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ABSTRACT

A study investigated the development of vocabulary knowledge in elementary school children as a function of story reading for partially known and unknown words. Subjects, 43 fourth-grade low-middle to middle-class children from a rural elementary school in the southeastern United States, participated in a vocabulary checklist in which they provided definitions or sentences for words they knew (known words), and checked off words they did not know the meaning of but were familiar with (partial-knowledge words). Children then read stories containing some of these words. The remaining words served as a control. Vocabulary growth was gradual for both known and unknown words. Moreover, word factors rather than text factors were more important in the development of vocabulary knowledge. (Contains 35 references, 3 notes, and 2 tables of data.) (Author/RS)

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Partial Word Knowledge and Vocabulary Growth During Reading Comprehension

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Abstract. *The experiment investigated the development of vocabulary knowledge in elementary school children as a function of story reading for partially known and unknown words. Fourth-grade children participated in a vocabulary checklist in which they provided definitions or sentences for words they knew (known words), and checked off words they did not know the meaning of but were familiar (partial-knowledge words). Children then read stories containing some of these words. The remaining words served as a control. Vocabulary growth was gradual for both known and unknown words. Moreover, word factors rather than text factors were more important in the development of vocabulary knowledge.*

Consider what might happen when a reader encounters an unknown word. Assume that the reader is able to create an orthographic representation of the word, or some sort of unified representation of the word's letters as Adams (1990) suggests. When a word is familiar, this representation is tied to multiple types of semantic information. The word *bear*, for example, might be tied to other words inlogical relations ("A bear is an animal"; Collins & Loftus, 1975), to associated concepts (forest, circus, other woodland animals, etc.), to specific memories ("The black bear we saw in the garbage dump in Cranberry Lake"), and so on. A less familiar word might be tied to a less rich set of semantic associations. For example, *calliope* may be tied only to the broad category of "musical instruments" and to memories of a circus. As the word is encountered in each new context, the information from that context is added to the already existing knowledge store, adding to the richness of a word's representation in memory, until, presumably, there is some saturation point where the word is sufficiently well known so that it could be understood in every context that it appears. For most people, the word *bear* is that well known, and there is room to grow on one's notion of *calliope*.

These words are known, more or less, by most adults. But consider a word that is probably unknown, like *minatory* in the following context:

> "Oh, all right," I grumbled. I turned off the water and went into the living room to do my stretches. Peppy didn't understand why I wasn't limber and ready to go as soon as I got out of bed. Every few minutes she'd give a *minatory* bark from the back. When I finally appeared in my sweats and running shoes, she raced down the stairs, turning at every half landing to make sure I was still coming. (Paretsky, 1988)

The reader probably could come up with a rough pronunciation, although there is some ambiguity about whether the "i" in the first syllable is short or long. But beyond that, the reader would have little to go on from the context. Most words are learned from context (Nagy & Herman, 1987; Sternberg, 1987), yet most contexts are uninformative by themselves (Schatz & Baldwin, 1986). That is, the vast majority of a person's word growth can be accounted for by exposure to words in written and oral context, not through direct instruction of some sort, but individual encounters with a word in a natural context are not likely to yield much useful information about that word. In a series of studies, Nagy, Herman, and Anderson (1985; Nagy, Anderson, & Herman, 1987; Herman, Anderson, Pearson, & Nagy, 1987) found that children do learn between 5% and 20% of previously unknown words from a single exposure in context. Nagy and Herman (1987) suggest that this process of learning words from context could account for the majority of observed vocabulary growth in school-aged children. Schatz and Baldwin (1986), however, found that adults had very little success identifying words that have been blanked out from naturally occurring contexts.

Because of this paradox between the fact that contexts tend to be individually uninformative and yet so important to vocabulary learning, it is important to understand how such learning takes place. The purpose of this paper is to examine the process of vocabulary growth from context, looking not only at the rate of acquisition from context, but also examining the effects of three sets of factors—(1) children's prior word knowledge, (2) differences between words, and (3) text factors—in children's incidental word learning. We will use the term *vocabulary growth* to refer to both the changes in word meaning that occur as a word goes from being completely unknown and unrecognizable to at least somewhat known and recognizable and the changes that occur during the accretion of word meaning for words that people can ascribe some degree of recognizability and meaning.

