk within the preschool classroom, studies have shown that preschool teachers' language is highly variable in the levels of complexity displayed and that teachers show considerable individual differences in their use of cognitively challenging language (Dickinson, 2001c; Dickinson, DeTemple, Hirschler, & Smith, 1992; Dickinson & Smith, 1991; Kontos, 1999). Studies have also shown that preschool teachers'

language use within the classroom typically centers on providing children assistance in obtaining items, managing behavior, supporting children in peer relations, praising children, and providing instructions for task completion (e.g., Dickinson, 2001c). We thus hypothesized that conceptually challenging questions would occur relatively infrequently within the 14 classrooms studied, particularly as compared to other types of questions, such as those focused on managing children's behavior.

The second goal was to determine the extent to which teacher questioning, in terms of both frequency and type, varied across different classroom contexts, namely storybook reading, child-directed contexts, and teacher-directed contexts. The extant literature suggests that context influences teachers' use of questions as well as cognitively challenging talk within the preschool classroom. For instance, in studies investigating naturally occurring teacher–child interactions in various classroom contexts (Girolametto, Hoaken, Weitzman, & van Lieshout, 2000; Giralametto, Weitzman, van Lieshout, & Duff, 2000), book reading was associated with a higher frequency of test questions and directive questions as compared to child-directed play-dough activities. Teachers encouraged more interaction in a play context by asking more open-ended questions and more *wh*-questions. O'Brien and Bi (1995) reported that teachers used a greater amount of complex language, including cognitively challenging questions, in child-directed dramatic play contexts, whereas Gest and colleagues found that decontextualized talk was most common during mealtime and cognitively challenging talk about vocabulary was most common during book reading (Gest, Holland-Coviello, Welsh, Eicher-Catt, & Gill, 2006). The current study extends the current literature by examining the complexity of teacher questions posed to preschoolers at risk for language and literacy difficulties in a broader array of activity contexts, namely teacher-directed contexts, child-directed contexts, and storybook-reading activities. We hypothesized that teacher-directed contexts and story activities might provide a better framework than child-centered contexts for delivering decontextualized language and posing cognitively challenging questions because educators are able to provide a priori organization for these activities and set goals to include specific language targets in their instruction.

METHOD

Participants

The primary participants in the study were 14 teachers and their teacher assistants working in public preschool programs serving at-risk children. A total of 192 children aged 4 were enrolled in these classrooms. Six of the classrooms, serving a total of 69 children, were affiliated with Head Start (teacher-to-student ratio of 1:6);

six classrooms, serving 96 children (ratio of 1:8), were funded through Title I; and two classrooms, serving 27 children (ratio of 1:7), were funded by the state's public pre-kindergarten initiative. For all programs, admittance was prioritized for children exhibiting specific risk factors, primarily low-income status. Eight classrooms were located in a rural, Appalachian county of the state in which the study was conducted. For this county, the median household income as reported by the 2000 U.S. Census was $26,149. The other six classrooms were located in a light industrial region of the state, for which the median household income was $45,290 (U.S. Census, 2000).

All teachers in the sample were non-Hispanic White women ranging in age from 24 to 53 years (M = 41.9, SD = 9.1). Teachers' experience in the classroom with children of any age ranged from 3 to 27 years, with a mean of 11.4 years (SD = 8.3). Although each classroom had a teaching assistant to provide full-time support, demographic information for the assistants was not collected as part of the larger study in which lead teachers were the primary focus. See Table 1 for additional details on the teacher participants.

General Procedures

In the fall of the academic year, a 90- to 120-min observation was conducted in each classroom. Observations were conducted by trained research personnel (e.g., research faculty, graduate students) for the purpose of recording a range of classroom activities on DVD for later analyses. The DVD recording captured instructional activities that occurred within the observations but did not include breakfast, snack, lunch, recess, or other activities taking place outside of the classroom. The camera was positioned so as to capture primarily the language of the teacher and/or teaching assistant in the classroom.

TABLE 1
Teacher Demographic Information

	Head Start (n = 6)		*Title I (n = 6)*		*State Pre-Kindergarten (n = 2)*	
Characteristic	*M*	*SD*	*M*	*SD*	*M*	*SD*
Age	48.83	7.25	42.33	9.47	35.00	15.56
Years of experience	9.16	4.49	13.50	10.88	11.50	12.02
Annual salary	$30,050	$6,145	$33,748	$9,361	$38,193	$8,051
Teacher education						
Associate's/some college	1		0		0	
Bachelor's	3		5		2	
Master's	0		1		0	

Transcription and coding. A written transcript was developed for 24 min of the videotaped classroom observation to conduct an in-depth analysis of the language used by teachers and their assistants in their classrooms. To capture a representative sample of classroom activities recorded during the observation, the transcriber created transcripts that included up to 12 consecutive minutes of a specific classroom activity (e.g., large-group instruction), after which the transcriber paused and waited until the next activity began and then continued to transcribe until a total of 24 min had been transcribed. The selection of a 24-min representative sample was consistent with previous research examining teacher–child interaction for similar purposes (e.g., de Rivera et al., 2005; Girolametto, Hoaken, et al., 2000; Girolametto & Weitzman, 2002). This process resulted in the transcription of a variety of instructional contexts (e.g., large group, story, art) for each classroom.

