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Bilinguals Contingently Respond to Teacher Inferential Questions during Shared Reading in Preschool

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ABSTRACT

Research Findings: This study used sequential analysis to investigate teachers' use of literal and inferential questions and their relation to children's responses during small-group shared reading in preschool. Participants were 202 dual-language learners (age 3–5 years) and 53 preschool teachers in multiethnic preschool classrooms in Norway. Teacher questions and child responses were coded for their inferential level, ranging from lower-order literal to higher-order inferential levels. Sequential analysis was employed to examine in which ways dual-language learners aligned their responses with the level of the preschool teachers' questions. We found that teacher questions were highly likely to elicit child responses on the same level, with higher-order inferential questions consistently followed by higher-order inferential child responses. *Practice or Policy:* The results suggest that preschool teachers can use not only literal but also more challenging inferential questions with dual-language learners and in this way, actively engage them in complex inferential talk during shared reading.

Introduction

In Norway, as well as in other countries in Europe and the United States, the home language of an increasing number of preschoolers is not the same as their preschool language. Many Norwegian preschoolers from immigrant minority groups learn Norwegian in preschool. Thus, they are dependent on the preschool's ability to meet their needs and provide them with a rich language environment and opportunities to practice and develop their Norwegian language skills in ways that support the children's future learning and text comprehension in school.

However, evidence suggests that dual-language learners (DLLs) may have limited access to stimulating conversations with adults in preschool. Previous studies documented that teachers tend to adjust their language to the linguistic level of second-language (L2) learners, with the result that they, compared to monolingual learners, receive less rich input and less frequent access to cognitively challenging conversations, diverse vocabulary, and complex syntax (Aarts et al., 2016; Jungbluth, 1993). Teachers have also been reported to minimize the linguistic output they expect of DLLs (Mets & van Den Hauwe, 2003).

According to Vygotsky's (1978) sociocultural theory of child development, children gradually become able to acquire knowledge through adult–child interactions. Participation in social interactional routines offers children predictable expectations and challenges them to use new lexical material in an interpretative and familiar context. Preschool teachers may facilitate children's language learning through scaffolding. In this instructional strategy, teachers engage children in interactions by asking questions that elicit answers in the children's zone of proximate development (Vygotsky, 1978) or slightly beyond the child's current ability (Bruner, 1983).

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Given the wide recognition of the continuity between early language abilities and later language and literacy, it is important to identify how young DLLs may be more exposed to and actively involved in high-quality teacher–child interactions in preschool classrooms. Longitudinal studies have shown that variations in the quality of the language environment during the preschool years predict children's long-term language and literacy outcomes (for a discussion, see Grøver et al., 2019; Uccelli et al., 2019). Aukrust (2007) demonstrated that the amount, lexical diversity, and complexity of teacher talk predicted L2 vocabulary skills in Turkish-speaking children learning Norwegian.

Substantial evidence has accumulated in the literature that points to specific classroom support practices that are particularly beneficial to children's language development during the preschool years. These practices include exposing children to sophisticated vocabulary and complex syntax, providing meaningful contextual support for new words, engaging children in repeated interactive shared reading, and having extended conversations about engaging topics (Grifenhagen et al., 2017). Shared reading exposes children to information and vocabulary beyond their everyday experiences. However, the efficacy of shared reading largely depends on the way adults structure the interactions that occur around and beyond book reading (Pollard-Durodola et al., 2016).

Shared Reading

Shared reading, defined as a practice in which a teacher and a group of children share a book together, is a familiar practice for preschoolers. Certain features of shared reading support the development of first and second language and literacy skills (Fitton et al., 2018). Shared reading provides opportunities for back-and-forth exchanges in which teachers and children can move beyond the immediate conversational context. This type of extended conversation about nonimmediate or inferential topics is known to be especially powerful for facilitating language growth, as such conversations require children to explicitly use their lexical and syntactic knowledge to build a linguistic structure (Grifenhagen et al., 2017). Dickinson (2001) revealed that participation in cognitively challenging and nonimmediate conversations in preschool is associated with higher vocabulary scores. Moreover, teachers' use of extended discourse with preschool children was found to be a unique predictor of children's later receptive vocabulary (Tabors et al., 2001).

Although the benefits of shared reading are well documented, in many preschool classrooms in Norway the practice is not consistent. Hagen (2018) found that few preschool teachers reported that shared reading was a regular practice. In addition, Dickinson (2001) documented great variability in how frequently preschool children hear books read to them. Previous studies have reported much variation in the ways teachers structure shared reading sessions in preschool. In particular, previous researchers emphasized considerable variation in teachers' ability to engage children in extended conversations about books (see Milburn et al., 2014). Teale (2003) argued that without substantive and ongoing training, teachers may not develop a deep understanding of different aspects of shared reading with preschoolers or manage to optimize children's learning in this context. Tompkins et al. (2017) pointed to specific features of adults' extratextual talk, the type of talk that extends the language in the book, as an effective means of promoting children's language skills. A growing body of literature has examined the cognitive demands of extratextual talk during shared reading, arguing that more cognitively demanding talk about a book is particularly effective in facilitating language development (Tompkins et al., 2017; Zucker et al., 2013).

Literal and Inferential Language

Cognitive distancing theory suggests that the language we produce can be described along a continuum (Sigel, 1986) from literal to inferential. Thus, this dichotomy refers to talk with varying levels of cognitive demand (van Kleeck et al., 1997). Inferential language is also known as

decontextualized language (Hindman et al., 2012), nonimmediate language, or cognitively challenging language (Massey et al., 2008). For the purposes of this paper, we use the dichotomy of literal and inferential language to investigate teacher and child talk during shared reading.

