Pre-existing Background Knowledge Influences Socioeconomic Differences in Preschoolers'

Word Learning and Comprehension

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Abstract

The goal of the current study is to explore the influence of knowledge on the socio-economic discrepancies in word-learning and comprehension. After establishing socio-economic differences in background knowledge (Study 1) we presented children with a storybook that incorporates this knowledge (Study 2). Results indicated that middle-income children learned significantly more words and comprehended the story better than lower-income children. By contrast, Study 3 presented children with a novel category, and found that children performed equally in their word learning and comprehension. This suggests that socio-economic differences in vocabulary and comprehension skills may be partially explained by differences in extant knowledge.

Keywords: Vocabulary; Comprehension; SES, Storybooks; Knowledge; Preschool

Preexisting Background Knowledge Influences Socioeconomic Differences in

Preschoolers' Word Learning and Comprehension

Preschool-aged children's early vocabulary knowledge and oral language comprehension have long-term implications for their academic success (Beck & McKeown, 2007). Unfortunately, these are also areas in which there are striking differences between children from impoverished backgrounds and those from more economically advantaged homes (Chall, Jacobs, & Baldwin, 1990; Hart & Risley, 1995). By the time they enter school, children from advantaged homes may know as many as 15,000 more words than children from less advantaged circumstances (Moats, 2001). These socioeconomic differences are highly related to children's literacy skills (Hart & Risley, 2003) and persist into the high school years (Biemiller, 2001), thereby perpetuating the ever-widening achievement gap (Cunningham & Stanovich, 1997). Improving the vocabulary knowledge and comprehension skills of low-income preschoolers is, therefore, a crucial issue at the forefront of educational research. The goal of the current study is to examine how background knowledge may relate to the socio-economic differences in these early literacy skills. Specifically, we examine how differences in extant knowledge may influence children's ability to incidentally learn words from and comprehend storybooks during shared book reading.

Background knowledge and learning words from storybooks

Shared book reading is an important context for the development of vocabulary. Book reading has been shown to be positively associated with children's vocabulary knowledge (Bus, van IJzendoorn, & Pellegrini, 1995; Mol & Bus, 2011), and storybooks are a vital source of vocabulary acquisition (Whitehurst et al., 1994), even before children learn to read

independently (Roth, 2002). Importantly, storybooks are a familiar resource for young children, being valued by both parents and teachers and preschool-aged children (Rideout, Vandewater, & Wartella, 2003).

But while storybooks may be an important source of new vocabulary, learning words from books is not always a straightforward task, especially for young children. For both independent readers and children listening to stories, words in narratives must frequently be learned implicitly. That is, when readers encounter an unknown word in a text, they must glean the word's meaning from the context - the meaning of the word is not usually highlighted or explicitly stated (Fukkink, Blok, & de Glopper, 2001). Given the demands of this task, it is perhaps unsurprising that children do not always learn the words they are exposed to in storybooks. In fact, meta-analyses have revealed that children may acquire less than 15% of the unknown words encountered in storybook texts (Swanborn & de Glopper, 1999). In short, although shared book reading is an important and valued context for oral language skills, it is also a context in which learning does not always occur automatically.

One factor that may influence children's ability to learn words from storybooks may be their preexisting knowledge. Previous research has demonstrated that children with larger vocabularies may acquire vocabulary implicitly from storybooks more readily than children with smaller vocabularies (Leung, 2008; Stahl & Nagy, 2006). One possible explanation is that metalinguistic factors, such as verbal IQ and working memory, explains the relationship between extant vocabulary knowledge and implicit word learning (e.g., Cain, Oakhill, & Lemmon, 2004; Nippold, 2002). Alternatively, children's extant vocabulary may be considered as an indicator of their general background knowledge (Anderson & Freebody, 1981), and the breadth and depth of their preexisting knowledge base may influence their implicit word learning (Nagy & Herman,

1987). This latter possibility is supported by evidence demonstrating that knowing fewer words

and having a more tenuous understanding of those words may each negatively impact children's

subsequent word learning (Penno, Wilkinson, & Moore, 2002). Because children's preexisting

knowledge may create a framework that facilitates the acquisition of new information

(Hambrick, 2003), knowing more about words and concepts may scaffold their ability to learn

related words and concepts implicitly from stories (Shefelbine, 1990). In this way, the general

knowledge base underpinning children's specific vocabulary knowledge may drive some of the

individual differences in implicit word learning from storybooks.

Background knowledge and story comprehension

Children's background knowledge may also influence their storybook comprehension

(Kintsch, 1988). To comprehend a storybook narrative, children must construct a mental

representation of the information contained in the text (Kendeou, van den Broek, White, &

Lynch, 2009). They must then connect sentences to form events, connect events to build a plot,

ultimately resulting in an integrated representation of the overall text (Mandler & Goodman,

1982; Stein & Glenn, 1979). Narratives are therefore mentally represented as an integrated

network of individual units of information (Graesser, Golding, & Long, 1996), and children

construct links between units through reasoning and inference (Cain & Oakhill, 2007; Kendeou,

van den Broek, White, & Lynch, 2007). As a result, children's inference making ability is crucial

to their overall comprehension of storybook narratives.