For the transcription process, the software program Systematic Analysis of Language Transcripts Research Version 8.0 (SALT; Miller & Chapman, 2000) was used. Transcription was conducted by research personnel who had achieved 90% accuracy across three transcripts after completing a transcription training program. During transcription, all preschool educators' utterances were transcribed in their entirety, as were any child utterances required for interpretation of the adult utterances. Because teachers and teacher assistants occasionally produced utterances off camera, it was sometimes impossible to reliably identify the speaker for an utterance. Lead teacher and teacher assistant language use were collapsed into a single speaker category (i.e., educator) for descriptive and inferential analyses. Recent work by Gest et al. (2006) found no appreciable differences in the rate of child-directed talk in 17 Head Start classrooms when comparing lead and assistant teachers; similarly, these researchers also showed the two groups of teachers to use decontextualized language at similar rates. Thus, it seemed methodologically appropriate to collapse data from lead and assistant teachers in the present study. Likewise, it reduced challenges in reliably attributing teacher utterances to leads versus assistants. All utterances were parsed at the utterance level following the SALT conventions. Utterances were deemed unintelligible following three passes, and these were not included in any analyses. Once transcription for a classroom observation was complete, the entire transcript was checked by a second transcriber to ensure accuracy.

Coding of classroom activity contexts. Khara L. Pence and a trained research assistant developed a classroom activity context coding protocol and trained research assistants to an agreement criterion of 85% accuracy or greater with a set of master-coded transcripts. Research assistants first completed a training session during which they coded and discussed two practice transcripts with the master coder and then established interrater reliability (85% accuracy or better) for three transcripts with the master coder. Each educator utterance was coded for

the specific classroom activity context in which it had occurred. Eight classroom activity contexts were coded, as shown in Table 2. In all, 100% of transcripts were coded and subsequently checked by reliable coders to ensure accuracy.

For the purposes of the present study, the eight classroom activity contexts were subsequently reduced to three categories for analyses: (a) teacher directed, comprising whole-class, large-group, and small-group activities; (b) child directed, comprising center- or choice-time activities, dramatic play, and art activities; and (c) story, comprising storybook-reading activities. This categorization was based upon classifications by Bunce (1995) and Girolametto and Weitzman (2002), who differentiated between activities that are relatively child directed and activities that are relatively teacher directed. Two activity contexts (i.e., music activities and activities not otherwise classified) were eliminated from analysis because so few of each were captured during classroom observations.

Coding of teacher questions. A coding scheme was developed to characterize the level of abstraction or cognitive complexity in educator questions. All coding was completed by Susan L. Massey and Khara L. Pence. Per this scheme, questions were first differentiated from other types of utterances (i.e., non-questions).

Once questions were identified within the transcripts, they were coded using a mutually exclusive and exhaustive set of three codes adapted from previous research (Dickinson & Smith, 1994; McGill-Franzen, Lanford, & Adams, 2002; van Kleeck et al., 1997). *Management questions* were those used to maintain conversation, manage behavior, clarify student utterances, or provide directives. *Less cognitively challenging questions* were those that were perceptually focused (i.e., focused on observable aspects of the environment) and included labeling letters, shapes, or objects; distinguishing opposites; and choosing among available items or tasks. *More cognitively challenging questions* were those that were conceptually focused (i.e., focused on nonpresent objects or past and future events) and in-

TABLE 2
Classroom Activity Context Codes

Context	*Description*
OPEN	Opening circle/greetings, with focus on calendar, daily theme, jobs, etc.
PLAY	Classroom activity dedicated specifically to thematic/dramatic play
CENTER	Centers or free-time activities, including blocks, computers, etc.
ART	Art center or table where creative activity is taking place
STORY	Activity during which teacher is reading a book to children
GROUP	Large- or small-group lesson, typically teacher led
MUSIC	Activity during which teacher and children dance or listen to, sing, or play music
OTHER	Contexts different from any of the above categories

cluded making inferences or predictions, analyzing information, and discussing vocabulary. Table 3 provides question types, definitions, and examples.

The reliability of the coding protocol was evaluated by double coding one fifth of the transcripts (n = 3). Susan L. Massey and Khara L. Pence independently coded each adult utterance as a question or non-question and then subsequently coded each question into one of the three question categories. An item-by-item comparison was made for each transcript to calculate an interrater agreement score. Interrater reliability was 93% for coding questions versus non-questions and 82% for coding question type. Any differences in coding were resolved by the two coders. The remaining 11 transcripts were also checked for accuracy by the coder who had not completed the initial coding, and any coding discrepancies were resolved prior to analyses.

Data Analysis

Prior to addressing our main research aims, we conducted descriptive analyses of the transcripts. First, we calculated the number and proportion of teacher utterances characterized as questions or non-questions. Second, we calculated the number and proportion of management, less cognitively challenging, and more cognitively challenging questions according to the three-level coding scheme described previously. Third, we classified teachers according to whether they were high, moderate, or low users of cognitively challenging questions.