Teachers' literal talk exposes children to and encourages them to label, describe, or recall information that is immediately available on the pages of the book or in their environment (Blank et al., 1978). For instance, the teacher's question "What is this?" requires children to perceive the object in the book and use their literal language skills to label it. Literal talk is effective for engaging children with emergent language skills to participate in the discussion during shared reading to make sure children have sufficient background knowledge and comprehension needed for further discussion. In contrast, teachers' inferential talk exposes children to and requires them to use inferential language skills to relate information in the book to their own experiences, make connections to other parts of the story, and make predictions, explanations, or hypotheses about implicit, nonimmediate information in the book (Blank et al., 1978). For instance, when a teacher asks, "Why do you think he still looks sad?," children are required to go beyond perceptually present information and focus on the implicit information in the book. By being engaged in cognitively challenging discussions, children are encouraged to process the story content on a deeper level and to use their inferential language skills to make connections between story events, draw on their own experiences or previous discussions, hypothesize, and reflect on characters' internal states. In books and in oral speech in the school context, much of the information is often left implicit. With well-developed inferential skills, children are able to read and participate in classroom discourse with better comprehension (Sembiante et al., 2018).

There is a need to understand the ways in which DLLs' use of inferential language may be elicited in adult–child interactions in preschool. There is evidence that preschoolers are more likely to make inferences when explicitly prompted and invited by adults to use inferential thinking in the context of shared reading (Danis et al., 2000; Zucker et al., 2010). This may be particularly true for many DLLs, who may have limited linguistic resources in their second language and, therefore, may be reluctant to initiate higher-order talk by themselves. Zucker et al. (2010) argued that by engaging in inferential talk with children, teachers elicit children's immediate use of inferential talk that over time results in the children improving these skills. Moreover, when children are exposed to inferential language and are explicitly encouraged to use their inferential skills at an early age, difficulties with reading comprehension may be prevented (Snow, 1991). Given the evidence that reading comprehension difficulties may be more prevalent among dual-language learners than among monolingual learners, it is important that DLLs have opportunities to develop their inferencing skills in their second language (Lesaux & Kieffer, 2010; Nakamoto et al., 2007; Spencer & Wagner, 2017).

Teacher Questions and Child Responses

Questions have been suggested as an effective means of engaging children in shared reading. By their nature, questions require responses; while verbalizing responses, children practice and actively engage with literal and inferential language. Specifically, researchers have suggested that particular types of questions tend to elicit a variety of elaborate responses that require children to go beyond literal comprehension (de Rivera et al., 2005; Teale, 2003). These types of questions are proposed to be particularly beneficial for preschoolers, as the questions invite children to reason, infer, predict, and explain.

The majority of previous studies, which were conducted in preschools with monolingual samples, have shown that most extratextual adult talk during shared reading tends to stay on the literal rather than the inferential level (Beck & McKeown, 2001; Danis et al., 2000; Dickinson & Smith, 1991; Hansen, 2004; van Kleeck et al., 1997). In addition, in a recent study of teacher–child interactions during shared reading, Hindman et al. (2019) found that the teachers' talk was dominated by closed questions and provided limited opportunities for child talk. Some researchers, such as Hindman et al. (2008), reported that in the year before school, preschool teachers used more inferential talk

(62%) than literal talk. This study examined inferential and literal talk in a sample of monolingual preschoolers who also scored above the testing norms on measures of letter recognition, basic decoding, and expressive vocabulary skills. In a review of shared book-reading interventions using questioning strategies, Walsh and Hodge (2018) called for more research on how teachers use inferential talk with child preschool groups that are more language heterogeneous. The studies above were conducted with monolingual preschoolers. Much less is known about whether and how often young DLLs are exposed to and invited to participate in literal and inferential talk during shared reading in preschool.

Recently, researchers have paid attention to the specific impact children's language use (output) has on their language development (Galloway & Lesaux, 2017). For example, in a large-scale study of 757 young DLLs, Bohman et al. (2010) demonstrated that language input alone does not have as much of an impact on preschoolers' language development in their first and second languages as input and output together. Researchers have argued that, although language input is most important when a child starts to use language, language output is crucial for developing language over time (Bohman et al., 2010; Galloway & Lesaux, 2017). According to Swain's (2000) output theory, spoken output "pushes learners to process language more deeply – with more mental effort – than does the input" (p. 99). We need to know more, not only about preschool teachers' use of literal and inferential questions with DLLs in shared reading situations but also whether and how young DLLs respond to these questions with literal or inferential language production. Walsh and Hodge (2018) pointed to the lack of analysis of the content of children's responses to different types of teacher questions as a gap in the existing literature. Studying adult–child interactions as they unfold in real time is particularly interesting, as they may provide indicators about the quality of adult–child interactions that tend to take place in the context of the modern multilingual classroom. Furthermore, it is important to examine how DLLs use literal and inferential talk to contribute to interactions, given the large individual variations in language skills among young L2 learners.