The Growth of Word Meaning

As word learning grows, a person's notion of a word's meaning grows from the first encounter with the word, where the word's meaning is totally unknown, to a partial knowledge of the word, to richer and richer understandings of the word's meaning. With words like *calliope* and *bear*, we can clearly see how knowledge of a word's meaning may get richer with more and more experience. An expert on wind instruments, or a mechanic working for a circus, may have as rich a notion of *calliope* as an average person has of *bear*. What is less clear is how that knowledge grows in the initial stages.

Durso and Shore (1991) have argued that word knowledge varies from total nonknowledge, to varying degrees of partial knowledge, to complete knowledge. People may have implicit or unreportable rather than explicit knowledge about the meanings of many words. If the word is totally unfamiliar, the word might possess all the characteristics of a non-word for the child. A person may not be able to report the word's meaning (or respond correctly on a definitional task), but may have some partial knowledge about the word—perhaps being able to describe it in the most general semantic terms, such as animacy, or by part of speech, such as *noun-ness* (Durso & Shore, 1991; Shore & Durso, 1990).

The method used by Shore and Durso (1990) to assess level of word meaning is similar to the one used in this research. Participants were first asked to provide a brief definition or synonym for each word on a checklist containing both words and nonwords. Next, participants were to go through the list again for words without definitions and try to use the words in a sentence. Words that could either be defined or used in a sentence were deemed *known* words. Third, participants were told to mark any remaining words that seemed familiar to them by placing a check mark by those words, including any that they "had seen or heard before, even if they had no real idea what it meant" (Shore & Durso, 1990, p. 316). These were deemed "frontier" or *partial-knowledge* words. In the present study, we also included as items in this category for these cases in which children showed, by their definition or partial misuse of a word, that they had knowledge of some fairly general domain knowledge of the word even though they appeared to be confused about the specific semantic constraints that applied to the word. Finally, participants were asked to go through the checklist one more time and circle any items they thought could possibly be real words, after being warned that all of the items were not real words. These and the remaining words were deemed *unknown* to the participant.[1]

Durso and Shore (1991) examined more closely the kinds of information possessed for words at each of these levels of word meaning. They found that adults possessed a surprising amount of information about both partially known and reportedly unknown words. For example, participants could choose sentences that did not violate the general semantic constraints or selectional restrictions of both partial-knowledge and unknown words at an above-chance level. They could also discriminate between a correct synonym and an incorrect one for partial-knowledge and unknown words. This suggests that their subjects had

[1]Durso and Shore (1991) did not include circled items as unknown because they believed that circled items might possess some residual form of knowledge for the word. However, we found that adults in an earlier study (Schwanenflugel, Duncan, McFalls, & Stahl, 1995) seemed confused by this instruction and fairly systematically circled pseudowords as often as real words, suggesting that adults and children were not using any real semantic knowledge to select out words under this instruction. In any case, our focus was on words that had a decided level of familiarity to young children, but whose meaning was not known.

some knowledge of even words that they reported as unknown, and that this knowledge could be used to make gross discriminations involving a word's meaning.

In other ways, partial-knowledge words were found to have the advantage over unknown words. Specifically, even though subjects could not define a word fully, they could choose between a sentence which maintained specific semantic constraints over one that did not at a better than chance level. Furthermore, for partial-knowledge words, people were able to identify whether words were used correctly in isolated sentences (rather than in contrasting sentences). Subjects were unable to perform either of these tasks for unknown words. Thus, implicit knowledge that people had about the meanings of unknown words was very fragile and easily disrupted by more difficult contrasts. Furthermore, vocabulary instruction consisting of providing adults with dictionary definitions appeared to particularly benefit unknown words over partial-knowledge words (Shore & Durso, 1990).