TABLE 3
Questioning Code Types, Definitions, and Examples

Code	*Definition*	*Examples*
Management (M)	Questions that maintain conversation, manage behavior, clarify, and provide directives	Are we ready? Have a seat, ok? Can you help him out?
Less cognitively challenging (LCC)	Questions about information that is perceptually available, or that offer concrete choices	What was this called? Would you like to be the door holder or the calendar person? Is your button smaller than my button?
More cognitively challenging (MCC)	Questions about nonpresent objects or past and future events. Questions require the child to draw an inference, analyze information, discuss vocabulary, or make predictions	What do you think this means? What do you think will happen next? What would we need to do to fix the toy?
Non-question (NQ)	Any utterance that is not a question	Look at this. This book is called *Curious George Rides a Bike.*

In order to examine differential frequencies of use for management, less cognitively challenging, and more cognitively challenging questions, we began our statistical analyses with chi-square tests for goodness of fit. We then moved to a logistic regression framework to determine the extent to which these frequencies were associated with different activity contexts. In the first logistic regression model, we contrasted management and nonmanagement (less cognitively challenging and more cognitively challenging) questions with activity context as the predictor variable. In the second model, we contrasted less cognitively challenging and more cognitively challenging questions (with management questions treated as missing) with activity context as the predictor. Activity context was coded using contrast codes, with the first contrast comparing story to both child-directed and teacher-directed contexts, and the second variable comparing child-directed to teacher-directed contexts with story ignored. For all analyses, results were consistent whether the clustering of the data (i.e., within classrooms) was ignored or explicitly included in a multilevel framework. Therefore, we report only the simpler results based on ignoring the clustering.

RESULTS

The first goal of the study was to determine the frequency with which preschool educators used questions in at-risk preschool classrooms and subsequently to determine how many of these were cognitively challenging. As shown in Table 4, questions composed approximately one third of teacher utterances compared to other types of utterances: Of 5,022 utterances coded, questions characterized 33.5% ($n = 1,680$). This percentage corroborated findings by Gest et al. (2006) and by de Rivera et al. (2005) that showed similar proportions of questions to nonquestions in teacher utterances directed toward toddlers and preschoolers.

Of the three types of questions coded in this study, management questions occurred most frequently (44.6%), followed by more cognitively challenging ques-

TABLE 4
Number (Proportion) of Question Types Overall

Type	*n (%)*
Sentence type	
Non-question	3,342 (66.5)
Question	1,680 (33.5)
Question type	
Less cognitively challenging	385 (22.9)
More cognitively challenging	546 (32.5)
Management	749 (44.6)

tions (32.5%) and less challenging questions (22.9%). Consequently, when considering children's exposure to questions as a category of educator utterances, management questions composed about 15% of teacher utterances, whereas more and less cognitively challenging questions composed about 11% and 8% of educator utterances, respectively. This finding showed that although questions composed a substantial portion of educators' language use, more cognitively challenging questions represented only one tenth of all educator utterances.

A chi-square test of equal proportions indicated that the types of questions occurred at different frequencies, $\chi^2(2) = 124$, $p < .01$. Specifically, management questions were used at a greater frequency than the two other types of questions, $\chi^2(1) = 18$, $p < .01$. Among nonmanagement questions, more cognitively challenging questions occurred at higher rates compared to less challenging questions, $\chi^2(1) = 29$, $p < .01$.

When examining individual differences among classrooms in the complexity of educators' question use, we found a range of 53 to 220 for total number of questions. The number of more cognitively challenging questions ranged from 11 in one classroom to 100 in another classroom; similar variability was observed with the other question types, with less cognitively challenging questions ranging from 0 to 105 and management questions ranging from 29 to 81. Because there appeared to be variability in the range of question types in individual classrooms, we divided classrooms into three categories of high, moderate, and low use of more cognitively challenging questions in order to provide a glimpse into patterns of question use across preschool classrooms. We used the raw frequency of use of more cognitively challenging questions per classroom to divide the sample into tertiles. High cognitively challenging questioners ($n = 5$) were those whose proportion of more cognitively challenging questions to total questions was greater than 44%. Educators classified as moderate cognitively challenging questioners ($n = 4$) used a proportion of more cognitively challenging questions between 26% and 44%. Low cognitively challenging questioners ($n = 5$) were those for whom more challenging questions composed less than 26% of their total questioning.

Figure 1 exhibits the total proportions of management, less cognitively challenging, and more cognitively challenging questions used by high, moderate, and low questioners. The high questioners predominantly asked more cognitively challenging questions followed by management and less cognitively challenging questions. Both moderate and low questioners predominantly used management questions more frequently than more or less cognitively challenging questions.