By definition, successful inference making requires children to integrate new information

from the storybook text with their existing knowledge base (Cain & Oakhill, 2007). To

successfully comprehend a storybook narrative, children must possess sufficient background

knowledge to be able to draw appropriate inferences. Although few studies have examined the

role of background knowledge in preschool-aged children's comprehension development, work with older children suggests a connection. For example, after reading a passage describing a half-inning of a baseball game, children's understanding of the passage depended upon their preexisting knowledge: poor readers with high knowledge of baseball displayed better comprehension than good readers with low knowledge of baseball (Recht & Leslie, 1988). This process may be further facilitated if children's background knowledge is already organized into a semantic framework that can readily accommodate the new information (Gelman, 2009; Hambrick, 2003). When Kendou and van den Broek (2007) examined the inferences made by individuals with accurate background knowledge about science as compared to individuals who held misconceptions about science, they found that readers who held misconceptions made a greater number of incorrect inferences about a text than those with accurate background knowledge, and, consequently, the entire text was misunderstood. Although these studies have examined the comprehension skills of elementary-school children, research is beginning to suggest that preschoolers' oral narrative comprehension requires similar cognitive processes (Paris & Paris, 2003).

The current study

Background knowledge, therefore, appears to be a key factor for both vocabulary acquisition and comprehension. According to the knowledge hypothesis (Anderson & Freebody, 1981), words are part of larger knowledge structures, and it is these knowledge structures, not the words per se, that may impact children's comprehension. Therefore, a child who might have more knowledge of a subject is likely to better comprehend text about that subject, as well as know more words related to the topic (Hirsch, 2006).

Given the well-documented effects of SES on children's vocabulary knowledge and

comprehension abilities (Chall et al., 1990; Hart & Risley, 1995), it could be that the variability

in children's knowledge base is what underpins such observed SES-related differences. There is

some evidence to suggest this may be the case. For example, higher-SES adults tend to have

greater general knowledge than lower-SES adults (Hofstetter, Sticht, & Hofstetter, 1999; Miller,

Esposito, & McCardle, 2011), and students from low-income backgrounds demonstrate

consistent disadvantages in background knowledge that persist well into high school (National

Science Foundation, 2000). Moreover, while book-reading may contribute to children's

background knowledge (Echols, West, Stanovich, & Zehr, 1996; Stanovich & Cunningham,

1993), children from low-income backgrounds tend to have less access to books and other print

resources in their homes (Purcell-Gates, 1996), schools (Duke, 2000), and neighborhoods

(Neuman & Celano, 2001). Overall, research suggests that children from lower-SES

backgrounds may have more limited background knowledge than their more economically-

advantaged peers. Given the similar patterns of SES differences in vocabulary knowledge and

comprehension, it is possible that disparities in children's background knowledge may underlie

the disparities in their incidental word learning and storybook comprehension.

The goal of the current study is to explore the influence of background knowledge of a

specific topic on the socio-economic discrepancies in incidental word learning and storybook

comprehension for preschool children. To examine the role of background knowledge, we report

on three studies. In Study 1, we examine children's background knowledge of a common

category—birds-- and how it may differ by socio-economic status.   In Study 2, we present

children with a specially-constructed storybook that incorporates this common category and

examine socio-economic differences in children's ability to learn novel words and

comprehension incidentally from the storybook.   Finally, in Study 3, we present children with

another storybook that incorporates an unknown category as an attempt neutralize the influence of background knowledge, and again examine socio-economic differences in children's word learning and comprehension.

Our studies examine the following logic: If socio-economic differences in vocabulary acquisition and comprehension are driven by differences in background knowledge, then we would expect that when children would hear a storybook on the topic (e.g. that relied on this background knowledge) middle-income children would outperform those from lower-income. If however, given an unknown topic (and therefore neutralizing background knowledge), we would assume that children from different SES backgrounds would perform similarly. Alternatively, if background knowledge was *not* a factor in the socio-economic disparities in children's vocabulary and comprehension skills, then we would assume that the differences between SES groups would be similar in both Studies 2 and 3.

Method

Participants. Throughout our three studies, children were randomly selected from classrooms in two sites: Head Start and private preschool programs including University-based and neighboring preschools. In the Head Start sites, all children lived in an economically disadvantaged neighborhood and were eligible for free- and reduced lunch. In the University-base sites, all children lived within the local community which served faculty, students, and staff in a large college town. These sites reported an average of less than sixteen percent of their students as being eligible for free or reduced lunch. Previous studies with samples drawn from the same population (Neuman, Newman, & Dwyer, 2011) indicated that parents in this population were highly educated, and more than half reported a household income of over

$100,000. Children were all native English speakers.

For Study1, we randomly selected 52 preschoolers from these two sites (29 middle-income; 22 low-income); in Studies 2 and 3, we increased our sample slightly to add statistical power, including 76 preschoolers (38 middle-income; 38 low-income) in Study 2 and 67 (28 middle-income; 30 low-income) in Study 3. Demographic information by study and SES-group are shown in Table 1.