In sum, there is a dearth of research on how teachers invite young DLLs to participate in extratextual talk during shared reading in preschool. In the present study, we were interested in whether preschool teachers' use of inferential questions elicited DLLs' inferential language production. To address this issue, we employed sequential analyses (Bakeman, 2011; Bakeman & Gottman, 1997), previously used in studies of adult–child interactions (Alvarenga et al., 2020; Danis et al., 2000; Meacham et al., 2016; Tompkins et al., 2017, 2013; Zucker et al., 2010). For example, researchers have used this analytical approach to demonstrate that monolingual preschoolers consistently respond with inferential talk to mothers' wh- questions (Tompkins et al., 2017) and to teachers' inferential questions in the shared reading context (Danis et al., 2000; Zucker et al., 2010). Similarly, in a recent study, researchers used sequential analysis to show that monolingual preschoolers are able to consistently follow complex emotional state talk during shared reading (Alvarenga et al., 2020). To our knowledge, the majority of previous studies were conducted with monolingual samples. However, Meacham et al. (2016) used sequential analysis in their study, whose child sample was 65% DLLs. The authors found that during sociodramatic play in preschool, children consistently respond with pretend play utterances to teacher topic-continuing utterances. Moreover, Tompkins et al. (2013), who conducted a study with a sample of preschoolers whose language scores were lower than age-based norms, utilized sequential analysis to examine teacher–child interactions in pretend play. The authors discovered that children's inferential utterances are significantly associated with teachers' inferential questions (Tompkins et al., 2013).

In relation to DLLs' participation in extratextual talk and how they align their contributions to the cognitive level in teachers' requests, much remains unknown. In the present study, we investigated the relation between teachers' use of literal and inferential questions and the content of children's responses during shared reading. The following research question was addressed: To what extent do children align their responses to the inferential level of teacher questions?

Methods

Sample

This study included teachers and young DLLs who participated in a researcher-developed shared reading intervention during one preschool year (for more information, see Grøver et al., 2020). A subsample consisting of 202 children (all DLLs, 44.1% girls) and 53 preschool teachers from the intervention group of the larger study was used for the present study. The teachers made audio recordings of reading sessions in which they shared one of the first books introduced as part of the intervention and delivered the recordings to the researchers. Participants were recruited from highly multiethnic classrooms in the larger Oslo area, where most children speak a non-Norwegian language at home. To be included in the study, children had to be identified as bilingual by their parents, and both parents had to speak a non-Scandinavian language at home. In the larger study, we recruited a mean of 3.77 target children per classroom. Presumably, not all the target children were present during the audio recording of the shared reading session. Teachers in the study reported a mean of 3.68 ($SD = 1.45$) participating target children. Children in our sample spoke different first languages at home: Albanian (4.2%), Arabic (10.3%), Bosnian (2.1%), Polish (10.8%), Russian (0.5%), Somalian (13.4%), Sorani Kurdish (6.2%), Tamil (8.2%), Turkish (4.6%), Urdu (19.1%), and Vietnamese (4.1%). Norwegian preschool classrooms are age-heterogeneous, serving children ranging in age from 3 to 5 years old. The ages of the children in the sample ranged from 33 to 67 months ($M = 52.68$; $SD = 9.29$). All the children were born in Norway, while 86.6% of their mothers and 79.9% of their fathers were born outside Norway. The large majority of DLLs had started preschool between the ages of 2 and 3 years (average age in months at preschool start $M = 26.31, SD = 10.66$). We asked the families about the languages the parents and children mostly used in their communication with each other (mostly first language = 1, about equal use of first and second languages = 2, mostly second language = 3). The majority of the mothers ($n = 122$) and fathers ($n = 120$) for whom we have language use data reported that they most often used their first language in communication with their child, while some mothers ($n = 38$) and fathers ($n = 26$) used a combination of their first language and Norwegian. Children used their first language (child to mother, $n = 59$; child to father, $n = 66$), Norwegian (child to mother, $n = 76$; child to father, $n = 60$), or a combination of their first language and Norwegian (child to mother, $n = 41$; child to father, $n = 33$). On average, most of the families had more than 10 children's books in Norwegian ($M = 2.57$; $SD = 0.71$) and fewer than 10 books in their first language (1 = 0–2 books, 2 = 3–10 books, 3 = 11–50 books, 4 = more than 50 books). We assessed children's receptive vocabulary in Norwegian with the British Picture Vocabulary Scale-II (BPVS-II Dunn et al., 1997), adapted and translated into Norwegian (Lyster et al., 2010). The BPVS-II was administered starting with the first item and using the stop criterion (see Grøver et al., 2020). Across all age groups, the target children's vocabulary scores in Norwegian were consistently more than one standard deviation lower than those of the monolingual norming sample. Note that the children were not assessed with BPVS in their L1s. A combined score of vocabulary knowledge, as this knowledge appeared in either the L1 or L2 assessments, could have diminished the vocabulary gap between the DLLs and the monolingual norming sample (see Monsrud et al., 2022).

The 53 preschool teachers were all experienced; more than half (51%) had 6 or more years of experience as lead teachers. Most had early childhood education degrees (68%), while others were in training or had other backgrounds (32%). More than half of the lead teachers (55%) reported that they currently focused on the learning area "Communication, language and text" of the national framework plan. The language of instruction in the preschool classrooms was Norwegian.

As part of the intervention, the teachers were asked to invite the children to participate in discussions of the books' themes and encourage the children's reasoning through questions. Each book that was shared came with support material that suggested, in the form of examples, how teachers could use the book to address various components of the intervention: to support children's vocabulary and reasoning, their skills in shifting perspectives, and their acquisition of associated topic knowledge. The material also included information on how teachers could extend the book theme through play and other activities. For the book on which this analysis is based, the support material

identified five targeted words that appeared in the book and proposed ways in which teachers could discuss the meaning of the words, suggested ways in which teachers could rework the text from various antagonists' perspectives ("let us try to retell the story from the perspective of the penguin"), and included three questions that exemplified, in a nonmanualized way, what teachers could ask about to support reasoning (for a more detailed presentation of the support material, see Authors, 2020).

