Teacher and child verbal behaviors during guided play: An exploration of vocabulary learning mechanisms

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CHAPTER 1

Introduction

High quality early education programs have the potential to produce lasting benefits for children. Evidence points to the beneficial impacts of high-quality programs especially for children who experience greater vulnerability due to their life circumstances (Center on the Developing Child, 2007). One of the critical elements that has consistently been associated with early education program effectiveness is a language-rich environment, which leads to greater oral language competence (NICHD Early Child Care Research Network, 2006). The focus on early oral language is critical because oral language is one of the basic building blocks of literacy development. Specifically, oral vocabulary knowledge is a foundational component of later reading comprehension. For example, a child's ability to differentiate and reproduce the sounds of her native language leads to her capacity to understand and then label objects in her environment. Then, the ability to combine words and produce and comprehend phrases forms a foundation for later skill in reading text. A convergence of research over the past two decades has demonstrated associations between early vocabulary knowledge and subsequent reading performance (Dickinson & Porche, 2011; National Early Literacy Panel, 2008; Senechal, Ouellette, & Rodney, 2006; Storch & Whitehurst, 2002). The strength of connection between early vocabulary knowledge and later reading achievement underscores the importance of enhancing children's lexicons early, especially for children who may enter early education programs with less robust oral language competencies due to adverse life circumstances.

Fortunately, the early education field has identified ways in which preschool classrooms foster linguistic environments that are related to children's language development. Characteristics of preschool teachers' language use, such as low teacher-to-child talk ratios, communication-facilitating behaviors, and analytic discussion during book reading activities, have shown positive relationships with vocabulary growth (Bowers & Vasilyeva, 2011; Dickinson & Tabors, 2001; Dickinson & Porche, 2011; Justice, Jiang, & Strasser, 2018). Furthermore, experimental vocabulary intervention results suggest that children deepen their understanding of words when explicit information about word meaning occurs along with multiple exposures (Coyne, McCoach, & Kapp, 2007; Marulis & Neuman, 2010; Wasik, Hindman, & Snell, 2016). Additionally, activities that enlist children's participation and give them opportunities to process word meanings at a deeper level has been shown to promote higher quality lexical knowledge (Loftus-Rattan, Mitchell, & Coyne, 2016; McKeown & Beck, 2014). Together, these areas of research emphasize the essential role of teacher input, explicit instruction, and teacher-child discussions about word meaning for children's vocabulary growth.

However, comprehensive literacy and language interventions and teacher professional development programs generally do not produce substantial effects on child language outcomes (Dickinson, 2011; Mendive, Weiland, Yoshikawa, & Snow, 2016; Powell, Diamond, Burchinal, & Koehler, 2010) with the exception of programs that provide extensive coaching (Bierman, Nix, Greenberg, Blair, & Domitrovich, 2008; Wasik, Bond, & Hindman, 2006; Wilson, Dickinson, & Rowe, 2013). Moreover, children's learning gains across more targeted vocabulary interventions also remain moderate, with children learning less than 25% of words taught (Wasik et al., 2016). Thus, questions remain about the more proximal processes that may influence children's vocabulary growth (Dickinson, Freiberg, & Barnes, 2011; Wasik et al., 2016).

One approach to exploring proximal processes through which children's vocabulary develops is to measure intervention dosage. Several studies have found associations between higher dosage and oral language gains (Connor, Morrison, & Slominski, 2006; Hamre et al., 2010), whereas other studies have found no links between dosage and children's literacy development (Domitrovich, Gest, Jones, Gill, & DeRousie, 2010; Odom et al., 2010). Dosage has been measured in several ways including minutes spent in instructional activities and number of activities implemented per week or over a unit of study. Studies that measure dosage in minutes, which is more precise than, for example, number of activities teachers implement, have demonstrated more consistent and positive associations between dosage and child learning (Connor et al., 2006; Hamre et al., 2010). Interestingly, most studies measure dosage as the teacher's level of implementation of activities whereas very few examine both teacher and child participation. In one exception, a study found that the amount of time children spent in activities in which they were active participants was associated with vocabulary growth (Connor et al., 2006). Similarly, another study found that the amount of children's contributions during discussions about new concepts and associated words was related to vocabulary gains (Bowne, Yoshikawa, & Snow, 2017). The present study aims to build on this line of research by examining the amount and features of teachers' and children's verbal participation in intervention activities. The present study focuses on measuring child engagement in particular as this may build on the field's understanding of factors that influence children's vocabulary growth.

The present study addresses these aims using data collected during a vocabulary intervention that examined the effects of book reading and guided pretend play on children's vocabulary development. Features of vocabulary instruction and children's verbal engagement

during the guided play component of the intervention were described and quantified through detailed coding of videotapes from one phase of the larger vocabulary study. In an effort to identify theoretically and empirically based factors that support word learning for analysis in the present study, the following chapters review relevant research. Chapter two describes theoretical frameworks that place vocabulary knowledge at the center of reading comprehension processes and examines empirical research on how lexical representations progress from low to high quality. Chapter three, drawing on a diverse body of empirical work including observational and experimental research across home and classroom environments, presents factors that have been associated with enhanced word learning. Chapter three also links these factors—multiple exposures to words, explicit information about word meaning, active processing activities, and using words in context—to theories on how lexical representations develop described in chapter two. Finally, chapter four explores how guided play methods may provide teacher and children opportunities to use and interact with words in ways that have been shown to deepen children's vocabulary learning.

In sum, this study had two primary objectives. First it was designed to describe the use of taught words by teachers and children within a guided play context that was designed by researchers to maximize learning of specific words. Second, this study investigated the relationships between multiple aspects of teacher and child language use and children's vocabulary breadth and depth growth.

CHAPTER II

Theoretical Framework: Vocabulary Knowledge and Reading Comprehension

Vocabulary knowledge can be described in terms of two dimensions, breadth and depth. Breadth of knowledge refers to the number of words stored in a child's lexicon whereas depth of knowledge refers to the quality of information known about individual words and semantic networks of interconnected words. The relationship between both dimensions of vocabulary knowledge and reading comprehension has been well established. Longitudinal studies that tracked children from kindergarten into the primary grades and studied children for two to ten years show that early vocabulary breadth relates to later reading success (Dickinson & Tabors, 2001; Senechal et al., 2006; Storch & Whitehurst, 2002). Research has also shown that depth of knowledge plays an especially strong and unique role in children's understanding of text (Roth, Speece, & Cooper, 2002). Early ability to define words, an indicator of deep vocabulary knowledge, has been associated with later reading performance (National Early Literacy Panel, 2008; Snow, Tabors, Nicholson, & Kurland, 1995). Furthermore, depth of vocabulary has been shown to predict reading comprehension above and beyond the association explained by breadth (Ouellette, 2006; Proctor, Silverman, Harring, & Montecillo, 2012; Protopapas, Sideridis, Mouzaki, & Simos, 2007). A study of elementary-age children who struggled to understand text highlights why vocabulary depth may be particularly important for reading comprehension (Nation, Clarke, Marshall, & Durand, 2004). These researchers found that 8-year-old children with poor comprehension scored equally as well as their peers on a measure of phonological skills but showed markedly lower semantic ability, as measured by ability to define words and

articulate connections between related words. These results indicate that normal phonological skills contributed to children's effective word recognition, but their reading comprehension was impaired by weak semantic knowledge. Several theoretical frameworks emphasize the connection between vocabulary depth and comprehension. Anderson and Freebody's (1981) knowledge hypothesis and Kintsch's (1998; 2005) construction-integration model propose that depth of word knowledge at the general level, conceptualized as a network of associated word identities and related concepts, is essential to sucessful comprehension. Perfetti's (2007) Lexical Quality Hypothesis argues that depth of knowledge at the individual word-level, including quality of information about form and meaning, is critical for understanding text and places word meaning processes at the center of comprehension (Perfetti & Stafura, 2014).

General-Level Depth of Vocabulary Knowledge

Conceptualizing depth of vocabulary knowledge at the general level acknowledges the complex organization of the mental lexicon, namely that knowledge about individual words cannot be separated from the degree to which individual words are integrated into the rest of the lexicon. For example, while acquiring a general understanding of a word, the learner primarily develops a link between label and referent. However, in order to differentiate between words in a lexical set such as verbs of motion (e.g., walk, run, rush, race), the learner must also sort out the semantic relations between the words, which in turn leads to more precise understanding of each individual word (Henriksen, 1999; Schmitt, 2014). This sorting out and strengthening of semantic relations among words is at the core of Anderson and Freebody's (1981) knowledge hypothesis, which contends that semantic networks of interconnected words and their associated

concepts drive reading comprehension. Successful readers draw on robust semantic networks as they make inferences about text meaning.

A similar theoretical framework that offers more specificity on the processes by which general depth of vocbulary knowledge influences comprehsion is Kintsch's (1988, 2005) construction-integration (CI) model. The CI model proposes that two processes involving the reader's mental representation of the text influence comphrenesion. In the construction phase, the reader creates a messy and somewhat incoherent representation of the text based on an associative network comprised of word meanings and concepts associated with the words. The subsequent integration phase refines the representation by pruning the associative network of irrelevant word meanings and associations. According to the CI model, quality of word knowledge affects both phases (Kintsch, 1988). If very few words in the text are familiar, or knowledge of words is imprecise and narrow, the associative network that is activated during the contruction phase will be limited. As a result, the reader's ability to select the appropriate word meanings and draw on related conceptual knowledge during the integration phase will be impaired. Thus, the CI model suggests that knolwedge about words should be precise and expansive. Readers should possess knowledge of polysemous word meanings and knowledge about relations among words, such as synonyms, antonyms, superordinate category membership, and syntactic and collocational restrictions. In sum, development of robust depth of vocabulary knowledge at the general level, conceptualized as strong connections among words in a broad semantic network that has the capacity to refine existing knowledge and create new nodes and connections as novel words and concepts are encountered, supports reading comprehension.

Word-Level Depth of Vocabulary Knowledge

Deep vocabulary knowledge can also be considered at the word-level. We draw on the Lexical Quality Hypothesis (LQH, Perfetti, 2007), which posits that deep knowledge about individual words enables readers to efficiently retrieve the appropriate meaning that fits the text and thus supports comprehension. According to the LQH, word identities are conceptualized as mental representations comprised of knowledge about the word's form and meaning. Knowledge of form includes a word's phonology, orthography, and grammatical features (Perfetti, 2007; Read, 2004). Knowledge of meaning includes the elaborated and specific knowledge of a word's meaning, such as the ability to differentiate synonyms, awareness of polysemous definitions, and the ability to discern between commonplace and more technical word meanings. Furthermore, the LQH asserts that knowledge about individual words falls on a continuum from low to high quality. Once stable phonological, orthographic, and syntactic representations of a word have developed, in addition to nuanced and rich semantic information about a word that can be generalized across various contexts, the overall lexical representation of that word is considered high quality.

According to the LQH, the form and meaning components are more tightly connected in higher quality representations, enabling readers to quickly retrieve the most relevant ideas when making sense of the context in which the word is encountered (Perfetti, Yang, & Schmalhofer, 2008). The Reading Systems Framework (Perfetti & Stafura, 2014) describes in more detail how word meaning processes facilitate skilled comprehension.

When making sense out of short passages, skilled comprehenders show immediate use of word meanings as they integrate what they read into their mental representation of the text (Yang, Perfetti, & Schmalhofer, 2005). This process, called "word-to-text integration," involves

several overlapping sub-processes. The word form triggers rapid, automatic access to a lexical entry and rapid, automatic activation of knowledge associated with the lexical entry from memory. The reader accesses memory of recently read text at the level of the situation model, or the mental structure that represents the reader's current understanding of the text. The reader also activates knowledge of context-appropriate meaning associated with the lexical entry. Perfetti and Stafura (2014) use the following example to explain the word-to-text integration process: (1) "While Cathy was riding her bike in the park, dark clouds began to gather, and it started to storm." (2) "The rain ruined her beautiful sweater." When reading the first sentence, a skilled reader forms a situation model around the storm event. The reader then encounters the noun phrase at the beginning of the second sentence, "the rain," which is understood immediately in relation to the situation model—the storm event. Word-to-text integration processes reflect a link between word identification and the reader's situation model of the text, mediated by the retrieval and selection of context-appropriate word meanings. In other words, one can think of the cognitive operations involved in word-to-text processes as lexically based. Given that knowledge and use of word meanings varies greatly across individuals, processes that rely on word meanings are likely to show individual differences. Research has demonstrated that more skilled comprehenders are better at understanding words and integrating their meaning into a situation model of the text than less skilled comprehenders (Perfetti et al., 2008; Yang et al., 2005). Moreover, since word-to-text integration processes recur with each phrase, word-to-text integration processes that approach automaticity are central to comprehension. Less automatic, or "sluggish" word-to-text integration can use up critical memory resources that would otherwise be employed to maintain coherence across sentences, draw inferences, and make comprehension repairs.

In sum, lexical knowledge emerges as the mediating factor that influences comprehension. Higher quality representations influence the efficiency and accuracy with which a reader can derive explanations for story events in texts. In contrast, lower quality representations are retrieved less quickly and thus impede comprehension. The relative quality of lexical representations—reflecting shallow to deep word knowledge—in addition to the organization of those lexical representations within semantic networks, either facilitates or hinders ability to understand text. An important question for the field, then, is how deep word knowledge develops. Research suggests that the process takes input and practice over extended periods of time.

New Word Acquisition

As children encounter more language, they acquire more experience comprehending and producing it. These experiences result in changes in the evolving representations that children create for each new word they hear. At first children create a representation for comprehension (C-representation) that consists of an acoustic template, which may have very little meaning attached to it (Clark, 2009). This process of creating an initial and incomplete lexical representation is widely referred to as "fast-mapping" (Carey, 1978; Carey, 2010; Gleitman, Cassidy, Nappa, Papafragou, & Trueswell, 2005). Upon subsequent encounters with the word over longer stretches of time, children will expand and fine-tune the representation by adding more information about meaning, syntax, and use—a process that has been referred to as "extended mapping" (Carey, 2010; Swingley, 2010). In addition to C-representations, children need representations for production (P-representations) in order to produce or say words. It takes time for children to produce appropriate pronunciations in the first three to four years of life

(Clark, 2009; Hoff, 2009). It may be that children access their C-representation for a word as they are trying to produce it. If they detect a mismatch between their production and their C-representation, they can repair their own utterance. In this way, the C-representation provides a model for what children should produce. As children adjust their P-representations to match what they have heard from more expert speakers and add more information about form and meaning to their C-representations, their C- and P-representations will grow more detailed and aligned (Clark, 2009; Postma, 2000).

Most researchers accept this division between comprehension and production and agree that there is a substantial difference in how well different lexical items are mastered in relation to ability to use the words in comprehension and production (Henriksen, 1999; McGregor, Sheng, & Ball, 2007). In some models of the lexicon, semantic and lexical nodes are linked within a distributed neural network (e.g., McClelland & Rogers, 2003). Other models hypothesize that the two types of representations are housed in different networks but the semantic representations activate the lexical forms in a "feed-forward" procedure during production (e.g., Caramazza & Shelton, 1998). Both models postulate an interaction between semantic and lexical knowledge: robust semantic knowledge will contribute a greater activation towards production than will a fragile semantic representation (McGregor et al., 2007). The finding that children can typically supply a more complete definition for a word they can retrieve during picture naming than for a word they fail to retrieve (McGregor, Newman, Reilly, & Capone, 2002) supports models that include semantic influences on productive mastery. However, knowledge of word meanings and lexical forms can dissociate. For example, Funnell, Hughes, and Woodcock (2006) have shown that children under six-and-a-half years were more likely to correctly label items they could not define whereas older children were more likely to define words that they could not correctly

label. In contrast, researchers have found a minority of cases (e.g., McGregor et al., 2002) in which preschool children showed strong semantic knowledge but were not able to name the word. The field continues to explore how the extended mapping process occurs within and across the domains of comprehension and production.

Experimental researchers have demonstrated that children can create and maintain fragile lexical representations that may then be strengthened by the acquisition of more accurate and nuanced information over time. Studies show that for one-and-a-half year olds, hearing a word in a semantically neutral context facilitates future learning of that word (Estes, Evans, Alibali, & Saffran, 2007; Swingley, 2007). The authors suggest that the initial construction of a phonological representation enabled the children to build up their knowledge of the word upon subsequent encounters. Similarly, Yuan and Fisher (2009) found that children had stored syntactic information about a novel verb, even though the initial exposure to the word provided very little semantic content. Preschool children also formed incomplete representations after brief encounters with words (Dickinson, 1984; Dollaghan, 1985). They could identity an object upon hearing its label after being exposed to a word only once. After hearing a new word two times, nearly half the sample recalled two of three phonemes in the correct order. Markson and Bloom (1997) demonstrated that four-year-olds and adults were equally good at recalling the novel name of an item they were exposed to four weeks earlier, suggesting that newly formed lexical representations persist in memory for some time. The plethora of research on fast-mapping of initial, partial representations stands in stark contrast to the dearth of research on extended mapping, even though there are many accounts that describe the protracted process of word learning (e.g., Bloom, 2002; Carey, 2010; Gleitman et al., 2005). A few studies have sought to reveal the incremental nature of word learning in children. For example, Seston,

Golinkoff, Ma, and Hirsh-Pasek (2009) demonstrated that 6- and 8-year olds continue to refine their knowledge of verbs past the preschool years.

Measuring Depth of Vocabulary Knowledge

Current measures of depth attempt to capture the multilayered and nuanced word knowledge that develops over time and results in high quality representations. It is important to supplement receptive measures with more sensitive measures of depth. Receptive measures reflect the number of entries in a child's lexicon but provide no information about the relative quality of the lexical representations associated with those entries. A child may be able to identify the correct picture that corresponds to a word label but possess only cursory knowledge about the word's full meaning. The opposite may also be true: a child may correctly identify a word on a receptive test and also possess a rich network of associated words and concepts linked to that word. Given the multiple aspects of depth, it is not suprising that the field continues to grapple with how best to measure this construct (Hadley & Dickinson, 2018). For example, it has proven difficult to measure the ongoing and simultaneous proces of mapping meaning onto form at the word-level and network building at the general-level of depth of vocabulary knowledge (Schmitt, 2014). The most promising recommendation suggests that researchers select specific measures of vocabulary depth that are most closely aligned with the type of post-initial learning addressed by the research questions (Milton, 2009; Read, 2004). The oral definition task used in the present study assesses depth of knowledge at the individual word level.

In conclusion, theories of reading and depth point to the need to foster young children's vocabulary knowledge, and depth of knowledge in particular. If we wish to improve the vocabulary development trajectories and future reading comprehension of EL and low-income

children, the line of research on extended mapping that uses laboratory tasks must be connected with research on how lexical representations and semantic networks develop over time in children's real-world learning environments such as classrooms, which are substantially more complex. The focus should be on adding new words to young children's lexicons in addition to building nuanced, high-quality representations of words. The two instructional aims are likely mutually supportive: as children add new words to their lexicon over time, their initially fragile representations and networks of word knowledge grow more nuanced and it becomes easier for them to distinguish new from old entries (Carey, 1978), thereby increasing depth. When children develop more precise and elaborated knowledge about a word, they likely learn additional, related words, thereby increasing breadth (Henriksen, 1999; Neuman, Newman, & Dwyer, 2011). Unfortunately, there has been little attention to fostering breadth and depth in preschool classrooms where exposure to high quality language environment and explicit instruction may occur (Neuman & Dwyer, 2009).

The following chapter reviews research on factors that have been shown to support the development of vocabulary knowledge. Based on these factors and related theories on how lexical representations develop, in the present study teacher and child language use during guided play sessions will be coded and examined for relationships to word learning.

CHAPTER III

Factors that Support Breadth and Depth of Vocabulary Knowledge

Theoretical models of vocabulary development that drive the current study align with factors that have been empirically linked to preschoolers' word learning. The following sections describe these word learning mechanisms and the studies that support them, including multiple exposures, explicit semantic information, active processing of meaning, and independent use. These factors reflect the importance of both quantity and quality of encounters with words in addition to characteristics of child engagement that appear to foster high quality lexical representations.

Multiple Exposures to Words

The quantity of input young children are exposed to influences their vocabulary knowledge (Hoff & Naigles, 2002; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Rowe, 2008; Zimmerman et al., 2009). Multiple exposures help children as they establish mental representations of the form of each word in addition to drawing inferences about possible meanings (Clark, 2009). Empirical support for the importance of quantity of input is abundant. Research on adult input in the home has demonstrated that the frequency of parental use of words in child-directed speech was related to young children's expressive knowledge and comprehension of nouns (Goodman, Dale, & Li, 2008). Similarly, a study of bilingually developing 1- to 2-year olds found that the size of their Spanish and English vocabularies was related to the amount of input they received in each language (Pearson, Fernandez, Lewedeg, &

Oller, 1997). In addition, young children's expressive vocabulary has been related to the overall quantity of input in mother-child conversations (Hoff & Naigles, 2002).