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Table 1 around here

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Study 1

The primary goal of Study 1 was to determine whether children's background knowledge of a common category varied as a function of socioeconomic status. We addressed two key questions: (1) What might children know about the characteristics of a common category (in this case, birds)? (2) If so, are there differences between those children who come from low-income circumstances compared to their middle-class peers?

Method

Instrument

Background knowledge: To assess children's background knowledge, we adapted a task, first developed by Susan Carey (1985) in her work on fast-mapping, and modified by Gelman and Coley (1990) in their research on conceptual knowledge among preschoolers. Selecting a common category (birds), we created a 16-item assessment that asked children to make inferences of novel words based on their understanding of the category. Such a task requires

children to apply their knowledge of a category to a new member of the category. Similar tests have been used as a measure of children's knowledge transfer in extant research (e.g. Butler & Markman, 2012; Graham, Booth, & Waxman, 2012; Neuman, Newman, & Dwyer, 2011).

The assessment began with two practice items. For example, "This is a beagle. It's a kind of dog. Do you think it barks?" The child responded with yes or no. In the case of each example, the experimenter would subsequently provide corrective feedback, such as "That's right! Dogs bark; or "I think dogs bark. A beagle is a dog, so beagles bark."

Following the practice items, the experimenter would administer the assessment. First, the child would see a picture of a type of bird against a white background with no contextual information. We used illustrations of real, but extinct birds to ensure children's unfamiliarity with the exemplar. The experimenter would then give the name of the bird (e.g., "This is a toma"), and say, "It is a bird." This would be followed by "Does a toma build a nest?" to which the child would answer yes or no. There were an equal number of correct and incorrect items, for a total of 16 items. Based on their understanding of the category, we would expect them to respond "yes" to the correct items (e.g. "does a toma build a nest?" and "no" to the incorrect items (e.g. "does a gombi eat candy?").

Test items were randomized and presented in a set order across participants. Responses were coded dichotomously (i.e., correct or incorrect), and a total correct score was derived for each child. In the current sample, the reliability of the measure was $\alpha=.86$.

Receptive language: We administered the Peabody Picture Vocabulary Test-III (PPVT; Dunn & Dunn, 1997), a standardized assessment designed to measure children's receptive vocabulary, to determine whether differences in background knowledge might be a factor of children's receptive language. In this assessment, the child is shown a set of four pictures and is

asked to point to the picture that represents the word provided orally by the examiner. The

reported reliability for the PPVT-III ranges from .91 to .94. Standard scores were used for all

our analyses.

Results

We compared children's performance on the task against the expected performance for

individuals who possessed no knowledge of the category. Because test items were dichotomous,

we would expect children with no preexisting knowledge about birds to guess randomly,

resulting in correct responses on 50% of trials. Children's scores were therefore compared

against a chance level of 0.50. Overall, children appeared to have knowledge about birds ($M =$

0.66, $SD = 0.17$). A one-sample t-test showed that children were correct on a statistically

significantly greater proportion of test trials than expected by chance ($t(43) = 6.78$, $p < .001$),

indicating that children's performance was not simply due to guessing. The effect size was large,

Cohen's $d = 0.94$ (although it should be noted that interpretations of d based on one sample tests

are typically larger than those based on independent t-tests), and established that young children

possess background knowledge about the category, birds, and its characteristics.

Next, we examined whether children's background knowledge varied by SES. Sample

means and standard deviations are presented in Table 2. An independent samples t-test revealed

statistically significant differences, ($t(43) = 3.22$, $p = .002$). The effect size was substantial,

Cohen's $d = .93$: Lower-income children had significantly more limited background knowledge

than their middle class peers.

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Table 2 around here

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Finally to examine whether these differences might a factor of language proficiency, we conducted an analysis of covariance, using children's receptive language as a covariant. Our analysis revealed that the statistically significant differences remained between SES groups, $F(1,48)=11.857$, $p <.001$, Cohen's $d=.94$: Even after taking into account children's receptive language skills, middle-income children appeared to have greater background knowledge about a common category than low-income children. Therefore, although vocabulary has been previously used to predict differences in general background knowledge (Leung, 2008; Stahl & Nagy, 2006), these results extend those findings by suggesting that there are SES-related differences in domain specific knowledge, over and above overall receptive vocabulary. This is a particularly important finding because domain specific knowledge has been shown to influence older children's word learning and comprehension (Cain et al., 2001). Therefore, our next step was to determine whether SES differences were apparent in word-learning and comprehension for preschool children when domain specific background knowledge was incorporated into a storybook.

Study 2

Our next study was to examine the possible consequences of differences in background knowledge on children's incidental word learning and comprehension. If SES differences in vocabulary and comprehension are partially due to differences in background knowledge, then we would assume that children from the middle-income group would outperform those from the low-income group on a task that required such background knowledge. Therefore, we asked the following questions: 1) Given SES differences in background knowledge about a common

category (e.g. birds), are there differences in word learning for children from different SES

groups? and, 2) Are there differences in their comprehension of text?