The final goal of this study was to determine if the frequency of cognitively challenging questioning varied across different classroom contexts. To address this goal, we calculated the proportion of question types that educators used in three different classroom contexts. As shown in Figure 2, teachers used different proportions of questions according to the classroom activity context. In teacher-directed contexts, management questions occurred most frequently ($n = 484$, 39.6% of

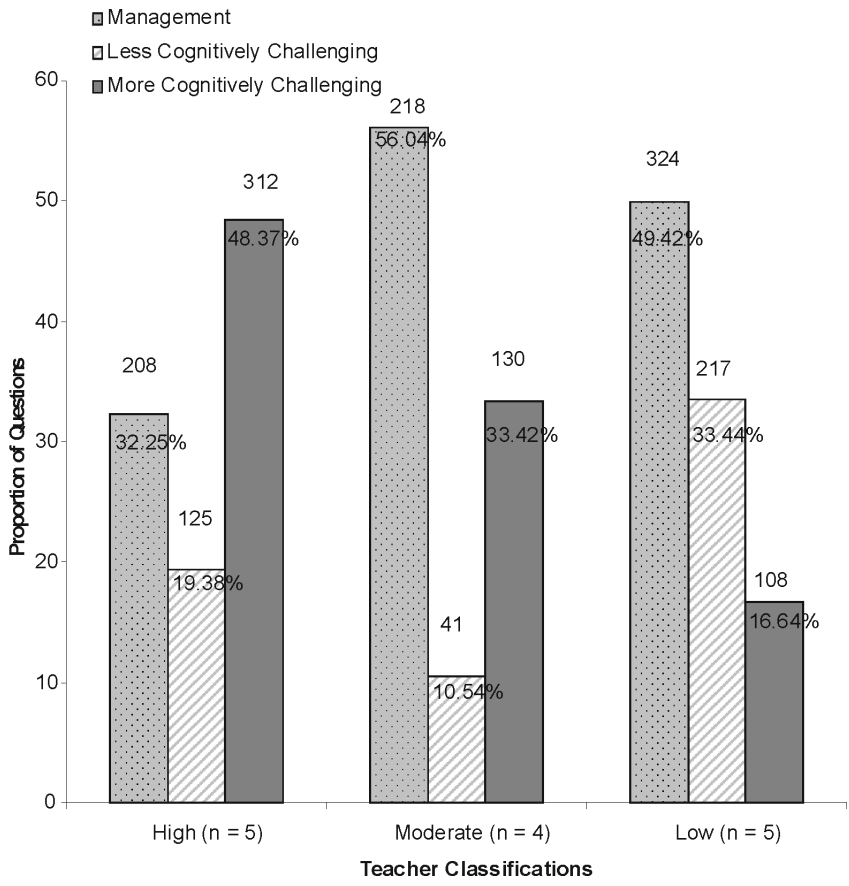

FIGURE 1 Proportion of question use by high, moderate, and low questioners.

questions), followed by more cognitively challenging questions ($n = 419$, 34.3%). Less cognitively challenging questions occurred least frequently within this context ($n = 318$, 26%). In child-directed contexts, management questions again occurred most frequently ($n = 246$, 61.4%), followed by more cognitively challenging ($n = 93$, 23.2%) and less cognitively challenging ($n = 62$, 15.5%) questions. A different pattern emerged for the story context, in which the most common type of question was more cognitively challenging ($n = 34$, 58.6%), followed by management ($n = 19$, 32.8%) and less cognitively challenging ($n = 5$, 8.6%) questions.

Results of the logistic regression indicated that the relative frequencies of question types significantly differed across the activity contexts. Compared to nonmanagement questions (less cognitively challenging and more cognitively challenging questions), management questions were about half as likely to occur in story contexts than in other contexts ($\exp[b] = 0.47$, $p < .01$), and about 2.5 times

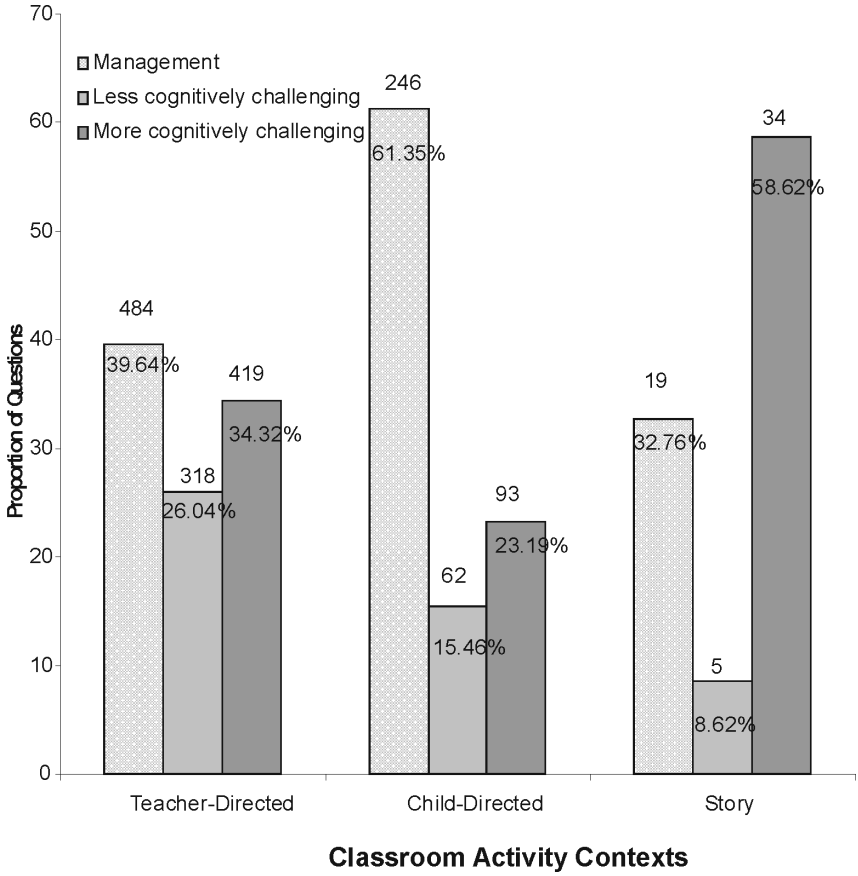

FIGURE 2 Proportion of question types according to classroom activity context.