Procedure

The present study investigated audiotaped shared reading of one of the first books in the intervention, the narrative storybook *Lost and Found* written by Oliver Jeffers (2011, in Norwegian translation). This book was selected for analysis because it includes captivating illustrations and touches on various topics that children could easily relate to, such as loneliness, belonging, compassion, and the development of an unexpected friendship. The teachers expressed that this book was much liked by the children and the teachers. Thus, we expected it to be engaging and suitable for inviting content-rich discussions and reasoning in preschool children. The analyses are based on the 53 audiotaped shared reading sessions that were conducted in small groups of one teacher and one to seven target children ($M = 3.79$; $SD = 1.51$). Therefore, the audiotaped reading sessions included only DLLs. The preschool teachers were asked to audiotape their second or third book-reading session. Additionally, we asked them to fill out the form to report the number of times they had shared the book with the children and which book-reading session they had recorded. All the teachers reported recording their second or third book-reading session. The average duration of the shared book-reading sessions was 15 min ($SD = 6$), with the length ranging from 3 to 32 min.

Transcription and Coding

The book-reading sessions were transcribed using the conventions of the Codes for the Human Analysis of Language (CHAT) of the Child Language Data Exchange System (CHILDES; MacWhinney, 2000). The speech flow was broken into single utterances with the help of pauses, intonation, and turn-taking. We were not able to distinguish individual child speakers with sufficient reliability. Therefore, individual child speakers were not identified in the transcripts. In the context of group reading sessions, children sometimes provided a collaborative response to a teacher's question, or multiple children simultaneously chimed in with different responses to the same question. In such cases, only the most elaborated or advanced child utterance was coded.

To be able to use sequential analysis to accurately estimate the likelihood and specificity of associations between teacher and child utterances, we needed to include in the analysis all types of text-related teacher and child utterances that occurred before, during, and after the shared reading sessions. Thus, we developed codes for teacher and child utterances until we were able to account for all types of utterances in teacher and child speech. This resulted in an exhaustive and mutually exclusive coding system for all teacher questions and subsequent child responses, as well as all the remaining teacher and child utterances. The codes for the teacher questions and child utterances were based on a framework that differentiates between four levels within literal and inferential language in teacher and child speech (see Blank et al., 1978; Danis et al., 2000; van Kleeck et al., 2006; Zucker et al., 2010). The exhaustive coding system for all the teacher and child utterances, as well as our analytic procedure, is presented and explained in the following section.

Teacher Codes

Text-Related Questions

All text-related teacher questions that were likely to require a literal or inferential response from the children were coded as either literal (levels 1 and 2) or inferential (levels 3 and 4) questions; see Table 1. Literal-level questions required children to use language to label and locate (level 1) or

Table 1. Coding descriptions and examples.

Code	Description	Example
Teacher literal question, level 1	Questions that ask for labels, locations of objects, characters, or other concrete entities in the book	*What is that?* *What is it called?*
Teacher literal question, level 2	Questions that ask for descriptions or recall of the story actions, objects, characters, or their qualities perceptually available through the illustration or text	*What are they doing then?* *What does the penguin look like?*
Teacher inferential question, level 3	Questions that ask to summarize, synthesize, or evaluate across more than one page, describe characters' feelings/ cognition, connect text to own experiences	*What were they going to use the boat for?* *Have you ever felt all alone?*
Teacher inferential question, level 4	Questions that ask for inferences, hypotheses, predictions, imagining alternative solutions/events, references to factual/world knowledge	*Why is he still sad?* *Why don't the penguins freeze?*
Child literal utterance, level 1	Utterances where a child responds to the most salient information in the book; labels objects or features; describes location of objects or characters	*It is a suitcase.* *Here is the boy.* *Red.*
Child literal utterance, level 2	Utterances that describe or recall story characters' actions, characters, objects, or their qualities available through text or a single illustration. Statements that complete the teacher prompt	*They are hugging.* *They are happy.*
Child inferential utterances, level 3	Utterances that draw a conclusion, synthesize, or summarize information from the text; recall related personal experience; infer about what happened without further justification; explain a word with contextual support	*I also felt lonely once when Mommy went grocery shopping.* *The penguin wanted to stay with the boy.*
Child inferential utterance, level 4	Utterance that draw on inferences with a justification, hypothesis, predictions, imagination, references to world/factual knowledge	*Maybe they wanted to be together because they liked each other.* *He is a penguin and penguins come from ice, the South Pole.*

describe and recall (level 2) actions, characters, or objects in the book. For instance, the question "What color is his nose?" was coded as a level 1 literal question, while the question "What is he doing?" was coded as a level 2 literal question. In contrast, the inferential-level questions demanded that the children use their language skills to integrate information from the book, relate it to their own experiences (level 3), or infer, reason, and hypothesize about implicit information that was further away from their immediate experiences (level 4). For example, the question "Have you ever felt lonely?" was coded as a level 3 inferential question. The question "Why didn't he want to go to the South Pole?" was coded as a level 4 inferential question (for more details and examples, see Table 1). When we discuss teacher questions in the following sections, we are referring to text-related questions.

