

Language Environments for Young Children with Hearing Loss:
Teachers' Use of Linguistic Input Strategies that Support Vocabulary Development

By

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To the Nini family
who welcomed me into their experiences with hearing loss,
taught me the importance of communication,
and inspired me to pursue a career in education

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CHAPTER I

INTRODUCTION

Children with hearing loss (CHL) are at risk for oral language delays that can impede academic achievement (Cupples, Ching, Crowe, Day, & Seeto, 2014; Fagan & Pisoni, 2010; Fitzpatrick, Crawford, Ni, & Durieux-Smith, 2011; Kyle & Harris, 2010; Moeller, Tomblin, Yoshinaga-Itano, Connor, & Jerger, 2007). Although mandatory newborn infant hearing screenings have reduced the average age of identification, CHL still experience auditory deprivation between the time hearing loss occurs and the time they receive hearing technology (e.g., hearing aids, cochlear implants). For children with congenital hearing loss, auditory deprivation occurs prenatally; and for children with significant hearing loss who are cochlear implant candidates, surgery usually occurs after 12 months of age and in some cases much later. Auditory deprivation during the first years of life can have a lasting impact on spoken language development.

To reduce oral language delays, preschool programs for CHL who are learning spoken language strive to provide language-rich environments that maximize exposure to language, especially vocabulary words and syntactic structures. Although lead teachers in preschools are likely to be the primary providers of linguistic input during the school day, there is limited research examining teachers for CHL's use of strategies that promote students' development of language skills. A first step in this line of inquiry is to examine teacher linguistic input in preschools for CHL. Specifically, this exploratory study described teachers' use of three linguistic input strategies that are strongly associated with vocabulary development in typically

developing children: incorporating instructional vocabulary into free play, extending discourse through conversational turns, and reading aloud. Information about teachers' use of these strategies could lead to subsequent interventions to improve the richness of the overall language environment in preschools for CHL.

Overview of the Problem

Children with hearing loss are at risk for oral language delays. Although CHL can potentially reach age-appropriate norms, many demonstrate consistent deficits on vocabulary and language measures. For example, 7- to 8-year-olds with hearing loss scored between 1.3 and 1.7 standard deviations below the norm on the Peabody Picture Vocabulary Test and the Clinical Evaluation of Language Fundamentals (Wake, Hughes, Poulakis, Collins, & Rickards, 2004). Perhaps even more striking is that 40% of the 86 participants scored more than 2 standard deviations below the mean. Similarly, in a sample of 5-year-olds who use spoken language, half of the 99 children scored in the lowest 27th percentile for receptive vocabulary (Cupples, Ching, Crowe, Day, & Seeto, 2014). Given the nature of congenital and pre-lingual hearing loss, deficits in oral language are often evident in very young children. By 18 months of age, children without hearing loss produce approximately 100 words. In stark contrast, CHL are likely to be twice that age before attaining a comparable expressive vocabulary size (Fenson et al., 1994; Mayne, Yoshinaga-Itano, Sedey, & Carey, 1999). Given the association between auditory access and vocabulary development, it is not surprising CHL often demonstrate receptive (Fagan & Pisoni, 2010) and expressive (Thal, DesJardin, & Eisenberg, 2007) vocabulary scores more comparable to the amount of time they have used hearing technology (i.e., their "hearing age")

than to their chronological age. Although language outcomes for CHL are highly variable, vocabulary is a common area of deficit.

Impact of oral language on literacy. A primary reason to investigate how teachers for CHL promote oral language is the strong relationship between early oral language performance and later literacy outcomes. For children without hearing loss, oral language skills have a direct influence on code-related skills (i.e., print knowledge, emergent writing, and phonological awareness). In a longitudinal study of 626 four-year-olds from preschool through fourth grade, oral language skills predicted almost half of the variance in code-related skills in a sample of economically disadvantaged preschoolers (Storch & Whitehurst, 2002). By third grade, oral language was a direct and significant predictor of reading comprehension. Direct relationships have also been found in larger and more economically diverse populations. The National Institute of Child Health and Human Development Early Child Care Research Network (NICHD, 2005) found that broad language skills in preschool predicted first grade decoding skills, and comprehensive language and vocabulary in preschool directly predicted third grade reading comprehension.

In addition to direct effects, oral language has indirect effects on reading. Language at 36-months of age predicted first grade decoding and third grade reading comprehension when mediated by code-related skills assessed during preschool and kindergarten (NICHD, 2005). For children from Head Start programs, indirect effects of early oral language skills on reading were significant as mediated by code-related skills, with preschool oral language being a stronger predictor of reading than kindergarten oral language (Storch & Whitehurst, 2002). This finding highlights the importance of oral language skills during preschool and supports the examination of teacher linguistic input in early childhood programs. Overall, oral language has both direct

and indirect effects that have a significant and lasting impact on reading achievement for children without hearing loss (Dickinson, Golinkoff, & Hirsh-Pasek, 2010).

Early oral language skills also predict later language and literacy skills for CHL. In a large study of 8- and 9-year-old cochlear implant users, overall linguistic competence was a strong predictor of reading ability (Geers, 2003). Receptive vocabulary scores have been highly correlated with measures of word-attack skills and sentence comprehension for children with cochlear implants (Fagan, Pisoni, Horn, & Dillon, 2007). Vocabulary plays a particularly significant role in supporting reading growth over time for CHL. In a longitudinal study, vocabulary was a stronger and more consistent predictor of reading ability than phonological awareness or speechreading (Kyle & Harris, 2010). For children with cochlear implants, both pre- and post-implant vocabulary performance were significant predictors of reading comprehension (Connor & Zwolan, 2004). These findings suggest that teachers should use strategies that develop oral language – especially vocabulary – for CHL during preschool.

Early childhood language input. It has long been known that linguistic input from adults during children’s first few years of life has a strong longitudinal impact on children’s language development (e.g., Hart & Risley, 1995). Hearing loss can adversely impact access to speech, thereby reducing both the quantity and quality of linguistic input CHL receive. Children with congenital hearing loss do not have access to speech as early as children without hearing loss (i.e., prenatally); and fewer than half of CHL are fit with amplification by the recommended age of 6 months (American Academy of Pediatrics, & American Speech-Language-Hearing Association, 2000; Center for Disease Control and Prevention Early Hearing Detection and Intervention, 2015). Surgery for cochlear implants is usually provided at 12 months of age or older, potentially adding to the amount of auditory deprivation for children with significant

hearing loss. Even after CHL receive hearing technology, the quality of linguistic input can be affected. For example, the acoustic signal provided by hearing aids has a restricted bandwidth known to impede word learning when compared to a wide bandwidth signal (Pittman, 2008). Children also vary in their consistency of hearing technology use such that younger children wear their devices less than older children (Walker et al., 2013). Thus, auditory access to speech for CHL is both delayed and different when compared to children without hearing loss. Consequently, CHL often exhibit language delays by the time they become eligible for preschool special education services on their third birthday (Moeller, Tomblin, Yoshinaga-Itano, Connor, & Jerger, 2007; Fitzpatrick, Crawford, Ni, & Durieux-Smith, 2011). To address these delays, teachers for young CHL should provide high quality language environments that maximize the use of linguistic input strategies, especially for vocabulary.

It is well documented that the quality of the preschool language environment influences children's subsequent language development (Girolametto, Weitzman, & Greenberg, 2003; Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002; Logan, Piasta, Justice, Schatschneider, & Petrill, 2011). Although assessments of *quality* can include infrastructure features, broad features of the classroom environment (e.g., space and furnishings), and interactions between teachers and children, these characteristics do not contribute equally to language gains. In a large-scale study of over 2400 children in 671 classrooms, supportive teacher-child interactions were more strongly associated with children's language development than program features such as the presence of a comprehensive curriculum or teacher variables such as educational degree or area of licensure (Mashburn et al., 2008). High quality preschools can even mitigate the language effects of low linguistic input in home environments (Hubbs-Tait et al., 2002; Tabors, Snow, & Dickinson, 2001). For example, the quality of teachers' instruction moderated the

relationship between student attendance and language growth for children from low socioeconomic backgrounds (Logan, Piasta, Justice, Schatschneider, & Petrill, 2011). Specifically, children who had high attendance in high quality classrooms showed greater language gains than children who had high attendance in low quality classrooms. This is a promising finding for children who are at risk for language delays such as CHL. Given the potential for preschools to be a protective factor for vocabulary and language development, investigating teacher-child interactions that are associated with language gains in early childhood classrooms is an important area of study for CHL.

Theoretical Rationale

The Emergentist-Coalition Model of word learning is an example of a theory that accounts for the considerable empirical evidence linking high quality, language-rich early childhood classrooms to language outcomes. The Emergentist-Coalition Model posits that attentional, social, and linguistic cues contribute to the effectiveness of linguistic input and that children's use of these cues changes over time (Hirsh-Pasek, Golinkoff, Hennon, & Maguire, 2004; Hollich et al., 2000). It is not surprising then that high quality early childhood programs are characterized by process-level factors such as supportive teacher-child interactions whereas structural factors, such as teacher qualifications or teacher-to-child ratio, show substantially less impact on child language outcomes (Howes et al., 2008). Teacher-child interactions provide a supportive and effective context for children to learn new vocabulary words because these interactions maximize teachers' use of attentional, social, and linguistic cues. This might be especially important for CHL because teacher-child interactions are likely to occur when the teacher is in close proximity to the child and while the child is attending to the teacher's speech.

Thus, there might be a favorable signal-to-noise ratio and the child with hearing loss might have access to visual cues (e.g., speechreading) that support comprehension of teachers' linguistic input.

Objective

The association between early language performance and later language and literacy outcomes warrants investigation of strategies teachers can use to maximize children's oral language development during early childhood. Despite a consensus that a language-rich environment is desirable for CHL, there is a limited body of research investigating teachers' use of linguistic input strategies associated with vocabulary development in this population. This study aimed to describe the use of three evidence-based practices derived from the literature examining vocabulary learning in children without hearing loss by lead teachers for preschoolers who were enrolled in an early childhood program for CHL. These strategies included: a) use of instructional vocabulary during free play, b) extending discourse through conversational turns, and, c) reading aloud.

CHAPTER II

REVIEW OF THE LITERATURE

Although direct vocabulary instruction can be effective (Marulis & Neuman, 2010), children learn the majority of words through repeated exposures (Graves, 2006). CHL require more exposures than children without hearing loss to acquire, extend, and retain new words (Walker & McGregor, 2013). Consequently, teachers for CHL need to incorporate vocabulary-enhancing linguistic input throughout the school day to maximize opportunities for word learning.

Adult-to-child speech is an especially effective type of linguistic input. That is, speech directed specifically to children has proven more important to vocabulary development than the number of words children overhear when adults talk to each other. For example, children's expressive vocabulary at age 2 was predicted by the amount of adult speech directed to them when they were 19 months old but was not related to the amount of overheard speech (Weisleder & Fernald, 2013). This finding supports other studies that report a positive relationship between the amount of maternal responsiveness to children's communicative attempts and child language outcomes (Tamis-LeMonda, Bornstein, & Baumwell, 2001). This pattern is consistent for CHL. In a longitudinal study of 188 children with severe to profound hearing loss, children of mothers with high ratings on a general linguistic stimulation measure did not demonstrate significant gains in language four years after cochlear implantation (Quittner et al., 2013). However, children whose parents had high ratings on both the general linguistic stimulation and maternal sensitivity measures outperformed children whose parents fell into any other group (e.g., high

linguistic stimulation and low maternal sensitivity; high maternal sensitivity alone). General linguistic stimulation referred to the overall number of words mothers generated and the measure of linguistic sensitivity captured the degree to which mothers directly interacted with their child (i.e., adult-to-child speech). Thus, adults maximize vocabulary learning for children both with and without hearing loss by embedding adult-to-child speech in positive and supportive interactions.

Although much of the research on adult-to-child speech has been conducted with mother-child dyads, teacher-child interactions are also a well-established conduit for language learning in early childhood programs. For example, the results of the Early Child Care Research Network led Dickinson, Darrow, and Tinubu (2008) to state, “The quality of teacher-child interaction is the most important predictor of enhanced language and cognitive development” (p.400). Given the potential to promote language, teacher-child interactions were the context for the three linguistic input strategies associated with vocabulary development that were the focus of the present study: incorporating instructional vocabulary into free play, extending discourse through conversational turns, and reading aloud.

Instructional Vocabulary

Several terms can be used to describe the vocabulary adults use with children. *Sophisticated* vocabulary refers to words that are relatively uncommon in frequency and are therefore likely to be unknown or only marginally known by young children. These words usually fall outside the 3000 most common words known by fourth graders (Chall & Dale, 1995). *Academic* vocabulary refers to words that are used more frequently in school than in casual conversations and are associated with students’ academic performance (Nagy &

Townsend, 2012). In this study, the term *instructional* vocabulary is used to refer to a discrete set of vocabulary words – words that could be considered sophisticated and academic – that are likely to provide word learning opportunities for preschoolers.