Stahl (1991) uses a connectionist model to discuss the accretion of information about a word through repeated exposures to that word's meaning in context. In Stahl's model, when a word is encountered for the first time, information about its orthography is connected to information from the context; so that after one exposure, a person may have a general sense of the context in which it appeared ("It has something to do with ...") or a memory of the specific context ("I remember seeing it in an automobile manual"), but not a generalizable sense of the meaning of the word. With repeated exposures, some nodes become strengthened as that information is found in repeated contexts, and become the way that the word is "defined."[2] Other information, found associated with the word in few contexts, may recede. In a connectionist model, as information is understood, it is represented in memory through links to other information already stored.

Consider the word "minatory" in the earlier context. In Stahl's (1991) model, the concept *minatory* will be linked to other concepts in the context, such as *dog*, *impatient*, and so on, or possibly to the whole scenario presented. As the word is encountered repeatedly, some of these elements are going to be reinforced, through repeated linking. These become the stronger components of the concept, such as

[2]Connectionist networks can be designed in a localist fashion to include a distinct lexical node level (c.f., Adams, 1990; Balota et al., 1991; McClelland & Rummelhart, 1981) to which meaning, orthographic, and phonological features are connected. In other words, each word has a separate representation containing information about its meaning, orthography, and phonology, as well as relations to other words. Alternatively, they can be designed in a distributive fashion to eliminate such a specific lexical level (Seidenberg & McClelland, 1989). In these models, a word is represented by interconnections between distinct levels of phonemic, semantic, and orthographic features, but no independent lexical representation per se is established. In the localist version, as word learning proceeds, new nodes are added to the network; meaning, orthographic, and semantic features are added to the nodes; and new connections to existing nodes may be made (see Adams, 1990). In the distributive version, there is no need for the establishment of a distinct, new node, and a new pattern of interconnections between phonemic, orthographic, and semantic nodes is accrued.

might be represented in a dictionary definition (see McKeown, 1991). If the links to other concepts are not repeated, they may recede in importance. The word *minatory* means "threatening," and thus the dog is an incidental, not an essential, part of the concept, and would likely be forgotten with repeated exposures.

Under a connectionist model, word meaning would grow at a relatively constant rate, dependent on the features of the context. Thus, people would show as much absolute gain in word knowledge from an unknown word as they would from a word for which they have some partial knowledge, all other things being equal. (As we will discuss below, all other things are rarely equal.) An alternative to this view comes from observations of young children's "fast mapping" of concepts (Heibeck & Markman, 1987; Rice, Buhr, & Nemeth, 1990). Children as young as 2 years of age have been found to show appreciable learning about a concept from a single exposure. They appear to acquire superordinate information, or other category information, very quickly, and later gradually add features to their knowledge representation. Fast mapping has been demonstrated with young children (Heibeck & Markman, 1987) and with children who have learning problems (Rice et al., 1990). If fast mapping is a general process, then children might be found to learn more information about unknown words than partially known words. In the case of *minatory*, the fast mapping would probably associate the new concept with "something to do with communication."

Word and Text Factors

Word factors. The strength and information available to the reader after a single exposure in context is presumed to vary according to both word and text factors. Word factors such as grammatical category and word concreteness have been found to influence the acquisition of words by young children (Gentner, 1982; Golinkoff, Mervis, & Hirsh-Pasek, 1994; Schwanenflugel, 1991). For example, young children acquire nouns earlier than verbs, which are, in turn, acquired before other open-class parts of speech such as adjectives and adverbs (Golinkoff, Hirsh-Pasek, Mervis, Frawley, & Parillo, 1995). Similarly, words with concrete meanings are acquired more easily than words with abstract meaning (Brown, 1957; Schwanenflugel, 1991). These studies all draw upon young children's acquisition of word meanings in their speech. This may or may not represent a different process from learning words from written context.