Method

Materials

For this study, we created an 18-page illustrated storybook about four birds that lived in a

house together. The book had a total of 238 words, and shared a common plot and story

grammar, including the setting (i.e., house), problem, response, and resolution (see Appendix).

The story featured the adventures of four types of birds (all extinct): the moa, faroe, cupido, and

kona. These words became our target vocabulary words. To further ensure that these birds were

unfamiliar to preschoolers, they were illustrated to be visually distinct from any common species

of bird or other animal, although each character possessed physical traits characteristic of a bird

(e.g., wings). (See appendix).

The storybook made three references to each of the four target vocabulary words. In the

first exposure to the word, children were given the word with a characteristic associated with

bird, such as "a cupido builds a nest because it is a bird." The remaining two exposures repeated

the characteristic and provided additional narrative information (e.g., "the cupido looked in her

nest and found a hat").

Measures

Vocabulary. To measure children's word learning from the storybook, we created an 8-

item receptive vocabulary assessment. The assessment was comprised of two sections designed

to measure vocabulary knowledge with varying levels of contextual support.

Words in Context. The first section of the word learning assessment measured

children's ability to respond to a question that included a target vocabulary word (Loftus et. al.

2010). The child viewed a grid of four professionally-drawn colored illustrations on a computer screen and was asked to point to an activity of the target bird (e.g., "Point to where the moa found his hat."). Of the four illustrations, one depicted the target location and three were foils (i.e., one location from the storybook that was not the target, two novel locations not previously presented). This task accessed the child's ability to identify the word in context. In the current sample, the reliability of the measure was α=.62. Although this is below desirable levels, Gersten et al. (2005) assert that reliabilities at this level can be considered acceptable for newly created measures and can indicate that a coherent measurement construct is being measured.

Words out of Context. The second section of the word learning assessment measured children's knowledge of the target words outside of the narrative context. Children viewed a grid of four professionally-drawn colored illustrations on a computer screen and were asked to point to the target (e.g., "Point to the moa."). One illustration depicted the target bird and three were foils (i.e., one bird from the storybook that was not the target, two novel birds not previously presented). Similar tests have been widely used to assess children's receptive vocabulary acquisition (e.g., Robbins & Ehri, 1994). In the current sample, the reliability of the measure was α= .63.

Test items were randomized and then administered in a set order across participants. Children's responses were scored dichotomously (i.e., correct or incorrect) and summed to yield an overall target word learning score (ranging from 0 to 8), which was then converted into a proportion score.

Storybook comprehension. To measure children's comprehension of the story, we created a 6-item receptive comprehension test. Children viewed a grid of four illustrations on a computer screen and were asked to point to the target. The questions included tests of critical

story events (e.g. "Point to the one that was waiting outside") as well as tests of their ability to

make causal inferences (e.g. "Point to why they needed the string"). Of the four illustrations, one

depicted the target and three were foils (i.e., one character from the storybook that was not the

target, two novel characters not previously presented). These items were also randomized, and a

total score (ranging from 0-6) was determined. In the current sample, the reliability of the

measure was α=.61.

Procedure

Children met one-on-one with a research assistant in a quiet area outside the classroom.

The research assistant read the book three times, resulting in a total of nine exposures to each of

the target vocabulary words. The research assistant provided no extra-textual comments during

the storybook reading.

Immediately following the book-reading, the child was administered the vocabulary and

comprehension measures. Book reading and assessments lasted approximately 20-25 minutes per

child.

Results

We first asked whether children's learning of words from the storybook varied by SES.

To examine this, we analyzed children's performance on words in context and words out of

context. Descriptive statistics are shown in Table 3.

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Table 3 around here

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We conducted an independent sample *t*-test with SES group as the independent variable

and words learned in context as the dependent variable. Children's performance on words *in*

context did not statistically significantly differ by SES group ($t(74) = .931$, $p = .355$, Cohen's $d = .22$). These results indicate that children were able to correctly identify these novel words when they were presented in a familiar context (i.e. as in the storybook).

Next, we examined children's learning of words when they were presented out of context. Here, the independent samples *t*-test revealed statistically significant differences between SES groups: Middle-income children correctly identified more words out of context than low-income children, ($t(74) = 2.09$, $p = .040$), with a moderate effect size (Cohen's $d = .48$). These results indicate that children's acquiring new words from storybooks may vary by SES.

Our next question addressed whether there were differences in story comprehension for children of different SES groups. Once again, an independent samples *t*-test revealed statistically significant differences: Children from the middle-income group demonstrated statistically significantly greater comprehension than those in the low-income group ($t(75) = 1.99$, $p = .050$), with a moderate effect size (Cohen's $d = .46$). These results indicated that low-SES children experienced greater difficulty comprehending the story than their middle-income peers. As predicted, these children appeared to learn statistically significantly fewer words when they were isolated from text and demonstrated statistically significantly poorer comprehension of the text compared to their counterparts from middle-income circumstances.