Teachers have opportunities to expose children to instructional vocabulary during free play. Free play is a hallmark of early childhood classrooms and consists of child-led activities that promote learning through hands-on experiences. During free play, children engage in activities such as dramatic play, blocks, and painting. In a sample of 2751 preschoolers, children spent the largest proportion of their day in free-choice activities (Chien et al., 2010). Consequently, free play offers considerable opportunities for teachers to interact with and provide linguistic input, including instructional vocabulary, to young children.

Teachers' use of sophisticated vocabulary during free play is associated with later language and literacy outcomes for children without hearing loss. In a longitudinal study of 57 preschoolers, Dickinson and Porche (2011) used audio recordings to analyze teacher talk during different times of the school day. Teachers' use of sophisticated vocabulary during free play was directly related to children's receptive vocabulary in kindergarten and indirectly related to their reading comprehension skills in fourth grade. Specifically, a higher proportion of sophisticated vocabulary use was associated with higher student performance levels. The significant and lasting contribution of this linguistic input strategy makes the use of sophisticated vocabulary an important component of creating a language-rich school environment for young children. Teachers' use of instructional vocabulary during free play for CHL is currently unknown.

To support children's understanding of instructional vocabulary, teachers might incorporate semantic supports before or after the use of an instructional word. Grifenhagen (2012) categorized semantic supports as Verbal Supports for Meaning such as definitions or

examples, Nonverbal Supports for Meaning such as pictures or objects, and Extended Discourse that incorporated the instructional word into a minimum of five conversational turns between the teacher and child. In a study of 51 Head Start teachers and 434 preschoolers, teachers' use of Nonverbal Supports for Meaning were associated with vocabulary gains for children with low initial language and Verbal Supports for Meaning were associated with gains for children with typical initial language (Grifenhagen, 2012). Similarly, children with low initial vocabulary levels benefitted when teachers "acted out" words but the same strategy was negatively associated with vocabulary growth for children with high initial vocabulary levels (Silverman & Crandell, 2010). These differential effects are consistent with the Emergentist-Coalition Model of word learning that asserts children make use of different cues based on their developmental level, with more advanced children relying primarily on linguistic cues. Overall, teachers' use of semantic supports can positively impact children's vocabulary knowledge. Teacher's use of semantic supports with instructional vocabulary for CHL is currently unknown.

It is well documented that teachers alter their linguistic input for different activities throughout the school day. For example, teachers' use of talk that gives objects non-real characteristics (i.e., pretend talk) is more likely during free play than during book reading or mealtime (Gest, Holland-Coviello, Welsh, Eicher-Catt, & Gill, 2006). It is less known, however, how teachers might alter their linguistic input during particular activities within free play. Kontos (1999) found that preschool teachers adjusted their linguistic input based on their role and the free play activity. There is also emerging evidence that teachers explicitly teach words more during block activities than during dramatic play but use a higher proportion of sophisticated vocabulary during dramatic play than when engaging with blocks (Dickinson,

Darrow, & Tinubu, 2008). Teachers' use of instructional vocabulary during different activities within free play for CHL is currently unknown.

Conversational Turns

Conversational turns – the back-and-forth exchanges used to extend discourse – are a measure of adult-to-child speech associated with vocabulary development. The importance of conversational turns is reflected in a report on the evidence base in preschool education that states learning “is enhanced in the context of warm, responsive teacher-child relationships and interactions that are characterized by back and forth – serve and return – conversations to discuss and elaborate on a given topic” (Yoshikawa et al., 2013, p.6). Unlike teachers' use of instructional vocabulary during free play, conversational turns require children to produce utterances in response to teacher remarks. Children's active participation might enhance their awareness of the attentional, social, and linguistic cues posited by the Emergentist-Coalition Model of word learning. This could be especially important for young CHL who – given the high prevalence of vocabulary delays – might rely on earlier-developing cues (i.e., attentional) longer than children without hearing loss to learn new words. In addition, conversational turns typically occur during episodes of joint engagement (i.e., the teacher and child are focused on the same object/event) which are associated with oral language development for children both with (Cejas, Barker, Quittner, & Niparko, 2014) and without hearing loss (Tomasello & Farrar, 1986).

Conversational turns has proven to be an especially effective linguistic input strategy when used with children without hearing loss. In a cross-sectional study of 275 families, parents' use of conversational turns had a robust association with children's language scores and was more strongly related to children's gains than adult word count (Zimmerman et al., 2009).

Perhaps even more compelling is that – in a longitudinal follow-up with 71 of those families – use of conversational turns retained strong significance even after controlling for children’s initial language levels. Conversational turns is also an effective strategy when facilitated by teachers. In preschool, teachers’ use of linguistic input that supported conversational turns was positively associated with the number of utterances, number of different words, and number of multiword combinations children produced (Girolametto, Weitzman, van Lieshout, & Duff, 2000).

There are few studies examining the use of conversational turns with CHL, although the emerging data indicate associations with vocabulary learning in this population as well. In a recent study, Ambrose, VanDam, and Moeller (2014) used Language ENvironment Analysis (LENA) processors to record and analyze the full-day auditory environments of 28 toddlers with mild-to-severe hearing loss. The frequency of conversational turns was positively correlated with children’s language performance when they were 2- and 3-years old; but the overall number of adult words children heard was not correlated with their language performance. These results support the idea that high rates of linguistic exposure alone are not sufficient for CHL to maximize their language learning, and that conversational turn taking supports early language development. In another study of eight preschoolers who wore the LENA for a single day, all children engaged in more conversational turns during 3 hours of an auditory-oral summer school program than during the rest of the day at home (Wiggin, Gabbard, Thompson, Goberis, & Yoshinaga-Itano, 2012). Although this study did not control for activity differences (e.g., young children might go home from school and nap for several hours which would eliminate opportunities for conversational turns), it shows that teachers trained to develop spoken language in CHL were using conversational turns as a linguistic input strategy. The amount and

variability of conversational turns experienced by CHL throughout the full preschool day is currently unknown.

Reading Aloud

Reading aloud provides an opportunity for teachers to provide linguistic input that includes more rare vocabulary words than typical conversational language. Specifically, conversations between adults and 3-year-olds contain approximately nine rare words per thousand whereas children's literature contains over three times that amount (Hayes & Ahrens, 1988). A close examination of 156 children and 25 teachers revealed there is high variability in the amount of time children are read aloud to during preschool, with the average being 4 minutes per day (Connor, Morrison, & Slominski, 2006). It is currently unknown how often or for how long teachers for CHL read aloud.

Beyond the sophisticated vocabulary in the text, teachers might provide additional linguistic input during read aloud through comments and questions. Preschool teachers' linguistic input during read aloud is associated with receptive vocabulary performance in kindergarten for children without hearing loss (Dickinson & Smith, 1994). Some remarks made by teachers during read aloud can be classified as contextualized and decontextualized talk. *Contextualized talk* refers to remarks that are directly connected to books such as describing the illustrations or asking questions about what just happened. *Decontextualized talk* refers to remarks that are abstract such as asking the children to make inferences, predicting what will happen next, or relating the book to the children's lives. There is evidence that children without hearing loss learn more words when their teachers use greater amounts of contextualized and decontextualized talk during read aloud (Hindman, Wasik, & Erhart, 2012). The frequency and

variability with which teachers for CHL use contextualized and decontextualized talk during read aloud is unknown.

Reading aloud differs from other linguistic input opportunities (i.e., use of instructional vocabulary during free play and use of conversational turns) in that it is usually a teacher-led instructional activity. Compared to free play, teacher linguistic input to preschoolers during book reading included significantly more varied vocabulary, elaborated comments, introduction of challenging concepts, and use of decontextualized language (Gest, Holland-Coviello, Welsh, Eicher-Catt, & Gill, 2006). However, reading aloud was also associated with preschool teachers' use of fewer conversation-promoting utterances than a free play "playdoh" activity (Girolametto, Weitzman, van Lieshout, & Duff, 2000). Although it is clear that teachers' linguistic input during book reading is likely to differ from other activities – with regards to contributions from both the text and the teacher – it is unclear how teachers for CHL engage in reading aloud.

Research Questions

To what extent do teachers for CHL use linguistic input strategies during a sample of teacher-child interactions?

1. What is the frequency and variability of teachers' use of instructional words during free play?
2. What is the frequency and variability of teachers' use of conversational turns throughout the school day?
3. What is the frequency and variability of teachers' use of reading aloud?

The purpose of this study was to describe teachers' use of three linguistic input strategies that promote vocabulary development in young children: use of instructional vocabulary during

free play, use of conversational turns, and reading aloud. Teachers alter their linguistic input based on context (Girolametto, Weitzman, van Lieshout, & Duff, 2000) so this study examined multiple activities that are common in early childhood preschool programs.

CHAPTER III

METHODS

Participants

Six teachers were recruited from the Mama Lere Hearing School at Vanderbilt University Medical Center. Five teachers consented and completed a participant information form that included questions about their educational training and years of teaching experience (see Appendix A). The teachers were 26-45 years old ($M = 31.2$) and had 1.5-16.5 years of teaching experience ($M = 6.7$). All teachers were female, held Master's degrees, and had state certification in *Special Education Hearing PreK-12*. Three teachers had additional certification in one of the following areas: *Special Education Modified K-12*, *Elementary Education K-6*, or *Early Childhood Education PreK-3*. The sample was appropriate for this exploratory study because it prevented the introduction of site-specific variables (e.g., different free play routines) that could influence teachers' use of the target strategies.

Parents of children whose teachers consented to the study were recruited to consent their children. A total of 26 children were consented: 16 CHL and 10 children without hearing loss. Four classrooms had 100% student participation; the remaining classroom had 40% student participation. Two additional children (one with and one without hearing loss) enrolled in the school and were consented after the study began. Data were not collected for either child because one attended part-time and the other was placed in a classroom that had already completed the study. Information about children who were consented was collected from school records: demographics (e.g., age, sex, ethnic/racial group, disability status, home language),

hearing history (e.g., age of amplification, type of amplification, pure-tone average [PTA] in the better ear, speech recognition threshold [SRT]), and standardized assessments of vocabulary, language, articulation, and cognitive/academic performance. A summary of student information is presented in Appendix B. Children without consent ($n = 3$) participated in the regular schedule to maintain the school-arranged class groupings but did not have individual data collected.

Setting

Data were collected at the Mama Lere Hearing School at Vanderbilt University Medical Center. The school is a private early childhood program that specializes in the development of spoken language. In addition to certified teachers of the deaf, the school has on-site pediatric audiologists and speech language pathologists who specialize in working with CHL. At the time of data collection, the preschool served approximately 20 CHL and 10 children without hearing loss who served as peer language models. Students were primarily grouped by age. Four classes contained 6 children including 2-3 hearing peers; one class contained 5 CHL and no hearing peers. Some children – mostly hearing peers – attended part-time (e.g., 2 or 3 days per week). Students began school at 8:00am and dismissed at 3:00pm with early dismissal at noon on Wednesdays. The school day consisted of typical preschool activities (e.g., morning circle, recess), academic instruction (e.g., handwriting, literacy), and disability-specific programming (e.g., spoken language instruction). A sample schedule is shown in Table 1.

Table 1

Sample Preschool Schedule at the Mama Lere Hearing School

Time	Activity
8:00-8:45	Listening checks, restroom, free play
8:45-9:10	Morning circle and snack
9:10-9:40	Recess
9:40-10:20	Language lessons and Discovery Room free play
10:20-10:40	Music/yoga/library
10:40-11:00	Phonological awareness; handwriting
10:00-11:30	Academic centers
11:30-1:30	Lunch and nap
1:30-1:50	Wake up and restroom
1:50-2:10	Read aloud
2:10-2:30	Optional experiences; academics
2:30-3:00	Free play

The auditory environment at the Mama Lere Hearing School was generally conducive to word learning opportunities in an educational setting. The average sound level in the classrooms during free play was 71.89 dBA, which is slightly lower than the average 74-78 dBA sound level typical in day-care settings (Lindstrom, Wayne, Södersten, McAllister, & Ternström, 2011). The rooms were smaller ($M = 314.06 \text{ ft}^2$) and contained fewer adults and children than typical general education preschool classrooms which likely contributed to favorable listening conditions.

Likewise, students' hearing technology appeared to be in good working condition, with only one teacher reporting changes to program settings for one cochlear implant user. Sound fields and/or personal FM systems were not reported or observed as being used in any of the classrooms. Data

from the LENA audio categories support the assumption that CHL in this study received good access to teachers' linguistic input (see Appendix C).