Three mechanisms help explain the relationship between quantity of input and early vocabulary development. First, caregivers who produce more speech use the same words multiple times. This frequency of exposure may benefit word learning because each different exposure is likely to vary in the accompanying nonlinguistic and linguistic contexts. Therefore, each exposure provides somewhat new information about the word meaning (Hoff & Naigles, 2002). Second, caregivers who produce more speech tend to use a greater number of different words (Hoff, 2006). Lexical density, or a high number of novel words relative to total words, in adult input has been associated with young children's vocabulary growth (Hoff & Naigles, 2002; Pan, Rowe, Singer, & Snow, 2005). Third, the diversity of syntactic environments in which words (especially verbs) are heard influence word learning.

Frequency is a potent factor affecting learning because children are active analyzers of adult input. They keep track of linguistic units as they analyze each new form that they encounter. For example, children keep track of form-meaning pairs, which allows them to determine that form one and form two are variants of the same stem and that they differ only in inflection (e.g., swim vs. swimming, cat vs. cats) (Clarke, 2009). Diversity of syntactic environments also supports multiple conjectures about the semantics of the word under analysis (Gleitman, 1990). This conclusion supports the finding that mother's use of verbs in diverse syntactic contexts accounted for the variance in both the frequency and syntactic diversity of young children's use of those verbs (Naigles & Hoff-Ginsberg, 1998). Also, the finding that mothers' use of verbs with various grammatical morphemes such as –ing, -ed and auxiliary verbs

was related to the frequency and variety with which their children used those morphemes (de Villiers, 1985) is consistent with that argument.

Older children also benefit from the above-mentioned aspects of adult input, such as multiple encounters with diverse vocabulary (Dickinson, Flushman, & Freiberg, 2009). Observations of parent-child interactions at age five revealed that mother's use of sophisticated vocabulary in informative conversations predicted children's vocabulary through third grade (Weizman & Snow, 2001). Similarly, parents' lexical diversity observed during play settings predicted their preschoolers' vocabulary a year later (Crain-Thoreson, Dahlin, & Powell, 2001). In classroom settings, the relationship between adult input and child word learning mirrors the one observed in home settings. When children were exposed to diverse vocabulary in preschool classrooms they showed greater word learning in kindergarten (Dickinson & Porche, 2011). Bowers and Vasilyeva (2011) found that the number of different words in teachers' speech controlling for the total number of words positively and significantly predicted receptive vocabulary growth over the preschool year.

Research on exposures to words during classroom book reading also suggests that multiple encounters matter for word learning. Three- and four-year-old children made greater gains in vocabulary after three readings of a book than after a single reading, with the comparison corresponding to a large effect size of 1.06 (Senechal, 1997). Similarly, kindergartners learned 12% of the words that they were only exposed to over four book readings (Biemiller & Boote, 2006). These findings suggest that mulitiple exposures can help children create initial representations. Of course, there are multiple cues to meaning within a book reading event that may support word learning beyond the fact of mere exposure. If a child understands the story events and characters, this may aid word learning because the events and characters will

be associated with the newly learned words (Dickinson et al., 2019). In addition, teachers may take advantage of gesture, prosody, book illustrations, and commentary to provide additional cues. However, we see more robust learning when teachers intentionally provide more explicit information about word meanings (Biemiller & Boote, 2006; Marulis & Neuman, 2010).

Explicit Semantic Information about Words

An important feature of adult input that benefits word learning is clear information about word meanings. This type of informative input can be provided in various early childhood education settings. Preschool teacher's brief explanations of words in conversation and in literacy activities has predicted children's growth on target vocabulary knowledge (Silverman & Crandell, 2010) and vocabulary size at the end of kindergarten (Dickinson & Porche, 2011; Dickinson & Tabors, 2001). Explicit support for learning the meaning of words also influences vocabulary acquisition in the context of book reading (Dickinson, Griffith, Golinkoff, & Hirsh-Pasek, 2012; Wasik et al., 2016). A meta-analysis of evaluations of explicit and implicit vocabulary instruction in pre-kindergarten and kindergarten demonstrated that interventions including explicit vocabulary instruction showed larger effect sizes than those which provided in-context exposure (Marulis & Neuman, 2010). Similarly, primary grade children made consistently greater gains when teachers explained new words during book readings than when they received only incidental exposure to them (Biemiller & Boote, 2006; Penno, Wilkinson, & Moore, 2002). For example, among kindergarten to second grade students, researchers found a 22% increase in learning when definitions were provided compared to the learning that occurred from mere exposure (Biemiller & Boote, 2006). In practical terms, Coyne et al. (2007) demonstrated that kindergarteners scored no better than chance on a receptive definition measure

after incidental exposure to words over three readings. In contrast, children answered 4.5 out of 6 yes/no questions correctly on the same measure for words that had been defined. Given the consistency of results from this line of research, it is well established that providing explicit information about word meanings enhances word learning.

At the same time, most high-quality interventions do not describe, nor have they examined, the types of information provided about words during instruction (Wasik et al., 2016). Typically, researchers describe definitions as "simple," "brief" or "child- friendly" with little specifitiy beyond that. However, the nature of the information we provide children may be as important as the quantity of information and frequency of exposure to the word form. If we wish to help children establish initial representations of new words and then offer opportunities to develop them into high quality representations, we need to attend to the complexity of information provided. Specific kinds of information are more salient for children learning new words, and the kinds of information vary by word type (Booth, 2009; Hadley, Dickinson, Hirsh-Pasek, Golinkoff, & Nesbitt, 2016). While the majority of words taught in interventions are concrete nouns, there is growing interest in teaching abstract nouns, verbs, and adjectives (e.g., Hadley et al., 2016; Justice, Meier, & Walpole, 2005) as high quality representations of all types of words are necessary for successful reading comprehension (Snow & Uccelli, 2009). High quality representations include a rich network of semantic associations around a word, including functional information, perceptual qualities, synonyms, gestures that represent meaning, and pragmatics of usage (Nagy & Scott, 2000)

Functional information. For preschoolers learning concrete nouns, functional information has been found to be highly salient (Booth, 2009; Greif, Kemler Nelson, Keil, & Gutierrez, 2006; Hadley et al., 2016; McGregor et al., 2002). Functional information includes

what an object does or is what it is used for, such as "a handkerchief is used to wipe your nose." That objects have causal powers and can influence and affect other objects in particular ways appears to have a distinctive explanatory force that aids word learning. Three- and four-year-olds were more likely to learn words that were defined in terms of their function (e.g., a spoon is used to scoop food) than in nonfunctional terms (e.g., a spoon is made out of metal; Booth, 2009; Nelson, O'Neil, & Asher, 2008). Similarly, Bauer, Booth, and McGroarty-Torres (2016) found that preschoolers learned the referents for novel tools that were introduced in terms of their function in the context of creating a fruit salad to a greater degree than when the novel tools were introduced in terms of their nonfunctional properties. In a related study, three-year-olds interacted with two puppets that either consistently described functional properties of novel artifacts and animals or consistently described nonfunctional properties of the same items. After a familiarization period, the children chose to hear from the puppet that provided functional descriptions on 72% of the test trials, suggesting that young children appear to be quite curious about how items behave, or what they do, in their environment (Alvarez & Booth, 2015). The benefits of functional information to word learning has also been shown to extend to kindergarten-age children, but not first-graders, who learned equally well from functional and non-functional descriptions (Booth & Alvarez, 2015).

Researchers have attributed the facilitative effect of functional information on early word learning to two potential explanations. One explanation is that children's inherent interest in functional information may focus their attention at the time of learning, which facilitates memory for words learned (Gopnik, 2000). A second explanation is that functional information provides a framework for the elaboration of lexical representations (Craik, 2002). As Booth (2009) notes, knowing that an animal stays warm by wrapping its wings around its body describes a goal-

oriented behavior in addition to providing information about why the animal's wings are so thick and wide. To examine the effects of these two explanatory mechanisms, Booth (2015) assessed the acquisition over time and memory for novel words taught to three-year-olds with descriptions that varied in the extent of functional information provided. Findings revealed that functional information benefited the initial acquisition phase of learning. However, there was no effect of functional information on retention after a two- to three-week delay. These results suggest that functional information appears to aid early word learning mainly by enhancing the process of initial encoding, rather than by enhancing the retention of lexical representations, although further studies need to replicate this research (Booth 2015). In practical terms, findings suggest that when planning for instruction, preschool teachers should use functional information in definitions and conversations about concrete nouns as this type of semantic information is highly salient for this age group and appears to facilitate at least initial encoding.

Perceptual qualities. There are two aspects regarding perceptual qualities that inform our thinking about word learning. The first is that the perceptual accessibility of a word has emerged as an important factor in ease of acquisition. Maguire, Hirsh-Pasek, and Golinkoff (2006) suggested that all words across grammatical classes can be placed on a continuum from less to more perceptually accessible based on factors such as shape, individuation, concreteness, and imageability. Shape refers to the reliability and consistency of an object's outline or an action's configuration. For example, a ball has a highly reliable and consistent shape and thus would score high on the perceptual accessibility continuum. The action "walking" would also receive a high score. Even though it is an action that unfolds in time, "walking" has a "verbal essence" (Golinkoff et al., 2002), which is a more universal representation of what that action looks like. In contrast, "idea" would score quite low on the perceptually accessible continuum.

Individuation refers to the ease with which the word can be discerned from other items in the scene (e.g., the word "and" does not correspond to distinct element in the world). Concreteness refers to the ability to see, hear, and touch something. Imageability is the degree to which a word is "picturable" or gives rise to a mental image, and is significantly correlated with age of acquisition (Bird, Franklin, & Howard, 2001). Considered together, shape, individuation, concreteness, and imageability characterize a word's perceptual accessibility, which predicts the ease with which a word is learned in young children (Maguire et al, 2006).

A second aspect of perceptual quality is relevant when considering concrete nouns. When children notice perceptual information about objects, such as basketballs and oranges are round, they are adding perceptual information to their representations of those words (Hollich, Hirsh-Pasek, Tucker, & Golinkoff, 2000). The ability to map perceptual qualities onto particular nouns is part of the categorization process, although over time children rely less on perceptual similarity and more on taxonomic membership for extension (Hollich et al., 2000; Smith, Jones, & Landau, 1992). Thus, definitional information for preschoolers should include perceptual qualities such as "a throne is shiny and has four legs" as this type of information may help children form initial representations for new words and may help children begin to form categories for words that will be fleshed out as semantic networks grow and word knowledge deepens.

Synonyms. Another aspect of meaning that improves the quality of lexical representations is knowledge of synonyms (Henriksen, 1999). A synonym conveys a word's core meaning and can be a single word or a brief, decontextualized definition (Miller & Fellbaum, 1991). The most commonly targeted type of knowledge in vocabulary instruction and assessment is recognition of synonyms, which are often considered definitions (Beck & McKeown, 2007;

Biemiller & Boote, 2006). In a study of what category of information was learned best by grammatical class, synonym was the best learned category for verbs, abstract nouns, and adjectives, a finding that was consistent with the type of instruction provided (Hadley et al., 2016). However, the way in which synonyms are used during instruction matters. As Nagy and Scott note, "A diet of synonyms and short glossary definitions runs the danger of failing to produce usable knowledge of those words" (p. 281, 2000). In contrast, when activities are designed to explicitly emphasize semantic associations between target words and familiar words (synonyms), gains on researcher-created and standardized vocabulary assessments have been demonstrated (Zipoli, Coyne, & McCoach, 2011). For example, after instruction on the word "minute," children heard the sentence, "We watched the ant carry a tiny breadcrumb." They were then asked, "Does this make you think of the word minute, or the word big?" (Zipoli et al., 2011). This type of elaboration that allows the meaning to flow from a specific instance of use (e.g., the ant) enriches the meaning that a synonym supplies during initial instruction. In other words, synonyms provide sufficient information for a broad understanding of meaning but models of usage help with refinement. The ability to articulate the subtle differences in meaning among the synonyms "hot," "sultry," and "scorching," for example, would be an indicator of deep word knowledge and metalinguistic awareness (Henriksen, 1999).

Gestures. Word meanings can also be represented through nonverbal means such as gesture. Teaching new words with a corresponding gesture indexes a word to an object or action, resulting in an embodied representation that has had positive effects on memory retrieval (Glenberg, Gutierrez, Levin, Japuntich, & Kaschak, 2004). Moreover, gesture plays a facilitative role in communication. Gestures have been found to be particularly beneficial for preschoolers' comprehension when used in tandem with complex language (McNeil, Alibali, & Evans, 2000).

In terms of their expressive language, preschoolers have used gesture to convey more complex ideas than their verbal abilities allowed (Göksun, Hirsh-Pasek, & Golinkoff, 2010). By using multiple means of representation such as gesture in vocabulary lessons, teachers can work toward meeting the needs of diverse learners with varying levels of language proficiency in their classrooms (Silverman & Hartranft, 2014).

Props. Semantic information about target vocabulary has also been provided with props that represent words (Bierman et al., 2008; Silverman, Crandell, & Carlis, 2013; Wasik & Bond, 2001; Wasik et al., 2006). Words that can be represented by props, which enable children to touch and see a physical representation, are highly perceptually accessible due to their concreteness. Thus, props may convey perceptual information about certain words (i.e., a shovel has a long handle). Props may also be used to demonstrate functional information about a word (i.e., a throne is for sitting; a platter holds food). Using props to illustrate and clarify word meanings is one of the consistently used strategies across high-quality book reading studies (Coyne et al., 2010; Coyne, Simmons, Kame'enui, & Stoolmiller, 2004; Gonzalez et al., 2010; Loftus, Coyne, McCoach, Zipoli, & Pullen, 2010; Zucker, Solari, Landry, & Swank, 2013). However, given the combination of strategies used to teach words, it is not feasible to measure the effectiveness of props separate from the other supports in the existing literature. A more fine-grained approach could quantify teachers' and children's use of props during book reading extension activities and explore the relationship between the dosage of supports like prop use and word learning.

Contextual information. An important supplement to explicit information about word meanings are models of usage that convey contextual information (Stahl & Fairbanks, 1986). Fully understanding a word from a definition requires strong meta-linguistic and meta-cognitive

skills unlikely to be achieved by young children, leading to partial and often incorrect interpretations (Nagy & Scott, 2000). Models of usage help a child understand the pragmatics of word use, as well as providing implicit information about the nuances of meaning (Nagy & Scott, 2000). For example, Pollard-Durodola et al. (2011) provided models of usage following a brief definition of the target word: "Water is a liquid. We can swim and play in water when it is a liquid." This strategy is part of a critical accumulation of experiences with words to build depth of knowledge. The contextual information provided about "liquid" in this example also illustrates how the different types of semantic information (e.g., synonym, function) about a word are often interconnected. This model of usage includes a synonym of "liquid" ("water") and a function of liquid when it is in the form of water (used for swimming.) Thus, the contextual information category of semantic information is more global in scope than narrow categories like synonym or gesture. It is an approach to instruction that often provides several aspects of meaning and can convey information about pragmatics.

The effectiveness of interventions that provide contextual information (Pollard-Durodola et al., 2011; Silverman et al., 2013) suggest that helping children connect target words to lived experiences and broaden the application of the target word to contexts beyond which it was taught can extend word meaning and possibly boost depth of knowledge. However, it is difficult to ascertain the effectiveness of individual strategies like models of usage that include contextual information because studies have implemented varying combination of strategies without providing detailed fidelity of implementation data.

In conclusion, providing children with explicit semantic information about words, including functional information, perceptual qualities, synonyms, gestures, prop representations, and contextual information is a strong starting point for fostering vocabulary development. Yet,

across high quality studies that provide children with explicit semantic information word learning remains significant but moderate (Wasik et al., 2016). The majority of studies show that children learned less than a quarter of words taught. An important topic for the field is how much exposure to different types of semantic information leads to substantive breadth and depth of word learning.

Active Processing of Word Meanings

Breadth and depth of word learning is further boosted when children engage in discussions about word meanings with adults (Dickinson & Smith, 1994; Marulis & Neuman, 2010; Perfetti & Stafura, 2014). Giving children opportunities to interact with words and theoretically process word meanings at a deeper level leads to higher quality representations (e.g., Loftus-Rattan et al., 2016; McKeown & Beck, 2014). While discussions about word meanings occur across the school day (Bowne et al., 2017; Dickinson, Hofer, Barnes, & Grifenhagen, 2014), the majority of early childhood vocabulary research is centered around shared book reading. Active processing activities and discussions commonly take place post-reading. This approach to vocabulary instruction draws from a cognitive processing framework, which posits that mental manipulation of ideas is critical for the learner's ability to use and apply new information (Miller, 2003). In the case of word learning, the cognitive processing framework suggests that learners need to "interact with and integrate various specific contexts of word use in order to form generalizations that are of sufficient quality to assist comprehension" (McKeown & Beck, 2014, p. 521). The goal is to generate a strong and precise link between the word (i.e., label) and referent (i.e., conceptual idea that the word represents) in the learner's memory. Increasingly, researchers have used a cognitive processing framework to develop post-

reading activities with significant, positive effects for kindergarten (Coyne, McCoach, Loftus, Zipoli Jr., & Kapp, 2009; McKeown & Beck, 2014; Silverman, 2007; Zipoli et al., 2011) and preschool children (Bierman et al., 2008; Loftus-Rattan et al., 2016; Pollard-Durodola et al., 2016; Silverman et al., 2013; Wasik & Bond, 2001).

Activities that promote active processing of word meanings fall on the higher end of a cognitive demand continuum. Lower cognitive demand activities include labeling picture cards or selecting the correct picture card from two choices. These lay an important foundation for later engaging in the more cognitively complex tasks that fall on the higher end of the continuum—inferring, relating, and associating (Dickinson & Smith, 1994; Pollard-Durodola et al., 2016). Cognitively challenging activities include the following: (a) asking children to distinguish between examples and non-examples of taught words (*reluctant* or not*?* "holding a tarantula spider") (Coyne et al., 2009; Loftus-Rattan et al., 2016; McKeown & Beck, 2014); (b) relating concepts to lived experiences (*burying* items in the sand table; asking children what they might hear in a *meadow*) (McKeown & Beck, 2014; Pollard-Durodola et al., 2011; Silverman et al., 2013); (c) discussing conceptual differences ("What is the difference between an island and a *meadow*?") (Gonzalez et al., 2014; Pollard-Durodola et al., 2016); (d) making choices ("We built a snowman in the *parlour*- is that silly or not silly? Why?) (Coyne et al., 2009; McKeown & Beck, 2014); (e) classifying words (Is a bat an insect? Is this a living or nonliving thing?) (Neuman et al., 2011; Pollard-Durodola et al., 2011); and (f) writing about words ("While you're drawing, I want you to tell me how you got dirty and what you used to *scrub* off all the dirt") (Neuman et al., 2011; Silverman et al., 2013). These active processing activities were included in instructional programs to theoretically build rich networks of connections that result in flexible, complex, and nuanced representations of word meanings (Perfetti, 2007).

A handful of studies compared the benefits of a book reading plus active processing activities approach for word learning to a book reading only approach. Analyses demonstrated that the book reading plus active processing approach led to greater gains in receptive (Coyne et al., 2009; Loftus-Rattan et al., 2016; McKeown & Beck, 2014; Silverman et al., 2013) and expressive word knowledge (Coyne et al., 2009; Loftus-Rattan et al., 2016; McKeown & Beck, 2014) compared to the book reading only approach. Moreover, two of the studies used expressive measures that required varying levels of word knowledge to answer assessment items correctly and found beneficial effects of the active processing approach for the quality (depth) of knowledge relative to quantity (breadth) of knowledge.

Coyne et al. (2009) used four measures that tapped varying levels of word knowledge. The book reading only approach enabled kindergarten students to demonstrate measurable word learning on approximately two-thirds of target words. However, the word leaning was only evident in the two measures that required low levels of word knowledge: (1) recognizing correct and incorrect definitions of target words and (2) answering yes/no questions that required partial knowledge (e.g., "Could you put a *parlor* in a bag?"). Word learning from the book reading only approach was not evident in the two measures that required higher levels of knowledge: (3) producing definitions of target words and (4) answering yes/no questions that required the children to make finer discriminations about word meanings (e.g., "If you lost your toy, would you be *dismayed*?"). For words taught with the book reading plus active processing activities, children also learned approximately two-thirds of the words but they showed word learning across all four measures. Similarly, McKeown and Beck (2014) developed a series of measures on a continuum from lower-order processing, represented by recognition of word meaning, to higher-order processing, represented by context integration, listening comprehension, and

production. The book reading plus active processing activities better enabled kindergarten students to integrate target words into context (e.g., explain why Sam might have been *stunned* when he looked in the doghouse) and produce target words associated with a picture relative to the book reading only approach. Results from Gonzalez et al. (2014) further highlight the importance of post-book reading active processing activities for preschoolers' depth of word learning especially. They found that frequency and duration of association-type questioning that provided higher levels of engagement (e.g., "What is the difference between an *apartment* and a house? Why do we have apartments in cities?") than labeling or defining-type questioning was associated with greater vocabulary gains. Specifically, the duration of the higher-level questioning was significantly related to receptive gains while both frequency and duration of higher-level questioning were related to expressive gains.