Experiment 3

Consequently, our final study attempted to neutralize background knowledge by introducing a storybook narrative context that would be novel to both groups. If children's preexisting background knowledge underlies the observed SES-related differences in their vocabulary knowledge and comprehension, then we would expect there would be no SES-related differences in learning.

We addressed the following questions: (1) Are the effects of SES on children's incidental word learning and comprehension ameliorated when the storybook is structured around an unfamiliar category? (3) Are children able to learn the properties of an unfamiliar category during shared book-reading, and, if so, does this vary by SES?

Study 3

Materials

For this study, we created an 18-page illustrated storybook similar to the one we used in our previous study—with one difference: The storybook used a novel category (i.e., wugs, a pseudo-word) and was designed around the adventures of four species of wugs. Similar to the previous study, the storybook made three references to each of the four target vocabulary words. The first exposure was paired with an essential property of the category, and the remaining two exposures repeated the property and provided additional narrative information. (See Appendix for an example of the text).

Measures

Vocabulary and Comprehension. Using the same tests, as in Experiment 2, we once again examined children's incidental word learning in context and outside of context. In the current sample, the reliability of in-context measure was $\alpha = .57$, and the reliability of the out-of-context measure was $\alpha = .66$. We also administered the same 6-item set of comprehension questions related to the story. In this sample, the reliability was $\alpha = .60$. In each case, scores were totaled, and then converted into proportion scores.

Inferences and Generalizations. Finally, to assess children's ability to make inferences and generalizations about their new words in an unfamiliar context, we constructed an assessment similar to the one we used in Study 1. The child was shown an illustration of a novel word (e.g., "This is a pobe"), and told that it was a member of the category (e.g., "It is a wug"). The child was then asked to determine whether the novel word possessed a particular characteristic of the category (e.g., " Does a pobe eat hay?"). Four test items addressed characteristics of the novel category described in the storybook (e.g., "Does a pobe eat hay?"); four items addressed properties of a familiar category but ones not described in the storybook (e.g., "Does a blicket build a nest?"); and four items addressed incidental properties not described in the storybook (e.g., "Does a simlet have a bed?"). The reliability of the measure was α=.76.

The order of questions was randomized and presented in a set order across participants. Children's responses were scored dichotomously for accuracy (i.e., correct or incorrect and then converted into a proportion score.

Procedure

Using a similar procedure as Study 2, each child was read the book three times, resulting in a total of nine exposures to each of the target words. During the reading, no extra-textual comments were provided by the research assistant. Immediately following the storybook reading, children completed all assessments. Book reading and assessments lasted approximately 15 to 20 minutes.

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Results

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Words in and out of context

We first asked whether children's socioeconomic background influenced their acquisition

of target vocabulary words from the storybook. Descriptives are shown in Table 4.

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Table 4 around here

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First, we examined children's word learning by comparing their performance against chance. One-sample *t*-tests revealed that both the middle-and-low-SES groups responded correctly on a statistically significantly greater proportion of test items than expected by ($t(29) =$ 7.41, $p < .001$, and $t(27) = 4.54$, $p < .001$, respectively). The effect sizes were large (low-SES: Cohen's $d = 1.75$; middle-SES: Cohen's $d = 2.75$). Across SES groups, children learned the target vocabulary words when they were presented in context. Comparing performance between groups, an independent samples *t*-test revealed no statistically significant differences by SES group ($t(56) = 0.57$, $p = .569$ Cohen's $d = .15$). Similar to Study 2, there were no statistically significant differences between groups.

To examine children's word learning when presented out of context, we compared their performance against a chance level of .25. One-sample *t*-tests revealed that neither the low- nor middle-SES groups' performance differed statistically significantly than expected by chance ($t(27) = .00$, $p = 1.00$, Cohen's $d = 0$ and $t(29) = 0.00$, $p = 1.000$, respectively, Cohen's $d = 0$). Comparing groups, an independent samples *t*-test indicated no statistically significant differences between low-income and middle-income groups ($t(56) = .00$, $p = 1.00$, Cohen's $d = 0$). These results suggest that both groups had difficulty acquiring vocabulary in isolation.

Story comprehension

Our next question addressed whether children's socioeconomic background influenced

their storybook comprehension. We first compared children's performance on the story comprehension assessment against chance (i.e., .25). Children in both the low- and middle-SES groups responded correctly on a statistically significantly greater proportion of test items than expected by chance ($t(27) = 6.67$, $p < .001$, and $t(29) = 8.41$, $p < .001$, respectively). The effects were large (low-SES: Cohen's $d = 2.56$; middle-SES: Cohen's $d = 3.12$) indicating that children from both groups successfully comprehended the storybook narrative.

Comparing groups, an independent samples t-test with SES indicated no statistically significant differences. Children in the low-SES group demonstrated storybook comprehension comparable to children in the middle-SES group ($t(56) = .57$, $p = .569$, Cohen's $d = .15$). When background knowledge of the topic was held constant, the SES-related differences in children's story comprehension were no longer statistically significant.