Free Play and Read Aloud Conditions

Children had several opportunities for free play throughout the day. Some free play occurred in the students' respective classrooms in the morning and afternoon. Free play also occurred in the Discovery Room, which was staffed by two assistant teachers. Children rotated through the Discovery Room for 20 minutes each day and were combined with children from another class. Data were collected during afternoon free play which was scheduled for the last 30 minutes of the school day. The free play activities varied by classroom but included choices such as drawing, puzzles, and playdoh. During free play, children either choose an activity and remained in that center for the duration of free play or moved among activities at will.

Read aloud was scheduled for 20 minutes every afternoon in each classroom. In addition, read aloud sometimes occurred as part of planned instruction (e.g., to support a language lesson on vocabulary or syntax) or as time permitted (e.g., planned lesson ended early). Teachers typically read a single book during a read aloud session.

Instructional Word List

The instructional word list was developed by Dr. Jill Grifenhagen (for a detailed description, see Grifenhagen, 2012). Her list refined Andrew Biemiller's (2010) list of 1,632 root words labeled as "top priority" words for children in the primary grades, which are known by 40-80% of second graders. Grifenhagen adjusted Biemiller's list by eliminating duplicates with multiple meanings and closed-class words such as prepositions and conjunctions and then adding derivational forms that did not alter word meaning. Her final list consists of 3,652 words

that are assumed to provide optimal word learning opportunities for preschool children (see Appendix D). The list was validated on a sample of 6 preschool children in a Head Start program. Although the list has not been validated for children with hearing loss, the rationale for adopting this list was that the populations are similar with regard to being at-risk for language delays and having experienced reduced linguistic input (albeit for potentially different reasons, hearing loss rather than poverty).

Procedures

All procedures and protocols were reviewed and approved by the Vanderbilt Institutional Review Board prior to initiating data collection. Consented teachers completed a participant information form. The primary investigator met with consented teachers prior to data collection to explain study procedures and ensure teachers could operate the recording devices. Information about consented children was collected from school files and teacher reports. Table 2 outlines the specific elements of the linguistic input strategies that were measured.

Table 2

Variables and Outcome Measures

Variables	Outcome Measures
Linguistic Input Strategies	
Instructional words	Number of instructional words per minute Number of semantic supports per instructional word Number of instructional words per activity
Conversational turns	Number of turns per child
Reading aloud	Minutes per day Percentage of contextualized and decontextualized remarks

Instructional words. Data on teachers' use of instructional words were collected using audio and video recordings.

Audio. Teachers' language was recorded using Language ENvironment Analysis (LENA) digital language processors. Teachers wore the LENA throughout the entire school day (approximately 6 hours) to prevent any unintended alterations to their linguistic input that might occur from turning on the recording device when free play or read aloud began. Teachers wore the LENA for four full days of school. Two teachers were recorded an additional day due to scheduling anomalies (e.g., school was closed for inclement weather). After excluding any days that might not have represented typical free play (e.g., more than one child was absent), two days were randomly selected for analysis. For each of those two days, a 10-minute sample from free play was analyzed for teachers' use of instructional vocabulary. Prior studies have used a single recording sample of 10 minutes (Bowers & Vasilyeva, 2011; Dickinson & Porche, 2011); using two recording samples in the present study provided insight into the relative stability of teacher linguistic input. Samples began when children were actively engaged in free play activities and the classroom was captured on video. Although teachers knew they were being recorded, they were blinded as to which aspects of their language would be analyzed. At the end of each day, audio recordings were saved as .wav files using the LENA software. Files selected for analysis were transcribed using rev.com. Rev.com is a paid transcription service that guarantees at least 99% accuracy.

Video. Free play sessions were video recorded to allow for analysis of semantic supports for meaning that might accompany the use of instructional words as well as potential activity influences. Video recordings were also used to verify audio information from the LENA (e.g., if confusions arose about whether linguistic input came from the lead teacher or another adult in

the room). The camera was set up in a corner to capture as much of the classroom as possible. Although the primary investigator briefly entered the classrooms to start the camera, the random selection of two sessions for analysis minimized any potential impact of the video recording process on teacher linguistic input or student behaviors that might have affected teacher linguistic input.

Reliability. All transcripts of teacher linguistic input during free play were verified by a trained graduate research volunteer. Half of the transcripts were coded by the research volunteer for the presence of semantic supports and activity influences.

Conversational turns. Children who were consented wore a LENA throughout the school day for the same days as their teachers. Their LENA was worn inside specially designed t-shirts that have a pocket on the chest to hold the recording device. Files from the children's LENAs were uploaded at the end of each school day. All available student data were used to analyze conversational turns.

Reliability. Multiple studies have evaluated the reliability of the LENA (Christakis et al., 2009; McCauley, Esposito, & Cook, 2011; Xu, Yapanel, & Gray, 2009). There is a strong correlation ($r = .92$) between the LENA and human coders for the number of adult words spoken during 12-hour recordings (Xu, Yapanel, & Gray, 2009). Overall, the reliability of the LENA is considered good with approximately 70% or higher agreement with human coders for labeling speech produced by the key child (i.e., the child wearing the LENA), adult male, and adult female speakers (VanDam & Silbert, 2013). The LENA is also reliable when used with CHL (VanDam et al., 2015) and in preschools (McCauley, Esposito, & Cook, 2011). The shirts worn by the children that hold the device are not believed to influence the effectiveness of the LENA's recording (VanDam, 2014).

Reading aloud. Teachers were asked to complete a reading log during the data collection phase that included start and end times of read aloud, titles of books read, number of children being read to, the person doing the reading, and the purpose of the reading. Teachers were instructed to record all instances of reading aloud and not only scheduled read aloud times.

Excluding any sessions that were atypical (e.g., more than one student was absent), two read-aloud sessions were randomly selected, transcribed, and coded for the presence of contextualized and decontextualized teacher talk. Procedures for coding were based on definitions and examples provided by Hindman, Wasik, and Erhart (2012). Coding began at the start of read aloud time (i.e., when the students transitioned from the previous task and the teacher began introducing a book) and lasted for the duration of the activity.

Reliability. Teacher reports of reading were verified using the LENA recordings. A trained graduate research volunteer coded half of the read aloud recordings for contextualized and decontextualized remarks.

Data Analysis

Primary analyses. The research questions were addressed using descriptive analysis. Teachers' use of the target linguistic input strategies was analyzed to provide an initial estimate of how these strategies are incorporated into instruction for CHL. Characteristics of the auditory environment were also analyzed to provide context for teachers' use of the linguistic input strategies.

Instructional words, semantic supports, and activities. Word learning opportunities were identified by comparing transcripts of teacher linguistic input during free play to the instructional word list using Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 1984).

When instructional words were identified, they were checked using the audio and video recordings to determine whether teachers' use of the instructional word was directed to a child/children. If the word was spoken to another adult or during self-talk, the word was not counted as a word learning opportunity. If the word was spoken to a child/children, it was considered a word learning opportunity and included in the results. Instructional words that were repeated counted as separate word learning opportunities for a total word count; but repeated words were counted only once for a unique word count. The number of word learning opportunities was divided by the length of the recording session to determine the number of instructional words used per minute. A paired samples t-test compared the number of instructional words used during the two data samples for each teacher. If the t-test indicated the means were not different, data from the two days selected for analysis were then averaged to estimate each teacher's use of instructional words per minute. The per minute interval was selected so the results herein can be compared to a prior study that used this metric (i.e., Grifenhagen, 2012).

Each use of an instructional word in adult-to-child speech was coded for three types of semantic supports: verbal supports for meaning, nonverbal supports for meaning, and extended discourse. When an instructional word was identified, the conversational context adjacent to the word was reviewed using the corresponding transcript and video recording. Semantic supports were operationalized based on Grifenhagen's (2012) methods. Verbal supports for meaning included spoken information such as definitions, examples of the instructional word, and contextual support. Nonverbal supports for meaning included pictures, objects, gestures, facial expressions, and intonation. Extended discourse included at least five conversational turns between the teacher and a child/children. If more than one occurrence of a support was used for

a single instructional word, each occurrence was counted separately. The total number of occurrences for each semantic support was divided by the number of instructional words to obtain the use of each semantic support per instructional word. Data from the two days selected for analysis were averaged to determine each teacher's use of semantic supports per instructional word.

In addition to semantic supports, child activities were coded when instructional words were identified. Child activities were recorded directly (e.g., puzzles, drawing, playdoh). Given the variability of activities offered in each classroom, teachers' use of instructional words was not analyzed at the individual activity level. Instead, activities were grouped into the following broad categories: pretend play, constructive play, manipulatives/books, and nonplay (Kontos, 1999). Cumulative data from activities over the two days selected for analysis were averaged to determine each teacher's use of instructional words per activity.

Conversational turns. Teachers' use of conversational turns was analyzed using the LENA software. The software recognizes conversational turns as instances when the target child and an adult engage in verbal exchanges with no more than 5 seconds between turns and without interruption from other speakers. The number of conversational turns was divided by the recording time to calculate the number of conversational turns per minute for each child and each day of data collection. The average of the conversational turns per minute for all the students within each classroom was used to determine the average number of conversational turns students' experienced with each teacher.

Reading aloud. The average number of minutes per day spent reading aloud was calculated by dividing the total read aloud minutes by the number of days data were collected. The number of contextualized and decontextualized remarks was averaged, respectively, for the

two days of data collection for each teacher. A paired samples t-test compared the number of contextualized and decontextualized remarks used during the two data samples for each teacher.

Supplemental analyses. Three additional analyses were conducted following data collection. First, teachers were interviewed about their experiences creating language-rich environments for young children with hearing loss (see Appendix E). These interviews were designed to gain insight into the teachers' individual descriptions of the linguistic input strategies they use. For example, a teacher whose students have concomitant conditions might describe different instructional goals (e.g., gross motor practice) than a teacher whose students are diagnosed only with hearing loss. Interviews were conducted by the primary investigator and lasted approximately 10 minutes.

Second, exploratory information was gathered about teachers' activities during free play. Teachers' activities were grouped into the following categories: directly engaged, indirectly engaged, and otherwise engaged. Directly engaged meant the instructional word was used when the teacher was engaged in the same free play activity as the child, indirectly engaged meant the teacher was primarily engaged in a different free play activity than the child being talked to, and otherwise engaged meant the teacher-to-child speech occurred while the teacher was not engaged in a child-specific free play activity (e.g., sitting at a desk). This information provided insight into the teachers' activities during free play which could have influenced their use of instructional words.

Third, one read-aloud transcript per teacher was analyzed for teacher responsivity. Teacher responsivity refers to teachers' use of practices that promote conversational exchanges with children such as responding to children's initiations and asking open-ended questions to encourage extended discourse. Teacher responsivity has been called a "powerful classroom

predictor” of preschoolers’ receptive vocabulary growth (Dickinson, 2006, p.189). Although nonverbal cues (e.g., eye contact) can be used to promote conversations with children, only teachers’ use of linguistic remarks was analyzed in this study. A description of the coding is provided in Appendix F.

CHAPTER IV

RESULTS

This study explored teachers' use of three linguistic input strategies that promote vocabulary development in young children: use of instructional vocabulary during free play, use of conversational turns, and reading aloud. The results provide preliminary data about how teachers for CHL use the aforementioned strategies.

Research Questions: To what extent do teachers for CHL use linguistic input strategies during a sample of teacher-child interactions?

Research question 1. *What is the frequency and variability of teachers' use of instructional words during free play?* Teachers used an average of 1.26 ($SD = 0.82$) total instructional words per minute and an average of 0.69 ($SD = 0.32$) unique instructional words per minute. Table 3 shows the average instructional word use per minute in each classroom. Paired t-tests for total and unique instructional word use across the two days selected for analysis were not significant ($p = 0.48$ and $p = 0.68$, respectively; see Figure 1). Total instructional word use ranged from a low of one word to a high of 40 words during a single 10-minute free play sample; unique instructional word use ranged from one to 15 words. Three total words were excluded from the analysis: two were used as children's names and one did not occur in adult-to-child speech.