Other Questions and Nonquestion Utterances
Other teacher questions that did not fit the categories above were coded as behavior management questions ("Do you want to say something?"), tag questions ("We are talking about penguins, aren't we?"), or recast questions ("Yeah, you think it's scary?"). The nonquestion teacher utterances were

coded as either teacher reading utterances (teacher utterances that involved full or partial reading of the printed text) or teacher other (all extratextual teacher utterances, such as statements, comments, fillers, and directives; e.g., "Look at how sad the penguin is"). See Appendix for an overview of the entire set of teacher utterance codes for the sequential analysis.

Child Codes

All text-related child utterances were coded into four categories with the increasing level of demand for inferential thinking, similar to the codes that categorized the teacher questions (see Table 1). Children's level 1 literal utterances contained labeling of the characters or the most salient information observable in the book illustrations ("Here is an umbrella"). Children's level 2 literal utterances contained a description or recall of a single scene in the book ("He went to the other side"). In contrast, level 3 inferential utterances required more cognitive effort by children: They were required to synthesize or summarize parts of the narrative or relate it to their own experiences ("I also felt lonely once when Mommy went grocery shopping"). Level 4 inferential utterances required children to hypothesize, analyze implicit information, or draw upon their world knowledge ("They wanted to be together because they liked each other"/"He was trying to get a friend"). We coded a child's "yes," "no," or "I don't know" utterance as a minimal response. The remaining child utterances were coded as child questions, play utterances, or nonintelligible utterances. See Appendix for an overview of the entire set of child utterance codes for the sequential analysis.

For the intercoder reliability test, the first author provided a fellow researcher with a thorough explanation of the coding scheme. First, to allow the co-coder to practice, the first author and the co-coder jointly ascribed codes to two training transcripts. Next, they independently coded five transcripts using the coding scheme. All discrepancies in coding were resolved through multiple joint reviews of the transcripts, where the first author and the co-coder came to a consensus regarding which codes applied to which utterances. The coding scheme was revised simultaneously to clarify ambiguities. Finally, to assess the reliability of the coding scheme, the first author and the co-coder independently coded 20% of the data (11 new transcripts). Interrater agreement was calculated separately for the teacher and child codes and yielded kappa coefficients of 0.83 for the teacher codes and 0.89 for the child codes, indicating good reliability.

Coding started when the teacher directed attention to the book by talking about it or mentioning the front cover or any of the pictures. Coding stopped when the teacher and the children started to talk about unrelated things. In total, we coded 8,667 teacher utterances and 5,303 child utterances.

Data Analysis

First, we applied the four-level literal and inferential codes to assess the literal and inferential levels in all text-related teacher questions and all child utterances. Second, we used the coding scheme to categorize the remaining teacher utterances as reading utterances, nonquestion utterances, or other questions, such as managerial, tag, and recast. The remaining child utterances were categorized as minimal, play, nonintelligible utterances, or questions. Third, we followed Bakeman and Gottman's (1997) sequential methodology to determine whether the teacher literal and inferential questions were associated with the subsequent child responses. The data files from each shared reading session consisted simply of codes for various types of utterances produced by either a teacher or a child, ordered as they occurred in real time. Thus, the data to be analyzed were represented as sequences (or chains) of codes. These sequences of codes were then prepared in the Sequential Data Interchange Standard (SDIS) format, entered into the Generalized Sequential Querier (GSEQ; Bakeman, 2011) program, and pulled across all 53 classrooms for further analyses. The GSEQ software was used because it allowed us to quantify the interactional patterns between the teachers' and children's utterances by using contingency tables to calculate patterns in the association rates of different types of utterances.

First, we used the GSEQ software to tabulate the frequencies of all teacher questions, reading and nonquestion utterances, and all types of child utterances. Second, the software identified all possible adjacent pairs of all teacher and child utterance codes from the entire set of codes pulled across the preschool classrooms. This resulted in 72 possible sequences of codes, such as teacher level 1 literal question → child level 1 literal utterance, teacher level 1 literal question → child level 2 literal utterance, and so on. Third, using the lag sequential method, we generated transitional probabilities that represent the likelihood of one speech event (*target*, e.g., child level 1 literal utterance or any other type of child utterance) immediately following another speech event (*given*; e.g., teacher level 1 literal question or any other type of teacher utterance) while simultaneously controlling for chance occurrences. Because we wanted the estimation of transitional probability to be as accurate as possible, we included all available codes for all types of teacher and child utterances in the sequential analysis (see Appendix for a full overview). Consequently, when calculating the transitional probability of a child level 1 literal utterance immediately following a teacher level 1 literal question, the sequential analysis considered the likelihood of a child level 1 literal utterance following any other type of teacher utterance (e.g., other types of teacher questions, nonquestions, or reading utterances).

To understand the nature and specificity of associations between teacher questions and child responses, we used the lag sequential method to calculate (a) the joint frequencies between all types of teachers' utterances and children's utterances; (b) their expected frequency, or the frequency expected by chance that a certain type of child utterance followed directly after a certain type of teacher utterance; and (c) the transitional probability that a certain type of child utterance followed a certain type of teacher utterance, compared to what is expected by chance, indicated by Allison and Liker's (1982) adjusted *z*-scores and associated *p* values. Probability is considered statistically significant when the adjusted residual *z* is significantly higher or lower than 0. For example, the observed frequency is greater than chance when the adjusted residual is positive and smaller than chance when the adjusted residual is negative (Bakeman, 2011). We also calculated (d) the strength of the sequential associations between different categories of teacher and child utterances, presented as effect sizes and indicated by the value of Yule's *Q*, ranging from – 1 to +1, where 0 indicates no effect (Yoder & Feurer, 2000).