more likely to occur in child-directed contexts than teacher-directed contexts (exp[b] = 2.46, $p < .01$). Compared to less cognitively challenging questions, more cognitively challenging questions were almost 5 times more likely in story contexts than in other contexts (exp[b] = 4.71, $p < .01$). The relative frequencies of more cognitively challenging and less cognitively challenging questions were not significantly different in child-directed compared to teacher-directed contexts (exp[b] = 1.19, $p = .33$).

DISCUSSION

This study was conducted to examine preschool educators' use of more cognitively challenging questions and to determine whether their rate of use of cognitively

challenging questions varied across different classroom contexts. The study was motivated by the understanding that questioning is a vital component of the preschool classroom and is a prevalent language intervention strategy. Indeed, preschool educators are given the responsibility of contributing to the development of children's language skills by eliciting language use and by engaging children in cognitively challenging discourse that will stimulate their inferential language abilities (van Kleeck et al., 2006). As Dickinson (2006) pointed out, the most powerful preschool classroom predictor accounting for children's later literacy skills is teacher support for extended discourse. He also noted the importance of conversations occurring in book-reading time, choice time, and group times, emphasizing that all classroom contexts provide vital milieus for supporting children's language development.

Contributing to the accumulating literature on preschool educators' language use within the at-risk classroom, the current study shows that approximately one third of teacher utterances were questions, a percentage similar to that reported previously (de Rivera et al., 2005; Gest et al., 2006). Of the 1,682 educator questions coded in this study, management questions composed the largest proportion, a finding corresponding to previous research investigating more general characteristics of preschool teachers' language use (Dickinson, 2001c; Dickinson et al., 1992; Dickinson & Smith, 1991; Kontos, 1999); these studies have shown that the language typically experienced by children in the preschool classroom is predominantly of a management nature. As this study shows, more cognitively challenging questions represented only a small proportion of the language children experienced in the at-risk preschool classroom, representing about 10% of preschool educators' utterances.

Although the majority of educators' questions were management questions, more cognitively challenging questions occurred at higher rates than less cognitively challenging questions. This is a somewhat surprising finding. Concrete language, which is synonymous with less cognitively challenging language input, serves to provide children with basic conceptual knowledge and vocabulary, whereas abstract language (i.e., more cognitively challenging input) serves to extend concrete knowledge into higher level processing (Blank et al., 1978; van Kleeck et al., 1997). Drawing from the work of van Kleeck et al. (1997), which found that less cognitively challenging questions and comments composed 70% of parental input to their preschoolers (compared to 30% of input for more cognitively challenging), we hypothesized that less cognitively challenging questioning would occur more frequently than more cognitively challenging questioning. One explanation for the educators' higher use of more cognitively challenging questioning in this study may relate to differing uses of comments and questions. The educators studied may have used comments to provide a concrete conceptual framework for the students and then questioned the children in an abstract manner to provide opportunity for language growth and a verbal display of knowledge

(Heath, 1989). van Kleeck (2003), in particular, has suggested that questions may socialize children into producing verbal displays of knowledge, whereas comments serve to teach information and to model higher levels of thinking. Comments are indeed an important part of preschool teachers' language input, with estimates indicating that they compose approximately two thirds of teacher utterances in the classroom (Gest et al., 2006). Given that this study only examined questions, it is not possible to determine the cognitive complexity of educator comments to see if educators used comments and questions in a mutually supportive way; nonetheless, this presents an interesting avenue for future research.

As anticipated, educators' use of more cognitively challenging questioning differed across various preschool classroom contexts. Educators were more likely to use more cognitively challenging questions compared to less cognitively challenging or management questions within the context of story activities. Storybook reading, in particular, provides a context in which teachers scaffold students' knowledge building and assess students' learning (Kintsch, 2005) through questioning. Previous research investigating the types of higher level cognitive demands placed on preschool children during storybook reading has found that discussion involves making inferences, reasoning, giving factual information, providing clarifications, and anticipating future events (e.g., Sorsby & Martlew, 1991; van Kleeck, 1998; van Kleeck et al., 1997). The present research suggests that preschool educators draw upon storybook-reading activities to develop children's abstract cognitive skills, which may lead to the self-questioning skills necessary for comprehension development in mature readers (Hanmaker, 1986; Palinscar & Brown, 1984) as educators model abstract questioning. It is unfortunate, however, that only 1% to 4% of the total preschool day (Dickinson, 2001a) is typically spent in a storybook-reading context, particularly given that this study shows that management questions dominate in the other two activity contexts studied.