Table 3

Instructional Word Use Results

Teacher	1	2	3	4	5
Total words per minute	1.80	.55	.30	2.25	1.40
Unique words per minute	.95	.45	.25	.95	.85

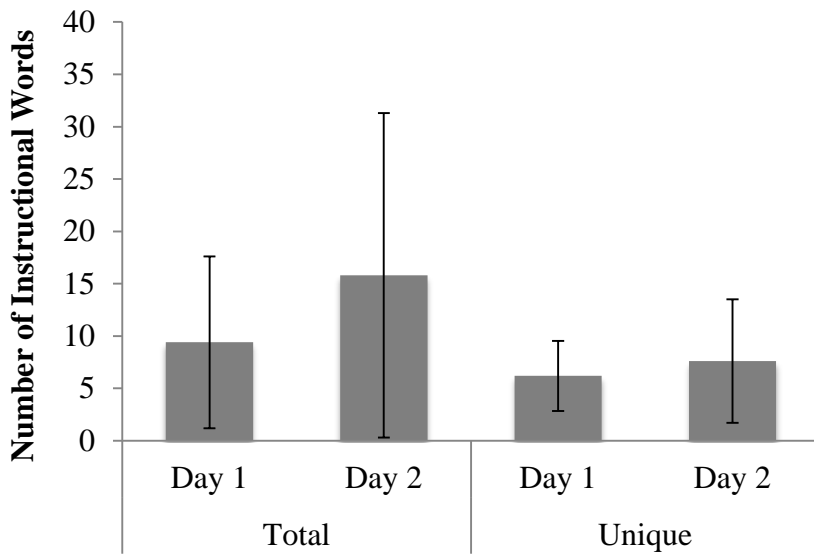


Figure 1. Paired t-test results (means and standard deviations) for use of instructional words during free play.

Teachers' use of semantic supports was examined each time an instructional word was used in adult-to-child speech. Semantic supports included Verbal Supports for Meaning, Nonverbal Supports for Meaning, and Extended Discourse. Overall, semantic supports were not highly prevalent during free play. Three of the five teachers did not use any semantic supports in conjunction with instructional words. The remaining two teachers rarely used semantic supports.

The highest use by a teacher during a single 10-minute free play segment was 0.38 semantic supports per instructional word. It should be noted that there were several occurrences when teachers were not in view of the video camera so that coding for nonverbal supports was not possible. Regardless, Nonverbal Supports for Meaning were most common ($M = 0.10$ per instructional word) and usually manifested as gestures (e.g., pointing to the bag of *tools*). Verbal Supports for Meaning were used one time by one teacher ($M = 0.01$ per instructional word). None of the teachers used extended discourse to support their use of instructional words. Data for each teacher are shown in Table 4.

Table 4

Average Use of Semantic Supports per Instructional Word

Teacher	1	2	3	4	5
Verbal Supports for Meaning	0	0	0	0	.04
Nonverbal Supports for Meaning	.11	0	0	0	.29
Extended Discourse	0	0	0	0	0

Due to the variability of free play choices across classrooms, children’s activities were analyzed using Kontos’ (1999) categories: *pretend play* such as dressing up and assuming the roles of other characters, *constructive play* such as art, blocks, and playdoh, *manipulatives/books* such as puzzles, games, and reading, and *non-play*. Across teachers, 50.79% of instructional word use occurred during constructive play, followed by 34.13% during manipulatives/books. An additional 11.91% of instructional words were used during non-play (e.g., while a child was

using the restroom) and 3.18% were used during pretend play. Frequency counts indicated that children engaged in manipulatives/books in every classroom on 9 of the 10 days included in the analysis, constructive play on 5 days across 3 classrooms, and pretend play on 4 days across 3 classrooms. Data for each teacher are presented in Table 5.

Table 5

Average Percentage of Instructional Word Use per Activity

Teacher	1	2	3	4	5
Pretend play	0	36.36	0	0	0
Constructive play	2.78	0	0	77.78	100
Manipulatives/books	88.89	54.55	0	11.11	0
Non-play	8.33	9.09	100	11.11	0

Research question 2. *What is the frequency and variability of teachers' use of conversational turns throughout the school day?* Teachers' use of conversational turns was estimated by averaging the conversational turn count reported by the LENA for all consented students in a teacher's class. Teachers averaged 1.36 ($SD = 0.28$) conversational turns per minute. Data for each teacher are shown in Table 6.

Table 6

Conversational Turns Results

Teacher	1	2	3	4	5
Conversational turns per minute	1.04	1.75	1.08	1.27	1.19

Research question 3. *What is the frequency and variability of teachers' use of reading aloud?* Reading aloud occurred in every classroom on every day of data collection. Two read aloud sessions were led by assistant teachers; all other reading aloud was conducted by lead teachers. Teachers read between one and three times per day ($M = 1.73$, $SD = 0.77$). Most sessions were planned in advance; some sessions occurred spontaneously (e.g., previous activity ended earlier than expected and the teacher initiated read aloud). Read aloud sessions lasted for an average of 10.15 minutes ($SD = 3.68$). Teachers read for an average of 16.40 minutes per day ($SD = 6.06$). Data for each teacher are presented in Table 7.

Teachers used contextualized and decontextualized remarks during every read aloud session selected for analysis. All except one teacher averaged more decontextualized remarks than contextualized remarks. The mean percentage of teacher talk containing contextualized remarks was 12.80% ($SD = 4.12$); the mean percentage of decontextualized remarks was 25.55% ($SD = 10.84$). The remaining 61.65% of teacher talk was characterized by other remarks (e.g., praising students, directing behavior). Paired t-tests across the two sessions selected for analysis were not significant for use of contextualized ($p = .92$) or decontextualized remarks ($p = .24$; see Figure 2).

Table 7

Reading Aloud Results

Teacher	1	2	3	4	5
Average time per read aloud session (mm:ss)	9:41	16:06	9:26	9:36	5:57
Average read aloud time per day (mm:ss)	16:58	24:08	16:30	17:17	7:08
% Contextualized remarks	10.34	18.99	9.23	15.04	10.39
% Decontextualized remarks	20.00	35.02	31.79	31.86	9.09
% Other remarks	69.66	45.99	58.97	53.10	80.52

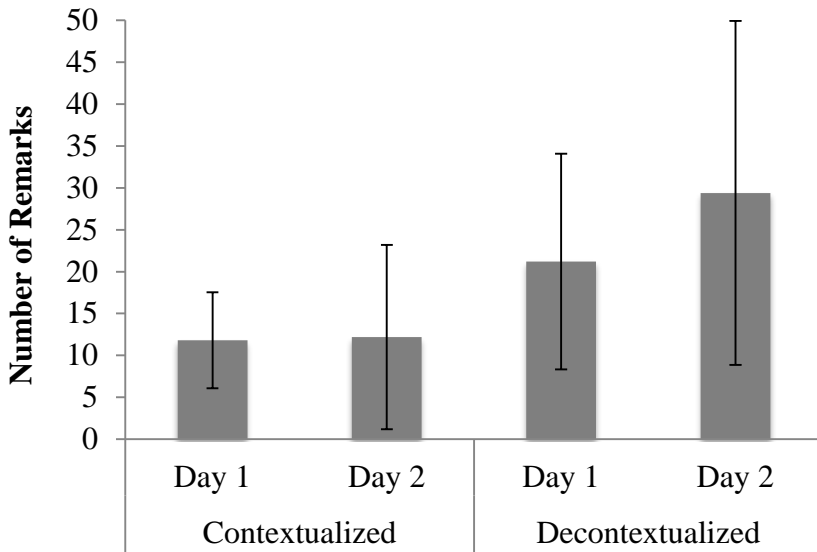


Figure 2. Paired t-test results (means and standard deviations) for use of contextualized and decontextualized remarks during read aloud.

Reliability. All transcripts selected for analysis were reviewed for accuracy by a graduate student studying speech language pathology. On the free play transcripts, four instructional words (one in each of four separate transcripts) were added to the original transcripts. All free play transcripts were reviewed for the use of instructional words. Reliability for the instructional words occurring in adult-to-child speech was 99%. Agreement on coding for semantic supports was 96%. Judgements about children’s activities during instructional word use was 90% and agreement on teachers’ engagement was 100%. For read aloud, 50% of the transcripts were coded for teachers’ remarks. Inter-observer reliability was 88.61% (range = 67.57% - 96.15%). Four of the five transcripts were coded with over 89% agreement.

Supplemental Analyses

An exploratory look at teacher activities during free play showed teachers used more instructional words when they participated directly in free play with the children than when they were otherwise engaged. Teachers who were engaged in free play almost always directed their use of instructional words to children who were engaged in the same activity. Teachers who were otherwise engaged during free play were often observing and recording children’s spontaneous language or preparing for dismissal. It should be noted that one teacher stated during her post-study interview that she assumed she was not supposed to interact with the children during this part of the study (even though teachers were directed to “do what they usually do” during free play). Comments made during free play by another teacher (e.g., “Tell your friends. I’m gonna watch.”) revealed that – although she interacted with the children directly during the first day of analysis – she intentionally interacted with them as little as possible on the second day.

Table 8

Raw Number of Instructional Word Use Relative to Teacher Activity

Teacher	1	2	3	4	5
Directly engaged	35	0	0	40	23
Indirectly engaged	1	0	0	0	0
Otherwise engaged	0	11	6	5	5

Teacher responsivity to students during read aloud was variable across teachers. Teacher responses to teacher-initiated conversations were almost twice as prevalent as student-initiated conversations. Teachers were also more likely to continue conversations they initiated; only one teacher continued a student-initiated conversation. Teachers responded to over 86% of conversational opportunities. Just over a third of teacher responses were considered semantically empty (e.g., praise statements). Data for each teacher are presented in Table 9.

Table 9

Teacher Responsivity Results

Teacher	1	2	3	4	5	<i>M</i>
Total Student-Initiated Responses	4	7	10	13	0	6.8
SI	2	6	6	8	0	4.4
SIContinue	0	0	3	0	0	0.6
SIEmpty	2	1	1	5	0	1.8
Total Teacher-Initiated Responses	6	20	8	27	4	13
TI	0	9	1	4	1	3
TIContinue	0	5	0	16	2	4.6
TIEmpty	6	6	7	7	1	5.4
Total of all responses	10	27	18	40	4	19.8
SIX	0	5	0	4	4	2.6

Note: See Appendix F for coding information.

Summary of Results

Teachers' use of three linguistic input strategies associated with vocabulary development in children without hearing loss was sampled from the language environment CHL experience in the selected preschool program. All five teachers used each of the target strategies on every day sampled. During free play, teachers used an average of 1.26 total instructional words per minute and an average of 0.69 unique instructional words per minute. Throughout the day, teachers averaged 1.36 conversational turns per minute. Teachers read for an average of 16.40 minutes per day. During read aloud, 12.80% of teachers' remarks were contextualized and 25.55% were

decontextualized. There was considerable variability between teachers in their use of each linguistic input strategy. A summary of the data for each teacher is presented in Table 10. The results of this study address a gap in the literature by describing how the selected linguistic input strategies are used by teachers for CHL.

Table 10

Summary of the Data

Teacher	1	2	3	4	5
Total instructional words per minute	1.80	.55	.30	2.25	1.40
Unique instructional words per minute	.95	.45	.25	.95	.85
Conversational turns per minute	1.04	1.75	1.08	1.27	1.19
Average read aloud time per day (mm:ss)	16:58	24:08	16:30	17:17	7:08
% Contextualized remarks	10.34	18.99	9.23	15.04	10.39
% Decontextualized remarks	20.00	35.02	31.79	31.86	9.09

Note: Gray shading indicates results above the mean.

CHAPTER V

DISCUSSION

The classroom language environment is important in educational programming for CHL because preschool language environments are associated with students' oral language and literacy outcomes. Teachers contribute to the language environment through linguistic input. This study explored the frequency and variability of teachers' use of three linguistic input strategies that typically occur during teacher-child interactions in preschool and are associated with vocabulary development. The results of this descriptive study provide information about preschool language environments for CHL. Specifically, two major findings emerged: 1) the frequency of teachers' use of the target linguistic input strategies was broadly consistent with, but sometimes lower than findings reported by other studies, and 2) the variability of teachers' use of the target linguistic input strategies was high. Both of these findings are discussed in more detail below.

Major Findings

Linguistic input strategies: Frequency. Overall, teachers' use of the target linguistic input strategies was consistent with or sometimes lower than findings reported by other studies. In Grifenhagen's (2012) study of 51 Head Start preschool classrooms, teachers' mean use of instructional words during free play was 2.04 total words per minute and 1.14 unique words per minute. Grifenhagen's results are almost twice as high as the instructional word use in the present study (1.26 total and 0.69 unique words per minute). Despite the difference in overall

word use, the ratio of unique to total instructional word use was similar in that unique words comprised approximately half of the total instructional words used in both studies. Dickinson and Porsche (2011) also reported low use of sophisticated vocabulary during free play. In programs serving low-income children, only .01% of words spoken by preschool teachers were low-frequency words.

Teachers' use of semantic supports per instructional word was also lower than Grifenhagen's (2012) results of 0.42 verbal supports for meaning, 0.27 nonverbal supports for meaning, and 0.39 extended discourse (compared to 0.01 verbal, 0.10 nonverbal, and no use of extended discourse in the present study). Nonverbal supports for meaning were used least often in Grifenhagen's sample whereas they were the most common support used in the present study. Given Grifenhagen's finding that use of nonverbal supports for meaning was associated with vocabulary gains for children with low initial language, the use of nonverbal supports for meaning with CHL is desirable and likely supportive of vocabulary growth.