Results

The descriptive results revealed a great deal of variability in the total number of teacher and child utterances produced per reading session. The teachers produced between 16 and 350 utterances per session, where 0 to 61 were reading utterances. Children produced between 15 and 256 utterances per session (for more descriptive results, see Table 2). Overall, the teachers produced more total utterances (*M* = 163.85, *SD* = 67.28) than the children (*M* = 102.36, *SD* = 51.93).

All forms of questions composed approximately one-fifth of the teacher utterances (22%; *n* = 1,929). Nonquestion utterances accounted for 59% and text reading utterances for 19% of all teacher utterances. Altogether, teachers asked 1,437 text-related questions, 211 managerial questions, 178 recast questions, and 103 tag questions. Overall, teachers who produced more utterances in total also asked more text-related questions (*r* = .65, significant at 0.01). Teachers who asked a larger number of questions overall also asked more literal (*r* = .49, *p* < .01) and inferential (*r* = .83, *p* < .01) questions.

As we focus on the teacher questions that invited the children to use literal or inferential language during shared reading, the remaining results mainly concern teacher text-related questions and child literal and inferential utterances. There was considerable variation in the number of text-related questions that teachers posed per reading session (*M* = 27.11; *SD* = 13.78; range 0–60). Overall, the majority of the teachers' questions were inferential (926 out of 1,437). During an average shared reading session, teachers asked substantially more inferential questions (*M* = 17.47; *SD* = 11.94; range 0–59) than literal questions (*M* = 9.64; *SD* = 7.66; range 0–31). However, large individual differences

Table 2. Descriptive statistics for the occurrence of teacher and child utterances.

	Total	M	SD	Range	Percentage
Teacher utterances	8684	163,85	67,28	16–350	100%
Teacher text-related questions	1437	27,11	13,78	0–60	17%
Literal, level 1	239	4,51	5,30	0–27	3%
Literal, level 2	272	5,13	4,84	0–24	3%
Inferential, level 3	660	12,45	8,55	0–39	8%
Inferential, level 4	266	5,02	6,16	0–35	3%
Teacher text-related comments	5156	97,28	47,67	10–220	59%
Teacher reading utterances	1599	30,17	19,36	0–61	18%
Teacher managerial questions	211	3,98	3,53	0–17	2%
Teacher recast questions	178	3,36	3,66	0–14	2%
Teacher tag questions	103	1,94	2,00	0–8	1%
Child utterances	5425	102,36	51,936	15–256	100%
Minimal answers	1228	23,17	16,48	3–81	23%
Literal, level 1	470	8,87	8,87	0–33	8%
Literal, level 2	843	15,91	12,99	0–66	16%
Inferential, level 3	1106	20,87	15,39	0–75	21%
Inferential, level 4	240	4,53	6,46	0–36	5%
Text-related questions	297	5,60	6,68	0–33	6%
Play utterances	72	1,36	1,76	0–8	1%
Other statements	656	12,38	12,43	0–57	12%
Unclear/unintelligible	402	7,58	7,48	0–31	8%

between the teachers appeared. The number of children in the reading groups was not associated with the number of inferential teacher questions. Nonetheless, teachers with few children in the reading groups asked more literal questions than other teachers ($r = -.17$, $p < .05$).

In contrast, the children produced a nearly equal number of literal (1,313) and inferential utterances (1,346), with a mean of 24.77 literal ($SD = 16.85$; range 0–82) and 25.40 inferential ($SD = 19.04$; range 0–91) utterances. Children provided 1,204 responses immediately following teacher text-related questions, meaning that children responded to 84% of all text-related questions. This indicates that, most of the time, young DLLs were able to use their L2 skills to follow up on teacher questions and actively engage in extratextual conversation about the book. When teachers asked many text-related questions, children also produced more utterances ($r = .57$, $p < .01$), inferential ($r = .63$, $p < .01$) and literal ($r = .29$, $p < .01$).

Sequential Associations between Teacher Questions and Child Responses

To find out whether the children were able to align their responses to literal or inferential levels in the teacher questions, we entered all teacher utterance types (text-related questions, other questions, reading, and other nonquestion utterances) as given at lag 0 and all types of children's utterances as the target at lag 1. Similar to previous studies of teacher questions and child responses, the children were likely to follow up teachers' questions with utterances on the same literal or inferential level. Table 3 shows the specific associations between the four levels of teacher questions and child utterances: The likelihood that literal and inferential questions were followed by child literal and inferential utterances on the same levels was statistically significantly higher than what would be expected by chance (χ^2 (df) = 4307.45 (81), $p < .01$). Furthermore, as indicated by the adjusted residuals and Yule's Q values, it was highly likely that (a) a level 1 teacher question was followed by a level 1 child response ($z = 32.88$, $p < .01$, Yule's Q = 0.96), (b) a level 2 teacher question was followed by a level 2 child response ($z = 19.21$, $p < .01$, Q = 0.83), (c) a level 3 teacher question was followed by a level 3 child response ($z = 18.67$, $p < .01$, Q = 0.69), and (d) a level 4 teacher question was followed by a level 4 child response ($z = 37.30$, $p < .01$, Q = 0.97). Notably, level 1 and 2 literal teacher questions were highly unlikely to be directly followed by level 3 and 4

Table 3. Sequential associations between teacher questions and child utterances.