Findings from these studies suggest that the addition of active processing activities enabled more robust and refined word knowledge, as measured by several assessments of depth. Results suggest that book reading provides initial exposure to a word in context that establishes a preliminary referent for the word. Explicit instruction on the word's meaning provides enough semantic information for understanding several uses and contexts for the word. However, when teachers join children in conversation post-reading to engage them in active processing, depth of learning results suggest that it can promotes flexible use of and thinking about words and build networks of connections, which lead to more complex, flexible, and nuanced representations of word meaning.

A limitation in our understanding of the role of active processing is the lack of attention to children's engagement in the activities. This lack means that we lack answers to questions such as, What do children's answers to teacher questions tell us about their developing word

knowledge? How often do children need to engage in conversations about word meanings to influence their breadth and depth of knowledge? The present study seeks to further examine the relationship between children's engagement in active processing activities and word learning across measures of breadth and depth.

Independent Word Use

Another factor supporting word learning that the present study will examine is children's independent word use. Producing novel words has been shown to benefit both acquisition (Senechal, 1997) and fluency (Clark, 2009). For example, when preschoolers labeled pictures during repeated shared book readings they showed greater gains in expressive vocabulary (Senechal, 1997). This finding suggests that practice at retrieving the phonological representation of the words was an important mechanism for word learning in general. Moreover, practice saying words and inflections help children increase their fluency in what they can verbally produce. Maintaining phonological representations, or, as Clark (2009) calls them, Production-representations, should also help children in accessing and retrieving the terms they need in varied contexts. Fluency of retrieval for purposes of producing lexical items has been linked to higher quality semantic representations (Henriksen, 1999; McGregor et al., 2007), suggesting that the development of comprehension- and production-representations are related and most likely are mutually reinforcing.

Children also need opportunities to use words as they are both deepening their knowledge of individual word meanings and strengthening the interconnectivity between nodes of knowledge in their semantic networks. Using a word to convey meaning in a natural and spontaneous sentence indicates substantial knowledge of the word's form and meaning (Nagy &

Scott, 2000; Silverman & Hartranft, 2014). But as children use words for their own purposes and take ownership of them, they likely continue to gain depth of understanding and skill in word use (Dickinson & Tabors, 2001; Harris, Golinkoff, & Hirsh-Pasek, 2011; Wasik et al., 2016).

As Bowne et al. (2017) found, teacher-child discussions in kindergarten classrooms around vocabulary words and associated conceptual information was positively related to end-of-year vocabulary growth. They coded for conceptual information about the target word including concrete examples such as actions, objects and pictures, facts, and information about what was not true about a word meaning. On average, teachers provided 50 pieces of information to children's 30 across the school day. When teacher and child contributions to the discussions were examined separately in an exploratory analysis, child contribution of conceptual information continued to show a positive and significant relationship with vocabulary growth, whereas teacher contributions did not. This finding emphasizes the importance of active child engagement in discussions. Independent use of words is one indication of active engagement. Bowne et al. (2017) concluded that children were both using the language introduced by the teacher regarding the new concepts and clarifying their own understanding of the concepts under discussion. In other words, Bowne's results suggest that teacher-child discussions in which children use new words may help them create links in their developing web of conceptual knowledge, and thus strengthen knowledge of individual words as well as connective nodes in the semantic network.

In experimental studies, practice with word usage is also a feature of effective vocabulary instruction. In a meta-analysis of vocabulary programs in the elementary grades, use of target words was one of several key features included in interventions that improved word knowledge *and* reading comprehension, indicating a higher degree of depth was fostered (Mezynski, 1983).

Similarly, researchers have included activities to encourage independent use of target words outside the classroom as a key feature of their intervention (Beck, Perfetti, & McKeown, 1982; McKeown, Beck, Omanson, & Pople, 1985). The addition of this feature improved elementary students' fluency of access, an important aspect of deep word knowledge, and ability to comprehend connected text (McKeown et al., 1985). The study authors noted that children's use of words "spontaneously in natural contexts outside of class….may have allowed the establishment of a wider variety of semantic links to the new words, which in turn make the new words more readily accessible" (McKeown et al., 1985, p. 533).

Vocabulary interventions for preschool-age children also emphasize the importance of independent use for deeper word learning. Wasik and Bond (2001) trained teachers to provide children with multiple opportunities to use book-related target words in extension activities such as science and art. Children in the interactive book reading plus extension activities condition outperformed children in the control condition (teachers read the same books, but received no training) on a depth of knowledge measure of target words. Results such as these only highlight the potential power of independent use of words for vocabulary learning. This strategy is typically part of a comprehensive instructional approach and has not been examined as a distinct component. The present study will explore the specific relationship between preschoolers' independent use of target words and breadth and depth of learning.

Taken together, theoretical foundations such as the knowledge hypothesis, the lexical quality hypothesis and the cognitive processing framework, in addition to empirical evidence suggest that optimally effective vocabulary interventions will offer children multiple exposures to words along with explicit semantic information, as well as opportunities for using words during active-processing activities with more expert language users. The research to date using

these intervention components is spread across preschool and early elementary classrooms. Questions remain about which aspects of instruction are most important for preschool-age children. In addition, the child's active role in instructional activities has received minimal attention. Several of the features of instruction that are beneficial, such as teacher-child conversations, point to the importance of children's engagement, but for the most part the field has studied those features based on what teachers ask children to do. Of equal importance is a better understanding of the types of experiences with words that foster breadth *and* depth of knowledge. While the two aspects of word learning are related, questions remain about the types of opportunities that develop the kind of nuanced and complete lexical representations that indicate deep vocabulary knowledge. The next chapter will explore teacher-guided pretend play as an optimal activity for leveraging the factors that support preschoolers' word learning.

CHAPTER IV

Pretend Play

Background

Play is one context in which children hear and use language in ways that may draw on multiple mechanisms that support word learning. Many have speculated that play has an important role in fostering language capacities important for later reading comprehension (Hirsh-Pasek, Golinkoff, Berk, & Singer, 2009; Roskos & Christie, 2013). Play is an activity that engages children in interactions with others and provides ways of using their language and minds that may help build children's ability to comprehend language, develop vocabulary knowledge, and acquire knowledge of complex syntax. Play may foster growth of language competencies associated with comprehension because, as children engage in social pretend play, they use precise and descriptive language to adopt and explain character roles and mental states and jointly construct story actions. By creating and living through stories, children have opportunities to engage in the kind of intentional interweaving of jointly produced language and personal experiences that is required for reading comprehension.

Research examining the association between play and language skills that support reading comprehension includes a diverse array of studies on language development (see Lillard et al., 2013 for a review). Scholars characterize *pretend play* or simply *play* as a type of playful activity that is pleasurable, spontaneous, nonliteral, all-engrossing, and having no extrinsic goals (Fein, 1981; Weisberg, Zosh, Hirsh-Pasek, & Golinkoff, 2013). This type of play, during which children experiment with different roles, has been referred to as make-believe, fantasy, symbolic,

sociodramatic, and dramatic play (Bodrova & Leong, 2007; Roskos & Christie, 2013). Historically, the relationship between play and language competence broadly conceived has been studied through two different research traditions that developed in parallel trajectories.

Pretend play research traditions. Two main research traditions examining play's contribution to children's language capacities developed around the same time and have pervaded the field since the 1960's. Based on the influential theories of Piaget (1962) and Vygotsky (1967), one tradition has focused on play's role in developing children's symbolic representation, and has argued that symbolic capacity extends to literacy and language skills. This argument remains mostly theoretical with some correlational evidence supporting it. The other tradition has studied play's role in developing a broader group of cognitive and linguistic skills. This strand has demonstrated an orientation toward establishing experimental outcomes and there has been less emphasis on an organizing theory out of which the hypothesized relationship between play and development of child capacities like language arises.

Play and symbolic representation. One long-standing research tradition, heavily influenced by the theories of Piaget (1962) and Vygotsky (1967), emphasizes play's role in the development of representational capacity (Fein, 1981; Tamis-LeMonda & Bornstein, 1994). Through symbolic play (i.e., an object such as a block represents a car, or a child becomes a monster) children practice the type of thinking that supports other representational activities such as using language and reading. Based on this theory that the ability to use symbols gained through play generalizes to other cognitive domains such as language and reading, researchers have hypothesized an association between development of symbolic play, language, and language-based skills important for later reading. For example, researchers who observed middle- and upper-income children during home visits or in childcare centers have demonstrated

associations between symbolic play (i.e., using one object to represent another different object) in very young children and receptive and expressive language (Tamis-LeMonda & Bornstein, 1994; Ungerer & Sigman, 1984) and between symbolic play in preschool and language skills such as phonological awareness in kindergarten and first grade that support reading (Bergen & Mauer, 2000). However, research in this tradition halted for the most part by the late 1990's (see Lillard et al., 2013 for a review). At the same time, another research tradition developed with a focus on lower-income children and an interest in a wider range of cognitive-linguistic child capacities driving the research.

Play and cognitive-linguistic skills. A second research tradition has been interested in the relationship between play and cognitive-linguistic skills, including intelligence, reasoning, self-regulation, story comprehension, and language (Dansky, 1980; Lovinger, 1974; Pellegrini, 1984; Saltz, Dixon, & Johnson, 1977; Smilanksy, 1968). Unlike research on symbolic representation, which drew consistently on a theoretical framework, there has been no unifying theory driving the inquiry into play's role in cognitive and linguistic skill development. Instead, the goal of these studies has been to extend and clarify previous findings regarding the effects of play on children's skills across varied aspects of development. The origin of these studies is widely recognized as Smilansky's experiment in 1968, which documented substantial, positive trends in children's pretend play and cognitive-linguistic development. Subsequent observational studies of middle- and high-income families found associations among play, environmental supports for play such as maternal involvement, and children's development (e.g., Tamis-LeMonda & Bornstein, 1994). Thus, researchers hypothesized that interventions aimed at increasing children's play would result in increases in cognitive and language skills. As a result, the majority of studies have targeted children from lower income families and/or language minority

families based on the premise that these subgroups of children (1) need support in cognitive and language development, (2) do not engage in pretend play as frequently as their higher-income peers (see Mcloyd, 1982 for a critical review of this claim) and (3) would benefit from adult support for increased play and related increases in cognitive and language skill. This body of studies involves classroom-based experiments. The adult support includes co-playing with children and asking questions to enrich children's play and thinking.

A main limitation of this work was the targeting of low-income children based on unqualified generalizations that they engage in less and poorer-quality pretend play than their higher-income peers, which suggested that they had a "play deficit." In fact, this claim is unsubstantiated due to the very small number of studies on social class differences, mixed findings, and methodological issues (Mcloyd, 1982; Weinberger & Starkey, 1994). For example, when social class differences in children's frequency of pretense have been identified (e.g., Smilansky, 1968), the criteria used may have been unnecessarily stringent, such as persistence in a pretend episode for ten minutes. In addition, very little research has explored low-income parents' beliefs about play (see Fogle & Mendez, 2006 for an exception). As a result, assumptions about the quantity and quality of low-income children's home experiences with pretend play are just that—assumptions. Furthermore, very little research has observed how pretend play occurs in culturally and linguistically diverse communities within the United States (see Howes & Wishard, 2004 for an exception), although there are comparisons of children's play behaviors across countries (e.g., Göncü, Mistry, & Mosier, 2000). As a result, criteria for identifying pretense may be more or less sensitive to culturally specific play behaviors and scripts that children from diverse cultural and linguistic backgrounds use to organize their play. Some play behaviors and scripts may not be recognizable to all researchers. A related issue is

that the field may be drawing on play approaches that are external to the subgroup of children receiving the intervention.

Current State of the Play-Language Research Field and Guided Play

The research involving preschool-age children's language development conducted today hails largely from the latter tradition that relates play to a broad set of cognitive-linguistic skills. I will focus on studies of play and children's vocabulary development as the present study addresses this relationship specifically.

Adult scaffolding of children's play is an essential feature of this tradition. Researchers participate in preschool children's play or coach teachers on how to participate in children's play in an effort to enrich the level of pretense and thus increase language use and learning (Neuman & Roskos, 1993). But instead of measuring an exhaustive set of cognitive-linguistic capacities (e.g., Saltz et al., 1977), over time researchers have increasingly focused on how adult-supported play contributes to learning discrete skills. The current term researchers use to refer to adult scaffolding during play in the service of a pre-determined learning goal is *guided play* (Weisberg, Hirsh-Pasek, & Golinkoff, 2013). In this form of guided play, the activity remains child-centered although adults may initiate play sequences and maintain a focus on the learning goal(s). The adult's role is to follow the child's lead and provide subtle guidance such as asking questions about what children are exploring within an environment that has been prepared to support specific learning objectives (Chi, 2009; Weisberg, Hirsh-Pasek, et al., 2013; Weisberg, Hirsh-Pasek, Golinkoff, Kittredge, & Klahr, 2016). These criteria apply to several forms of play such as pretend, physical, exploratory and construction play. Learning objectives vary across different forms of play. For example, guided *construction* play has been used to

foster geometric knowledge (Verdine et al., 2019). Guided *pretend* play has most often been used to foster language skills such as narrative comprehension (Pellegrini, 1984) and vocabulary (Han, Moore, Vukelich, & Buell, 2010). For example, in guided pretend play in a classroom setting, the teacher may select a small group of children to play with her during center time, suggest a theme, and encourage children to act out specific scenes that elicit target vocabulary. It is important to note that features of conventional pretend play such as spontaneity, lack of extrinsic goals, and voluntary participation may be relaxed when play is used in classroom settings for learning purposes (Hirsh-Pasek et al., 2009).

A limitation in the current work is the lack of a unified theory supporting the hypothesis that guided play creates conditions that enable language development, although some researchers have linked principles of word learning to playful learning contexts (Harris et al., 2011).
A second limitation is the outcome-oriented nature of studies and lack of attention to possible mechanisms at work in the guided play context that contribute to language learning. Specifically, there has been a lack of attention to the child's role in guided play activities that may lead to vocabulary learning. While research done in home settings has examined features of children's language use during play and associations with language development (e.g., Tamis-LeMonda & Bornstein, 1994), as guided play studies have moved to the classroom researchers have focused in large part on teacher behaviors such as defining and discussing words as the word-learning mechanisms to observe (e.g., Silverman et al., 2013). One exception comes from a longitudinal study conducted by Dickinson and Tabors (2001). They collected fine-grained data on potential mechanisms, such as characteristics of child and teacher talk during play in preschool, and found that, for example, when four-year-olds had teachers who limited their own talking and gave children more time to talk, children performed better on oral language assessments at the end of

kindergarten. In a related investigation of teacher-child conversations during play-doh sessions in classrooms serving low-income preschoolers, Justice, McGinty, Zucker, Cabell, and Piasta (2013) found that children mirrored teachers' use of syntactically complex utterances. These studies highlight the importance of children's verbal engagement in activities. Yet, the majority of studies do not investigate mechanisms of word learning by observing child engagement nor do they base hypotheses linking play to language development on compelling theoretical frameworks. To address these needs, we examine guided play studies with a lens informed by theoretically and empirically-based factors that support vocabulary development described in the previous chapter.

Multiple Exposures to Words

Guided play studies capitalize on the well-established evidence that the number of words to which young children are exposed influences their vocabulary development (Hoff & Naigles, 2002; Rowe, 2008; Zimmerman et al., 2009). Observational studies demonstrate that the number of sophisticated words and diversity of words teachers produce has predicted children's growth on standardized vocabulary measures (Bowers & Vasilyeva, 2011; Dickinson & Porche, 2011). During guided play, adult-child conversations provide opportunities for repeated exposure to target words previously introduced during book reading (Han et al., 2010; Weisberg et al., 2015). Guided play also provides opportunities for children to be repeatedly exposed to thematically-linked words inspired by everyday themes such as *grocery store* and *doctor's office* (Dansky, 1980; Smilansky, 1968). However, it is important to examine the relative impact of quantity of exposure to other factors that are critical for the development of full and nuanced lexical representations.

Explicit Semantic Information About Words

Guided play is an activity that provides opportunities for teachers to give children explicit information about word meanings (Han et al, 2010; Weisberg et al., 2015). Moreover, given that a high-quality lexical representation includes elaborated and specific knowledge of a word's meaning, it is important to explore how guided play may support children's learning of various types of semantic information. Explicit information could constitute a brief definition such as "to bake is to cook in the oven," or it could be a rich constellation of semantic information. For example, during guided play when a child pauses to comment on a *prop* representing a target word (e.g., "throne"), the teacher may briefly define it as a "shiny gold chair." She has provided the child a *synonym* for throne ("chair") while also pointing out *perceptual qualities* ("shiny, gold") that distinguishes thrones from other types of chairs. The teacher may also suggest to the child playing with a figure: "Your queen could sit in the throne," thereby explaining the main *function* of this target word and providing *contextual information* about who (queen) is typically associated with thrones. While book reading studies have demonstrated the value of explicit information compared to mere exposure (Marulis & Neuman, 2010), there is still more to be learned about the quantity and types of information that benefits breadth and depth of word learning in a guided play context.

One of the few experimental guided play studies to date conducted by Han, Moore, Vukelich, and Buell (2010) found that book reading plus guided play sessions led to greater gains in target word knowledge compared to book reading sessions, controlling for time spent in instruction. Specifically, they found that children in both conditions made gains in their receptive vocabulary, but only children in the book reading plus play condition made gains in

their expressive vocabulary knowledge, assessed as ability to produce a target word after looking at its picture. In characterizing the explicit information that children were given about word meanings, the authors stated that child-friendly definitions and a word-related gesture or use of a concrete prop to show action were shared with children during book reading. Play sessions involved acting out the target word (e.g., *bake* a pretend cake and put it in the play oven) while the adult talked to the children about the process (e.g., "Now it's time to put the cake in the oven. We have to wait until it's finished baking."). While it is intriguing that the play sessions were related to greater depth of knowledge learning gains, it is not clear why this result occurred. Questions remain about how systematic the authors were in providing different types of semantic information, such as synonyms, perceptual qualities, functional information, or contextual information about words during play sessions.

In addition, the words in the Han et al. (2010) study were predominantly Tier 1, or words that Beck, McKeown, and Kucan (2013) characterize as words from children's daily experiences that are only deemed appropriate for instruction when they are useful and interesting to the children learning the words. We need to better understand how explicit and varied types of semantic information influence the word learning of Tier 2 words, or sophisticated words of high utility, which are the focus of the present study. In addition, we need to better understand the extent to which quantity of semantic information influences children's performance on assessments that measure different levels of word learning. For example, the researcher-created task in the Han study is similar to the standardized Boston Naming Test (Goodglass & Kaplan, 1983), which measures one aspect of depth, proficiency in retrieval. To label the pictured objects children must have a robust phonological representation and efficient lexical retrieval of the word form. In contrast, an expressive measure such as a definition task requires the additional

ability of retrieving and articulating lexical information attached to the word form, which may require instruction that further refines depth of word knowledge.

Active Processing of Word Meanings

Children benefit from follow-up activities that allow them to learn more about words presented in book reading (Mol, Bus, & de Jong, 2009). As the cognitive processing framework asserts, more robust learning occurs with deliberate manipulation of ideas (McKeown & Beck, 2014). For word learning, the framework suggests that children need to actively process the connection between a lexical label and its conceptual idea with the ultimate goal being a stable and nuanced link in their memories. Moreover, according to the lexical quality hypothesis, the strength of these links has consequences for reading comprehension (Perfetti, 2007; Perfetti & Hart, 2002). A cluster of studies has demonstrated that active processing activities following book reading better enable preschoolers' word learning relative to book reading alone (Bierman et al., 2008; Pollard-Durodola et al., 2016; Silverman et al., 2013; Wasik & Bond, 2001).

A handful of guided play studies have incorporated this support for word learning as part of an active processing approach following book reading with positive effects (Hadley, Dickinson, Hirsh-Pasek, & Golinkoff, 2019; Levy, Schaefer, & Phelps, 1986; Weisberg et al., 2015). For example, as a child plays with a dragon figure, the teacher might ask a question that requires the child to evaluate the appropriateness of a target word in two contexts: (1) the familiar context from the book reading and (2) different contexts from the book reading. The teacher might ask: "If the dragon and the princess are helping each other, are they *quarreling*? Are they *quarreling* if they fight over who gets the book?" One of the benefits of asking active processing questions during guided play is that the play scenarios may provide a more

accessible, embodied context for thinking about word meanings (Glenberg et al., 2004). In contrast, questions in the majority of book reading plus active processing studies are decontextualized with only a picture representation to support children's higher-level thinking in some instances. These decontextualized questions may be more difficult for children with language comprehension challenges to understand and benefit from. Indeed, many active processing approaches found greater effects on word learning for children with higher initial receptive vocabulary (Coyne et al., 2009; Loftus-Rattan et al., 2016). Guided play may allow children with lower levels of language competence to respond to questions with a higher cognitive demand because they have props to manipulate while reenacting a familiar narrative.