Nagy et al. (1987) found that conceptual complexity influenced word learning, at least at a gross level. They distinguished between words that were synonyms for a well-known concept, such as *pusillanimous*, and those that represent concepts not known by the child, such as *osmosis*. They found practically no incidental learning from context at the highest levels of complexity. However, they could only make gross distinctions among words and only found differences at the highest levels of complexity. Durkin (1990) also found differences in learning from context due to complexity. In our study, the words used were of an intermediate level of complexity, and we did not expect to see differences due to this factor.

Text factors. Text factors such as the degree of contextual support (Beck, McKeown, & McCaslin, 1983), the number of repetitions in the text, and the importance of the sentence containing the word to the story as a whole (Stahl, 1991) might also influence how well a word is learned.

According to Beck et al. (1983), contexts can range from being directive (in the sense that they direct a highly specific meaning for an unknown word), generally directive (providing a general meaning for a word), neutral, and misdirective (misleading the reader about the meaning of a word). Beck et al. (1983) derived this scheme from an analysis of contexts. Then, they had a small group of subjects derive the meanings of nonsense words placed in contexts of various types. They found that contextual support aided their adult respondents in deriving word meanings. Deriving word meanings is a different task than incidental word learning, involving different types of processing (Stahl & Kuhn, 1996). Thus, it is unclear whether strength of contextual support will aid in incidental word learning.

The number of repetitions of the word in the text is another text factor. We assume that the more the word is repeated, the more knowledge would be gained about that word.

Similarly, if the word is essential to the construction of major ideas from the passage, then the reader might exert more effort in determining the meaning of the word. Importance may affect learning from context in at least two ways. First, readers may devote more attention to deriving a word whose meaning is important for understanding the important concepts in a story. Second, readers may get more elaborate information about a word located relatively high in the text structure. According to text processing models (e.g., Kintsch & van Dijk, 1978), if a word is located in an idea relatively high in the text structure (that is, part of an important idea), the passage will provide more information on that idea and thus on the word. Consequently, a person may learn more about words located in more important ideas, leading to more word learning.

In this study, we examined the effects of text reading on the growth of word knowledge for words that are partially known and unknown to children. Furthermore, we examined the effects of word features (concreteness and part of speech) and text features (contextual support, number of repetitions in the texts, and importance) on word learning in children.

Method

Participants

Participants were 43 fourth-grade, low-middle to middle-class children from a rural elementary school in the southeastern United States who participated in all four sessions of the experiment. An additional 18 children participated but were eliminated because they did not complete all four sessions of the study, primarily because of school absences. The children were primarily of European-American origin, although approximately 20% of the children were from either Latino- or African-American backgrounds. None of the children participating had been referred for special education services in reading.

Stimuli and Procedure

Children first completed the vocabulary checklist. A week later, they participated in the story comprehension phase, reading two stories 1 day apart. Three days later, they were asked to complete a definition test.

Vocabulary checklist. Children were given a vocabulary checklist consisting of 24 words that they were likely to know, 12 pseudowords (phonologically regular nonwords), 12 nonwords (phonologically irregular nonwords), and 96 difficult words that were 2 to 4 years above their grade level according to Dale & O'Rourke (1976), a compendium of words ranked by the grade level at which two-thirds of their test sample could answer a multiple choice item correctly. Thirty-nine of these difficult words were target words from four stories that were used in the study (10 from each story; 1 word from these 40 was inadvertently omitted on the checklist). The pages of checklists were randomly ordered so that each child in the classroom possessed a different random ordering of the stimuli. The instructions for the checklist were as follows:

> I want to know what you know about words. I have given each of you a list. Everybody in the class has a different list. On your list, there are some real words and some made-up words. I will now tell you what we want you to do with this list of words. I have several things I would like you to do with this list, so listen carefully.
>
> I would like you to write a definition or a short sentence for every word that you can on the list. Please make your definitions or sentences as clear as possible so that I know that you know the meaning of the word. So, for example, if the word was "library" you might write "a place where I go to borrow books" or "media center" or "Jane went to the library to do her homework"; but I wouldn't just write "a place" or "It was a library." I am not interested in the number of words that you know. So just do your best and that will be fine with me. When you are finished, put your pencil down and work on the assignment that the teacher left you to do." (*Experimenter waited until all children were finished with this phase*.)
>
> Next, I would like you to go through the list again and place a check mark (*experimenter demonstrated on the board*) beside any word that you left blank if you have seen it before or if it is familiar to you, even if you are not quite sure what it means. For example, you might not exactly know what the word "antibiotic" means, although you might have heard your doctor or mother say it. (*Again, experimenter waited until all children were finished with this phase*.)
>
> Next, I would like you to go through the list one last time. If you haven't seen or heard an item on the list before, but for some reason you think that it really is a word, please circle the word. (*Experimenter demonstrated this again with the word "oasis" written on the board*.) Remember, some of the items should be left blank because they are not all real words.

A correct definition or sentence was termed a *known* word for the child. A blank or circled item was termed an *unknown* word for the child. A domain-related but essentially incorrect definition or a checked word was termed a *partially known* word for the child. For example, for the word "typed" one child wrote the definition, "write with ink," which preserved the general semantic domain of the word but was essentially incorrect about the specific characteristics of the word. Words for which a completely incorrect definition or use of the word in the sentence was provided were eliminated from the study for the child. (Typically, these words were ones for which the child confused the word for another one that s/he knew; e.g., the definition "something you get when you win a game" for the word "price," confusing "price" with "prize.") One experimenter was responsible for identifying and scoring all the vocabulary items into one of the above categories. A reliability check by another experimenter for 15 (or 25% of) subjects indicated a 97% agreement rate in classifying children's definitions on the checklist.

Story comprehension phase. One week later, each child read two of the possible four stories, one each on sequential days. The stories were existing texts written at about the sixth-grade level, 2 years beyond the assigned grade level of our participants. The stories were "The Midnight Visitor" by R. Arthur (1017 words), "Guardian of Cherry Trees" by J. Wakamiya (822 words), "Jorinda and Joringel" translated by E. Shub (904 words), and "The Army of Two" by P. E. Clyne (1037 words). Approximately, 2.7%, 4.1%, 2.8%, and 3.9% of the words in each of the stories, respectively, were at least 2 years beyond the fourth-grade level according to the Dale and O'Rourke (1976) list. The stories were counterbalanced across children. Each child read only two of the texts, but different children received different texts and in different orders, so that approximately the same number of children read each text on either the first day or the second day. The unread stories and the targeted words in those stories served as a control condition for each child from which to examine the influence of story reading on vocabulary development.

To ensure, in a general way, that the children had read the stories with comprehension, the children were asked to write a summary of the story immediately after reading it. A list of major idea units in the stories were created by the experimenters and the children's recall protocols were scored against them. Overall, children recalled 27% (SD = 12.9) of the major idea units in the stories.

Definition test phase. Three days later, children were asked to complete a multiple choice test containing the targeted items from the story. Each word was followed by four randomly arranged options: (a) the correct definition; (b) a partial definition reflecting domain relevant, partial knowledge; and (c) two incorrect definitions.

Results

Scores on the definition test were calculated for the story and no-story conditions by averaging over words classified by each child as known, partially known, or unknown in the vocabulary checklist phase. Items were given a score of 0 if they selected any of the incorrect definitions, 1 if they selected the partial definition and 2 if they selected the correct definition.[3] Ten children were eliminated from further analysis because they failed to indicate items in either the partially known, or un-

[3]Two items were inadvertently omitted from the definition test. Another item functioned as known by all the children in the study and, therefore, was not included in the regression analyses examining the growth of vocabulary knowledge as determined by the definition test.

Table 1
Mean Definition Test Scores as a Function of Story Condition and Original Knowledge Level

	Original Knowledge Level		
Condition	Unknown	Partially Known	Known
No Story			
M	.57	.81	1.39
SD	.31	.50	.59
Story			
M	.70	1.00	1.19
SD	.40	.56	.77

Note: 0 = miminum (unknown); 2 = maximum (known).

known conditions in the vocabulary checklist phase, making an assessment of vocabulary growth in these conditions impossible for these subjects. Essentially for these dropped subjects, the task was too easy because they knew all of our targeted words. The mean scores for each condition on the definition test for the remaining 33 participants can be found in Table 1.