Contrary to our hypothesis that teacher-directed contexts would provide a better framework for delivering decontextualized language as compared to child-directed contexts, there was no significant difference in the relative frequencies of use of less cognitively challenging and more cognitively challenging questions. As Figure 2 indicates, the overall proportion of more challenging questions was higher in teacher-directed contexts than child-directed contexts, although this difference was not statistically significant. These results may reflect findings from studies investigating teacher–child interactions during child-directed play in which joint attention and child motivation were integral in promoting adult–child conversation (Girolametto, Weitzman, et al., 2000; Gmitrova & Gmitrov, 2003; O'Brien & Bi, 1995). These studies, however, did not focus specifically on teacher questioning.

This study has several important limitations warranting note. First, because each of the utterances we analyzed was produced by 1 of 14 teachers, we had a nested data structure. Although we did not analyze the potential effects of class-

room teacher on the amount and type of questioning, we must acknowledge that characteristics particular to teachers and their classroom environments might have been related to the amount and types of questioning they used during the videotaped classroom interactions. Second, the study did not distinguish among group sizes observed. The quality and quantity of adult language input may vary according to group size and the level of child response interaction (McCabe et al., 1996; Morrow & Smith, 1990); therefore, group size may have been a confounding factor in this study. Third, the study did not consider the amount of professional development educators may have received regarding using questions to promote concept development or language and literacy development. Given the considerable variability seen in this study among the educators, it seems plausible that some educators had received training on the use of open-ended (more cognitively challenging) questions in their classroom activities (Arnold et al., 1994; Dale et al., 1996; Valdez-Menchaca & Whitehurst, 1992). Fourth, the study did not distinguish among content in each classroom context. For example, during storybook reading, the books were typically narrative in nature, but it is not known whether the children were familiar with the materials.

Despite these limitations, the present work expands researchers' understanding of children's language experiences within their preschool classrooms and is an important complement to studies showing the importance of high-quality language input (including questioning and exposure to cognitively challenging language) for at-risk preschoolers. The results of this study also provide a rationale for intensive, ongoing professional development designed to promote changes in preschool educators' language use within the classroom. An abundance of research supports the need for preschool teachers and other early childhood educators to be involved in continual professional development addressing language and literacy instruction (Anders, Hoffman, & Duffy, 2000; Snow, Burns, & Griffin, 1998; Taylor, Pearson, Clark, & Walpole, 2000; Walpole & McKenna, 2004), and training preschool educators has produced positive outcomes for children's language. For instance, in a study designed to train day care staff in ways to promote children's engagement in extended conversations, Girolametto, Weitzman, and Greenberg (2003) found that these professionals increased the quality of their language input, which in turn resulted in positive outcomes in children's use of language. Wasik and colleagues (Wasik & Bond, 2001; Wasik et al., 2006) also demonstrated positive effects for children's vocabulary skills following professional development training for preschool teachers. They trained teachers in implementing interactive book-reading strategies, asking open-ended questions, and promoting conversation in storybook-reading contexts and in other classroom contexts such as center time and circle time. Future research may focus on extending educators' use of cognitively challenging questioning in classroom contexts beyond storybook reading to promote language development throughout the day.

ACKNOWLEDGMENTS

The findings reported here are based on research conducted as part of the Preschool Curriculum Evaluation Research (PCER) program funded by the Institute of Education Sciences, U.S. Department of Education, through Grant R305J030084 to the University of Virginia. The content of this publication does not necessarily reflect the views or policies of the PCER Consortium members (including the Institute of Education Sciences), and mention of trade names, commercial products, or organizations does not imply endorsement by the U.S. government.

We would like to thank Alice Wiggins for directing the University of Virginia's site of the PCER project, and Angela Beckman and Will Massey for their assistance with coding data. We are also grateful to the faculty members and research assistants who assisted with data collection for this project.

REFERENCES

Anders, P. A., Hoffman, J. V., & Duffy, G. G. (2000). Teaching teachers to teach reading: Paradigm shifts, persistent problems, and challenges. In M. L. Kamil, P. B. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research* (Vol. 3, pp. 721–744). Mahwah, NJ: Erlbaum.

Arnold, D. H., Lonigan, C. J., Whitehurst, G. J., & Epstein, J. N. (1994). Accelerating language development through picture book reading: Replication and extension to a videotape training format. *Journal of Educational Psychology, 86,* 235–243.

Blank, M., Rose, S. A., & Berlin, L. J. (1978). *The language of learning: The preschool years.* New York: Grune & Stratton.

Bunce, B. H. (1995). *Building a language-focused curriculum for the preschool classroom: Vol. II. A planning guide.* Baltimore: Brookes.

Chapman, R. S. (2000). Children's language learning: An interactionist perspective. *Journal of Child Psychology and Psychiatry, 41,* 33–54.

Curenton, S. M., & Justice, L. M. (2004). African American and Caucasian preschoolers' use of decontextualized language: Literate language features in oral narratives. *Language, Speech, and Hearing Services in Schools, 35,* 240–253.

Dale, P. S., Crain-Thoreson, C., Notari-Syverson, A., & Cole, K. (1996). Parent-child book reading as an intervention technique for young children with language delays. *Topics in Early Childhood Special Education, 16,* 213–235.

de Rivera, C., Girolametto, L., Greenberg, J., & Weitzman, E. (2005). Children's responses to educators' questions in day care play groups. *American Journal of Speech-Language Pathology, 14,* 14–26.