Inferences and Generalizations

Our final analysis was designed to measure children's ability to make inferences about an unfamiliar category. Because children's responses were scored dichotomously, we once again first examined their performance on the assessment against a chance level of .50. One-sample t-tests indicated that children in both groups responded accurately on a statistically significantly greater proportion of items on this assessment than expected by chance ($t(29) = 4.54$, $p < .001$, and $t(27) = 5.80$, $p < .001$, respectively). The effects were large (low-SES: Cohen's $d = 1.68$; middle-SES: Cohen's $d = 2.23$). These results indicated that children in both groups were able to make inferences from the storybook and were able to generalize these characteristics to new category exemplars.

Comparing groups, an independent samples t-test further indicated that, although there were moderate differences between the groups, these differences did not approach statistical

significance ($t(56) = 1.45$, $p = .154$, Cohen's $d = .38$). In other words, children in both SES groups were able to learn the characteristics of an unfamiliar category during shared book reading, though there may be some differences between groups that we were unable to detect due to limited power. When we neutralized background knowledge by constructing a storybook that contained an unfamiliar topic to both groups, there were no longer statistically significant differences between low-income and middle-income children in their ability to acquire incidental word learning, storybook comprehension, or to make inferences and generalizations.

Discussion

In this study we examined the role of background knowledge on children's ability to learn incidentally from storybooks. Consistent with our hypotheses, we found socioeconomic differences in children's background knowledge (Study 1), which when applied to a storybook reading context appeared to significantly affect low-income children's ability to extract word meanings out of context as well as their comprehension (Study 2). As predicted, however, when we held background knowledge constant by introducing an unknown topic, there were no significant differences in children's word learning, comprehension, or ability to make inferences between SES groups (Study 3). Taken together, these results suggest that differences in low-income children's vocabulary development and comprehension skills may be attributed, in part, to limitations in their pre-existing knowledge base.

This research builds on a large body of work that has shown the effects of background knowledge and comprehension (Anderson & Nagy, 1992; Anderson & Pearson, 1984). For example, studies have shown that individual differences in prior knowledge affect the ability to extract explicit and implicit information from text and integrate this text-based information in reading comprehension (Graesser, Singer, & Trabasso, 1994; Kintsch, 1988, 1998). Other

studies (Cain, Oakhill, & Bryant, 2004) have examined multiple factors including the relative

contributions of inferential processing, domain knowledge metacognition and working memory

to learning from text. Our results are consistent with this research (Cain & Oakhill, 2007;

Kendou & van den Broek, 2007; Recht & Leslie, 1988), highlighting the role of background

knowledge on children's incidental word learning and comprehension for children as early as

preschool.

Yet, to date in the research, there has been little attempt to examine whether these

differences might be attributed, in part, to environmental factors that may limit children's

opportunity to develop background knowledge. For example, Neuman and Celano (2001)

reported striking differences in access to print for children who live in low-income circumstances

compared with their more middle-class peers. Further, recent evidence (Neuman & Celano,

2012) suggests that these limitations in access might extend to the new media environment in

communities of poverty and privilege, further accentuating knowledge differentials. In this

respect, background knowledge may reflect the extent to which children may have cognitively

supportive activities in these early environments (Neuman, 2008). Studies by Cunningham and

Stanovich and their colleagues (Cunningham & Stanovich, 1997; Stanovich & Cunningham,

1993; West & Stanovich, 1991) have shown how differences in print exposure early on are

predictive of content knowledge and later reading comprehension. Our results, therefore extends

previous research: Given that the decoding demands were eliminated in this read-aloud context,

it shows the difficulties that low-income children may experience in interpreting stories when

preexisting knowledge may be lacking.

These results further highlight the importance of background knowledge to the cognitive

processes that underlie oral language comprehension. When children possess limited

background knowledge about a particular domain, their understanding of new vocabulary words

may be increasingly dependent upon contextual information. Studies have shown that reliance

on context as the primary means for identifying new words is not an optimal strategy (Nicholson

& Whyte, 1992). For example, the low-income children in this study had no difficulty

identifying the unknown words when they were in the context of the story. However, in the

more isolated task, when they were required to identify a word outside of context, there were

significant differences between groups. Without adequate background knowledge, it suggests

that these low-income children may not have had a well-constructed semantic framework into

which they could easily slot new vocabulary words (Gelman, 2009; Hambrick, 2003).

These results may provide an explanation for the modest effects of storybook reading on

children's vocabulary development. Recent meta-analyses (Mol, Bus, deJong, & Smeets, 2008),

for example, have reported moderate effect sizes for dialogic reading with very young children

(ES = .59), with diminishing effects for children ages 4 to 5 and those at-risk (ES = .14). These

results could reflect the differential effects of background knowledge. For example, in Study 2,

where background knowledge could have been a factor, middle-class children were better able to

learn words incidentally and comprehend the story better than those from lower-income

backgrounds. When we leveled the playing field using a novel topic, there were smaller

differences between low-income and middle-income children, suggesting that the differences in

background knowledge were at work. Consequently, these results highlight the need to build

background knowledge more strategically and thoroughly than merely activating prior

knowledge (since it may not exist), or introducing to children to new words prior to storybook

reading. Rather, researchers and practitioners should consider additional knowledge-building

supports in their regular instructional regime (Pinkham, Kaefer & Neuman, 2012).