Teacher question	Child utterance				
	Literal,level 1	Literal,level 2	Inferential, level 3	Inferential,level 4	Minimal response(yes/no)
Literal, level 1	**151/18.73** **(32.88*/0.96)**	21/30.70 (−1.95/−0.22)	1/41.81 (−7.26/−0.96)	0/10.96 (−3.49/−1.00)	14/51.70 (−6.23/−0.66)
Literal, level 2	15/20.39 (−1.29/−0.17)	**133/33.42** **(19.21*/0.83)**	14/45.51 (−5.39/−0.60)	1/11.93 (−3.34/−0.86)	37/56.29 (−3.06/−0.27)
Inferential, level 3	7/50.66 (−6.90/−0.80)	18/83.03 (−8.31/−0.71)	**278/113.06** **(18.67*/0.69)**	5/29.64 (−4.99/−0.75)	190/139.83 (5.27/0.25)
Inferential, level 4	1/21.31 (−4.75/−0.92)	2/34.94 (−6.22/−0.91)	13/47.57 (−5.79/−0.64)	**137/12.47** **(37.30*/0.97)**	63/58.83 (0.65/0.05)

Observed frequency of associations/expected frequency (adjusted residuals, *p =< 0.01/strength of association – mean Yule's Q, from −1 to +1, where 0 is no effect).

inferential child responses. Furthermore, as we can see in the negative Yule's Q values in Table 3, inferential teacher questions (levels 3 and 4) were highly unlikely to elicit literal child responses (levels 1 and 2).

Discussion

Teacher Questions and Child Responses

A major result of the present study is that the DLLs consistently aligned the inferential levels of their responses with the inferential levels of the teacher questions. These results provide a compelling expansion of the existing literature on adult questions. The results show that the DLLs were able to contribute to inferential talk when teachers invited such talk in small groups during shared reading. Other studies of shared reading with monolingual preschoolers in the whole-class setting have shown that at each cognitive level, adults' questions are likely to be followed by preschoolers' responses on the same level, and unlikely to be followed by responses on different levels (Tompkins et al., 2017, 2013; Zucker et al., 2010). To our knowledge, these findings have not been previously documented in studies of shared reading with language-heterogeneous groups of young DLLs who learn their second language in preschool. Similar to monolingual preschoolers in previous studies, the DLLs in this study were highly unlikely to provide inferential responses to literal teacher questions and literal responses to inferential teacher questions. Thus, the children in this study were able to follow up more advanced level 3 and 4 inferential questions.

These results are important as they shed light on distinct pathways by which teacher questions effectively elicit DLLs' own immediate use of inferential talk. In this way, teachers can scaffold DLLs' inferential language use. Teachers can also use questions to socialize children into making inferences, reasoning about implicit information in the book, anticipating future events, and drawing connections to their own experiences and knowledge about the world. In the longer run, DLLs' exposure to inferential talk and ability to answer higher-order inferential questions can be a pathway to greater language and literacy skills (Tompkins et al., 2017). Moreover, when teachers model inferential questioning behavior during shared reading, children learn ways to ask questions about the text that are important for their future text comprehension development (van Kleeck et al., 2006).

Another finding is that the preschool teachers in this study posed more inferential questions than literal questions. Level 3 inferential questions were posed the most frequently among the four levels along the literal–inferential continuum. We also found that 22% of the average teachers' utterances were questions. This percentage is similar to that reported in previous studies, where approximately one-third of teachers' utterances were questions (Massey et al., 2008; Zucker et al., 2010). Thus,

although the proportion of inferential teacher questions was larger than the proportion of literal teacher questions, the overall number of questions in this study was not larger than that documented in other studies.

The finding that teachers in this study had higher ratios of inferential to literal questions is somewhat surprising. Findings from previous studies with monolingual samples suggest that early childhood teachers tend to ask more lower-order literal questions than higher-order decontextualized questions (Hindman et al., 2012). Findings also suggest that teachers generally tend to ask questions on the literal level (Beck & Mckeown, 2001). At the same time, in studies of questions during shared reading, Massey et al. (2008) and Zucker et al. (2010) found that teachers pose slightly more cognitively challenging questions than cognitively simple questions in the whole-group preschool classroom setting. The present findings provide a compelling expansion of findings in existing studies conducted with monolingual preschoolers by describing inferential levels in teacher question use with a diverse DLL sample in small-group shared reading. This type of shared reading can follow different patterns than whole-class shared reading. Specifically, the teachers in this study most often asked level 3 inferential questions. This may indicate that level 3 questions were particularly suitable for adapting inferential talk to small-group shared reading with diverse groups of DLLs.

One explanation for the higher ratios of inferential questioning in the present study may be that the teachers had recently entered an intervention study in which they were encouraged to ask questions to facilitate children's reasoning about the book. We assume that this likely resulted in levels of inferential questioning that differ from routine teacher questioning behavior during shared reading with young DLLs. Furthermore, reading the same book for the second or third time may have allowed the teachers to use it more as a starting point for discussion and, in this way, invite more reasoning rather than just focusing on getting children familiar with the book. At the same time, it is plausible that the higher ratios of inferential questions could also be explained by the characteristics of the sample. More than half of the lead teachers reported they focused on the learning area "Communication, language and text" of the national preschool curriculum the year the intervention took place. Previous research has shown that preschool teachers may generally ask few open-ended questions during shared reading (Wasik & Hindman, 2020) and struggle to incorporate high-level talk in the context of classroom interactions (Wasik et al., 2006). Therefore, it is promising that the teachers in this study were able to incorporate more inferential questions into their book-reading sessions.