DeTemple, J. M. (2001). Parents and children reading books together. In D. K. Dickinson & P. O. Tabors (Eds.), *Beginning literacy with language: Young children learning at home and in school* (pp. 31–51). Baltimore: Brookes.

DeTemple, J., & Snow, C. E. (2003). Learning words from books. In A. van Kleeck, S. A. Stahl, & E. B. Bauer (Eds.), *On reading books to children: Parents and teachers* (pp. 16–36). Mahwah, NJ: Erlbaum.

Devescovi, A., & Baumgartner, E. (1993). Joint-reading a picture book: Verbal interaction and narrative skills. *Cognition and Instruction, 11,* 299–323.

Dickinson, D. K. (2001a). Book reading in preschool classrooms: Is recommended practice common? In D. K. Dickinson & P. O. Tabors (Eds.), *Beginning literacy with language: Young children learning at home and in school* (pp. 173–203). Baltimore: Brookes.

Dickinson, D. K. (2001b). Large-group and free-play times: Conversational settings supporting language and literacy development. In D. K. Dickinson & P. O. Tabors (Eds.), *Beginning literacy with language: Young children learning at home and in school* (pp. 223–255). Baltimore: Brookes.

Dickinson, D. K. (2001c). Putting the pieces together: Impact of preschool on children's language and literacy development in kindergarten. In D. K. Dickinson & P. O. Tabors (Eds.), *Beginning literacy with language: Young children learning at home and in school* (pp. 257–287). Baltimore: Brookes.

Dickinson, D. K. (2006). Toward a toolkit approach to describing classroom quality. *Early Education and Development, 17,* 177–202.

Dickinson, D. K., DeTemple, J. M., Hirschler, J. A., & Smith, M. W. (1992). Book reading with preschoolers: Co-construction of text at home and at school. *Early Childhood Research Quarterly, 7,* 323–346.

Dickinson, D. K., & Smith, M. W. (1991). Preschool talk: Patterns of teacher-child interaction in early childhood classrooms. *Journal of Research in Early Childhood Education, 6,* 20–29.

Dickinson, D. K., & Smith, M. W. (1994). Long-term effects of preschool teachers' book readings on low-income children's vocabulary and story comprehension. *Reading Research Quarterly, 29,* 104–122.

Gest, S. D., Holland-Coviello, R., Welsh, J. A., Eicher-Catt, D. L., & Gill, S. (2006). Language development subcontexts in Head Start classrooms: Distinctive patterns of teacher talk during free play, mealtime, and book reading. *Early Education and Development, 17,* 293–315.

Girolametto, L., Hoaken, L., Weitzman, E., & van Lieshout, R. (2000). Patterns of adult-child linguistic interaction in integrated day care groups. *Language, Speech, and Hearing Services in Schools, 31,* 155–168.

Girolametto, L., & Weitzman, E. (2002). Responsiveness of child care providers in interactions with toddlers and preschoolers. *Language, Speech, and Hearing Services in Schools, 33,* 268–281.

Girolametto, L., Weitzman, E., & Greenberg, J. (2003). Training day care staff to facilitate children's language. *American Journal of Speech-Language Pathology, 12,* 299–311.

Girolametto, L., Weitzman, E., van Lieshout, R., & Duff, D. (2000). Directiveness in teachers' language input to toddlers and preschoolers in day care. *Journal of Speech, Language, and Hearing Research, 43,* 1101–1114.

Gmitrova, V., & Gmitrov, J. (2003). The impact of teacher-directed and child-directed pretend play on cognitive competence in kindergarten children. *Early Childhood Education Journal, 30,* 241–246.

Halliday, M. A. K. (2004). The place of dialogue in children's construction of meaning. In R. B. Ruddell & N. J. Unrau (Eds.), *Theoretical models and processes of reading* (5th ed., pp. 133–145). Newark, DE: International Reading Association.

Han, M., Roskos, K., Christie, J., Mandzuk, S., & Vukelich, C. (2005). Learning words: Large group time as a vocabulary development opportunity. *Journal of Research in Childhood Education, 19,* 333–345.

Hanmaker, C. (1986). The effects of adjunct questions on prose learning. *Review of Educational Research, 56,* 212–242.

Hargrave, A. C., & Sénéchal, M. (2000). A book reading intervention with preschool children who have limited vocabularies: The benefits of regular reading and dialogic reading. *Early Childhood Research Quarterly, 15,* 75–90.

Heath, S. B. (1989). Oral and literate traditions among Black Americans living in poverty. *American Psychologist, 44,* 367–373.

Huebner, C. E., & Meltzoff, A. N. (2005). Intervention to change parent-child reading style: A comparison of instructional methods. *Applied Developmental Psychology, 26,* 296–313.

Huttenlocher, J., Vasilyeva, M., Cymerman, E., & Levine, S. (2002). Language input and child syntax. *Child Psychology, 45,* 337–374.

Justice, L. M., Meier, J., & Walpole, S. (2005). Learning new words from storybooks: An efficacy study with at-risk kindergartners. *Language, Speech, and Hearing Services in Schools, 36,* 17–32.