There are, however, a number of important limitations in this research. For example, given our interest in determining children's background knowledge, these studies did not provide extra-textual supports during the book readings. Although this allowed us to examine children's ability to acquire incidental word learning and comprehension from the storybooks themselves, it did not represent an authentic storybook reading activity. Studies have shown, for example, that extra-textual comments can effectively scaffold children's learning (Haden, Reese & Fivush, 1996; Justice, Meier, & Walpole, 2005; Whitehurst et al., 1994). As a consequence, our results may have underestimated children's ability to learn from storybooks.

Further, our studies only focused on a single topic—birds, and assessed only a single type of word learning--nouns. Birds, as a topic, had been selected because it represents a familiar domain for young children (DeMarie-Dreblow, 1991; Gelman & Coley, 1990), in which many individual subordinate category members are new. Yet clearly this topic may have privileged middle-class children, as shown in the between-subject SES differences in Study 1. Consequently further research is needed to examine the relationship between background knowledge and SES for domains in which low-SES children might have greater expertise, as well as individual variations among children. Such research would help to determine how best to scaffold background knowledge for young children's subsequent learning.

Additionally, although the use of completely novel information in Study 3 suggests that background knowledge was the main factor influencing the differences between SES groups, there is the possibility that other, unmeasured, differences between groups might have contributed to these findings. Furthermore, the lack of statistically significant findings in Study 3 may have been partially attributable to a lack of statistical power, rather than a complete absence of effects. Additional research with a larger sample with randomized conditions would be

required to further explore these findings and make a strong causal argument. Finally, the reliabilities on several of the instruments were low, reflecting the difficulties of assessment among preschool children. Although our measures indicated that children's responses were above chance, further research is needed to develop robust measures with greater internal consistency.

Traditionally, studies of early literacy have focused on the phonological components and language skills associated with successful reading (National Early Literacy Panel, 2008). These studies have often acknowledged the importance of background knowledge but have rarely developed interventions or programs designed to improve it. Recent studies, however, have demonstrated that low-income children can significantly benefit from content-rich interventions that support both skill development and conceptual knowledge that are critical for making inferences and generalizations (Gonzales et al., 2011; Neuman, Newman, & Dwyer, 2011; Neuman & Kaefer, 2013). Such findings suggest that a more intentional integration of knowledge and language skills may be beneficial for early literacy development.

These issues become especially salient in the age of Common Core standards. To meet the demands of these new standards, children will be expected to develop knowledge through text, both narrative and informational, within specified difficulty ranges at each grade level. Studies have shown that informational text, in particular, is likely to have a greater density of conceptual language and academic terms than typical storybooks or narrative texts (Cervetti et al., 2009; Duke, 2000). Consequently, these texts will place increasing demands on children's prior knowledge, further attenuating other risk factors.

Without greater efforts to enhance background knowledge, differences in children's knowledge base may further exacerbate the differences in children's vocabulary and

comprehension. While it is only a first step, therefore, this study clearly demonstrates the

importance of fostering young children's background knowledge as a means for providing a firm

foundation for learning in the early years.

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86, 542-555.

Appendix

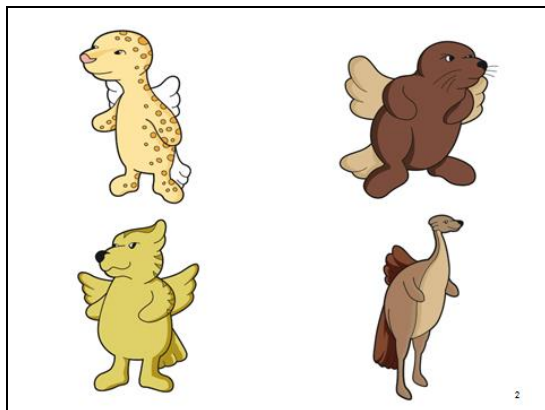*Pages from book for Study 2 (Bird information)*

A moa builds a nest because it is a bird.
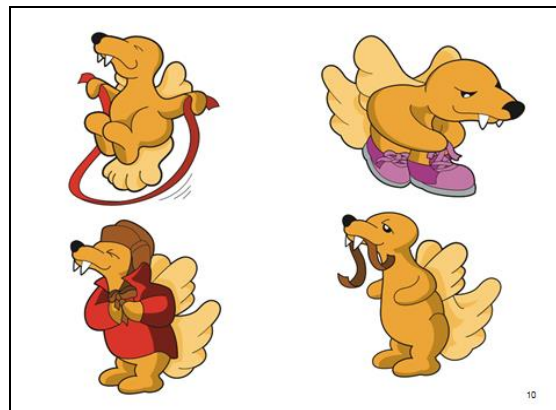The moa looked in his nest
and found his hat.
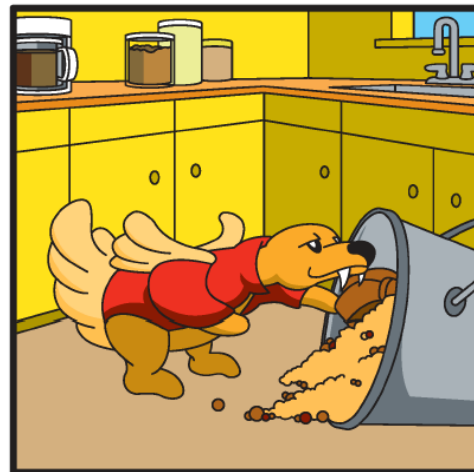
A kona eats seeds because it is a bird.
The kona looked in his bucket of seeds
and found his hat.