Nonetheless, active processing questions have been infrequently featured in guided play interventions. This is most likely due to the emphasis on guided play as an activity setting that best encourages responsive interactions (Bredekamp, 2004; Harris et al., 2011; Hollich et al., 2000) and the findings that responsive teacher strategies such as following children's lead in conversation have been positively associated with language and literacy gains (Cabell, Justice, Konold, & McGinty, 2011; Hamre et al., 2010; Peisner-Feinberg et al., 2001). In addition, the majority of guided play studies that used responsive strategies examined growth in children's general vocabulary knowledge and therefore there may have been less focus on deepening knowledge of specific words through questioning (e.g., Christakis, Zimmerman, & Garrison, 2007; Dansky, 1980). In contrast, the guided play studies that teach specific words feature the active processing component (e.g., Hadley et al., 2019; Weisberg at al., 2015). Questions remain about the role active processing questions play in guided play and whether this type of interaction with word meanings benefits preschoolers' learning of researcher-selected words.

Independent Word Use

Guided play may also be an optimal setting for another factor that may support vocabulary development- independent use of words. Given that preschool classrooms, and whole-group book readings in particular, provide limited occasions for child-initiated talk (Wasik & Hindman, 2011), it is important to identify settings like guided play that may present more opportunities for child-initiated talk and word use (Rowe, 1998; Silverman & Hartranft, 2014; Weisberg, Zosh, et al., 2013). Researchers have observed increases in preschoolers' language and target vocabulary use when participating in guided play. For example, among 283 children in 22 public school preschool classrooms funded through Title I, Farran & Son-Yarbrough (2001) found that children were more likely to talk to teachers and peers in reciprocal or cooperative play, which involved interactions with others, than they were in less social types of play such as parallel play. Smilansky (1968) found that children who participated in enriching experiences such as book reading followed by guided play used a greater range of words (i.e., words used without repetition) than children who participated in only guided play or only enriching experiences. Similarly, Dansky (1980) observed that children who had participated in a guided play intervention displayed significantly more talk when taking on a pretend role during free play after the intervention than children from control conditions (pretend play without adult guidance and exploratory object play). Evidence of talk while assuming a role during post-intervention free-play suggests that language use was fostered and practiced in guided play sessions. Although these studies did not assess children's word learning, they provide preliminary evidence that guided play elicits children's independent use of novel words.

Independent word use during guided play may enhance deep word learning especially because the grammatical and semantic components are enriched over multiple opportunities to

use the word while interacting with more linguistically advanced play partners. When children engage in play they use words in appropriate syntactic frames for varied purposes as they talk about events and roles (Farver, 1992; Howe, Petrakos, Rinaldi, & LeFebvre, 2005). Specifically, observational evidence indicates that during pretend play, middle class children use complex syntax including auxiliaries, verb expansions, and temporal clauses (Ervin-Tripp, 1991) and more complete syntactic utterances (Vedeler, 1997). Similarly, preschoolers used syntactically complex utterances during play-doh sessions in classrooms serving low-income children (Justice et al., 2013). Children's word learning during guided play could be enriched due to play's support for increased conversation with a more advanced partner and related complex syntax use.

Producing target words in more complex utterances may also contribute to knowledge of the inflectional affixes that create different grammatical forms of the same target word. Support for this finding comes from data collected during the *Read-Play-Learn* project (Newman & Dickinson, 2013) related to books about knights and dragons. Consider uses of *charge*, one of the words they sought to teach. A teacher used the present participle form of *charge* when she added the inflectional affix *–ing*: "The dragon's going to go *charging* at the knight." Later during the same play session, the teacher and a child were acting out the role of the dragon and the knight and negotiating whether or not they should fight. The child provided the following explanation as to why they should remain friends, and in doing so she used the infinitive form of the target word, which serves as a direct object in this utterance: "When you're enemies you're not friends, and then you have *to charge* at each other." Engaging in pretend play provided an opportunity for the child to hear and independently use different grammatical forms of the word *charge*, which may have deepened the child's knowledge of the word. Interestingly, the child's utterance also contained an elaborate explanation of the conditions under which one charges,

revealing her semantic and grammatical knowledge of "charge." This points to the mutually supportive relationship between grammar and vocabulary learning. Research shows that children learn information about a word's part of speech by noticing the linguistic context in which they encounter the word (Imai et al., 2008). In turn, children build on their preliminary understanding of word meanings as they observe words being used across varied contexts (Gillette, Gleitman, Gleitman, & Lederer, 1999). However, we need to better understand the relationship among children's independent use of words and use of different grammatical forms and deep word learning.

Implications for the Present Study

A review of the literature reveals multiple factors important for fostering word learning. Yet questions remain about the possible combinations of strategy use and dosage in a guided play setting that result in preschooler's word learning and whether certain strategies lead to smaller increments in word learning as captured on measures of depth, as opposed to vocabulary breadth. Questions also remain about how children's contributions to the discourse during guided play may influence their word learning. There has been a lack of attention to this mechanism. Several meta-analyses point to adult-child interactions during book reading and extension activities as a critical element for vocabulary learning to occur (Marulis & Neuman, 2010; Mol et al., 2009; Wasik et al., 2016). However, the adult-child interactions are broadly characterized as teachers asking children questions with very little attention paid to features of children's responses or other aspects of their verbal engagement in guided play activities beyond responding to teachers. To address these gaps in the field, (1) descriptive research questions will examine how teachers and children interact with words during guided play and (2) hypotheses

will be tested regarding specific features of child engagement and teacher instruction during guided play that may support preschool children's breadth and depth of vocabulary knowledge. While these research questions and hypotheses are driven by theory and prior research, the constraints of the guided play intervention warrant a note of caution that findings may not reflect how teachers and children spontaneously engage in talk in everyday classrooms.

Research Questions and Hypotheses

Research Questions

The following research questions were explored to describe the prevalence of teachers' and children's use of language during guided play sessions and associations between teachers' and children's language use:

1. How do teachers use language during guided play? How frequently do they use the following instructional features:
    a. provide definitions,
    b. provide models of usage
    c. ask active processing questions,
    d. provide semantic information,
    e. vary the grammatical form of words.
2. How do children use language during guided play? How frequently do children engage with target words in the following ways:
    a. answer questions
    b. independently use target vocabulary,

c. use different grammatical forms of target vocabulary,

d. contribute pieces of semantic information about target words?

3. What are the associations between teachers' and children's patterns of language use?

    a. Does the amount of teacher use of target vocabulary relate to child use of target vocabulary?

Hypotheses

The main goal of the present study was to examine specific features of child engagement and teacher instruction during guided play that supported preschool children's breadth and depth of vocabulary knowledge. Based on the review of research above, I made two hypotheses about growth in word knowledge:

1. Word knowledge growth will be associated with the frequency of children's use of the following:

    a. total number of target words,

    b. independent use of target words,

    c. use of different grammatical forms of target words,

    d. contributions of semantic information about target words,

    e. answers to teacher questions about target words.

2. Word knowledge growth will be associated with the frequency of teachers' use of the following instructional features:

    a. total use of words,

    b. definitions of target words,

    c. models of usage of target words,

    d. use of different grammatical forms of target words,

e. semantic information about target words,

f. asking active processing questions about target words.

CHAPTER V

Methods: Research Design and Analysis

Study Description

The data for the present study were collected as part of a larger experiment (*Read-Play-Learn* see Toub et al., 2018) that examined the effects of book reading and pretend play on children's vocabulary development. *Read-Play-Learn* was a project that used an iterative design over three years to develop and refine book reading and play methods for use by preschool classroom teachers. In earlier phases of the project, Language Specialists (LS's) delivered the intervention model to small groups of children. By the third and final year, classroom teachers implemented the intervention. Data for the present study come from phase 4.2, which occurred in spring of the second year of the project. Classroom teachers delivered the intervention with the support of LS coaching (*see Procedures*). *Read-Play-Learn* was implemented across two sites. Data for the present study come from four state-funded preschool classrooms located in one site: a medium-sized city in the southeastern United States.

Teacher Participants

Four female classroom teachers delivered the intervention. All teachers possessed Bachelors or Masters degrees plus state licensure in early childhood education.

Child Participants

Participants included 51 children. Recruitment focused on children who did not have intellectual disabilities and who were not identified as English Learners (EL). Most children spoke English as their primary language (90%). The sample is comprised of 31 males (61%) and

20 females (39%). The average age of the sample was 4.8 years at pre-test. Ethnicity data for this phase is incomplete. Demographics from prior phases of the experiment, which recruited children from classrooms in the same state-funded program, indicate that the majority of children were African-American, with smaller percentages of White and Latino children, and from primarily low-income households.

Procedures

The goal of *Read-Play-Learn* during phase 4 was to compare the effectiveness of play and picture card activities as supplements to book-reading instruction in a within-subjects design. The experiment was conducted from February through April 2013. All children were individually pre-tested and post-tested by members of the research team for knowledge of target vocabulary within one week prior to and following the intervention. Teachers read the story four times to the whole class over a span of two weeks. Immediately following each book reading, teachers lead mixed-gender play sessions of three or four children in a designated area of the classroom. Each child participated in a play session after each reading of the story, totaling four play sessions. A tripod and video camera were positioned to capture the play behaviors of the children and conversations between children and teachers. Children also participated in six picture card vocabulary review sessions that reinforced words that were *not* taught during play over the two-week intervention. Classrooms were randomly assigned to counterbalanced books.

Intervention Approach (*Read-Play-Learn*)

Book and word selection. The book reading and play intervention was developed around a dragon theme. Two books were chosen to read to the children: *The Knight and the Dragon*

(dePaola, 1980) and *Dragon for Breakfast* (McMullen & McMullen, 1990). Both books were comparable in terms of the pictorial representations of most target words, text complexity, and length.

Sixteen target words per book, including four abstract nouns, six concrete nouns, and six verbs were selected using the following procedures. First, we identified words in the story that were considered Tier 2, or sophisticated words of high utility (Beck et al., 2013). Additional target words had to be inserted in the texts as the original text in both books had fewer than 16 Tier 2 words. Next we considered whether words could be easily explained in child-friendly terms, and whether the words were semantically and phonologically distinct from one another. We also cross-referenced our selection with Biemiller's (2010) list of words, which are rated in terms of appropriateness for instruction by grade level. Twelve target words did not appear on the Biemiller (2010) list. Of the 20 target words that were on the list, 80% were characterized as at least Level T2—high priority words that are typically known by more advanced students by the end of second grade and not known by at-risk students. According to the Dale-Chall (1995) list of common words, 75% of our target words were rare.

Book Reading. Word meanings were explained over four whole-group book readings. The sixteen target words were split into set A and set B. Set A was the focus of instruction during the first and third readings. Set B was the focus of instruction during the second and fourth readings. Immediately prior to the book reading, teachers reviewed the day's eight focus words with picture cards that showed the word in a context different from the book. Teachers provided definitions and references to the word's use in the story. They encouraged children to guess or repeat the word and used gestures with the children. During each reading, rich explanations of focus words were provided as the words occurred in the text. Rich explanations

consisted of (a) drawing children's attention to a word by pointing to the picture, which also helps illustrate meaning (e.g., "look at the dragon's nose; these are his *nostrils*" [pointing to the nose in the picture]); (b) definitional information delivered in concise, child-friendly language (e.g., *nostrils* are the little holes in your nose); (c) the use of gesture, when possible, to kinesthetically reinforce meaning (e.g., can you point to your *nostrils*?), and (d) an example of a word in a context other than the one used in the story (e.g., we use *nostrils* to breathe air, not fire"). The eight words that were not the focus of instruction were defined briefly as they occurred in the text.

In order to test the benefit of play on children's word learning, half of the target words (n = 8) from each book were assigned as *play* words and half were assigned as *picture card* words. Play words were used and supported during play sessions following the readings while *picture card* words were not used during play. To make equivalent the number of exposures of *picture card* words to *play* words, teachers reviewed the *picture card* words with children in whole group activities using picture cards three additional times per week. Concrete nouns, abstract nouns, and verbs were equivalently distributed across *play* and *picture card* words (see Appendix A for word lists).

Play. Teachers lead small groups of three or four children in four play sessions over the two-week intervention. Children, who were randomly placed into playgroups, remained in the same playgroup for the duration of the intervention. A set of book-related props was developed for each book to support children's story reenactment and to elicit thinking about target words. Researchers provided teachers with guidance cards that included suggestions for different scenes to enact from the story and types of questions to ask children to encourage thinking about target words. During play sessions 1 and 2, teachers guided children through a reenactment of the

story. During play sessions 3 and 4, children selected a novel scene to explore through play. The eight *play* words were distributed across the play sessions so that only four words were the focus of instruction during any given play session.

Sessions 1 and 2. The teacher started play sessions 1 and 2 with a story and vocabulary review using illustrations from the book. This activity served as a plot review to aide children's story reenactment and as a vocabulary review to further support word learning. During the before-play review half of the *play* words were briefly defined, and the other half were the main focus of the review. The before-play review was conversational while the children and teacher looked at the book illustration and included the teacher's use of the word, provision of a definition, and elicitation of the word from children, as well as recall of key events.

Following the before-play review, teachers helped children select roles and lead children in a story reenactment. Guidance cards suggested how teachers could enact a role themselves and playfully use target words as the story reenactment unfolded (see Appendix B). Teachers provided brief definitions and questions to prompt children's word usage (e.g., "You pretend that you are the dragon and let's *charge* at each other," and "Let's all *charge*! You start there, and I'll start here. Ready, set go! What are we doing?") The goal was to draw children's attention to each of the day's target words at least three times. Teachers were also encouraged to use other target words if the opportunity arose based on children's interests.

Sessions 3 and 4. Teachers began play sessions 3 and 4 by presenting children with a choice of play scenarios that were different from the story (i.e., beach, birthday party). There were guidance cards specific to each play scenario. Instead of a before-play review, teachers briefly reviewed all 8 *play* words during toy distribution before sessions 3 and 4. Teachers then asked questions and made suggestions to orient children to the new play scenario (e.g., "What

should we pack to go to the beach?") Teachers were instructed to use each of the day's four target vocabulary words at least once during play in each of three contexts: (1) a definition (e.g., "What *mayhem*! That is when there is a lot of mess and trouble."), (2) a closed-ended question (e.g., "Is *mayhem* calm or a little crazy?"), and (3) an open-ended question (e.g., "How is *mayhem* different than calm and peaceful?"). Teachers were encouraged to either use examples from the guidance card or develop their own questions and ways to use target words when following the lead of children's unique play.

Picture Card Words. The *picture card* words were reviewed in a whole-class picture card game. At three convenient times per week, the teacher showed non-story-related illustrations of all eight *picture card* words, provided definitions, and prompted children to say the words. Each *picture card* word was taught 6 times outside of the book-reading sessions, on six days within the two-week period.

Transcription

All videotaped play sessions were transcribed at the utterance level by a commercial transcription service. Transcripts began with the start of the play session and concluded when the teacher indicated that the play session ended or the video recording stopped. Each child was assigned an identifying code so that utterances could be matched to individual children for the generation of child-level predictors. On the rare occasion when it was impossible to match utterances to a specific child due to visibility issues or the camera angle, the child utterance in question was not coded for analysis. All transcripts were verified by the author or a second coder who reviewed every transcript while watching the videotape and corrected any errors.

Coding of Play Sessions

A coding system was developed by the author to identify instances in which teachers and children used and discussed target words. The average video length was 13.08 minutes (median 13.23 minutes) and ranged from 8-17 minutes. Analyses controlled for length of video as a way of equalizing intensity of exposure to the intervention.

Identifying vocabulary instruction and child engagement with words. Only teacher and child utterances that included a target word or posed or answered a question about a target word were coded. This decision followed from the literature on vocabulary instruction emphasizing the importance for children of both developing a representation of the word being discussed and connecting the representation to semantically rich information about the meaning and usage of the word (Stahl & Nagy, 2006). Utterances received a code that differentiated between direct *use* of a word and *reference* to a word. For example, questions that referenced a specific target word but did not feature the word directly (e.g., "What is this?" (teacher points to *throne* prop) were coded as *reference*. Some utterances targeted more than one word at the same time (e.g., "*Servants*, get the king his *throne*.") Such utterances received two *use* codes—a *use* code attached to *servants* and a *use* code attached to *throne*. To evaluate the reliability of this categorization system, 11 transcripts (20% of the total sample) were double coded by an undergraduate student trained in the coding procedure. Substantial interrater reliability (Landis & Koch, 1977) was achieved for the identification of teacher vocabulary instruction and child engagement with words (percent agreement ranged from 89.04 to 100.00%). The total *number of words used and referenced* across all play groups were estimated.

Coding the nature of vocabulary instruction and child engagement. After utterances were identified, a set of codes was applied to identify the nature of instruction and quantity of

different types of information provided about each word. Each teacher utterance was coded for type of instructional strategy and type of information provided about the word. Each child utterance that responded to an instructional strategy and conveyed a type of information about the word was coded. For the full coding manual see Appendix C.

In order to ensure reliable use of the coding instrument throughout the study, an undergraduate student coded a randomly-selected subset of 20% of transcripts and videos. The author trained the secondary coder in the coding system, and training transcripts were double-coded until the two coders reached the reliability criterion, defined as Cohen's Kappa value of at least 0.80. Percent exact agreement is commonly reported in studies of a similar nature. However, Cohen's Kappa calculation, a more conservative representation of reliability, adjusts for the possibility of chance agreement between two observers (Banerjee, Capozzoli, McSweeney, & Sinha, 1999). The secondary coder independently coded 20% of the transcripts/videos to demonstrate maintained reliability. Cohen's Kappa were calculated for each of the coding categories. Reliability was only below criterion on one occasion. Researchers have not yet reached wholesale agreement on acceptable levels of Kappa calculations. However, some research suggests that levels ranging from 0.40 to 0.75 are considered adequate (Fleiss, 1981). Reliability exceeded criterion overall, with an average of Cohen's kappa = 0.83. Interrater reliability for specific categories is given when each code is described.

Codes were developed through an iterative process that began with descriptive utterance level codes of a sample of three transcripts (intentionally selected to represent both book-based and novel scenario play sessions), with the codes detailing the nature of instructional strategy and information provided in each utterance. A review of the literature on the factors that support

vocabulary learning highlighted the following important aspects of instruction and child engagement, which could also be found in the transcripts coded.

Grammatical variation of word use. Nouns were coded as singular, plural, possessive or adverb form (i.e., foolishness changed to foolish). Verbs were coded as base/infinitive, present tense, past tense, past participle, or present participle form. Interrater reliability was high for this category (0.90).

Nature of instruction. Coders selected one of three mutually exclusive options for the type of instruction in which a target word was used: use in context, definition, active processing question. Use in context refers to *models of usage* that help children understand the pragmatics of word use and provide implicit information about the nuances of meaning but there is no explicit attempt to define the word (e.g., "anybody else want to *charge* over to the knight?"). *Definition* was coded when teachers made an explicit attempt to tell children the word meaning (e.g., *nostrils* are the little holes in his nose"). *Active processing questions* asked children to synthesize (e.g., what is a throne?") or analyze word meaning (e.g., how are *talons* different from hands?). See Appendix D for examples of instruction types coded. Interrater reliability was adequate for this category (0.76).

Child engagement. Given the need to better understand the role that children's engagement plays in the vocabulary learning process (Bowne et al., 2017), coders selected from two mutually exclusive options for the type of child engagement observed: question response or independent target word use. *Question response* was coded when a child responded correctly to a teacher question while using a target word (e.g., teacher: "so if you're not friends you're what?" child: "*enemies*") or while referencing a target word (e.g., teacher: "what is a *throne*? Child: "you sit in"). *Independent use* was coded when a child used a target word spontaneously, in

absence of teacher questions or prompts (e.g., I'm *charging* at the princess!"). See Appendix D for examples of child engagement types coded. Interrater reliability was high for this category (0.87).

Semantic information. Coders selected from eight non-exclusive codes to describe the kinds of semantic information provided about word meanings in each utterance. These codes were as follows: 1) gesture - teacher or child performed a gesture that illustrated a word's meaning in conjunction with verbal use of the word; 2) prop – target word was indexed to a toy/prop; 3) function – information about a word's process, purpose or use was provided (e.g., "those are called *scales* and they're going to protect you"); 4) perceptual qualities - properties of nouns/how target word looks, smells, tastes, feels, or sounds was provided (e.g., "a *handkerchief* is made out of cloth"); 5) synonym - a word or short phrase that is equivalent to target word was provided (e.g., "*weeping* is when you're crying"); 6) antonym – information about what is not part of the concept was provided (e.g., "I'm not your enemy; I'm your friend"); and 7) picture – teacher or child pointed at the picture card for the word. See Appendix E for examples of teacher and child utterances and semantic information codes assigned. Interrater reliability was adequate for this category (0.68).