Although the current study did not compare teachers for CHL to other preschool teachers, the low use of instructional words and semantic supports could reflect teachers' implementation of free play. In the current sample, some teachers used free play to observe and record students' spontaneous language – an activity common for teachers of CHL but uncommon for general education teachers – or to prepare for the end of the school day because free play occurred directly before dismissal. The presence of the Discovery room (a separate classroom students rotated to for free play activities) might also have contributed to differences in teacher engagement and linguistic input. Knowing children had already received free play earlier in the day in the Discovery room could have made teachers more likely to use classroom free play for observation and dismissal preparations, thereby reducing their adult-to-child interactions and use

of instructional vocabulary. Student differences could also have contributed to the differing outcomes of instructional words and semantic supports between this study and Grifenhagen's results. Young CHL often exhibit delayed language skills which could have inhibited the amount and quality of student talk (thereby potentially attenuating teacher talk) as well as the use of extended discourse.

Although free play activities differed among the classrooms for CHL, teachers used greater amounts of instructional words during constructive play than during other types of play. This result is consistent with Kontos' (1999) finding that teachers spent the highest amount of free play time (approximately 41%) engaged in constructive play activities with preschool children, and talked more than during manipulatives and nonplay activity settings. Teachers in the Kontos study spent the least amount of time – and the least amount of talk – in pretend play activities which is also consistent with the present study's result that the fewest number of instructional words per activity occurred during pretend play.

The frequency of teachers' use of conversational turns ($M = 81.6$ turns per hour) was similar to what has been reported in other studies. Although Wiggin and colleagues (2012) did not report raw data, 7 of the 8 students were exposed to more than 60 conversation turns per hour while in a preschool for CHL, and five of the students were exposed to 80 or more. In natural/home environments (i.e., not school settings), toddlers with mild to severe hearing loss were exposed to approximately 60 conversational turns per hour (Ambrose, VanDam, & Moeller, 2014). In a preschool for children with autism spectrum disorders, children also experienced 60 conversational turns per hour (Dykstra, Sabatos-DeVito, Irvin, Boyd, Hume, & Odom, 2012). Norms determined by the LENA Foundation show a decreasing trend in the number of conversational turns most children experience at home between 26 and 48 months of

age, with the 50th percentile being under 40 conversational turns per hour by the time children are 4 years old. An interesting finding from the current study that warrants further investigation is that CHL were engaged in conversational turns more than children without hearing loss in three of the four teachers' classes that included hearing peers. Although one might assume the presence of peers with typical language might divide teachers' linguistic input – thereby reducing the amount provided to CHL – that does not seem to be the case for the children in this study.

The frequency of read aloud – although higher than the 4 minute per day average in Connor, Morrison, and Slominski (2006) – was lower than the minimum of 45 minutes per day across three sessions recommended for preschool classrooms (Dickinson, 2001). Only one read aloud session lasted the duration of the scheduled 20-minute afternoon read aloud time. Given that read aloud was part of a school-wide schedule, it is possible individual teachers altered their plans to fit the needs of the children. Although teachers sometimes read aloud in addition to the scheduled time, only one teacher met (and exceeded) reading aloud for a total of 20 minutes during the day.

Frequency of teachers' use of contextualized and decontextualized remarks differed from Hindman, Wasik, and Erhart's (2012) results in both frequency and configuration. Unlike the CHL, the sample of Head Start preschoolers heard more contextualized than decontextualized remarks. Both types of remarks comprised 58% of teacher talk for the Head Start preschoolers compared to just over 38% for CHL.

There are several factors that might have influenced the amount of contextualized and decontextualized remarks teachers' made during read aloud. The selection of the book itself can be associated with teachers' linguistic input. Teachers have a longer mean length of utterance

and make more comments about vocabulary when reading narrative stories than when reading predictable texts (Dickinson, Hofer, Barnes, & Grifenhagen, 2014). Other considerations are whether the book is fiction or nonfiction, whether the book was selected as part of a larger set of read aloud material, and the complexity of the text itself. Teachers' remarks during read aloud might also be influenced by how many times the story has been read to the children. For example, one teacher explained the word *mozzarella* when she initially read a book but, after several readings, she used a cloze procedure to promote children's expressive use of the word. Whereas the teacher's remarks would be coded as decontextualized during the first reading, they would not be considered contextualized or decontextualized during the later reading. It is unknown whether teachers for CHL reread texts more often than general education preschool teachers; however, rereading was implemented frequently by the teachers in this study.

In summary, the frequency of teachers' use of the target linguistic input strategies was consistent with but sometimes lower than those reported in previous studies. These other studies also report generally low use of linguistic input strategies, thereby suggesting potentially missed opportunities for teachers to further promote language growth. For example, teachers serving economically disadvantaged preschoolers only used linguistic input associated with student language growth (e.g., asking open-ended questions) about 36% of the time (Turnbull, Anthony, Justice, & Bowles, 2009). Although an optimal amount of teacher talk is unknown – and too much could be detrimental to children's language and literacy outcomes (Dickinson & Porche, 2011) – it is generally agreed that teachers' use of language-promoting linguistic input could be increased in preschools, and that was observed herein as well.

Linguistic input strategies: Variability. Teachers' use of the target linguistic input strategies was highly variable across teachers. When teachers' use of total instructional words per minute is extrapolated over 30 minutes of daily free play, the number of instructional words students would be exposed to in a school year (assuming 180 days) ranges from 1620 to 12,150 words. That is, one teacher's students will hear seven and a half times the amount of instructional words as students in another teacher's class. High variability was also found in Grifenhagen's (2012) study, where teachers' maximum use of total instructional words per minute was over 12 times the minimum amount.

Teacher conversational turn rates were also highly variable in this study. Using a conservative estimate of four hours of potential linguistic input per school day (to account for nap and other quiet times), Teacher 2's children would participate in over 30,000 conversational turns more than Teacher 1's children over the course of a school year. Again, this variability is consistent with other studies. Wiggin and colleagues (2012) found conversational turns ranged from fewer than 60 per hour to over 160 per hour in a small sample of children in an oral preschool. Although they were not in a preschool environment, toddlers with hearing loss were engaged in conversational turns ranging from 16 to 103 per hour (Ambrose, VanDam, & Moeller, 2014). Preschool teachers for children with autism spectrum disorders were also highly variable with a range of approximately 6 to 114 conversational turns per hour (Dykstra, Sabatos-DeVito, Irvin, Boyd, Hume, & Odom, 2012). The norms determined by the LENA Foundation show high variability in the number of conversational turns 4-year-olds experience at home, with the 10th percentile experiencing fewer than 17 conversational turns per hour and the 90th percentile experiencing almost 75 conversation turns per hour.

Similarly, high variability was observed between teachers during read aloud. The teacher who read aloud the most averaged three times more read aloud time per day than the teacher who read aloud the least. This variability is consistent with results reported by Hindman, Wasik, and Erhart (2012) in which the maximum duration of read aloud sessions by preschool teachers was about four times longer than the minimum amount. Variability across teachers was also found in the linguistic input they provided during read aloud. In this study, teachers' maximum use of contextualized remarks was double the minimum amount; maximum use of decontextualized remarks was almost four times the minimum amount. Again, this variability is consistent with Hindman and colleagues' (2012) findings during read aloud in which teachers' use of contextualized remarks ranged from one third to 150% of the average and use of decontextualized remarks ranged from 10% to more than 200% of the average.

Although use of the target linguistic input strategies was highly variable across the five teachers, there was low variability within teachers. Paired t-tests across two days were not significant for use of instructional vocabulary during free play, use of semantic supports with instructional vocabulary, use of conversational turns, or use of contextualized and decontextualized remarks during read aloud. This finding suggests relative stability in teachers' use of linguistic input in this sample of teacher-child interactions. One could speculate that stability within teachers combined with variability across teachers at the same school could indicate that teacher-level variables uniquely influence teachers' use of linguistic input along with student- and school-level variables. Indeed, Turnbull and colleagues (2009) state, "It is important to note that the prevalent interaction style used by a given teacher is a powerful mediator of the type of language children experience and, ultimately, children's language growth within the preschool classroom" (p.57). Teachers' beliefs about teaching – such as the extent to

which they feel their responsibility is to disseminate information and control their classroom – might impact the opportunities they provide for language-stimulating activities such as conversational turns (Dickinson, Freiberg, & Barnes, 2011). One possible teacher-level variable is teacher responsivity. Although it was beyond the scope of this study to determine a relationship between teacher responsivity and teacher linguistic input, other studies have demonstrated the importance of adults’ conversational responsivity to children’s language development (Cabell et al., 2011; Girolametto, Weitzman, van Lieshout, & Duff, 2000; Tamis-LeMonda, Bornstein, & Baumwell, 2001).

Limitations

Although this study was an important first step towards examining teachers’ use of linguistic input strategies for CHL, it has several limitations. First, the sample size was small and the teachers were recruited from a single school. The single location was beneficial in that it controlled for potential cross-site differences that could have made the results difficult to interpret. However, recruiting teachers from a single school limited the potential number of teacher participants as well as the generalizability of the findings.

Second, the data collection could not distinguish between teachers’ use of the target linguistic input strategies for CHL and children with normal hearing who were enrolled in the school as peer models. Thus, teachers for CHL might implement the target strategies differently in classrooms with different configurations of students (e.g., only CHL, higher ratio of hearing peers to CHL). Although this study did not systematically compare the number of instructional words spoken to CHL versus hearing peers during free play, review of the transcripts and observation of the videos revealed teachers frequently talking to CHL. This observation is supported by data from the LENA that showed CHL experienced more conversational turns than

children without hearing loss. Therefore, although the target linguistic input strategies were used with CHL, it is uncertain how the presence of children without hearing loss might have influenced each teacher.

A third limitation is that each linguistic input strategy was examined only during a single activity. Although sampling a variety of strategies across the school day was a general strength of the study in that it provided a broad description of the overall language environment CHL experience, the method does not provide comprehensive information about teachers' implementation of each strategy throughout the full school day. For example, this study examined teachers' use of instructional vocabulary during free play but teachers might also use instructional vocabulary during read aloud (Dickinson, Hofer, Barnes, & Grifenhagen, 2014; Gest, Holland-Coviello, Welsh, Eicher-Catt, & Gill, 2006). Similarly, decontextualized remarks are most common during mealtime – a time of day that was not sampled in this study (Gest, Holland-Coviello, Welsh, Eicher-Catt, & Gill, 2006).

Finally, this study was subject to the difficulties of collecting observational data that are common in dynamic school environments. As expected, there were minor inconsistencies during data collection both across and within classrooms. For example, although classrooms were similar in the number of students assigned to each teacher, they were not equal. Unexpected situations (e.g., a student getting sick and leaving school early) were rare but it is impossible to determine what impact – if any – these events might have had on the results. The presence of additional adults in the classroom could also have influenced how teachers talked to children. Attempts were made to reduce these occurrences by posting signs on the classroom doors and by having teachers record when other adults were present. Again, these instances were infrequent but it is possible they affected the final outcomes. Despite these variables, it could be argued

that such anomalies are typical of school programs, thereby supporting the ecological validity of the present results.

Future Directions

This study provided a preliminary examination of teacher linguistic input to CHL. Three specific linguistic input strategies that are associated with vocabulary growth in typically-developing children were explored in a sample of teacher-child interactions in a preschool for CHL. Given the paucity of information about teachers' use of linguistic input strategies for CHL, there are multiple research avenues that should be explored.

First, future research should expand on the current study to a) determine whether the present results are indicative of the broader population of teachers for CHL, b) explore a wider variety of teacher linguistic input techniques (e.g., cognitively-challenging talk) across broader contexts (e.g., mealtime), and c) determine whether teacher linguistic input is associated with student language and literacy outcomes for CHL. Given advancements in hearing technology and early identification, the language development of today's CHL often resembles typically-developing children more closely than other special populations (VanDam et al., 2015). Thus, there is reason to believe the considerable evidence on the impact of teachers' linguistic input to typically-developing children might prove true for CHL, thereby making it an important field of study.

Second, studies are needed to explore and evaluate the relative contributions of underlying factors that contribute to teachers' linguistic input. Factors implicit to the child, the teacher, and the context/setting are likely to impact how teachers talk (Farkas & Beron, 2004; Hoff, 2006; Maier, Vitiello, & Greenfield, 2012; Massey, Pence, Justice, & Bowles, 2008). For

example, teachers' use of linguistic stimulation techniques – such as asking open-ended questions – usually occurred independently of children's discourse which might indicate teacher-level and/or context/setting factors contribute more to teacher-talk styles than child-level factors (Turnbull, Anthony, Justice, & Bowles, 2009). Identifying these variables and their potential influence has implications for developing interventions intended to improve teachers' use of linguistic input.