Justice, L. M., Weber, S. E., Ezell, H. K., & Bakeman, R. (2002). A sequential analysis of children's responsiveness to parental print references during shared book-reading interactions. *American Journal of Speech-Language Pathology, 11,* 30–40.

Kintsch, E. (2005). Comprehension theory as a guide for the design of thoughtful questions. *Topics in Language Disorders, 25,* 51–64.

Kontos, S. (1999). Preschool teachers' talk, roles, and activity settings during free play. *Early Childhood Research Quarterly, 14,* 363–382.

Massey, S. L. (2004). Teacher-child conversation in the preschool classroom. *Early Childhood Education Journal, 31,* 227–231.

McCabe, J. R., Jenkins, J. R., Mills, P. E., Dale, P. S., Cole, K. N., & Pepler, L. (1996). Effects of play group variables on language use by preschool children with disabilities. *Journal of Early Intervention, 20,* 329–340.

McGill-Franzen, A., Lanford, C., & Adams, E. (2002). Learning to be literate: A comparison of five urban early childhood programs. *Journal of Educational Psychology, 94,* 443–464.

Miller, J., & Chapman, R. (2000). SALT: Systematic analysis of language transcripts [Computer software]. Madison: University of Wisconsin–Madison, Waisman Center, Language Analysis Laboratory.

Morrow, L. M., & Smith, J. K. (1990). The effects of group size on interactive storybook reading. *Reading Research Quarterly, 25,* 213–231.

O'Brien, M., & Bi, X. (1995). Language learning in context: Teacher and toddler speech in three classroom play areas. *Topics in Early Childhood Special Education, 15,* 148–163.

Palinscar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction, 1,* 117–175.

Reese, E., & Cox, A. (1999). Quality of adult book reading affects children's emergent literacy. *Developmental Psychology, 35,* 20–28.

Snow, C. E., Burns, M. S., & Griffin, P. (Eds.). (1998). *Preventing reading difficulties in young children.* Washington, DC: National Academy Press.

Sorsby, A. J., & Martlew, M. (1991). Representational demands in mothers' talk to preschool children in two contexts: Picture book reading and a modelling task. *Journal of Child Language, 18,* 373–395.

Taylor, B. M., Pearson, P. D., Clark, K. M., & Walpole, S. (2000). Effective schools and accomplished teachers: Lessons about primary-grade reading instruction in low-income schools. *Elementary School Journal, 101*(2), 121–165.

United States Census Bureau (2000). State and county quick facts. Retrieved March 15, 2006, from http://quickfacts.census.gov/qfd/states/51/51047.html

Valdez-Menchaca, M. C., & Whitehurst, G. J. (1992). Accelerating language development through picture book reading: A systematic extension to Mexican day care. *Developmental Psychology, 28,* 1106–1114.

van Kleeck, A. (1998). Preliteracy domains and stages: Laying the foundations for beginning reading. *Journal of Children's Communication Development, 20*(1), 33–51.

van Kleeck, A. (2003). Research on book sharing: Another critical look. In A. van Kleeck, S. A. Stahl, & E. B. Bauer (Eds.), *On reading books to children: Parents and teachers* (pp. 271–320). Mahwah, NJ: Erlbaum.

van Kleeck, A., Gillam, R. B., Hamilton, L., & McGrath, C. (1997). The relationship between middle-class parents' book-sharing discussion and their preschoolers' abstract language development. *Journal of Speech, Language, and Hearing Research, 40,* 1261–1271.

van Kleeck, A., Vander Woude, J., & Hammett, L. (2006). Fostering literal and inferential language skills in Head Start preschoolers with language impairment using scripted book-sharing discussion. *American Journal of Speech-Language Pathology, 15,* 85–96.

Vasilyeva, M., Huttenlocher, J., & Waterfall, H. (2006). Effects of language intervention on syntactic skill levels in preschoolers. *Developmental Psychology, 42,* 164–174.

Walpole, S., & McKenna, M. C. (2004). *The literacy coach's handbook: A guide to research-based practice.* New York: Guilford Press.

Wasik, B. A., & Bond, M. A. (2001). Beyond the pages of a book: Interactive book reading and language development in preschool classrooms. *Journal of Educational Psychology, 93,* 243–250.

Wasik, B. A., Bond, M. A., & Hindman, A. (2006). The effects of a language and literacy intervention on Head Start children and teachers. *Journal of Educational Psychology, 98,* 63–74.

Weizman, Z. O., & Snow, C. E. (2001). Lexical input as related to children's vocabulary acquisition: Effects of sophisticated exposure and support for meaning. *Developmental Psychology, 37,* 265–279.

Whitehurst, G. J., Falco, F. L., Lonigan, C. J., Fischel, J. E., DeBaryshe, B. D., Valdez-Menchaca, M. C., et al. (1988). Accelerating language development through picture book reading. *Developmental Psychology, 24,* 552–559.

Wilcox-Herzog, A., & Kontos, S. (1998). The nature of teacher talk in early childhood classrooms and its relationship to children's play with objects and peers. *Journal of Genetic Psychology, 159,* 30–44.