Variables

Variables were calculated as the sum of all counts of the verbal behavior across four play sessions. To control for time spent in instruction, each behavior sum was divided by the total length of play sessions in minutes (sum of four session lengths). See Table 1 for more information.

Table 1
Names and definitions of variables coded to describe the nature of vocabulary instruction and child engagement

Variable Coded	**Definition**
Teacher use of target words	The total number (*see note at bottom of table*) of target words used by the teacher.
Teacher grammatical variation	Count of all grammatical variations in teacher target word use.
Teacher definitions	Count of all target word definitions provided by the teacher.
Teacher models of usage	Count of all teacher models of usage of target words that conveyed implicit information about word meaning.
Teacher active processing questions	Count of all active processing questions about target words that teachers asked children.
Teacher contribution of semantic information about meaning	Count of all new references to information provided by teachers about the meaning of the target word, including gesture, prop and pictorial representations, functional information, perceptual qualities, synonyms, and antonyms.
Child use of target words	The total number of target words used by each child.
Child independent use of target words	The total number of target words used independently by each child.
Child grammatical variation of target words	Count of all grammatical variations in each child's target word use.
Child response to teacher questions	Count of each child's responses to teacher questions about target words.
Child contribution of semantic information about meaning	Count of all new references to information provided by each child about the meaning of the target word, including gesture, prop and pictorial representations, functional information, perceptual qualities, synonyms, and antonyms.

Note. To control for time spent in instruction, all counts of verbal behavior were summed across four play sessions, then divided by the sum of session lengths in minutes.

Measures

Pre- and post-testing sessions each consisted of both a receptive and an expressive test, in a counterbalanced order, with children tested individually. Additionally, the Peabody Picture Vocabulary Test, Fourth Edition (PPVT-4 Dunn & Dunn, 2007) was delivered one week before

the start of the intervention to provide a baseline standardized measure of general vocabulary knowledge. PPVT standardized score was used as a child-level covariate in quantitative analyses.

Vocabulary Breadth Measure. To assess children's receptive understanding of target words, a new measure was designed and modeled after the PPVT-4 and administered pre-test and post-test. Similar multiple choice tests have been widely used to assess target word comprehension (Blewitt, Rump, Shealy, & Cook, 2009; Penno et al., 2002; Senechal, 1997). The examiner stated a word and asked the child to select the referent from three illustrations, including a correct referent, a conceptually related foil (e.g., fish for the target word *pond*) and a thematically related foil (e.g., stream for the target word *pond*). For the target word *cabin*, the conceptual foil used was a picture of a tent and the thematic foil was a picture of logs. The pictures of the target words used in the testing were different from the pictures used during the intervention. Four practice items depicting familiar objects were used at the beginning of the test to be certain that children understood the task. The test for the dragon theme consisted of 40 items, including 16 words taught during book reading and during play sessions, 16 words taught during book reading but not during play sessions, and 8 control words. Control words were the same difficulty as target and exposure words. Children were not trained on them through either instruction or exposure.

Vocabulary Depth Measure. We used the New Word Definition Test-Modified (NWDT-M; Hadley et al., 2015), an experimenter-designed measure, to assess children's depth of knowledge of taught words. Children were asked to define concrete nouns, abstract nouns, and verbs using verbal response and gesture. For each word, children were asked, "What is *throne*?" for example, and "Can you show me or tell me anything else about *charging*?" Children's responses were transcribed by testers and videotaped.

A coding schema, adapted from the work of Blewitt, Rump, Shealy, and Cook (2009), was developed to categorize and score children's responses for the number of correct information units given. A child's total score on the expressive task was an average of the number of information units contained in that child's responses to all test items. Coding was conducted by research assistants who demonstrated at least 90% agreement with a Gold Standard coder during training. Twenty percent of coded assessments were compared against the Gold Standard coder's data. The average percent agreement was 96.3% with a mean Cohen's kappa value of 0.93.

Coding Scheme. Eight information unit categories were used to score children's responses for semantic content and contextual information: perceptual qualities, functional information, part/whole descriptions, meaningful context, basic context, synonyms, antonyms, and gestures. Each information unit was worth 1 point except for basic context, which was worth .5 points. The first four categories were used for concrete nouns only. Perceptual qualities included properties such as how something looks, smells, tastes, feels, or sounds. Functional information included any process, purpose, or use for concrete nouns and answers the question, "What do you do with it?" Part/whole described a distinct part of a target word or the whole that the target word was a part of. The remaining categories were used for all word types. Synonyms included any word or short phrase that was equivalent to the word being explained, and provided decontextualized meaning information. Gestures included gestures or actions that showed knowledge of the word's meaning (e.g., child bringing curled fists up to eyes and making circular motions to represent *weeping*).

We also coded for two types of use in context. Meaningful context included responses that showed knowledge of the target word in a typical, meaningful context, along with semantic

information. For example, in response to the test item *throne*, one student said, "Chair that only kings and queens get in." In this example, "chair" would be scored for synonym, and "only kings and queens get in" would be scored for meaningful context, because the student used an example to illustrate individuals who might sit in a throne along with semantic information. Basic context, worth only 0.5 point, was a simple association between a target word and a typical context, without any use of semantic information. For example, a child might say, "put them on," for spectacles, a response that does not include semantic information but still contains an association with a typical context in which the target word is used. Incorrect or irrelevant responses received a score of 0. See Appendix F for examples of student responses and scoring.

Analytic Approach

We used multilevel regression models to account for interdependency among observations (e.g., repeated observations within children (n = 51) nested in play-groups (n = 13), which are nested in classrooms (n = 4)). The intraclass correlations from an unconditional two-level model for the breadth measure indicated that 89% of the variance was attributed to differences between children, and 11% of the variance was due to differences between playgroups. For the depth measure, 96% of the variance was attributed to differences between children, and 4% of the variance was due to differences between playgroups.

In analyses, we examine children's residualized gains (post-test vocabulary knowledge controlling for pre-test vocabulary knowledge) in vocabulary knowledge in relation to variables that represent the nature of vocabulary instruction and features of child engagement. We included a number of covariates in this analysis to control for characteristics of children that might relate to their vocabulary skills: PPVT, age, gender, and language minority status. Due to

concerns about power, we only included in our final models those control covariates (PPVT and age) that showed a significant relationship with children's vocabulary growth. In addition, we checked that each predictor variable was evenly distributed.

We hypothesized that each variable of interest could be important for word learning based on theoretical models of vocabulary development and empirically-based vocabulary studies. Moreover, correlations between some variables were large enough that they could have had implications for multi-collinearity (see Table 5). Thus, each predictor variable in the equation below was entered into a separate prediction model with covariates for hypothesis testing. See Appendix G for full models. We tested the associations among each of the five child-level predictors for child engagement, each of six playgroup-level predictors for teacher language use and instruction, and the two vocabulary outcome measures, accounting for the nesting of $children_{ij}$ in $playgroups_j$:

$$POSTTEST_{ij} = \gamma 00 + (\gamma 1 * PRETEST_{ij}) + (\gamma 2 * PPVT_{ij}) + (\gamma 3 * AGE_{ij}) + (\gamma 4 * CHILD\_PREDICTOR_{ij}) + U0j + eij$$

$$POSTTEST_{ij} = \gamma 00 + (\gamma 1 * PRETEST_{ij}) + (\gamma 2 * PPVT_{ij}) + (\gamma 3 * AGE_{ij}) + (\gamma 01 * TEACHER\_PREDICTOR_{j}) + U0j + eij$$

Finally, due to small sample size and low statistical power, we used standardized mean difference effect sizes to interpret the significance of the magnitude of effects as opposed to relying solely on significance levels of p-values (Farran, Meador, Christopher, Nesbitt, & Bilbrey, 2017). To calculate standardized mean difference effect sizes, the sample was split into a below-median group and an above-median group on each predictor variable. Then, covariate

adjusted means for the below- and above-median groups were obtained to use in the effect size calculation, which adjusts the differences for both scale and precision of measurement and size of the sample.

CHAPTER VI

Results

Describing the Language Experience in Guided Play Sessions

These analyses address research questions 1-3 and present patterns of language use by teachers and preschool children in guided play sessions through descriptive statistics.

Teacher language use. Research Question 1 addresses the characteristics of teachers' target word use and the prevalence of instructional features that have been found to support word learning. Tables 2 presents the average target word use and type of instructional move per minute for each teacher, which accounts for time teachers spent in play sessions. Table 3 presents the total behaviors per play session in order to convey the actual amount of word use that occurred. Teachers A and B had four playgroups *(n* = 16 play sessions). Teacher C had two playgroups (*n* = 8 play sessions) and Teacher D had three playgroups (*n* = 12 play sessions).

Target word use. As shown in Table 3, there was considerable variability in total target word use. In fact, there was greater variability in total word use than in the other categories of teacher word use. Teacher A used 67 target words, on average, per play session whereas Teacher C used target words 23 times per play session on average. Teachers were asked to focus on four target words per play session. Teacher A's total word use suggests that children were exposed to each target word around 17 times. In contrast, Teacher C's total word use suggests that children were exposed to each target word around 6 times per session. However, in practice, teachers could have distributed their use of the four target words unevenly across the session, for example, focusing on the concrete nouns and verbs more frequently than the abstract nouns.

Teacher use by form class was not analyzed in the present study.

Grammatical variability. Teachers changed the grammatical form of target words at different rates. Teacher A, in a pattern consistent with her total word use, changed grammatical forms most frequently at 4.5 average changes per play session. In contrast, Teacher C, who used target words the least, changed grammatical forms two times per session, on average. No teacher exceeded seven grammatical changes during a play session.

Instructional features. Table 3 depicts the average use of the following types of vocabulary instruction: definitions, models of usage, and active processing questions. Teachers provided definitions infrequently, ranging from 0.8 to 2.5 definitions per play session. Teachers varied in their models of usage, or use of target words in contexts that provided implicit information about word meanings. Teachers A, B, and D provided models of usage between 15 – 20 times per play session whereas Teacher C provided roughly half that amount at 8.4. Teacher questions were divided into questions about word meanings that featured a target word (e.g., "Who sits in a *throne*?") and questions that referenced a target word (e.g., "What is this?" as teacher points to a toy throne). There was an inconsistent pattern in teacher questions. Teachers A and B used questions that featured a target word more frequently than questions that referenced target words. Teacher C used roughly the same number of each type of question, whereas Teacher D used twice as many word reference questions.

The variation of instructional strategies within individual teacher play sessions was also considerable. For example, Teachers C and D asked a minimum of 0 questions during one play session and a maximum of 7 and 28 questions, respectively, during another play session. Similarly large ranges were observed in teachers' definitions (0-7) and models of usage (1-38) across play sessions, suggesting that teachers were not consistent in their use of instructional

strategies across the four play sessions for a given playgroup or they were not consistent in strategy use across their playgroups.

Semantic information. Type of semantic information, including antonym, function, gesture, perceptual quality, picture representation, prop representation, and synonym, were coded whenever a teacher used a target word. A single use of a target word could receive more than one semantic information code. Table 4 displays the average semantic information units provided per play session by each teacher in total and disaggregated by type. Teachers A and D provided the most units of information with 39.8 and 37.9 per play session, respectively. Given that four words were the focus of instruction per play session, this suggests teachers on the high end provided roughly 9.5 semantic units of information per word. On the low end, Teacher C provided children with 13.5 units of information per play session, on average, or 3.4 units per word. Antonym and perceptual quality were the types of information least likely to be provided to children, and this was consistent among all teachers. The most frequently used types of semantic information were less consistent among teachers. Teachers A and D (*Dragon for Breakfast*) used function information and props most often whereas Teachers B and C (*Knight and Dragon*) used gesture and pictures most often (see Appendix E for examples).

Table 2

Average Teacher Instructional Strategy Use Per Minute

	Teacher A			Teacher B			Teacher C			Teacher D		
	Per Minute	Min	Max	Per Minute	Min	Max	Per Minute	Min	Max	Per Minute	Min	Max
Total Word Use	4.90	4.50	5.20	3.30	2.90	3.50	2.10	2.00	2.20	4.00	3.70	4.3
Grammatical Form Changes	0.30	0.30	0.40	0.30	0.20	0.40	0.20	0.20	0.20	0.20	0.20	0.2
Definitions	0.20	0.10	0.20	0.20	0.20	0.30	0.00	0.10	0.10	0.10	0.10	0.2
Models of Usage	1.50	1.00	1.90	1.10	0.90	1.40	0.80	0.70	0.80	1.10	1.00	1.3
Questions												
Word Use	0.60	0.50	0.70	0.70	0.40	1.00	0.30	0.20	0.50	0.50	0.30	0.7
Word Reference	0.20	0.20	0.30	0.30	0.30	0.40	0.30	0.30	0.30	1.00	0.80	1.1
Semantic Information Units	2.54	2.16	3.03	1.73	1.12	2.15	1.01	0.93	1.08	2.09	2.08	2.11

Table 3

Average Teacher Instructional Strategy Use Per Play Session (Total Number of Play Sessions/Total Minutes)

	Teacher A (16/219)			Teacher B (16/214)			Teacher C (8/88)			Teacher D (12/158)		
	M	Min	Max	*M*	Min	Max	*M*	Min	Max	*M*	Min	Max
Total Word Use	67.3	49.0	86.0	43.7	24.0	70.0	22.8	10.0	35.0	52.1	10.0	86.0
Grammatical Form Changes	4.5	2.0	7.0	3.8	1.0	7.0	2.0	0.0	5.0	2.6	0.0	7.0
Definitions	2.5	0.0	6.0	3.0	0.0	7.0	0.8	0.0	2.0	1.8	0.0	7.0
Models of Usage	19.8	5.0	38.0	14.8	1.0	30.0	8.4	3.0	13.0	14.7	1.0	38.0
Questions												
Word Use	8.1	1.0	28.0	9.6	3.0	19.0	3.6	0.0	6.0	6.0	0.0	28.0
Word Reference	3.5	1.0	7.0	4.4	2.0	8.0	3.1	0.0	7.0	13.0	0.0	21.0
Semantic Information Units	39.8	12.0	58.0	25.7	6.0	54.0	13.5	3.0	18.0	37.9	13.0	39.0

Table 4

Average Semantic Information Units Provided by Teachers Per Play Session

	Teacher A		Teacher B		Teacher C		Teacher D	
	N	%	N	%	N	%	N	%
Total	39.8		25.7		13.5		37.9	
Antonym	0.1	0	2.1	8	0.6	5	0.0	0
Function	11.8	30	3.9	15	1.9	14	9.5	25
Gesture	5.8	15	5.7	22	3.9	29	3.4	9
Perceptual Quality	1.1	3	2.4	9	0.6	5	2.9	8
Picture	5.3	13	5.4	21	4.1	31	4.7	12
Prop	11.2	28	2.4	9	1.1	8	12.5	33
Synonym	4.4	11	3.8	15	1.3	9	4.9	13

Patterns among teacher language use. The correlation matrices in Table 5 display patterns among teacher word use and instructional features. Positive relationships were found among teachers' total word use, grammatical variability, definitions, models of use, and semantic information units ($p < 0.01$). In contrast, teacher's use of questions about target words was not significantly related to the rest of the instructional features. Teachers appeared to ask a similar number of questions regardless of their total word use. Moreover, the two different types of questions were negatively related *(*$p < 0.05$), suggesting that if teachers asked more of one type (i.e., questions that used a target word), they were likely to ask fewer of the other type (i.e., questions that referred to a target word).

In order to further examine teacher-level trends in instructional input (i.e., definitions, models of usage) and instructional interactions such as questions, variables were summed and then averaged by playgroup to create composite variables for descriptive purposes only. As seen in Figure 1, teachers' instructional input was fairly consistent across their playgroups, suggesting that each teacher provided roughly the same amount of instructional input for each playgroup despite potentially varying needs of different groups of children. Similarly, Figure 2 presents

teachers' average instructional interactions per playgroup and indicates that there was more variability across teachers than within a teacher's playgroups, although Teachers B and C asked substantially fewer questions in one of their groups than their other groups. Another pattern of interest is Teacher D's preference for asking questions that referenced target words while all other teachers showed the opposite trend.

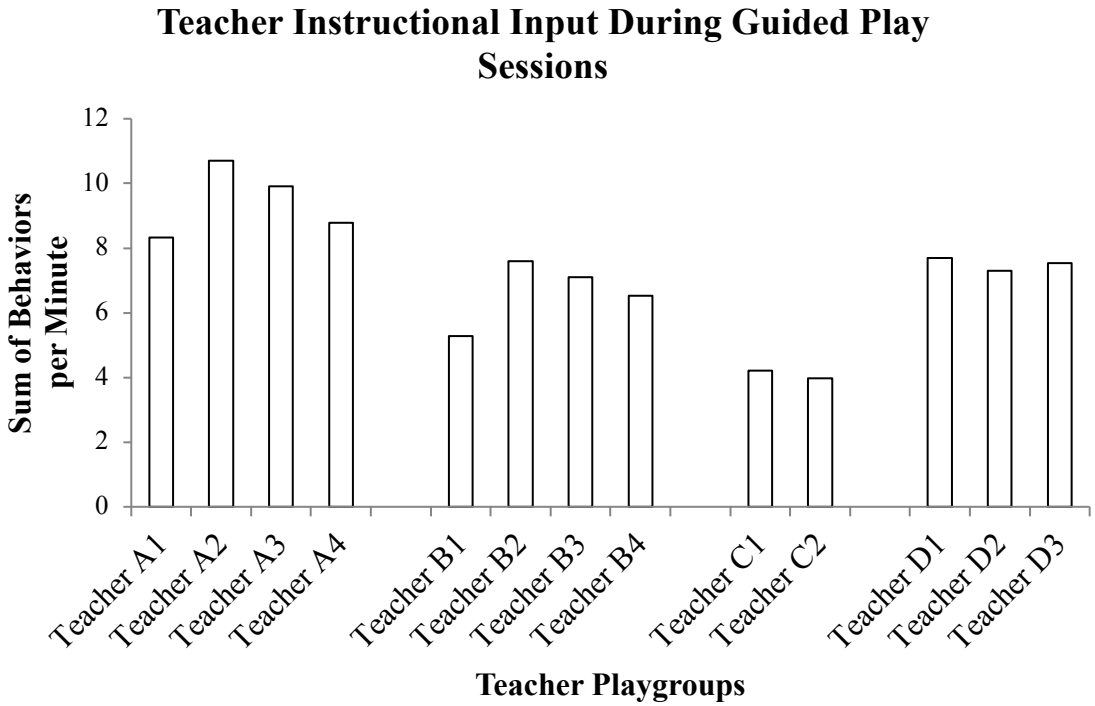

Figure 1. Teacher instructional input calculated as the sum of the following variables: semantic information contributions, total target word use, models of target word usage, different grammatical forms of target words used, and definitions. Original variables were calculated as the sum of behaviors across four play sessions divided by total time spent (minutes) in play sessions.

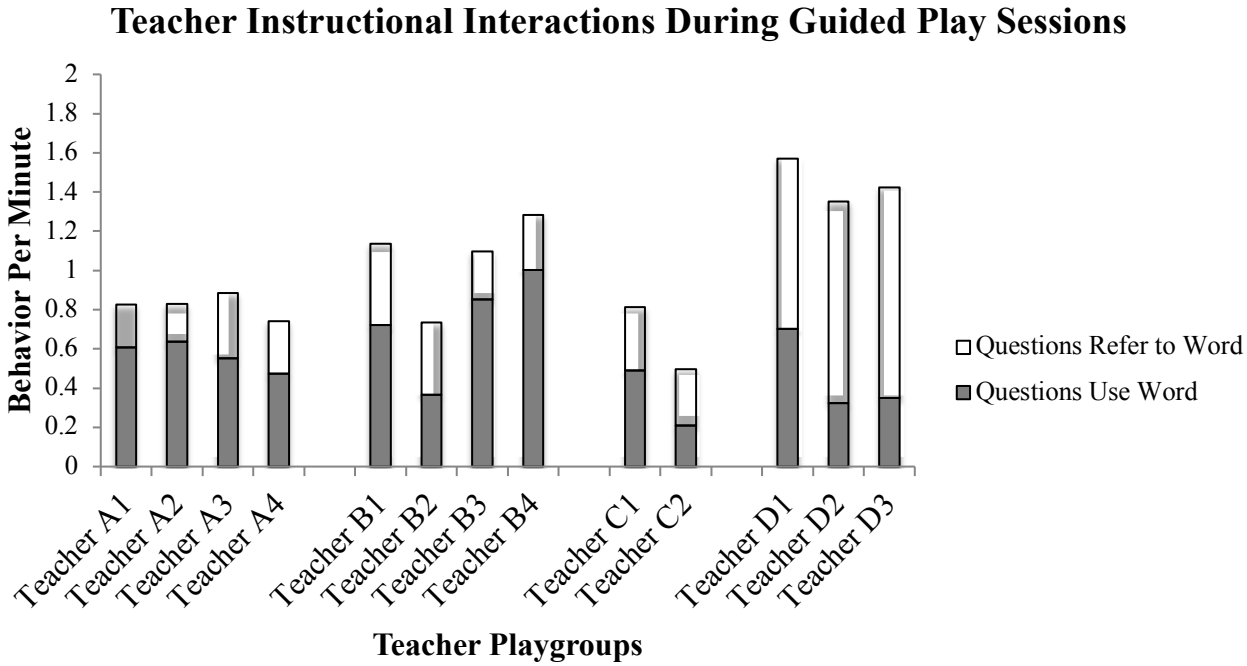

Figure 2. Teacher instructional interactions calculated as the sum of the following variables: questions asked about target words while using a target word (e.g., "which chair a *throne*?) and questions asked about target words while referring to a target word (e.g., "what is this fancy gold chair called?). Original variables were calculated as the sum of behaviors across four play sessions divided by total time spent (minutes) in play sessions.