Analyses of Vocabulary Growth as a Function of Story Reading

In order to assess whether children's vocabulary knowledge changed as a function of story reading, the definition test scores were analyzed using a Story Condition (Story, No Story) X Knowledge Level (Unknown, Partial Known, Known) repeated measures analysis of variance (ANOVA) with both factors serving as within-subject factors. This analysis yielded a nonsignificant main effect of Story Condition, $F(1,32) < 1$, $p > .20$, but a significant main effect of Knowledge Level, $F(2, 64) = 41.82$, $p < .0001$. More importantly, however, is the finding of a significant interaction between these two factors, $F(2, 64) = 3.43$, $p = .0385$. As seen in Table 1, the form of this interaction appeared to indicate that word knowledge growth was larger for partial knowledge and unknown words than for known words.

To tease apart the source of the interaction, two partial ANOVAs were performed. First, an ANOVA was performed that compared the definition test scores for the Story and No-Story conditions for known words. As anticipated from prior research, there was no gain in vocabulary knowledge as a function of story reading for known words, $F(1, 32) = 1.74$, $p = .197$. Second, a 2 (Story Condition) X 2 (Vocabulary Checklist Knowledge Level) ANOVA was performed comparing the definition test scores for the unknown and partial-knowledge words for the story and no-story conditions. This analysis yielded a significant main effect of Story Condition, $F(1, 32) = 6.20$, $p = .018$, and Vocabulary Checklist Knowledge Level, $F(1, 32) = 18.67$, $p < .0001$. However, the interaction between Story Condition and Vocabulary Checklist Knowledge Level was nonsignificant, $F < 1$, $p > .20$.

The relative growth, represented by the ratio of Story to No-Story condition Means, was 22% and 23%, respectively, for partially known and unknown words. This suggests a similar accretion of semantic information about the words, regardless of initial level of knowledge about those words. (Students who were initially rated as "knowing" the word did not have enough room to grow on our measure, which did not assess increasing richness of knowledge.)

Influence of Text and Word Factors on Vocabulary Growth

We conducted further analyses to examine the importance of text and individual item factors in predicting vocabulary growth. Words were scored on five predictor variables:

- *Word Concreteness*. This variable was operationalized as the mean rated imageability of the items' referent (Paivio, 1968) across four experimenters; imageability was rated on a 1 (low) to 7 (high) scale, $M = 4.3$, $SD = 1.34$; Cronbach coefficient alpha $= .69$;
- *Grammatical Part Of Speech*. This variable distinguished nouns from nonnouns (1 = noun, 0 = nonnoun); 28% of the items were nouns;
- *Number Of Repetitions*. This variable indicated the number of times the word appeared in the text ($M = 1.14$, $SD = .68$; range 1–5);
- *Contextual Support*. Beck et al.'s (1983) contextual transparency rating procedure was used where surrounding contexts were rated on a 1 (low transparency) to 4 (high transparency) scale and averaged across the ratings of four experimenters; Cronbach coefficient alpha = .73; and
- *Text Importance*. Words were rated by the four experimenters on the importance of the sentence in which the word appeared using Omanson's (1985) rating scale with 1 representing high importance, 2 representing low importance, and 3 representing a distracting detail; Cronbach coefficient alpha = .77.

For the dependent measure, we averaged definition test scores across children for each word in the study for Story and No-Story conditions separately. The correlations between the variables used in this analysis can be found in Table 2.