Finally, future studies should evaluate interventions designed to increase teachers' use of linguistic input strategies. Specifically, intervention studies are needed to determine the frequency of use that maximizes vocabulary and language outcomes for CHL. A theoretical “sweet spot” would likely balance teachers' use of linguistic input strategies with ample time for students' linguistic contributions (Dickinson & Porche, 2011). Additional studies are also needed to determine the differential effects of teachers' use of linguistic input strategies on children with varying language levels. Previous studies support the need for individualized interventions in response to children's development (Grifenhagen, 2012; Hindman, Wasik, & Erhart, 2012), findings that are supported by the Emergentist-Coalition Model of word learning.

In summary, multiple opportunities exist to extend the current study and examine teachers' use of linguistic input with CHL. The overall goal – to create language-rich school environments for young CHL – has potential to impact the long-term language and literacy outcomes for CHL. As stated by Dickinson and Tabors (2002): “Our data strongly indicate that it is the nature of the teacher-child relationship and the kinds of conversations that they have that makes the biggest difference to early language and literacy development” (p.17). This study contributed to an emerging understanding of how teachers for CHL use linguistic input strategies during teacher-child interactions in the hopes that future studies might capitalize on the

information and provide further insights into how teachers can best serve the unique educational needs of children with hearing loss.

Appendix A

Teacher Intake Form

Please complete the form below, including as much detail as possible. Thank you!

1) First Name: _____

2) Last Name: _____

3) Date of Birth: _____

4) Age (years): _____

5) Gender: Female Male Declined

6) Educational Background: Please list your institution(s) of higher education, degree(s) earned, and field(s) of study (Ex: Vanderbilt Univ, B.S. in Special Education):

7) Teaching Certification: Please list the certification areas listed on your current teaching license: _____

8) Teaching Experience: Please list your current and previous jobs in education as well as approximate dates of employment (Ex: Cobb County Schools in Atlanta, GA; early childhood teacher for children with hearing loss (self-contained, auditory/oral); August 2012-present): _____

9) Please describe any additional experiences that might be relevant to your work as a teacher for children with hearing loss (Ex: I achieved LSLS AvEd certification in 2014. I work as a counselor at a day camp for children with hearing loss (Summers 2012-present). My sister has hearing loss and wears hearing aids.): _____

Appendix B

Student Information

Demographics ($N = 26$)

Age	CHL: $M = 51.81$ months Hearing peers: $M = 46.80$ months Range = 37-62 months
Sex	CHL: 9 female Hearing peers: 6 female Overall = 57.69% female
Race/Ethnicity	White, Non-Hispanic = 84.62% Black/African American = 3.84% Asian = 3.84% More than one race = 7.69%
Disability	Concomitant disability/condition = 23.08% (e.g., cerebral palsy, Pendred syndrome)
Home Language	English = 92.31%
Free/Reduced Lunch	Qualify = 11.54% Unknown = 7.69%

Hearing History

Age of amplification ($n = 15$ CHL)	Birth-12 months = 46.67% 13-24 months = 20.00% 25-36 months = 26.67% 37 months or older = 6.67%
Hearing devices ($n = 16$ CHL)	Bilateral hearing aids: 43.75% Bilateral cochlear implants: 37.50% Bimodal: 12.50% Bone-anchored hearing aid: 6.25%
PTA in better ear ($n = 9$ CHL)	$M = 44.67$ dB HL; range = 33-58 dB HL
SRT in better ear ($n = 8$ CHL)	$M = 28.13$ dB; range = 20-35 dB

Assessments ($n = 14$ CHL)

Receptive vocabulary	$M = 94.71$; range = 73-117
Expressive vocabulary	$M = 104.86$; range = 60-141
Language	$M = 91.43$; range = 63-114
Articulation	$M = 91.21$; range = <55-118
Cognitive/Academic	
Bracken ($n = 7$)	$M = 89.29$; range = 50-116
KBIT-2 ($n = 3$)	$M = 88.67$; range = 70-100

Note: Student assessment information was gathered from school records. Various assessments were used: 1) Receptive vocabulary was assessed using the Peabody Picture Vocabulary Test ($n = 10$) or the Receptive One-Word Picture Vocabulary Test, 2) Expressive vocabulary was assessed using the Expressive Vocabulary Test ($n = 11$) or the Expressive One-Word Picture Vocabulary Test, 3) Language was assessed using the Clinical Evaluation of Language Fundamentals ($n = 9$) or the Preschool Language Scale, 4) Articulation was assessed using the Goldman-Fristoe Test of Articulation ($n = 10$) or the Arizona Articulation Proficiency Scale, and 4) Cognitive/Academic abilities were assessed using the Bracken School Readiness Assessment (receptive) or the Kaufman Brief Intelligence Test, as listed.

Appendix C

Average Percentage of Time in LENA Audio Categories

Category	Percentage of Time*	Description	Examples
Silence and Background	37.15	Sounds that are very far away; sounds not coming from humans that do not match other LENA categories	Children napping in a quiet room
Meaningful	36.00	Live speech by adults or children that occurs close to the LENA recorder	Teacher reading a book to the class
Distant/Overlap	21.95	Live speech that is farther away from the LENA recorder; multiple speakers at once	Two teachers talking just outside the classroom door; several children talking at the same time while pretending to cook breakfast in the play kitchen
TV and Electronic Sounds	2.88	Low quality audio coming through a speaker	Children watching a movie for indoor recess; music playing from a radio during nap time
Noise	2.02	Bumps, jiggles, and rattles	Blocks knocked down during free play, water running from the faucet, hands clapping

* Average daily recording time was 6 hours 21 minutes 52 seconds.

Appendix D

Instructional Word List (Grifenhagen, 2012)

A-bomb	adjust	apologized	article
A-bombs	adjusted	apologizes	articles
absence	adjusting	apologizing	assign
absences	adjusts	apology	assigned
absent	adopt	appetite	assigning
absolute	adopted	appetites	assigns
absolutely	adopting	applaud	assist
absorb	adopts	applauded	assisted
absorbed	agenda	applauds	assisting
absorbing	agendas	applauding	assists
absorbs	alert	applied	assume
abuse	alerted	applies	assumed
abused	alerting	apply	assuming
abuses	alerts	applying	assumes
abusing	allegiance	appointment	astonish
accent	allegiances	appointments	astonished
accented	allegiant	appreciate	astonishes
accents	allergic	appreciated	astonishing
accept	allergies	appreciates	attach
accepted	allergy	appreciating	attached
accepting	alternate	approach	attaches
accepts	alternated	approached	attaching
accident	alternates	approaches	attack
accidental	alternating	approaching	attacked
accidents	amuse	appropriate	attacking
accompanied	amused	appropriately	attacks
accompanies	amuses	approve	attend
accompany	amusing	approved	attended
accompanying	ancient	approves	attending
accomplish	angle	approving	attends
accomplished	angled	arch	attract
accomplishes	angles	arched	attracted
accomplishing	anniversaries	arches	attracting
ache	anniversary	arching	attractive
aches	announce	area	attractively
achieve	announced	areas	attracts
achieved	announces	argue	audience
achieves	announcing	argued	audiences
achieving	annoy	argues	avalanche
achy	annoyed	arguing	avalanches
acre	annoying	arrange	avenge
acres	annoys	arranged	avenged
act	antibiotic	arranges	avenger
acts	antibiotics	arranging	avengers
address	anxious	arrest	avenges
addressed	anxiously	arrested	avenging
addresses	apologetic	arresting	average
addressing	apologetically	arrests	averagely
adjective	apologies	arthritic	avoid
adjectives	apologize	arthritis	avoided

avoiding
avoids
await
awaited
awaiting
awaits
awake
awaked
awakes
awaking
aware
bacteria
bacterial
bad
badly
balance
balanced
balances
balancing
bald
balder
baldest
baldly
ball
ball
balled
balling
ballot
ballots
balls
balls
ban
band
bands
bans
bare
barer
barest
bargain
bargained
bargaining
bargains
bash
bashed
bashes
bashing
bay
bays
beast
beastly
beasts
beat
beating
beats
beverage
beverages

beware
bewared
bewares
bewareing
biceps
biceps
bin
binocular
binoculars
bins
bit
bits
bitter
bitterer
bitterest
bitterly
blast
blasts
blizzard
blizzards
bloodshot
bluff
bluffed
bluffing
bluffs
blush
blushed
blushes
blushing
board
boarded
boarding
boards
boast
boasted
boasting
boasts
bolt
bolts
bone
bones
boney
bonus
bonuses
boost
boosts
border
borders
bother
bothered
bothering
bothers
bow
bows
braid
braided

braiding
braids
brave
bravely
braver
bravest
bright
brighter
brightest
brightly
brim
brims
broil
broiled
broiling
broils
bruise
bruised
bruises
brutal
brutally
buried
buries
burrow
burrowed
burrowing
burrows
burying
bury
busier
busiest
busily
business
businesses
busy
calculate
calculated
calculates
calculating
calm
calmed
calming
calms
camouflage
camouflages
cancel
canceled
canceling
cancels
capture
captured
captures
capturing
career
careers
carnivorous

cast
casted
casting
casts
cause
caused
causes
causing
caution
cautions
cemeteries
cemetery
certain
certainly
certified
certifies
certify
certifying
chain
chained
chaining
chains
challenge
challenged
challenges
challenges
challenging
chance
chances
channel
channels
chapter
chapters
character
characters
charge
charges
charities
charity
chart
charts
cheap
cheaper
cheapest
cheaply
cheat
cheated
cheating
cheats
check
checked
checking
checks
cheer
cheers
chief

chiefly
china
choice
choices
choose
chooses
choosing
chose
chunk
chunks
cinch
cinches
circular
circularly
claim
claims
clarified
clarifies
clarify
clarifying
classified
classifies
classify
classifying
clear
clearer
clearest
clearly
clinic
clinical
clinics
clip
conquering
conquers
conserve
conserved
conserves
conserving
construct
constructed
constructing
constructive
constructively
constructs
consume
consumed
consumes
consuming
contact
contacted
contacting
contacts
contain
contained
containing
contains

clipped
clipping
clips
clockwise
clot
clots
clotted
clue
clues
clump
clumps
clumpy
clumsier
clumsiest
clumsily
clumsy
coach
coached
coaches
coaching
coast
coasted
coasting
coasts
cock
cocks
cocoon
cocoons
code
coded
codes
collect
contest
contested
contests
continue
continued
continues
continuing
contribute
contributed
contributes
contributing
convince
convinced
convinces
convincing
cooperate
cooperated
cooperates
cooperating
corridor
corridors
cost
costly
costs

collected
collecting
collects
college
colleges
colonial
colonially
column
columns
combine
combined
combines
combining
comma
commas
common
commoner
commonest
commonly
commotion
commotions
communicate
communicated
communicates
communicating
communities
community
companion
companions
compare
compared
compares
counselor
counselors
courage
courageous
courageously
courtesies
courtesy
coward
cowards
cozier
coziest
cozily
cozy
craft
crafts
crafty
cram
crammed
cramming
cramp
cramps
crams
crease
creased

comparing
complete
completely
complicate
complicated
complicates
complicating
compound
concern
concerned
concerning
concerns
conclude
concluded
concludes
concluding
concussion
concussions
conduct
conducted
conducting
conducts
confuse
confused
confuses
confusing
congratulate
congratulated
congratulates
congratulating
conquer
conquered
creates
creature
creatures
crises
crisis
crop
crops
crosswise
crow
crowd
crowded
crowding
crowds
crowed
crowing
crown
crowns
crows
crude
crudely
cruder
crudest
cruel
crueler

cruellest
cruelly
cruise
cruises
crush
crushed
crushes
crushing
crust
crusts
crusty
crutch
crutches
crystal
crystals
cube
cubed
cubed
cubes
cubing
cuddle
cuddled
cuddles
cuddling
cultural
culture
cultures
cupid
cupids
curdle
curdled
curdles
curdling
cure
cured
cures
curing
curious
curiously
curse
cursed
curses
cute
cutely
cuter
cutest
cycle
cycled
cycles
cycling
dab
dabs
daily
dairies
dairy
damage

damaged
damages
damaging
dangle
dangled
dangles
dangling
daredevil
daredevils
dart
darted
darting
darts
dawn
dawns
dazzle
dazzled
dazzles
dazzling
dead
deadly
deaf
deafest
deafly
declare
declared
declares
declaring
decode
decoded
decodes
decoding
decrease
decreased
decreases
decreasing
deduct
deducted
deducting
deducts
deed
deeds
deep
deeper
deepest
deeply
defeat
defeated
defeating
defeats
defend
defended
defending
defends
deflate