Table 5

Correlation Matrices for Outcome Measures, Teacher Verbal Behaviors, and Child Verbal Behaviors

		M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	VB (pre)	3.28	1.41	1														
2.	VB (post)	6.08	1.38	0.200	1													
3.	VD (pre)	0.82	1.21	-0.054	0.046	1												
4.	VD (post)	8.04	4.57	0.085	0.302*	0.286	1											
5.	PPVT (pre)	94.68	13.16	0.215	0.318*	0.360*	0.486**	1										
6.	T-#	3.76	1.02	-0.412**	-0.353*	0.061	-0.031	-0.345*	1									
7.	T-GV	0.26	0.08	-0.096	-0.186	-0.046	-0.069	-0.411**	0.584**	1								
8.	T-D	0.17	0.07	-0.067	-0.161	-0.255	-0.270	-0.296*	0.427**	0.731**	1							
9.	T-M	1.16	0.34	-0.183	-0.193	0.091	0.101	-0.244	0.709**	0.721**	0.451**	1						
10.	T-Q	1.00	0.31	-0.165	-0.010	-0.159	-0.073	0.046	0.213	-0.298*	0.039	-0.042	1					
11.	T-SU	1.96	0.60	-0.292*	-0.325*	0.043	0.020	-0.242	0.922**	0.672**	0.570**	0.837**	0.123	1				
12.	C-#	0.32	0.18	-0.005	0.315*	0.039	0.407**	0.389**	0.165	0.068	0.162	0.121	0.220	0.205	1			
13.	C-IU	0.07	0.08	0.103	0.067	0.146	0.507**	0.255	0.284*	0.276	0.116	0.322*	-0.120	0.343*	0.656**	1		
14.	C-GV	0.01	0.02	0.078	0.062	-0.007	0.279	0.126	0.030	0.014	0.027	0.019	-0.062	0.049	0.435**	0.587**	1	
15.	C-QRU	0.11	0.11	-0.023	0.296*	0.159	0.348*	0.491**	0.016	-0.251	-0.127	-0.018	0.401**	0.026	0.748**	0.180	0.036	1
16.	C-SU	0.08	0.08	0.028	0.435**	0.235	0.377**	0.414**	0.093	0.008	0.036	0.145	0.160	0.123	0.800**	0.605**	0.277	0.657**

Note. VB = vocabulary breadth score for target words; VD = vocabulary depth scores for target words; T-# = total number of target words used – teacher; T-GV = grammatical variation of target word use – teacher; T-D = total number of target words defined- teacher; T-M = total number of models of target word usage – teacher; T-Q = total number of active processing questions asked about target words – teacher; T-SU = total number of semantic points – teacher; C-# = total number of target words used – child; C-IU = total number of target words used independently – child; C-GV = grammatical variation of target word use – child; C-QRU = total number of answers to teacher questions while using target words – child; C-SU = total number of semantic information points – child; All teacher and child behavior sums were divided by total minutes spent in instruction. Breadth measure values indicate the total number of items that were answered correctly. Depth measure values indicate the total number of information units children provided for all words. Values for variables 6 -16 represent the sum of types of word uses and semantic information points across four play sessions divided by total minutes spent in play sessions.

Child language use. Research Question 2 examines how children use target words and interact with word meanings during guided play sessions. Table 6 presents the average child language experience per play session across teachers. On average, children in most of the play groups used between four and five target words per session except for children in Teacher C play groups, who used 2.4 words per session on average. There was also considerable variation among individual children. The average minimum frequency was one word use per session whereas the average maximum frequency was 10.3 per session.

Grammatical variability. Children changed the grammatical form of target words infrequently. Across all playgroups, the average number of different grammatical forms children used of any target word was less than one. The maximum average number of changes made by a child was 4 changes during a session with Teacher B.

Independent word use. On average, children did not use words independently (i.e., independent of teacher direction) very frequently during play sessions, although children in Teacher A playgroups used words at more than double the rate (1.4 words per session) than did children in Teacher C playgroups on average (0.4 words per session). The maximum average use of words independently was 3.3 per session in both Teacher A and B playgroups.

Responding to teachers. There was very little variability in children's rate of answering questions, which mirrors the minimal variability in teacher questioning. Children in Teacher D playgroups are an exception: on average they answered three questions per session while using a target word with an average maximum of 8.5 answers per session. This result is consistent with Teacher D's higher rate of questions that reference target words (see Table 5).

Semantic Information. Type of semantic information was coded whenever children used target words. On average, children contributed between 0.6 and 1.4 units of semantic information

per play session across teachers. Twenty percent of children never contributed semantic information. Fifty-four percent of children contributed between one and seven units of semantic information summed across four play sessions. Twenty-six percent of children contributed between eight and fifteen semantic information units across four play sessions.

Table 7 displays the distribution of children's semantic information units across type of verbal engagement. The majority of semantic information units were coded when children responded to teacher questions while using a target word (60%) and when they used target words independently (40%). As shown in Table 8, children exhibited a strong preference for using props when talking about words. Fifty-nine percent of the semantic information units coded when children used words independently and forty percent of units coded when children answered teacher questions were prop representations or target words.

Patterns among children's language use. The correlation matrices in Table 5 presents associations among features of children's verbal engagement. Children's total use of target words was positively related to independent use of target words, grammatical form changes, use of words when responding to teacher questions, and semantic information contributions ($p < 0.01$). Using words while answering teacher questions was *not* related to independent use or grammatical variability of words, although it was positively related to semantic information contributions ($p < 0.01$). In addition, baseline PPVT score was positively related to all categories of child verbal engagement except for independent use and grammatical changes to words.

Table 6

Descriptive Statistics of Child Language Use Per Play Session

	Teacher A			Teacher B			Teacher C			Teacher D		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Total Word Use	4.4	1.3	9.5	4.1	1	8.5	2.4	1	3.8	5.3	1.3	10.3
Grammatical Form Change	0.8	0.0	3.0	0.6	0.0	4.0	0.5	0.0	1.0	0.4	0.0	2.0
Independent Use	1.4	0.0	3.3	0.7	0.0	3.3	0.4	0.0	1.5	0.7	0.0	2.5
Response to Teacher Questions												
Word Use	1.0	0.0	3.0	1.1	0.0	3.0	0.8	0.0	1.5	3.0	0.5	8.5
Semantic Information Units	4.4	0.0	12.0	4.0	0.0	9.0	2.3	0.0	8.0	5.7	0.0	15.0

Table 7
Number of Semantic Information Units Conveyed as Children Used Target Words During Play Sessions

	Frequency	%
Independent Use	73	40
Response to Teacher Questions	110	60

Table 8
Types of Semantic Information Conveyed as Children Used Target Words During Play Sessions

		Frequency	%
Independent Use			
	Antonym	2	3
	Function	12	16
	Gesture	9	12
	Perceptual Quality	1	1
	Picture	5	7
	Prop	43	59
	Synonym	1	1
Response to Teacher Questions			
	Antonym	8	7
	Function	15	14
	Gesture	14	13
	Perceptual Quality	3	3
	Picture	18	16
	Prop	44	40
	Synonym	8	7

Patterns among teacher and child language use. Research question three examines patterns among teacher and child verbal engagement. Several significant relationships of interest between teacher and child verbal behaviors emerged from descriptive analyses (see Table 5). Total teacher word use and models of usage were both positively related to children's independent word use (p <0 .05). Total teacher word use was negatively related to children's baseline PPVT score, suggesting that teachers used target words less, on average, during play sessions with children who had higher average entering language skills. However, when teacher

word use was examined across their different playgroups, it appears that teachers did not consistently use fewer words with higher-average playgroup PPVT scores (see Table 9).

Table 9
Pre-Intervention PPVT Standardized Score and Teacher Total Target Word Use

		PPVT		Teacher Total Word Use (per minute)	
		Mean	Range	Mean	Range
Teacher A	Playgroup 1	96.0	33	4.5	0.4
	Playgroup 2	84.0	2	5.2	2.9
	Playgroup 3	77.3	37	5.1	0.7
	Playgroup 4	85.8	18	4.9	0.7
Teacher B	Playgroup 1	90.3	21	2.9	2.9
	Playgroup 2	97.5	18	3.4	3.4
	Playgroup 3	94.0	4	3.3	1.4
	Playgroup 4	89.3	33	3.5	2.5
Teacher C	Playgroup 1	95.0	12	2.2	2.3
	Playgroup 2	107.8	29	2.0	1.9
Teacher D	Playgroup 1	96.8	43	4.3	2.9
	Playgroup 2	104.8	16	3.6	1.9
	Playgroup 3	105.3	10	4.0	1.7

Instructional Features, Child Verbal Engagement, and Growth in Vocabulary Knowledge

Hypotheses 1 and 2 examine the associations among types of teacher language use and instruction, types of child verbal engagement, and vocabulary learning. Table 10 provides mean raw scores and standard deviations for measures of vocabulary breadth and depth at pretest and posttest. Linear mixed modeling was used to account for the clustering of child participants in playgroups and to allow for the inclusion of variables at the child and playgroup levels. Two-level hierarchical linear models were used, as preliminary analyses suggested non-zero intra-

class correlation at the classroom level. Therefore, two-level models, nesting children within playgroups, were conducted separately for each outcome. Child-level covariates included in the models were PPVT baseline score, age, and pretest score on each respective measure.

We tested the associations among each child-level predictor variable (γ_1) for child engagement and the two vocabulary outcome measures, accounting for the nesting of $children_{ij}$ in $playgroups_j$:

$$Posttest_{ij} = \gamma_{00} + (\gamma_1 * Pretest_{ij}) + (\gamma_2 * Age_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_4 * ChildPredictor_{ij}) + U_{0j} + e_{ij}$$

Then we tested the associations among each playgroup-level predictor variable (γ_{01}) for teacher language use or instruction and the two vocabulary outcome measures, accounting for the nesting of $children_{ij}$ in $playgroups_j$:

$$Posttest_{ij} = \gamma_{00} + (\gamma_1 * Pretest_{ij}) + (\gamma_2 * Age_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TeacherPredictor_{ij}) + U_{0j} + e_{ij}$$

See Appendix G for full models for each hypothesis.

Variables and missing data. The distributions of all variables were checked for skewness and kurtosis. Only children's grammatical changes to words showed a strong positive skew. However, the distribution's shape resulted from a floor effect as many children did not engage in this verbal behavior. Since a transformation would not have improved the shape of the distribution, the variable was used as is.

Finally, four children were either chronically absent or left the pre-kindergarten program early and thus did not complete the depth measure post-test. Two children were not present for the breadth measure post-test. Thus, 47 children had scores for analysis of the depth measure gains and 49 children had scores for analysis of the breadth measure gains.

Table 10
Depth and Breadth Measure Unadjusted Means (Standard Deviations)

Variable	Pretest	Posttest
Breadth Measure	3.28 (1.41)	6.08 (1.38)
Depth Measure	0.82 (1.21)	8.04 (4.57)

Note. Breadth measure values indicate the total number of items that were answered correctly. Depth measure values indicate the total number of information units children provided across all words.

Teacher language use and instruction. Hypothesis 1 examines the relationships between teacher language use and instruction and vocabulary learning. There were no statistically significant associations between the variables representing teacher instruction and language use and children's residualized gain on the measures of vocabulary breadth or depth (see Table 11). However, several teacher behaviors associated with residualized gains of effects sizes of 0.20 or higher were identified (see Table 13). Conventions for interpretations of effect size were derived from Cohen (1988) as cited in NICHD Early Child Care Research Network (2006). Small to moderate effect sizes were found ranging from 0.21 to 0.72, indicating that there was an educationally meaningful difference between the amounts of word learning in the two groups (below and above the median predictor variable value). Thus, it was determined that the following teacher behaviors showed significant and negative associations with children's breadth of vocabulary gains: total target word use (d = -0.72), grammatical flexibility (d = -0.24), definitions (d = -0.36), and semantic information (d = -0.21). In terms of children's depth of vocabulary gains, the following teacher behaviors showed significant, negative associations: grammatical flexibility (d = -0.37) and definitions (d = -0.67). In contrast, teacher models of usage showed a positive association with depth gains (d = 0.25).

Child verbal engagement. Hypothesis 2 examines the relationships between types of child verbal engagement during guided play sessions and vocabulary learning. Analysis indicated

that several features of child language use were associated with word learning (see Table 12). Contributions of semantic information showed a positive and statistically significant association with growth in vocabulary breadth ($p = 0.011$). Independent word use showed a positive and statistically significant association with growth in vocabulary depth ($p = 0.007$). Child behaviors associated with residualized gains of effects sizes of 0.20 or higher were also identified (see Table 13). The following child verbal behaviors were associated with breadth of vocabulary gains: total word use ($d = .51$), grammatically flexible use ($d = 0.22$), contributions of semantic information ($d = 0.73$), and responses to teacher questions while using target words ($d = 0.31$). These child verbal behaviors were associated with depth of vocabulary gains: total word use ($d = 0.73$), independent use ($d = 0.61$), grammatically flexible use ($d = 0.41$), contributions of semantic information ($d = 0.70$), and responses to teacher questions while using target words ($d = 0.69$).

Table 11

Parameter Estimates (Standard Errors) for Teacher Instruction Prediction Models

Parameters	Vocabulary Breadth	Vocabulary Depth
Level 1, Child		
Intercept,	-0.530 (3.922)	-10.385 (13.037)
Pretest Score,	-0.020 (0.153)	0.160 (0.574)
PPVT	0.023 (0.015)	0.176 (0.062)**
Age	0.094 (0.054)	0.007 (0.188)
Level 2, Playgroup		
Teacher Word Use	-0.308 (0.256)	0.295 (0.696)
Parameters	Vocabulary Breadth	Vocabulary Depth
Level 1, Child		
Intercept,	-3.114 (3.762)	-8.419 (12.378)
Pretest Score,	0.050 (0.146)	0.189 (0.570)
PPVT	0.027 (0.016)	0.172 (0.063)**
Age	0.110 (0.053)*	-0.010 (0.184)
Level 2, Playgroup		
Teacher Grammatical Flexibility	-0.444 (3.309)	1.597 (8.956)
Parameters	Vocabulary Breadth	Vocabulary Depth
Level 1, Child		
Intercept,	-3.197 (3.538)	-3.218 (11.224)
Pretest Score,	0.050 (0.146)	0.039 (0.570)
PPVT	0.027 (0.015)	0.159 (0.059)**
Age	0.110 (0.053)*	-0.035 (0.179)
Level 2, Playgroup		
Teacher Definitions	-0.487 (3.469)	-11.537 (8.849)
Parameters	Vocabulary Breadth	Vocabulary Depth
Level 1, Child		
Intercept,	-3.314 (3.463)	-6.601 (11.183)
Pretest Score,	0.049 (0.148)	0.156 (0.578)
PPVT	0.028 (0.015)	0.171 (0.060)**
Age	0.111 (0.053)*	-0.019 (0.182)
Level 2, Playgroup		
Teacher Questions	-0.049 (0.785)	-0.709 (1.927)
Parameters	Vocabulary Breadth	Vocabulary Depth
Level 1, Child		
Intercept,	-2.531 (3.609)	-11.281 (11.875)
Pretest Score,	0.040 (0.147)	0.153 (0.566)**
PPVT	0.026 (0.015)	0.176 (0.060)
Age	0.109 (0.053)*	0.006 (0.182)
Level 2, Playgroup		
Teacher Models of Usage	-0.450 (0.775)	1.771 (2.157)

Parameters	Vocabulary Breadth	Vocabulary Depth
Level 1, Child		
Intercept,	-0.706 (3.716)	-9.046 (12.537)
Pretest Score,	-0.006 (0.148)	0.184 (0.570)
PPVT	0.025 (0.015)	0.171 (0.060)**
Age	0.093 (0.053)	0.000 (0.189)
Level 2, Playgroup		
Teacher Semantic Information	-.0552 (0.410)	0.313 (1.153)

Note. Standard errors adjusted for interdependency of children nested within playgroups.
**$p < .01$, *$p < .05$.

Table 12

Parameter Estimates (Standard Errors) for Child Engagement Prediction Models

Parameters	Vocabulary Breadth	Vocabulary Depth
Level 1, Child		
Intercept,	-2.604 (3.278)	-6.954 (10.701)
Pretest Score,	0.068 (0.142)	0.387 (0.569)
PPVT	0.018 (0.016)	0.126 (0.065)
Age	0.105 (0.052)*	0.015 (0.178)
Child Word Use	1.680 (1.105)	5.694 (3.883)
Parameters	Vocabulary Breadth	Vocabulary Depth
Level 1, Child		
Intercept,	-3.371 (3.368)	-11.332 (10.103)
Pretest Score,	0.047 (0.146)	0.158 (0.518)
PPVT	0.026 (0.016)	0.125 (0.057)
Age	0.113 (0.054)*	0.097 (0.170)
Child Independent Use	1.012 (2.934)	24.524 (8.661)**
Parameters	Vocabulary Breadth	Vocabulary Depth
Level 1, Child		
Intercept,	-3.311 (3.370)	-9.228 (10.913)
Pretest Score,	0.046 (0.145)	0.288 (0.565)
PPVT	0.027 (0.015)	0.154 (0.060)
Age	0.111 (0.054)*	0.030 (0.183)
Child Grammatical Flexibility	6.516 (11.584)	43.564 (37.309)
Parameters	Vocabulary Breadth	Vocabulary Depth
Level 1, Child		
Intercept,	-2.252 (3.433)	-6.113 (11.307)
Pretest Score,	0.070 (0.245)	0.239 (0.576)
PPVT	0.019 (0.017)	0.150 (0.072)
Age	0.102 (0.053)	-0.013 (0.182))
Child Question Response	2.213 (1.970)	3.948 (8.546)
Parameters	Vocabulary Breadth	Vocabulary Depth
Level 1, Child		
Intercept,	-2.054 (3.131)	-6.317 (10.812)
Pretest Score,	0.047 (0.135)	0.176 (0.558)
PPVT	0.010 (0.015)	0.132 (0.065)
Age	0.108 (0.049)*	0.011 (0.180)
Child Semantic Information	6.968 (2.614)**	12.359 (9.94

Note. Standard errors adjusted for interdependency of children nested within playgroups.
**$p < .01$, *$p < .05$.