Examples of vocabulary and comprehension tests for Study 2
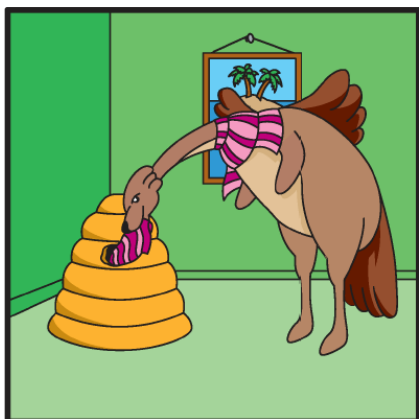

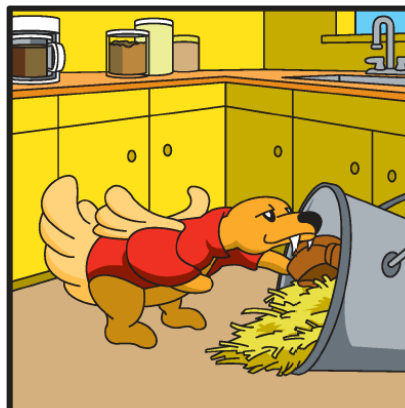**Vocabulary: "Point to the moa"**   **Comprehension: "Point to why they needed the string"**

Pages from book for Study 3 (Novel information)

A moa builds a hive because it is a wug.
The moa looked in his hive
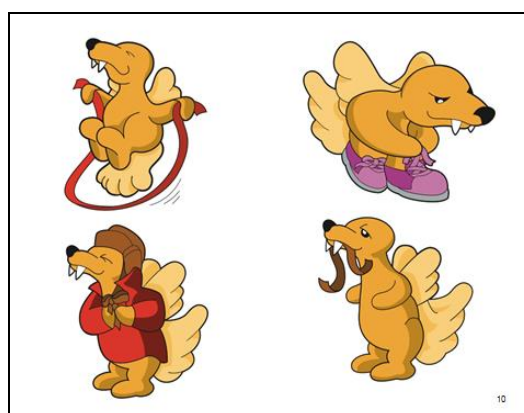and found his hat.

A kona eats hay because it is a wug.
The kona looked in his bucket of hay
and found his hat.

Examples of vocabulary and comprehension tests for Study 3

Vocabulary: "Point to the moa"   **Comprehension: "Point to why they needed the string"**

Table 1

Participant demographics by SES group for studies 1-3

		Lower SES	Higher SES
Study 1	N	22	29
	Mean Age (in months)	56.37	57.55
	Gender	59% male	52% male
		68% Caucasian	79% Caucasian
	Ethnicity	27% African American	13.8% Asian
		4.5% Other	4.5% Other
Study 2	N	38	38
	Mean Age	59.16	59.44
	Gender	50% male	34% male
		68.4% Caucasian	55.3% Caucasian
	Ethnicity	21% African American	39.5% African American
		7.9% Hispanic	2.6% Hispanic
		2.6% Other	2.6% Other
Study 3	N	28	30
	Mean Age	60.70 months	58.41 months
	Gender	47% male	42% male
		66.7% Caucasian	80.0% Caucasian
	Ethnicity	11.5% African American	13.3% African American
		11.5% Hispanic	3.3% Hispanic
		7.6% Other	3.3% Other

Table 2.

Percent (and standard deviations) on outcome measures for Study 1 by SES group.

Assessment	Low income (n=22)	Middle income (n=29)
Background Knowledge	58% (13%)	69% (17%)
PPVT	88.73 (11.29)	117.82 (9.22)

Table 3.

Percent (and standard deviations) on outcome measures for Study 2 by SES group.

	Low income Group (n = 38)	Middle income Group (n = 38)
Vocabulary		
Words in Context	44% (24%)	48% (21%)
Words out of Context	22% (24%)	36% (31%)
Story Comprehension	61% (27%)	73% (26%)

Table 4.

Percent (and standard deviations) on outcome measures for Study 3 by SES group.

	Low income (n = 28)	Middle income (n = 30)
Vocabulary		
Words in Context	49% (27%)	57% (24%)
Words out of Context	25% (29%)	25% (27%)
Story Comprehension Assessment	60% (27%)	64% (25%)
Inferences and Generalizations	63% (12%)	59% (10%)