deflated
deflates
deflating
delicate
delicately
delicious
deliciously
delight
delighted
delighting
delights
demand
demanded
demanding
demands
demolish
demolished
demolishes
demolishing
den
denominator
denominators
dens
dent
dented
dents
deodorize
deodorized
deodorizes
deodorizing
deposit
deposited
depositing
deposits
depth
depths
desert
deserted
deserting
deserts
desire
desired
desires
desiring
destroy
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destroying
destroys
detach
detached
detaches
detaching
detect
detected
detecting
detects

develop
developed
developing
develops
device
devices
diagram
diagrams
diameter
diameters
diamond
diamonds
diaper
diapers
difficult
difficultly
digest
digested
digesting
digests
dim
dimmed
dimming
dims
dip
dipped
dipping
dips
direct
direction
directions
directly
dirt
dirty
disappoint
disappointed
disappointing
disappoints
disaster
disastrous
disasters
disc
discard
discards
disciplinary
discipline
disciplines
discover
discovered
discovering
discovers
discs
discuss
discussed
discusses
discussing

disease
diseased
diseases
disgust
disgusted
disgusting
disgusts
dishonor
dishonored
dishonoring
dishonors
dismiss
dismissed
dismisses
dismissing
display
displayed
displaying
displays
displays
dispose
disposed
disposes
disposing
dispute
disputed
disputes
disputing
disrupt
disrupted
disrupting
disrupts
dissolve
dissolved
dissolves
dissolving
distant
distantly
distract
distracted
distracting
distracts
ditch
ditches
dodge
dodged
dodges
dodging
dose
dosed
doses
dosing
double
doubly
doubt
doubted

doubting
doubts
dough
dove
doze
dozes
draft
drafts
drafty
drain
drained
draining
drains
drama
dramas
dramatic
drench
drenched
drenches
drenching
dribble
dribbled
dribbles
dribbling
drift
drifted
drifting
drifts
drill
drilled
drilling
drills
drip
dripped
dripping
drips
drool
drooled
drooling
drools
drop
dropped
dropping
drops
drops
drowse
drowsed
drownses
drowsing
drug
drugged
drugging
drugs
drugs
drum
drummed

drumming
drums
duel
dueling
duels
dull
duller
dullest
dully
dummies
dummy
dump
dumped
dumping
dumps
dungeon
dungeons
duplicate
duplicated
duplicates
duplicating
dusk
dusks
dusky
dust
dusted
dusting
dusts
duties
duty
earn
earned
earning
earns
Earth
Earthy
ease
eased
eases
easing
echo
echoed
echoes
echoing
edit
edited
editing
edits
effort
efforts
egg
eggs
elder
elderly
elders

electrocute
electrocuted
electrocutes
electrocuting
elf
eliminate
eliminated
eliminates
eliminating
elves
embarrass
embarrassed
embarrasses
embarrassing
emerge
emerged
emergencies
emergency
emerges
emerging
emotion
emotions
enclose
enclosed
encloses
enclosing
encourage
encouraged
encourages
encouraging
enemies
enemy
energetic
energies
energy
entertain
entertained
entertaining
entertains
environment
environmental
environments
epidemic
epidemics
equal
equally
equator
equators
equipment
equipments
erase
erased
erases
erasing
error
errors

erupt
erupted
erupting
erupts
estimate
estimates
evacuate
evacuated
evacuates
evacuating
evaporate
evaporated
evaporates
evaporating
even
evener
evenly
event
events
evergreen
evergreens
evidence
evidenced
evidences
evidencing
evil
evils
exact
exactly
exam
examine
examined
examines
examining
exams
excellent
excellently
excess
excesses
exchange
exchanged
exchanges
exchanging
excite
excited
excites
exciting
exclaim
exclaimed
exclaiming
exclaims
excuse
excused
excuses
excusing
execute

executed
executes
executing
exercise
exercised
exercises
exercising
exist
existed
existing
exists
expand
expanded
expanding
expands
expect
expected
expecting
expects
experiment
experimented
experimenting
experiments
explore
explored
explores
exploring
export
exported
exporting
exports
express
expressed
expresses
expressing
extend
extended
extending
extends
extinct
extra
extraordinarily
extraordinary
extreme
extremely
extremes

faint
fainter
faintest
faintly
faith
faiths
familiar
familarly
fan
fang
fangs
fans
fantasies
fantasy
faucet
faucets
fault
faults
favorite
FBI
feeling
feelings
fellow
fellows
female
females
fertilize
fertilized
fertilizes
fertilizing
fib
fibs
fidget
fidgeted
fidgeting
fidgets
fierce
fiercely
fiercer
fiercest
fig
figs
figure
figured
figures
figuring
fill
filled
filling
fills
filth
filthy
final
finally
fine
finely

finer
finest
firm
firmer
firmest
firmly
flake
flakes
flakey
flap
flapped
flapping
flaps
flare
flared
flares
flaring
flash
flashes
flashy
flat
flatly
flatter
flattest
flee
fled
fleeing
flees
fleet
fleets
flesh
fleshes
fleshy
fling
flung
flinging
flings
flip
flipped
flipping
flips
flock
flocks
flop
flopped
flopping
flops
flow
flowed
flowing
flows
fluid
fluids
flush
flushed
flushes

flushing
flutter
fluttered
fluttering
flutters
foam
foams
foamy
fog
foggy
fogs
fold
folded
folds
folk
folks
follow
followed
following
follows
forbade
forbid
forbidding
forbids
force
forces
forgave
forgive
forgives
forgiving
formulate
formulated
formulates
formulating
fort
forts
fossil
fossilized
fossils
fraction
fractions
fragile
freight
freights
friction
frictions
fright
frights
frown
frowned
frowning
frowns
fumble
fumbled
fumbles
fumbling

function
functioned
functioning
functions
funeral
funerals
furnace
furnaces
fuss
fussed
fusses
fussing
future
futures
gadget
gadgets
gain
gained
gaining
gains
gap
gaps
gasp
gasped
gasping
gasps
gaze
gazed
gazes
gazing
gear
gears
gem
gems
generous
generously
genius
geniuses
gentle
gentler
gentlest
gently
genuine
genuinely
germ
germs
germy
ghost
ghostly
ghosts
glamour
gleam
gleamed
gleaming
gleams
glee

glees
glide
glided
glides
gliding
glisten
glistened
glistening
glistens
gloom
glooms
gloss
glosses
goal
goals
gobble
gobbled
gobbles
gobbling
goggles
goo
gooey
gorgeous
gorgeously
grace
grade
graded
grades
grading
grand
grandeur
grandest
grandly
grant
granted
granting
grants
graph
graphs
grasp
grasps
gratitude
gray
grayer
grayest
great
greater
greatest
greatly
greed
greedy
groom
groomed
grooming
grooms
grubbier

grubbiest
grubbily
grubby
gruesome
gruesomely
guarantee
guaranteed
guarantees
guide
guided
guides
guiding
guiltier
guiltiest
guiltily
guilty
gulp
gulped
gulping
gulps
gust
gusts
gusty
gut
guts
gutter
gutters
guy
guys
gymnastics
habit
habits
hack
hacked
hacking
hacks
halt
halted
halting
halts
harsh
harsher
harshes
harshly
haunch
haunches
haze
hazel
hazes
hazy
heal
healed
healing
heals
heap
heaped

heaps
height
heights
help
helped
helping
helps
herd
herds
hibernate
hibernated
hibernates
hibernating
hid
hide
hides
hiding
hilarious
hilarities
hilarity
hind
hint
hinted
hinting
hints
hip
hips
hire
hired
hires
hiring
hiss
hisses
hollow
hollowly
honest
honestly
hoop
hoops
horrid
horridly
horror
horrors
hostage
hostages
hug
hugged
hugging
hugs
hull
hulls
humiliate
humiliated
humiliates
humiliating
hump

humps
hunch
hunches
hustle
hustled
hustles
hustling
hydrant
hydrants
identical
identically
ignore
ignored
ignores
ignoring
image
images
immediate
immediately
impress
impressed
impresses
impressing
improve
improved
improves
improving
incident
incidental
incidents
include
included
includes
including
index
indexes
indicate
indicated
indicates
indicating
individual
individually
influence
influenced
influences
influencing
inform
informed
informing
informs
inhale
inhaled
inhales
inhaling
inherit
inherited

inheriting
inherits
initial
initials
injuries
injury
innocent
innocently
insane
insanely
insecure
insecurely
insert
inserted
inserting
inserts
inspect
inspected
inspecting
inspects
instant
instants
instruct
instructed
instructing
instructs
insult
insults
insure
insured
insures
insuring
intelligent
intelligently
interest
interests
interrupt
interrupted
interrupting
interrupts
introduce
introduced
introduces
introducing
intrude
intruded
intrudes
intruding
invade
invaded
invades
invading
invert
inverted
inverting
inverts

investigate
investigated
investigates
investigating
invite
invited
invites
inviting
involve
involved
involves
involving
irritate
irritated
irritates
irritating
issue
issues
item
items
jagged
jaggedly
janitor
janitorial
janitors
jealous
jealously
jog
jogged
jogging
jogs
judge
judged
judges
judging
junk
junks
junky
knuckle
knuckles
label
labels
laboratories
laboratory
lace
laced
laces
lacing
laid
lair
lair
language
languages
lap
laps
lash

lashes	literate	mains	moldy
latch	literature	major	month
latches	literatures	majorly	months
late	litter	male	mood
later	littered	males	moods
latest	littering	mammal	moody
launch	litters	mammals	mosquito
launches	lives	manage	mosquitoes
lay	loan	managed	mount
laying	loaned	manages	mountain
lays	loaning	managing	mountains
lead	loans	maneuver	mounted
leads	locate	maneuvers	mounting
learn	located	mangle	mounts
learned	locates	mangled	mow
learning	locating	mangles	mowed
learns	locker	mangling	mowing
least	lockers	marathon	mows
led	lone	marathons	mumble
legal	lonely	master	mumbled
legally	longitude	masters	mumbles
legend	longitudes	mate	mumbling
legends	longitudinal	mated	mummies
leisure	loop	mates	mummy
lend	looped	mathematician	mustache
lent	looping	mathematicians	mustached
lending	loops	mating	mustaches
lends	loose	matter	mustard
length	loosely	mattered	mustards
lengths	looser	matters	mustardy
lengthy	loosest	maximum	muzzle
lesson	lose	may	muzzled
lessons	loses	measure	muzzles
level	losing	measured	mysterious
levels	lost	measures	mysteriously
lick	low	measuring	naked
licked	lower	medicinal	nastier
licking	lowest	medicine	nastiest
licks	lowly	medicines	nastily
lid	luck	medieval	nasty
lids	lucks	melodies	native
life	lucky	melody	natives
limit	lump	mention	nectar
limited	lumps	mentioned	nectars
limiting	lumpy	mentioning	negative
limits	machine	mentions	negatively
link	machines	miniature	nervous
linked	magazine	mission	nervously
linking	magazines	missions	nightmare
links	magnificent	model	nightmares
liquefied	magnificently	moist	nonsense
liquefies	magnified	moister	nonsensical
liquefy	magnifies	moistest	note
liquefying	magnify	moistly	noted
liquid	magnifying	mold	notes
liquids	main	molds	noting

notion
notions
noun
nouns
novel
novels
nude
numb
number
numbest
numbly
numeral
numerals
numerous
numerously
nutrition
nutritious
observe
observed
observes
observing
obvious
obviously
occasion
occasional
occasions
occur
occurred
occurring
occurs
odor
odors
ointment
ointments
operate
operated
operates
operating
opponent
opponents
opportunities
opportunity
opposite
opposites
optional
optionally
oral
orally
organize
organized
organizes
organizing
orphan
orphaned
orphans
oval

ovals
ox
oxen
oxygen
pace
paced
paces
pad
padded
padding
paddle
paddled
paddles
paddling
pads
pal
palm
palms
pals
pant
panted
panting
pants
paradise
paradises
paragraph
paragraphs
parallel
paralyze
paralyzed
paralyzes
paralyzing
parcel
parcels
parliament
parliaments
participate
participated
participates
participating
particular
particularly
pasteurize
pasteurized
pasteurizes
pasteurizing
patient
patiently
pattern
patterned
patterns
pause
paused
pauses
pausing
peace

peaces
pearl
pearls
pearly
pebble
pebbles
pebbly
peek
peeked
peeking
peeks
peel
peeled
peeling
peels
peer
peered
peering
peers
percent
percentage
percents
perkier
perkiest
perkily
perky
permanent
permanently
pharmacies
pharmacy
photograph
photographed
photographing
photographs
phrase
phrased
phrases
pickle
pickled
pickles
piece
pieced
pieces
pile
piled
piles
pioneer
pioneers
pitch
pitched
pitches
pitching
plain
plainer
plainest
plainly