Table 13

Standardized mean difference effect sizes based on students' post-test assessment scores for students who experienced high versus low levels of each verbal behavior

Child Verbal Behavior	Assessment	High			Low			
Total Word Use		N1	M1	SD1	N2	M2	SD2	Effect Size
	Breadth	25	6.46	0.96	24	5.78	1.60	0.51
	Depth	24	9.52	4.43	23	6.37	4.20	0.73
Independent Use		N1	M1	SD1	N2	M2	SD2	Effect Size
	Breadth	26	6.07	1.23	23	6.15	1.56	-0.06
	Depth	25	9.27	4.61	22	6.59	4.16	0.61
Grammatically Flexible Use		N1	M1	SD1	N2	M2	SD2	Effect Size
	Breadth	19	6.31	1.26	30	6.00	1.47	0.22
	Depth	19	9.06	4.51	28	7.22	4.56	0.41
Semantic Information		N1	M1	SD1	N2	M2	SD2	Effect Size
	Breadth	25	6.59	1.00	24	5.65	1.53	0.73
	Depth	22	9.55	4.31	25	6.58	4.22	0.70
Response to Teacher Question		N1	M1	SD1	N2	M2	SD2	Effect Size
	Breadth	24	6.32	1.37	25	5.90	1.38	0.31
	Depth	22	9.48	4.74	25	6.52	3.86	0.69
Teacher Verbal Behavior	Assessment	High			Low			
Total Word Use		N1	M1	SD1	N2	M2	SD2	Effect Size
	Breadth	22	5.58	1.37	27	6.52	1.25	-0.72
	Depth	21	7.89	5.02	26	7.98	4.28	-0.02
Grammatically Flexible Use		N1	M1	SD1	N2	M2	SD2	Effect Size
	Breadth	23	5.92	1.36	26	6.25	1.40	-0.24
	Depth	21	6.94	4.25	26	8.62	4.83	-0.37
Definition		N1	M1	SD1	N2	M2	SD2	Effect Size
	Breadth	26	5.87	1.33	23	6.36	1.41	-0.36
	Depth	24	6.38	3.85	23	9.35	4.98	-0.67
Model of Usage		N1	M1	SD1	N2	M2	SD2	Effect Size
	Breadth	23	6.11	1.36	26	6.10	1.42	0.01
	Depth	20	8.65	4.86	27	7.48	4.35	0.25
Semantic Information		N1	M1	SD1	N2	M2	SD2	Effect Size
	Breadth	27	5.97	1.27	22	6.26	1.52	-0.21
	Depth	24	8.34	4.76	23	7.57	4.43	0.17
Question		N1	M1	SD1	N2	M2	SD2	Effect Size
	Breadth	25	6.11	1.50	24	6.10	1.27	0.00
	Depth	23	7.50	5.13	24	8.36	3.93	-0.19

CHAPTER VII

DISCUSSION

The purpose of this study was to examine the relationships between teacher and child participation in a guided play activity and children's vocabulary growth. While guided play has been found to boost gains on standardized (Han et al., 2010) and researcher-created (Toub et al., 2018) assessments of vocabulary knowledge, the core practices of guided play have largely remained inside the black box of intervention results. This research contributes to the field in two important ways. First, it is one of the first studies to analyze children's verbal engagement with taught words in a guided play vocabulary intervention and to attempt to identify proximal processes that relate to learning gains. The finding that children's use of words was associated with vocabulary growth supports the premise that guided play nurtures development through engaging children as active participants in the learning process (Chi, 2009; Weisberg et al., 2013). Second, the findings begin to address questions in the field about which aspects of teacher language use and guidance may effectively support vocabulary learning in the context of guided play (Han et al., 2010; Weisberg et al., 2016). The positive association between teachers' play-embedded word use and learning gains emphasize the importance of modeling how to use new vocabulary for children. In contrast, negative associations between total teacher word use and learning gains highlight the liability of teacher-dominated discourse, which is a growing concern in the field (Farran et al., 2017; Hindman, Wasik, & Bradley, 2019; Neuman & Dwyer, 2009). More broadly, given the interest in fostering a linguistically-rich environment in preschool classrooms with oral language benefits (Dickinson & Porche, 2011; Justice et al. 2018), these

findings are important for understanding how early childhood educators can implement guided play as one approach to fostering vocabulary knowledge.

Child Engagement and Guided Play

Children's verbal engagement with taught words was positively associated with their vocabulary learning gains. Effect sizes describing the magnitude of the effects for higher levels of participation across categories of word use ranged from 0.40 to 0.73, indicating that there were educationally meaningful differences in amounts of word learning. From a theoretical perspective, these findings align with models of early word learning that emphasize providing children with opportunities to talk when vocabulary, grammar, and pragmatic knowledge are rapidly developing (Harris et al., 2011; Hollich et al., 2000). These findings are also consistent with work that has empirically examined children's role in classroom discourse and learning (Bowne et al., 2017; Dickinson & Porche, 2011; Gamez, 2015; Hindman et al., 2019).

Similar to results from Hindman et al. (2019) on teacher-child interactions during shared book reading, the present study found that higher levels of child engagement, including responding to teacher questions and independent (i.e., unsolicited) talk, were related to greater vocabulary growth. The type of engagement associated with the largest effect size was child use of words in ways that revealed associations with semantic information ($d = 0.73$, breadth measure; $d = 0.70$, depth measure). This finding complements a related result on the association between child contributions of conceptual information about word meaning (i.e., facts, actions, objects and pictures, and information about what was not true about a word meaning) during discussions with teachers and vocabulary growth (Bowne et al., 2017). A common trend among the present study and these similar investigations (Bowne et al., 2017; Hindman et al., 2019) is

that overall teacher contributions were not uniquely predictive of children's learning; instead, more child talk was linked to more vocabulary learning in each study. In addition, Dickinson and Porche (2011) found that a higher ratio of child-to-teacher talk during free play in preschool was associated with vocabulary size at the end of kindergarten. Thus, the value of children's verbal participation for vocabulary development has emerged across studies of early childhood activities including book reading (Hindman et al., 2019), whole-group discussion of new concepts (Bowne et al., 2017) and free play (Dickinson & Porche, 2011). The present study extends the literature on child involvement by identifying this word learning mechanism in the context of guided play.

The guided play method was designed to give children opportunities to use taught words while reenacting the read-aloud story-line, conversing with teachers, and exploring props with the idea that these multiple and diverse encounters with words would result in progressive refinement of representations from low to high quality (Bloom, 2002; Clark, 2009; Perfetti, 2007). One type of child word use that has not yet been analyzed in vocabulary interventions to our knowledge is grammatically flexible use of words, which showed an educationally significant relation to depth of learning gains ($d = 0.41$) in the present study. This finding is consistent with theories proposing that high-quality, stable lexical representations include knowledge about a word's various grammatical forms such as the singular and plural forms of nouns or present and past tenses of verbs (Henriksen, 1999; Perfetti, 2007; Schmitt, 2014). Moreover, the ability to produce different forms of words indicates familiarity with different linguistic contexts that may accompany flexible use of word forms. Just as children build on their preliminary understanding of word meanings as they observe words being used in varied syntactic constructions (Gillette et al., 1999), children may also build on their partial knowledge

by using different forms of words in their own constructions and thus notice nuances in meaning. Flexibility of use reveals a higher degree of ownership of words (Nagy & Scott, 2000), and, viewed through a functional lens, is a true marker of high-quality word knowledge.

Taken together, the types of verbal engagement children exhibited here align with the guided play principle of child-directed exploration within a learning environment prepared to support specific learning outcomes (Weisberg et al., 2016). These findings on child engagement begin to substantiate core practices of guided play approaches that have been found to boost word learning compared to more teacher-directed approaches (Han et al., 2010; Toub et al., 2018).

At the same time, it is important to note that not all children participated equally in the guided play activity. This study is one of the first to analyze child participation in intervention activities at the individual level and results indicate that children with higher entering vocabulary knowledge used target words more frequently, thereby learning more than their less talkative peers. Children who scored above the median (94) on the PPVT gained one point more on the breadth measure and two points more on the depth measure than children who scored below the median on the PPVT. These descriptive results suggest that guided play may lead to the Matthew effect, which refers to a widely-identified trend of higher ability children making greater vocabulary gains than lower ability children (Barnes, Dickinson, & Grifenhagen, 2017; Loftus-Rattan et al., 2016; Penno et al., 2002; Robbins & Ehri, 1994).

Interestingly, a guided play experiment that used methods similar to the present study tested the effectiveness of book reading with the addition of play to promote the ability of high-risk children to learn vocabulary words better than high-risk children who experienced book reading instruction only. To identify a high-risk subgroup, Han et al., (2010) recruited

preschoolers whose PPVT standard scores were at least one standard deviation below the mean (85 or lower) (Han et al., 2010). While children in the play condition made only moderate gains on Tier 1 taught words (e.g., *bake*) compared to their peers in the non-play condition, a greater percentage of children in the play condition (62.5 percent) reached a standard score of at least 85 on the PPVT post-test compared to the non-play group (44 percent). Given that research assistants delivered the guided play intervention to children in groups of two in the Han et al., (2010) study, children's overall vocabulary knowledge may have benefited from a learning environment that is not typical in preschool classrooms—an uninterrupted 10-minute period conversing in a playful setting with an adult and one other child with a similar level of vocabulary knowledge. In contrast, the present guided play method was delivered by classroom teachers to groups of four children who had wide ranges in PPVT standard scores (total sample range was 57-126). It could be that children with higher entering vocabulary knowledge drew teachers into interactions more frequently, thereby reducing time teachers spent responding to and eliciting participation from children with lower vocabulary knowledge and verbal engagement levels. Prior research has shown that children's language level appears to affect teachers' input (e.g., de Rivera, Girolametto, Greenberg, & Weitzman, 2005; Girolametto & Weitzman, 2002) with consequences for children's verbal engagement (e.g., Girolametto et al., 2000; Girolametto & Weitzman, 2002). Further work to understand how preschool teachers foster participation among groups of children with varying language competencies will be important.

Role of Teachers in Fostering Learning

Our analysis of teacher language and supports for vocabulary learning suggests that there are both benefits and liabilities of teacher talk in a guided play setting. Much attention has been dedicated to the role teacher language plays in promoting young children's vocabulary growth across the school year (Bowers & Vasilyeva, 2011; Dickinson & Porche, 2011) and in book reading interactions (Barnes et al., 2017; Wasik et al., 2016). Yet there is still much to be learned about the teacher's role when the aim of the activity is to foster more child autonomy and initiation of language with teacher guidance primarily acting as a lever to maximize child participation and thus learning (Bodrova & Leong, 2007; Hirsh-Pasek et al., 2009).

Teacher contributions to word learning. Growth in depth of vocabulary knowledge was positively associated with teacher modeling of word use ($d = 0.25$). This type of use was coded when teachers embedded a target word in their speech in ways that conveyed implicit information about meaning without an explicit attempt to define the word (e.g., "the *talons* help the dragons swim!"). Providing children with examples of word use in contexts beyond that of initial instruction is one of several strategies used in effective vocabulary interventions (Pollard-Durodola et al., 2011; Silverman et al., 2013). The present finding provides evidence that teacher modeling of new vocabulary may be especially salient for children in a guided play setting because this type of teacher talk often related to children's play. Furthermore, this type of teacher talk was positively correlated with children's independent word use, a finding consistent with research on links between teachers' sociodramatic play-embedded instructional talk (i.e., using advanced thematic vocabulary while enacting a role) and the frequency of child talk (Meacham, Vukelich, Han & Buell, 2014). Noticing teachers' models of target word use may have

reinforced word meaning and encouraged children to practice using words on their own with benefits for word learning.

Consider the following teacher model of the word *rummage* in a semantically rich context: “I’m going to go *rummage* through this sand castle over here and see if I can find something we can play with on the beach.” A few conversational turns later, a child produces the following independent utterance: "*Rummage* through your box.” The child used the word *rummage* in a similar context—to look for something to play with—but instead of a sand castle the child used a prop from the play set, a box, to act out *rummaging*. This example illustrates how teacher models and children’s independent use may have facilitated incremental learning. Children may have observed teachers use of words and then used the teacher’s context as a scaffold when building their own utterance, thereby adding more subtle aspects of meaning to their representation of the word. It appears that some of children’s independent uses may have been fostered by teacher modeling with potential word learning advantages stemming from both child and teacher behaviors. These findings lend empirical support to methods that emphasize embedding taught words into guided play discourse (e.g., Hadley et al., 2019; Han et al., 2010).

Liabilities of teacher talk. Findings showed that, in contrast to hypotheses, overall teacher word use was negatively associated with breadth of learning (d = -0.72) and teacher definitions showed a negative relationship with breadth (d = -0.38) and depth of learning (d = -0.67). These findings diverge from research on the benefit of multiple exposures through repeated reading of books (Biemiller & Boote, 2006) and explicit information about meaning (Wasik et al., 2016) for word learning in preschool and early elementary book reading studies. At the same time, they dovetail with research in other areas of early childhood suggesting that limiting teacher talk and promoting communication-facilitating behaviors like listening to

children (Farran et al., 2017) and using a slow pace of conversation to encourage interaction during small group activities (Justice et al., 2018) predicts preschoolers' vocabulary growth.

What emerges, then, is the importance of matching teacher support to the learning context. Book reading is inherently a teacher-driven context whereas guided play is a context in which children are meant to be more verbally engaged and drive the interactions. Children may be more receptive to teacher input in a book reading context and less receptive to teacher input in the guided play context as their attention and expectations around participation shift to align with the demands of each setting. Moreover, teachers who had less experience with guided play methods and constructivist pedagogy in general may have faced challenges shifting their supports between the book reading and guided play components of this particular intervention. The guided play approach described in the present study placed unique demands on teachers. Given the instructional goal of teaching specific words, the approach attempted to weave together instructional strategies, such as definitions and questions about target words, and responsive behaviors like following children's lead. In addition, teachers gave children interesting new props (i.e., toys) to manipulate and encouraged children to act out the story. Thus, teachers faced a complex task of providing specific input plus guiding and responding to children's play.

The negative relationship between teacher definitions and vocabulary growth underscores the liability of overly-didactic interactions in guided play. Definitions may have served as a proxy for the extent of teachers' linguistic responsivity. Fewer definitions may indicate that teachers spent more time listening to children and responding to their initiations, behaviors that have been found to contribute to vocabulary growth (Cabell et al., 2015; Justice et al., 2018; Zimmerman, et al., 2009). On the other hand, more definitions suggest low teacher responsivity.

Teachers who spent more time inserting definitions may have had difficulty matching children's play and verbal behaviors and were thus less facilitative of children's participation. Some teachers may have felt less comfortable with guided play and spent more time on didactic interactions in general. To be fair, the intervention asked teachers to define each word at least once during the play session. Although the guidance materials also suggested teachers incorporate word review based on children's play, this appeared to be challenging for some teachers in this small sample. It is also possible that the coding scheme used here, which focused on teacher-child interactions within three conversation turns of a target word use, failed to capture the entirety of connected discourse about word meaning that may have contributed to vocabulary growth. Nonetheless, this work contributes knowledge about the relationships between specific features of teacher language use and word learning in a guided play setting for the field to consider and examine further.

Props Support Talk about Words

Another salient finding from this study involves the role of props in facilitating child talk about words and thereby vocabulary growth. When children used words independently and answered teacher questions about words, they referenced props more frequently than any other semantic information category. This finding is in accord with the use of props to illustrate and clarify word meanings in high-quality book reading studies (Coyne et al., 2010; Coyne, Simmons, Kame'enui, & Stoolmiller, 2004; Gonzalez et al., 2010; Loftus, Coyne, McCoach, Zipoli, & Pullen, 2010; Zucker, Solari, Landry, & Swank, 2013). In the guided play context, the role of props focuses attention on the importance of preparing the environment to encourage child exploration in relation to specific learning goals (Homonichl, 2012; Montessori, 1966;

Weisberg et al., 2013). Similar efforts to foster meaningful teacher-child conversations and increase child verbal productivity in particular have emphasized carefully selected props as a mechanism to increase vocabulary (Bond & Wasik, 2009; Wasik, 2008) and shape knowledge (Fisher, Hirsh-Pasek, Newcombe, & Golinkoff, 2013).

Props can be considered in terms of fostering motivation to participate in playful learning activities and in terms of providing strategic supports for the learning goal (Bond & Wasik, 2009; Singer, Golinkoff, & Hirsh-Pasek, 2006). In this study, physical representations of target words (e.g., a *throne* toy) may have been especially helpful for facilitating children's initial fast-mapping of referent to label. In addition, although conclusions cannot be drawn from the present analyses, manipulating props may have created links to semantic information made visible by props, such as perceptual qualities (a *throne* looks like a chair but it's shiny). Manipulating props may have also reminded children of the function of certain nouns, such as the dragon's *scales* protect it from harm when in battle with a knight. In other words, props may have helped children attend to different types of semantic information related to the target word even though the utterance that received the prop semantic information code ("my *throne*") did not convey that type of information.

Practical Implications

A central implication of these findings for practice in early childhood classrooms is the value of teachers and children conversing in small groups. Small group activities seem uniquely positioned to foster a balance of rich teacher language input and child talk (Dickinson & Smith, 1994; Justice et al., 2018; Kontos & Keyes, 1999; Turnbull, Anthony, Justice, & Bowles, 2009). However, depending on teachers' approach to instruction, small-group activities may be more

didactic in nature (Dickinson et al., 2014; Durden & Dangel, 2008) while others provide opportunities for using language-enhancing strategies (Cabell, Justice, McGinty, De Costera, & Forston, 2015; Hassinger-Das et al., 2016). The liability of teacher-dominated talk found in this study corroborates concerns that high proportions of total talk in preschool classrooms are from teachers, which leaves little space for child contributions (Cabell et al., 2015; Dickinson, Darrow, & Tinubu, 2008; Hindman et al., 2019).

What is likely needed is specific guidance on how leaders of childcare centers and state-funded prekindergarten programs can foster a shared vision among teachers around what small group activities might look and sound like in early childhood classrooms. Moreover, identifying barriers to fostering more child-directed learning experiences during small group activities will be important in efforts to move towards a shared vision around the importance of high-quality interactions. For example, the perceived goal of preschool as primarily a vehicle for kindergarten readiness may result in more teacher-directed learning and a focus on skill mastery. As the importance of small group time in preschool programs gains more attention (Fuligni, Howes, Huang, Hong, & Lara-Cinisomo, 2012; Lonigan, Farver, Phillips, & Clancy-Menchetti, 2011; Piasta & Wagner, 2010; Wasik, 2008), it will be necessary to guard against a narrowing of what small group learning can entail. In fact, the term "small group instruction" may contribute to a focus on overly teacher-directed lessons. Basic skills instruction, characterized by closed-ended questions about letter or numeral knowledge, which is pervasive in preschool (Farran et al., 2017), is not likely to support child-initiated language use. The challenge is to preserve some small group time for higher-level conversation with child verbal productivity being the teacher's goal (Bond & Wasik, 2009).

Furthermore, the role of props in the present study points to a potential and practical word-learning mechanism that could be leveraged across many different learning experiences with a small group of children and teacher, not just the guided pretend play activity examined here. Sorting activities with collections of natural objects like pieces of bark, rough and smooth stones, or fabrics with contrasting textures and functions could engage children in conversations with teachers about new words at the science and discovery centers. Ball and ramp games at the blocks center might elicit talk about speed, size, and acceleration. The key is to select props that are linked to interesting, novel content and spark children's verbal engagement.

Limitations

Although this study provides important information about the nature of vocabulary instruction and child engagement in a preschool guided play setting and identifies aspects of this instruction and engagement that show relationships to children's vocabulary growth, there are several important limitations to address. First, this is not an experimental study of the effect of these different practices on child word learning. Causal inferences cannot be drawn from these findings. Instead, they are descriptive of this group of teachers and children in a particular instructional setting. Experiments would need to be conducted that randomly assigned children to different conditions in order to determine the directionality of the associations described here. Second, statistical power was limited due to the small number of classrooms. Third, the present study did not control for learning that occurred during book reading instruction. It could be argued that children who used words during guided play developed their lexical representations during book reading instruction. Use during play may merely reflect that initial learning, with no added benefit of play. In addition, the findings are specific to one interactional context.

Generalization to other teacher-child classrooms activity settings is not merited. Fourth, current analyses have not examined learning trajectories by word type. Patterns of acquisition might have varied by form class or imageability. Fifth, the verbal behavior coding system did not examine teacher responsiveness, which is theoretically important for vocabulary development (Harris et al., 2011) and has been shown to support language growth (Cabell et al., 2011; Zimmerman, et al., 2009). The video sound quality and camera angles were not conducive to reliably coding teacher responsivity. Finally, lack of a qualitative lens limits what we understand about how interactions during guided play foster word learning. A multimodal method of instruction like guided play requires research methods that are equipped to analyze complex and interdependent factors that may influence vocabulary development, such as joint attention, the relationship between nonverbal and verbal communication, or how props may have driven language use and thus learning.

Conclusions

The present study suggests that vocabulary knowledge develops when children are verbally engaged in talk about words with teachers who limit their own contributions and make space for enhanced child participation. In the small group guided play activity examined here, children's overall verbal engagement, including answering teacher questions and using words independently and flexibly, was most strongly related to vocabulary growth. Findings suggest that supporting the lexical quality of words involves a complex weaving together of teacher input delivered in responsive interactions with a substantial dose of child-initiated talk. Thus, playful activities that allow for child agency and adult guidance in a carefully planned environment are promising contexts for increasing child participation and verbal engagement with benefits for

learning. Taken together with findings on the association between lower teacher-to-child talk ratios (e.g., Dickinson & Porche, 2011), more teacher elicitation of child talk (Cabell et al., 2015) and language gains, current results suggest that an optimal preschool classroom language environment is one in which both teacher and children contribute and the discourse is more evenly distributed than is current practice (Farran et al., 2017). As early childhood classrooms seek to foster vocabulary development, investigations like this that focus on engagement from the child's perspective are needed to identify proximal processes contributing to word learning.

Appendix A

Target Words by Book and Form Class

The Knight and the Dragon		
Form Class	Book Reading and Picture Cards	Book Reading and Play
abstract noun	reflection	ancestors
	scheme	enemies
concrete noun	cavern	nostrils
	frock	scales
	lance	talons
verb	exhale	charge
	polish	gallop
	arrive	rummage

Dragon for Breakfast		
Form Class	Book Reading and Picture Cards	Book Reading and Play
abstract noun	pride	foolishness
	sorrow	mayhem
concrete noun	platter	handkerchief
	pond	servants
	spectacles	throne
verb	chuckle	emerge
	scorch	stamp
	whimper	weep

Appendix B

Sample Guided play Guidance Card

Knight and Dragon: Days 1 and 2

Set Up:

1. TOY ASSIGNMENT: One toy is given to each child. If needed, give a second toy to each. Make a list for the toy they get the next day.
2. WORDS USED: As each toy is handed out use the target word(s) associated with the toy:

dragon: He has sharp talons and scales that cover his body. And don't forget about the fire that comes out of his nostrils. Later, you can make the dragon rummage for the books from his ancestors.

princess: You get to be the princess! She doesn't want the knight and dragon to be enemies.

knight: Here is the knight. He gallops on his horse and they charge at the dragon.

horse: You have a horse. It gallops very fast carrying the knight.