Another possible explanation for the high level of inferential questions in this study is that we assessed only the inferential level of teacher questions and did not examine the content or inferential level of the teacher comments. Previous research have suggested that teacher comments and questions tend to serve different purposes and can be used in a mutually supportive way (Massey et al., 2008). For instance, participating teachers could have widely used comments to provide children with the concrete contextual information needed to answer more complex inferential questions.

Limitations

The study includes several features that limit the conclusions that can be drawn. First, we investigated preschool teacher questions and child responses in the context of reading one book rather than examining question and response patterns across several books within different genres. It is possible that patterns in teacher questioning behavior change when teachers share an informational nonnarrative or wordless picture book with DLLs (for informational narrative book reading, see Zucker et al., 2010). In addition, all the teachers were participating in an intervention in which they were asked to encourage children's reasoning with the help of questions. The teachers were provided with support material that included nonmanualized examples of questions that invite children's reasoning. Although the teachers in the present

study were able to tailor their inferential questions to the interactions they had with children, we acknowledge that the teacher questioning behavior was influenced by the teachers' participation in the intervention. It seems plausible that the same number and patterns of inferential questions would not be equally present in teacher–child interactions during shared reading in preschool classrooms outside an intervention. However, this study showed that when teachers invite inferential talk, children match their responses to the level of the teachers' questions in a highly contingent manner.

Another limitation is that we focused primarily on inferential teacher questions and their relation to children's responses in the context of real time, without analyzing the content of the teachers' nonquestion utterances and their relation to the children's responses. Teacher follow-up utterances and teacher–child multiturn exchanges are also of great interest and could contribute to a better understanding of the pathways that are useful in making inferential talk with DLLs more sustained. We focused primarily on temporal contingency between teacher questions and child responses; thus, future work could examine the content and inferential levels of teacher comments to DLLs and the relations of their levels to children's responses.

Implications

This study extends previous studies of monolingual children's language experiences in pre-school classrooms by providing an important illustration of how DLLs can be exposed to literal and inferential talk during shared reading. The results imply that using inferential questions to encourage children's inferential talk can be an effective means of involving DLLs in higher-order analytic talk about topics the children might not initiate themselves. Given the diverse sample, we assume that not all the DLLs in this study provided inferential responses to the teacher questions. However, listening in and overhearing inferential talk about engaging topics may also serve as an important learning mechanism for children with limited L2 proficiency (Blum-Kulka & Gorbatt, 2014). Previous researchers have suggested that children take an active role while listening to complex and engaging conversations that their peers have with adults and each other (Akhtar, 2005). Future work should investigate how opportunities to learn by listening to inferential talk between an adult and peers benefit young DLLs with varying levels of L2 proficiency.

More generally, this study is an important complement to studies that argue for the importance of exposing all children to literal and inferential levels of talk to ensure their language and literacy development, and to give them the best possible opportunities to develop their later language and text comprehension skills. Thus, the results provide a rationale for preschool teacher professional development that focuses on explicit instruction for how to support DLLs' future literacy and text comprehension skills by exposing them to more literal and inferential talk and explicitly encouraging DLLs to engage in inferencing. During pre-school teacher training, teachers are advised to use open-ended questions during shared reading. However, knowing how to implement this practice with DLLs, a diverse group of children with large variations in L2 proficiency, may still be challenging. To know how to effectively scaffold inferential-level talk about the book, teachers may need more guidance regarding the thoughtful and strategic use of questions (see Grøver et al., 2020). Inferential questions are important for scaffolding and children's gradual internalization of inferential skills (Tompkins et al., 2013; van Kleeck et al., 1997). Therefore, we also suggest that future studies could investigate whether an intervention with relevant examples of questions teachers may ask has the potential to increase teachers' abilities to incorporate more inferential language in their text-based interactions with DLLs and encourage children to engage more in inferential talk.

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Appendix

Table A1. Summary of teacher and child utterance codes for sequential analysis.

	Coding category	Definition
Teacher	Teacher reading utterance	Reading full or partial lines of the text
	Teacher other	Non-question utterances: narrative-related statements, comments, prompts
	Teacher narrative-related questions	
	Literal, level 1 question	Questions that require child to attend to the most salient information available through an illustration or text
	Literal, level 2 question	Questions that require child to focus on specific aspects of objects/events and draw connections/relations between visible objects on the page
	Inferential, level 3 question	Questions that require child to integrate information from the book or draw connections to relevant personal experiences
	Inferential, level 4 question	Questions that require child to reason about implicit information or make a knowledge-based inference
	Teacher other questions	
	Managerial question	Questions related to behavior/reading task management
	Tag question	Statements turned into questions by adding a tag
	Recast question	Repeat/recast/repair questions
Child	Minimal response	Minimal response or token phrase (*Yes/No/I don't know*)
	Literal, level 1 utterance	Utterance that attends to the most salient information in text/print
	Literal, level 2 utterance	Utterance that focuses on features of objects/scene/event, demonstrates connections between objects in the book
	Inferential, level 3 utterance	Utterance that integrates information from the text/illustrations or draws a connection to child's own life
	Inferential, level 4 utterance	Utterance that demonstrates reasoning about implicit information in the book or draws on factual knowledge
	Child question	Information-seeking question related to the text.
	Child play	Playful utterance: word or sound repetition, rhyme
	Child unclear	Utterance unclear/incomplete/irrelevant