plastic
plastics
plead
pleaded
pleading
pleads
plug
plugged
plugging
plugs
plunge
plunges
plural
point
pointed
pointing
points
poison
poisonous
poisons
poke
poked
pokes
polish
polished
polishes
polishing
pollen
pollens
pollute
polluted
pollutes
polluting
pond
ponds
popular
popularly
populate
populated
populates
populating
portfolio
portfolios
portion
portioned
portions
portrait
portraits
position
positioned
positions
positive
positively
possess
possessed
possesses

possessing
possible
possibly
post
posted
posts
pouch
pouches
pounce
pounced
pounces
pouncing
pout
pouted
pouting
pouts
powder
powdered
powders
power
powers
practically
practice
practiced
practices
practicing
precise
precisely
predator
predators
predatory
predict
predicted
predicting
predicts
prefer
preferred
preferring
prefers
pregnancy
pregnant
present
presented
presenting
presents
press
pressed
presses
pressing
pressure
pressures
pretend
pretended
pretending
pretends
previous

previously
prey
preys
pride
prides
prince
princely
princes
principal
principals
private
privately
privilege
privileged
privileges
problem
problems
proceed
proceeded
proceeding
proceeds
produce
produced
produces
producing
profession
professions
program
programs
progress
progressed
progresses
progressing
project
projects
propeller
propellers
properly
properties
property
propose
proposed
proposes
proposing
protein
proteins
protest
protested
protesting
protests
provide
provided
provides
providing
public
publication

publications
publicly
publics
publish
published
publishes
publishing
puff
puffed
puffing
puffs
pulley
pulleys
punctuate
punctuated
punctuates
punctuating
punish
punished
punishes
punishing
purchase
purchased
purchases
purchasing
pure
purely
purer
purest
purpose
purposes
pus
pusses
quantities
quantity
quench
quenched
quenches
quenching
quiver
quivered
quivering
quivers
race
races
rage
rages
raise
raised
raises
raising
rapid
rapidly
rare
rarely
rarer

rarest
rash
rashes
rather
raw
rawer
rawest
ray
rays
real
realer
realest
realities
reality
realize
realized
realizes
realizing
rear
reason
reasons
rebel
rebelled
rebellng
rebels
receive
received
receives
receiving
reckless
recklessly
recognize
recognized
recognizes
recognizing
recommend
recommended
recommending
recommends
recover
recovered
recovering
recovers
recuperate
recuperated
recuperates
recuperating
recycle
recycled
recycles
recycling
refer
referred
referring
refers
refund

refunds	resolutions	rinse	rule
refuse	resolve	rinsed	rules
refused	resolved	rinses	salt
refuses	resolves	rinsing	salts
refusing	resolving	ripe	salty
register	resort	riper	satisfied
registered	resorts	ripest	satisfies
registering	respect	rise	satisfy
registers	respected	rises	satisfying
regular	respecting	rising	sauce
regularly	respects	risk	sauces
rehearse	respond	risks	save
rehearsed	responded	roam	saved
rehearses	responding	roamed	saves
rehearsing	responds	roaming	saving
reject	responsible	roams	scab
rejected	responsibly	roar	scabs
rejecting	rest	roars	scan
rejects	restrain	robe	scanned
remain	restrained	robes	scanning
remained	restraining	robot	scans
remaining	restrains	robots	scar
remains	rests	rocket	scarf
remark	result	rockets	scarred
remarkable	results	rod	scars
remarkably	retain	rode	scarves
remarked	retained	rodeo	scatter
marking	retaining	rodeos	scattered
remarks	retains	rods	scattering
remove	reveal	romance	scatters
removed	revealed	romances	scene
removes	revealing	rookie	scenes
removing	reveals	rookies	scent
replied	revenge	room	scented
replies	revenge	rooms	scents
reply	reverse	rose	science
replying	reverses	rough	sciences
report	review	rougher	scientific
reported	reviewed	roughest	scoot
reporting	reviewing	roughly	scooted
reports	reviews	routine	scooting
reptile	rich	routines	scoots
reptiles	richer	rub	scorch
request	richest	rubbed	scorched
requested	richly	rubbing	scorches
requesting	rid	rubs	scorching
requests	riddled	rudder	score
research	ridding	rudders	scored
researched	ride	rude	scores
researches	rides	rudely	scoring
researching	riding	ruder	scramble
resist	rids	rudest	scrambled
resisted	rim	ruin	scrambles
resisting	rims	ruined	scrambling
resists	rink	ruining	scrap
resolution	rinks	ruins	scrape

scraped	settle	shivered	skid
scrapes	settled	shivering	skidded
scraping	settles	shivers	skidding
scraps	settling	shock	skids
scratch	several	shocked	skill
scratched	severe	shocking	skilled
scratches	severely	shocks	skills
scratching	severer	shocks	skin
scream	severest	shook	skinned
screamed	shack	short	skinning
screaming	shacks	shorter	skins
screams	shade	shortest	skip
screech	shaded	shortly	skipped
screeches	shades	shout	skipping
scribble	shades	shouts	skips
scribbled	shading	shred	skirt
scribbles	shady	shreds	skirts
scribbling	shaft	shriek	slant
scuba	shafts	shrieked	slants
scubas	shake	shrieking	slash
seal	shakes	shrieke	slashes
sealed	shaking	shrug	slaughter
sealing	shall	shrugged	slaughters
seals	shallow	shrugging	slay
search	shallower	shrugs	slaying
searched	shallowest	shut	slays
searches	shallowly	shuts	sleet
searching	shame	shutting	sleets
second	shames	sign	slick
secondly	shape	signed	slicker
secure	shapes	signified	slickest
securely	sharp-witted	signifies	slickly
securer	sharp-wittedly	signify	slight
securest	shave	signifying	slighter
seize	shaved	signing	slightest
seized	shaves	signs	slightly
seizes	shaving	silvers	slime
seizing	shear	similar	slimes
sell	sheared	similarly	slimy
selling	shearing	simple	slip
sells	shears	simpler	slipped
sense	sheet	simplest	slipping
sensed	sheets	simply	slips
senses	shell	sir	sliver
sensing	shells	siren	slop
sentence	shelter	sirens	slopped
sentences	shelters	sirs	slopping
series	shift	sizzle	slops
serious	shifts	sizzles	slumber
seriously	shine	skate	slumbered
sermon	shined	skated	slumbering
sermons	shines	skates	slumbers
serve	shingle	skating	slush
served	shingles	sketch	slushy
serves	shining	sketched	smell
serving	shiver	sketches	smelled

smelling	soothed	spirited	stacked
smells	soothes	spirits	stacks
smelly	soothing	spit	staff
smooth	sort	spits	staffs
smoother	sorts	splendid	stage
smoothest	soup	splendidly	stages
smoothly	soups	splinter	stain
snag	soupy	splinters	stained
snagged	sour	spoil	staining
snagging	sourer	spoiled	stains
snags	sourest	spoiling	stair
snap	sourly	spoils	stairs
snapped	souvenir	sport	stall
snapping	souvenirs	sports	stalled
snaps	span	spout	stalling
snatch	spanned	spouts	stalls
snatched	spanning	spread	stamp
snatches	spans	spreading	stamped
snatching	spark	spreads	stampedede
sneak	sparks	spring	stampedes
sneaked	spatter	sprung	stamping
sneaking	spattered	springing	stamps
sneaks	spattering	springs	stand
sniff	spatters	sprout	standing
sniffed	special	sprouts	stands
sniffing	specials	spurt	stare
sniffs	speck	spurted	stared
snip	specks	spurting	stares
snipped	spectacular	spurts	staring
snipping	spectacularly	spy	stash
snips	speech	spying	stashed
snoop	speeches	squat	stashes
snooped	speed	squats	stashing
snoops	speeded	squatted	steam
snooping	speeding	squatting	steams
snout	speeds	squeal	steamy
snouts	spell	squealed	stem
sob	spelled	squealing	stems
sobbed	spelling	squeals	stick
sobbing	spells	squeeze	sticking
sobs	spend	squeezed	sticks
sock	spending	squeezes	stiff
socks	spends	squeezing	stiffer
sofa	spent	squint	stiffest
sofas	spice	squinted	stiffly
soft	spices	squinting	still
softer	spicy	squints	stiller
softest	spied	squirm	stillest
softly	spies	squirmed	sting
solar	spill	squirming	stings
sold	spilled	squirms	stir
solid	spilling	squirt	stirred
solidly	spills	squirted	stirring
song	spine	squirting	stirs
songs	spines	squirts	stomach
soothe	spirit	stack	stomachs

stood	stupidly	surprise	symbol
strain	sturdier	surprised	symbolic
strained	sturdiest	surprises	symbols
straining	sturdily	surprising	syrup
strains	sturdy	surrender	syrups
strand	subject	surrendered	tale
stranded	subjects	surrendering	talent
stranding	subway	surrenders	talented
strands	subways	suspect	talents
stray	success	suspected	tales
strays	successes	suspecting	tallies
stretch	suck	suspects	tally
stretched	sucked	suspend	tangle
stretches	sucking	suspended	tangles
stretching	sucks	suspending	tar
strict	sudden	suspends	target
stricter	suddenly	swap	targets
strictest	suffer	swapped	tars
strictly	suffered	swapping	task
strip	suffering	swaps	tasks
stripe	suffers	swarm	taught
stripes	suffocate	swarms	teasing
strips	suffocated	sway	teach
strive	suffocates	swayed	teaches
strived	suffocating	swaying	teaching
strives	suggest	sways	team
striving	suggested	swear	teams
stroke	suggested	swore	tear
stroked	suggests	swearing	tearing
strokes	summaries	swears	tears
stroking	summary	sweat	tease
stroll	summon	sweated	teased
strolls	summoned	sweating	teases
structural	summoning	sweats	technician
structure	summons	sweet	technicians
structures	supervise	sweeter	temper
struggle	supervised	sweetest	temperature
struggled	supervises	sweetly	temperatures
struggles	supervising	swell	tempers
struggling	supplies	swelled	term
stuck	supply	swelling	terms
stuff	support	swells	terrified
stuffed	supported	swing	terrifies
stuffing	supporting	swung	terrify
stuffs	supports	swinging	terrifying
stumble	suppose	swings	test
stumbled	supposed	swipe	tested
stumbles	supposes	swiped	testing
stumbling	supposing	swipes	tests
stun	sure	swiping	text
stunned	surely	switch	texts
stunning	surer	switches	texture
stuns	surest	swoop	textured
stupid	surgeries	swooped	textures
stupider	surgery	swooping	thaw
stupidest	surgical	swoops	thawed

thawing
thaws
thieves
thick
thicker
thickest
thickly
thief
thirst
thirsts
thirsty
thorn
thorns
thorny
thought
thought
thoughts
threw
thrill
thrilled
thrills
throw
throwing
throws
tickle
tickled
tickles
tickling
tide
tides
tidier
tidiest
tidily
tidy
timber
timbers
tingle
tingled
tingles
tingling
tip
tips
tire
tired
tires
tiring
title
titles
toast
toasted
toasting
toasts
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Appendix E

Teacher Interview Questions

1. How would you describe your teaching style?
2. How would you describe your class?
3. Do you have any knowledge and/or skills that you prioritize for your students? Broadly, what do you do to teach these?
4. What are your goals for the students during free play? What things do you do to accomplish them?
 - a. What language skills do you hope to foster? What specific strategies do you use?
 - b. Are there any problems you encounter during free play? If so, how do you deal with them?
5. What are your goals for the students during read aloud? What things do you do to accomplish them?
 - a. What language skills do you hope to foster? What specific strategies do you use?
 - b. Are there any problems you encounter during read aloud? If so, how do you deal with them?
6. What do you do to create a language-rich environment throughout the school day?

Appendix F

Teacher Responsivity Codes

Code	Description
SI	Student initiates conversation and teacher responds with semantic content related to the student's remark
SIContinue	Continuation of a student-initiated conversation; this could occur several times during a back-and-forth conversation
SIEmpty	Teacher responds to student-initiated conversation but the response lacks related semantic content (e.g., praise or repeating the student)
TI	Teacher initiates conversation then responds after a student response
TIContinue	Continuation of teacher-initiated conversation; multiple students could be involved
TIEmpty	Teacher responds to student during a teacher-initiated conversation but the response lacks related semantic content (e.g., praise or repeating the student)
SIX	Student initiates conversation but teacher does not respond

Note: Remarks where teachers use a cloze procedure (e.g., teacher is reading a familiar book and pauses so students say the next word) or prompt students to repeat a remark to fix articulation or language errors do not count as responsivity opportunities.

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