3. Teacher's TOY. Teacher selects a toy that seems needed to complete the play. Announce that you will be the ____. Use your character to move the activity forward in a playful manner.

Keep toys for later scenes out of sight and out of reach.

SCENE ONE:

1. SET THE SCENE: Introduce castle. Identify the library. Establish where each character will be (dragon, knight, princess).
2. What happened in the beginning? Encourage play related to book reading, preparing for the battle. Try to use your toy to make suggestions, ask questions.
3. Talk about the dragon using key words using your toy to talk for you.

OBJECTS	WORDS	Playful use	Questions to prompt use
Books	**Rummage** **Day 1**	I can't find my books. I will **rummage** around to find them.	I am looking for my book. What am I doing? Can you help me rummage for books?
Dragon	**Ancestors** **Day 2**	Oh these books are really old. They must be from my **ancestors**.	Do you remember who wrote these very old books?

Princess	**Enemies** **Day 2**	I want to help the knight find a book, but I don't want the knight and dragon to be **enemies.**	The knight and dragon don't get along very well. What do we call them?

SCENE TWO: **SET THE SCENE: Shift to the fight scene. Remind them that they do not run into each other.**			
OBJECTS	**WORDS**	**Playful use**	**Questions to prompt use**
Knight & Horse	**Galloping** **Day 2**	My horse can **gallop** really fast and knock you over.	Watch me! What is my horse doing? (make galloping noises)
	Charging **Day 1**	You pretend that you are the dragon and let's **charge** at each other.	You start there, I'll start here. Ready, set go! What are we doing?
Dragon	**Talons** **Day 1**	You better watch out, my sharp **talons** can scratch you!	What are my sharp claws called? (point to talons)
	Nostrils **Day 2**	I can blow fire out of my **nostrils** during the fight! (Make fire breathing sounds ghhh!)	Where do I breathe fire from? (prompt for nostril not nose)
	Scales **Day 2**	You can't hurt me; my hard **scales** will keep me safe!	What are these hard things on my body? (point to scales)
Princess	**Enemies** **Day 1**	I don't like seeing the knight and dragon fight each other. They shouldn't be **enemies** anymore!	Are the knight and dragon friends or are they…?

SCENE THREE: Pick up words you have missed. Reinforce words. **SET THE SCENE: Shift to barbecue scene. Provide new props. Encourage children to recall the action.**			
OBJECTS	**WORDS**	**Playful use**	**Questions to prompt use**
Princess	**Enemies** **Day 1**	I don't want the knight and dragon to be **enemies** anymore. I'm going to teach	The knight and dragon didn't like each other much; what did we call them?

		them how to set up a restaurant!	
Knight & Horse	**Enemies** **Day 1**	Let's not be **enemies** anymore; let's start a restaurant together!	Are we friends now, dragon? What were we called when we didn't like each other?
Dragon	**Nostrils** **Day 2**	I can blow fire out of my **nostrils** to cook the burgers. (Make fire breathing sounds ghhh!)	Where do I breathe fire from? (prompt for nostril not nose)

Appendix C

Coding Manual

Variable coded	**Definition**
Video ID	Enter Video ID in first column. Example: 4_17_24_Grp1_5613_Play4
Play day	Which play day are you coding? (Last number in Video ID) • 1 • 2 • 3 • 4
Book	Which book was read before the play session? *(Book will be clear once the teacher starts handing out toys specific to book or talks about target words.)* • Dragon for Breakfast (DB) • The Knight and the Dragon (KD)
Word	Which target word was used or made reference to? See word list below for words by book and condition. If a child or teacher uses a word from either book, please code the use. For example, if children are playing with toys from Dragon for Breakfast but they say a target word from Knight and Dragon code the use.
Use or refer-teacher	Did the teacher use or refer to the word? The refer code is appropriate if the target word is used (by teacher or a child) within 3 conversational turns either before or after the utterance in question. • Use Teacher: Here is the ***throne***. • Refer Teacher: What is this shiny gold chair? Child: A ***throne***!
Use or refer-child	Did the child use or refer to the word? The refer code is appropriate if the target word is used within 3 conversational turns either before or after the utterance in question. • Use Child: I'm ***galloping***. • Refer Child: What is that called? Teacher*: Throne*
Condition	Play or Picture card word (see list below)
Word type	• Abstract noun (AN) • Concrete noun (CN) • Verb (V)

	• Refer (R)
Grammatical form-teacher/child	In what grammatical form did the teacher or child use the word? • Noun singular: throne • Noun plural: throne(s) • Noun possessive: servants(s' or 's) • Noun to adverb: foolish (changed from foolishness) • Noun to verb: serve (changed from servants) • Verb base form: to charge • Verb 3rd person singular present: charge(s) • Verb past tense: charg(ed) • Verb past participle: I have already charg(ed). • Verb progressive aspect: charg(ing)
Word use - teacher	How did the teacher use the word? How much semantic information is embedded in the utterance? • BASIC USE: teacher uses word but does not provide any semantic information about the word meaning. **Example 1** That's right, the *servants*. **Example 2** Charge! • MEANINGFUL USE: Models of usage that help children understand the pragmatics of word use and provide implicit information about the nuances of meaning; there is no explicit attempt to define the word. This is an intentional effort by the teacher to demonstrate how the word can be used. **Example 1** Oh, I've had mayhem at my house where people are running around. **Example 2** Anybody else want to *charge* over to them? **Example 3** Guys, I'm glad that you had those *scales* to protect you. **Example 4** I'm going to go *rummage* around and see if I can find a present for the dragon for his birthday. **NON-Example 1** What would you like to do now, *servant*? (doesn't give any implicit information about servant; this is basic use) **NON-Example 2** Give the *servant* some. (doesn't give any implicit information about servant; this is basic use)

	• DEFINITION: explicitly connects the spoken word with an overview or summary of the word meaning **Example 1** *Nostrils* are the little holes in his nose. **Example 2** Those are called *scales* and they're going to protect you. • PROMPT USE: teacher prompts children to say the word; there is no attention to the word meaning. **Example 1** Say *rummaging*. **Example 2** Can you say *charge*? • QUESTION: teacher asks a question specifically aimed at eliciting children's thinking about the meaning of a target word. If the teacher uses a target word while asking a question that is not meant to elicit thinking about the word meaning, this would be coded "basic use." Teacher questions do not get coded for semantic information type. **Example 1** What is a *throne*? **Example 2** What do the *servants* do? **Example 3** What part of your body do you *stamp*? **NON-Example 2** What would you like to do now, *servant*? This would be coded "basic use." • REPEAT: teacher repeat's child's use of target word either verbatim or adding a phrase that doesn't provide substantive, new information about the word. **Example 1** Child: I see *throne*. Teacher: I see the *throne*, too! **Example 2** Child: *Charge*! Teacher: Yes, *Charge*! *Note*: One utterance may contain multiple units of semantic information: A *throne* is a *special chair (synonym)* for the *king or the queen* to *sit in* (*function*). Code for all information units present per utterance. *Note*: If teacher uses 2 target words in one utterance, start another line in the spreadsheet for the second word used. If the utterance provides a definition for

	"galloping" and the word says "galloping" twice, only code the first utterance as "Definition." Enter the second use of gallping as "basic use."
Word Use- child	How did the child use the word? How much semantic information is embedded in the utterance? Note: Often the child will **answer a question** that reveals their knowledge of various semantic features of a target word. Examples are noted below. • REPEAT:. If the teacher asks a question and all children answer at the same time, each child response is coded as question response. However, if one child answers first and other children provide the same answer after, the subsequent children's answers would be coded REPEAT. **Example 1** Teacher: What does the king do? Child 1: sit in his *throne* and go to bed. (QUESTION RESPONSE) Child 2: sit in his *throne*. (REPEAT) • PROMPT USE RESPONSE: child responds to teacher's prompt to use a target word. There is no discussion of word meaning. **Example 1** Teacher: Can you say *mayhem*? Child: *mayhem* • QUESTION RESPONSE: child responds correctly to a teacher question while using a target word or in reference to a target word. If the teacher asks a question while using a target word but the question does not require children to think about the meaning of a target word, the child's response would NOT be coded (i.e., Teacher: "Would you like to blow fire out of your *nostrils* and light some candles? Child: Yeah) **Example 1** Teacher: So if you're not friends you're what? Child: *enemies* **Example 2** Teacher: How are you going to cook the hamburgers? Child: with my *nostrils* **Example 3** Teacher*:* What is a *throne*, Issac? Child: you sit in. **Example 4** Teacher: When you *charge* at something are you running fast or slow? Child: fast

	• QUESTION RESPONSE INCORRECT: child responds incorrectly to a teacher question while using a target word or in reference to a target word **Example 1** Teacher: So if you're not friends you're what? Child: *ancestors* **Example 2** Teacher: When you *charge* at something are you running fast or slow? Child: slow! • CHILD INITIATED: child **uses** target word spontaneously, in absence of teacher questions or prompts. This code does not apply to child references to words. **Example 1** Teacher: Alright, we got to have the throne. There/ You can sit there. Child: Come on, let's make a sand castle. Child: My *throne*.
Semantic Information type – teacher and child	What type of semantic information was provided in the utterance? • GESTURE: A gesture, action, or facial expression that provides knowledge of the word meaning. **Example 1- Teacher** Teacher: Can you show me how you *charge*? (moves fist together in charging motion) **Example 2 - Child** Child: I'm *charging* at the princess. (moves horse in charging motion) **Example 3 - Child** Teacher: What does *rummaging* look like? Child: (rummaging motion with hands) **Example 4 - Child** Teacher: That is it, *stamping* his foot. You are exactly right. Child: Like this (stamps his foot). NOTE: gesture for verbs, not prop • PROP: A concrete example of the target word meaning. Prop code only applies to nouns. **Example 1 - Teacher** The *throne* needs its king! (holding up throne prop) **Example 2 - Teacher** Here are the *servants*? (passes child servant figure) **Example 3 - Child** My *throne* (child puts king in throne prop). **Example 4 - Child** Sit in his *throne* and go to bed (holding throne prop).

	• FUNCTION: Any process, purpose or use. Any movement or action (only as it describes a noun). If a child answers a question from the teacher about a target noun's function, this would also be coded as function even if the child only says the word (see example 5). **Example 1 - Teacher** A *throne* is a special chair for the king or the queen to *sit in (function)*. **Example 2 - Teacher** Those are called *scales* and they're going to *protect you (function)*. **Example 3 - Teacher** The *servants* and they *clean and cook* (*function*) for the king and queen. **Example 4 - Child** Teacher: What is a *throne*, Ronny? Child: You sit in. (answer reveals knowledge of function, child's answer refers to *throne*). **Example 5 - Child** Teacher: No, what's going to protect him (*function of scales)?* Child: The *scales*. **Example 6 - Child** Teacher: What can you use our *nostrils* for? Child: to breathe out fire. • PERCEPTUAL: Properties of nouns; how it looks, smells, tastes, feels, or sounds. **Example 1 - Teacher** A *handkerchief* is made out of cloth. **Example 2 - Child** Teacher: What are these little hard things on the dragon's body? Child: *scales* (the child's response would be coded as "perceptual," the teacher's utterance would be coded as "question") • SYNONYM: Any word or short phrase that is equivalent to the target word. Provides decontextualized information about the word. **Example 1- Teacher** *Weeping* is when you're *crying (synonym)*. **Example 2 - Teacher** A *throne* is a *special chair (synonym)* for the king or the queen to sit in. **Example 3 - Teacher** When you *cause a lot of trouble* (*synonym*) and you knock things over it is called *mayhem*. **Example 4 – Child** A throne is like a chair.

	• ANTONYM: A word that is the opposite of the word being explained, plus "not" or other negating word. **Example 1 - Teacher** I'm not your *enemy*; I'm your friend. **Example 1 - Child** Teacher: So if you're not friends you're what? Child: *Enemies*! • PICTURE: An example of the target word in picture form. **Example 1** Points to story illustration card and says: They're running together, they're *galloping*, *galloping*, *galloping* towards each other really, really fast.

Word List
(AN = abstract noun)

Dragon for Breakfast	***The Knight and the Dragon***
Play Words	**Play Words**
Days 1 & 3	*Days 1 & 3*
mayhem (AN)	ancestors (AN)
servants	enemies (AN)
stamping	galloping
throne	talons
Days 2 & 4	Days 2 & 4
emerging	charging
foolishness (AN)	nostrils
handkerchief	rummaging
weeping	scales
Picture Card Words	**Picture Card Words**
chuckling	arriving
platter	cavern
pond	exhaling
pride (AN)	frock
scorching	lance
sorrow (AN)	polishing
spectacles	reflection (AN)
whimpering	scheme (AN)

Appendix D

Examples of Teacher and Child Utterances and Teacher Instruction and Child Engagement Codes Assigned

	Transcript	Teacher Instruction	Child Verbal Engagement
Example 1- Play Session #3, Beach scenario with props from *Dragon for Breakfast* book			
Teacher	You're getting hungry, king?		
Teacher	King, why don't you get off the *throne*.	Model usage	
Teacher	And I need the *servants* to find our picnic lunch.	Model usage	
Teacher	*Servants*!	Use/Grammatical Form Change	
Teacher	Oh *servants*!	Use	
Teacher	Okay, you're the *servant*.	Use	
Teacher	Could you bring us our picnic lunch, please?		
Child 1	Yes. King can I have some?		
Teacher	Alright, the *servant* is the one who takes care of the king and the queen.	Definition	
Teacher	Oh I like how the *servant* said.	Use	
Teacher	The *servant* said, "Get out of your chair so you can eat your picnic lunch."	Model usage	
Child 1	Can I have some, king?		
Teacher	And that chair is called a *throne*.	Definition	
Child 1	Can I have some, king?		
Child 2	Yeah.		
Child 3	Can I have some?		
Teacher	Give everyone some picnic lunch, *servant*.	Model usage	
Child 1	Hey, get off my sand.		
Teacher	The king is *stamping* his foot.	Model usage	
Teacher	King, why are you *stamping* your foot?	Question	
Child 2	Mad		
Teacher	You're mad?		
Teacher	I'm so sorry you're mad, king.		
Teacher	Look at him *stamping* his foot.	Model usage	
Teacher	Why are you mad?		
Child 1	Get out of my sand.		
Teacher	Oh, don't cause any *mayhem*.	Model usage	
Teacher	Why are you mad, king?		
Child 1	Don't get me in any *mayhem!*		Independent Use
Example 2 – Play session # 2, Reenacting *Dragon for Breakfast* story line			

Teacher	Queen can you give me something to wipe my tears?	Question	
Teacher	What is this?	Question	
Child	A *handkerchief*.		Answer- use
Teacher	What do I need if I'm weeping?		
Child	A *handkerchief*.		Answer- use

Appendix E

Examples of Teacher and Child Utterances and Semantic Information Codes Assigned

Speaker	Utterance	Semantic Information Code
Example 1		
Teacher	Now, look in this picture. they're fighting each other, so they're not friends. They're what? Do you remember?	
Child	*Enemies*	Antonym
Example 2		
Teacher	I saw you were breathing your fire.	
Teacher	What are you breathing your fire out of, dragon?	
Child	I'm the dragon.	
Teacher	How are you breathing fire?	
Child	Out of my *nostrils*.	Function
Example 3		
Teacher	I see the dragons are over there getting ready	
Teacher	Oh, they're making sure their *scales* are hard to protect them and they're getting them all ready, making - breathing fire.	Function Perceptual
Teacher	Oh, he's looking at his *talons*.	
Teacher	What are you doing to get ready for the fight?	
Teacher	He's - oh, he's fixing his belt.	
Teacher	He's getting all of his - his armor ready.	
Child	*Talons*, *talons*	Prop
Teacher	Oh, you're getting your *talons* ready?	
Example 4		
Teacher	Queen can you give me something to wipe my tears?	
Teacher	What is this?	
Child	A *handkerchief*.	Prop
Teacher	What do I need if I'm weeping?	
Child	A *handkerchief*.	Prop

Appendix F

Examples of Student Assessment Responses and Information Codes Assigned

Target Word	Student Response	Information Unit Coded for
Handkerchief	"If you are sad you use it to blow your nose"	Meaningful Example Function
Mayhem	"Knocking everything down"	Basic Context
Throne	"Queen or king sits in when they are talking." "It's a sparkly new chair"	Meaningful Example Function Perceptual information
Weeping	"When you cry." (Assessor note: "child made crying sounds and held hands up to eyes.")	Synonym Gesture
Emerging	"Something is coming out of an egg" (Assessor note: "hand coming out of other hand.")	Synonym Gesture

Appendix G

Analytic Models for Hypothesis Testing

Hypotheses	Dependent Variable	Independent Variable	Model
1a	Breadth	Child Total Use	$BREADTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * BREADTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_4 * CHILD\_USE_{ij}) + U_{0j} + e_{ij}$
1a	Depth	Child Total Use	$DEPTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * DEPTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_4 * CHILD\_USE_{ij}) + U_{0j} + e_{ij}$
1b	Breadth	Child Independent Use	$BREADTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * BREADTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_4 * CHILD\_IND\_USE_{ij}) + U_{0j} + e_{ij}$
1b	Depth	Child Independent Use	$DEPTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * DEPTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_4 * CHILD\_IND\_USE_{ij}) + U_{0j} + e_{ij}$
1c	Breadth	Child Grammatical Changes	$BREADTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * BREADTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_4 * CHILD\_GRAM_{ij}) + U_{0j} + e_{ij}$
1c	Depth	Child Grammatical Changes	$DEPTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * DEPTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_4 * CHILD\_GRAM_{ij}) + U_{0j} + e_{ij}$
1d	Breadth	Child Semantic Information	$BREADTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * BREADTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_4 * CHILD\_SEM_{ij}) + U_{0j} + e_{ij}$
1d	Depth	Child Semantic Information	$DEPTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * DEPTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_4 * CHILD\_SEM_{ij}) + U_{0j} + e_{ij}$
1e	Breadth	Child Answer Questions	$BREADTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * BREADTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_4 * CHILD\_ANSWER_{ij}) + U_{0j} + e_{ij}$
1e	Depth	Child Answer Questions	$DEPTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * DEPTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_4 * CHILD\_ANSWER_{ij}) + U_{0j} + e_{ij}$

2a	Breadth	Teacher Total Use	$BREADTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * BREADTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_USE_{ij}) + U_{0j} + e_{ij}$
2a	Depth	Teacher Total Use	$DEPTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * DEPTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_USE_{ij}) + U_{0j} + e_{ij}$
2b	Breadth	Teacher Definitions	$BREADTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * BREADTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_DEF_{ij}) + U_{0j} + e_{ij}$
2b	Depth	Teacher Definitions	$DEPTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * DEPTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_DEF_{ij}) + U_{0j} + e_{ij}$
2c	Breadth	Teacher Models of Usage	$BREADTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * BREADTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_MODEL_{ij}) + U_{0j} + e_{ij}$
2c	Depth	Teacher Models of Usage	$DEPTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * DEPTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_MODEL_{ij}) + U_{0j} + e_{ij}$
2d	Breadth	Teacher Grammatical Changes	$BREADTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * BREADTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_GRAM_{ij}) + U_{0j} + e_{ij}$
2d	Depth	Teacher Grammatical Changes	$DEPTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * DEPTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_GRAM_{ij}) + U_{0j} + e_{ij}$
2e	Breadth	Teacher Semantic Information	$BREADTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * BREADTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_SEM_{ij}) + U_{0j} + e_{ij}$
2e	Depth	Teacher Semantic Information	$DEPTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * DEPTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_SEM_{ij}) + U_{0j} + e_{ij}$
2f	Breadth	Teacher Questions	$BREADTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * BREADTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_Q_{ij}) + U_{0j} + e_{ij}$
2f	Depth	Teacher Questions	$DEPTH\_POST_{ij} = \gamma_{00} + (\gamma_1 * DEPTH\_PRE_{ij}) + (\gamma_2 * AGE_{ij}) + (\gamma_3 * PPVT_{ij}) + (\gamma_{01} * TEACHER\_Q_{ij}) + U_{0j} + e_{ij}$

Note. Child-level covariates in each model are pretest score on the dependent variable measure, age, and PPVT-4 standardized baseline score. BREADTH_PRE = pretest score on the researcher-created picture identification receptive vocabulary measure. BREADTH_POST = posttest score on the researcher-created picture identification receptive vocabulary measure. DEPTH_PRE = pretest score on the researcher-created New Word Definition Test-Modified (NWDT-M; Hadley et al., 2015). DEPTH_POST = posttest score on the researcher-created New Word Definition Test-Modified (NWDT-M; Hadley et al., 2015).

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