To assess the influence of word and text factors on vocabulary growth, we conducted two stepwise regression analyses, one predicting the growth of words indicated as partially known on the vocabulary checklist and one predicting the growth of words previously indicated as unknown. For each of these equations, we entered the scores of the definition test on these words from children not having read the story as a control for baseline recognizability of the definitions. For unknown words, none of the variables entered other than

Table 2
Correlations between Variables used in Regression Analyses

Variables	No Story Unknown	No Story Partial	Story Unknown	Story Partial	Concreteness	Contextual Support	Number of Repetitions	Text Importance	Part of Speech
No Story Unknown	—	.46	.37	.40	.16	.13	.10	-.23	.06
No Story Partial		—	.26	.28	.43	.02	.24	-.11	.19
Story Unknown			—	.44	.06	.02	.24	.13	-.20
Story Partial				—	.38	.04	.20	-.02	-.23
Concreteness					—	.16	.28	-.05	.26
Contextual Support						—	.20	-.35	.34
Number of Repetitions							—	-.12	.24
Text Importance								—	-.27

(r_{crit} = .33)

the baseline no-story definition test scores were systematically related to vocabulary knowledge as after story reading, R^2 = .137, $F(1,35)$ = 5.39, p = .026.

For partially known words, the findings were different. Specifically, by itself, baseline definition test scores were only marginally related to definition test scores following story reading, R^2 = .081, $F(1, 35)$ = 3.00, p = .093. In fact, when baseline definition test scores as well as the other variables were allowed to enter the equation, only word concreteness, grammatical part of speech, and baseline definition test scores (which were forced in the equation) remained in the equation; together accounting for 28.55% of the variance in definition test scores following story reading, $F(3, 35)$ = 4.26, p = .012. In this final equation, concreteness was positively related to vocabulary growth as a function of story reading, β = .1526, $F(3,35)$ = 5.44, p = .026, such that high imageability words were acquired more easily than low imageability words. Interestingly, and contrary to prior research on vocabulary acquisition in young children, nouns were actually acquired more poorly than nonnouns (adverbs, adjectives, and verbs), β = -.419, $F(3,35)$ = 5.53, p = .025. Partial r^2 indicated that grammatical part of speech accounted for an additional 8.3% of the variance in definition test scores following story reading beyond baseline definition test scores, $F(3, 35)$ = 3.28, p = .079. Word imageability accounted for an additional 12.15% of the variance in definition test scores, $F(3,35)$ = 5.44, p = .026. Thus, word characteristics rather than text characteristics appeared to have greater importance on the growth of vocabulary knowledge as a function of story reading.

Discussion

In this study, word meaning developed at a similar level for partial-knowledge words and unknown words; even though partial-knowledge words, at minimum, bore an element of familiarity for our participants and unknown words did not. This finding concurs with the growing conclusion in the research literature that children's vocabularies can and do develop as a function of story reading (e.g., Nagy, Anderson, & Herman, 1985; Nagy, Herman, & Anderson, 1987). This growth occurred despite the fact that the vast majority of vocabulary items in our study tended to appear only once in the stories that the children read. Moreover, our findings indicate that vocabulary knowledge develops as a function of reading and is a gradual and relatively even process, at least for words at these levels of knowledge.

This finding of a gradual development of vocabulary knowledge for both unknown and partial- knowledge words is at variance with the findings of Shore and Durso (1990). Shore and Durso found that unknown words were more greatly benefitted by direct vocabulary instruction in the form of providing participants with dictionary definitions. In particular, people gained specific features rather than general semantic features for these unknown words. In their study, participants appeared to possess general semantic constraint knowledge for most of the words in the study, making the task of vocabulary learning one of acquiring specific semantic features.

In our study, examination of the cell Means is indicative of one of the main differences between our results and those of Shore and Durso (1990). If the children had been acquiring specific features primarily for unknown words, one would have expected the cell Mean for the unknown words to have hovered much closer to 1 before story reading (which would have reflected general semantic constraint knowledge) and closer to 2 afterward (which would have reflected knowledge of specific features). However, this was not the case. The general constraint knowledge for unknown words, in particular, was lower in our study a priori than it appeared to be for the adults used in Shore and Durso (1990). And, in general, our subjects did not appear to learn much about the specific constraints of words.

On the other hand, the children participating in our study may have had a more difficult discrimination to make than in the Shore and Durso (1990) study. Children in our study had to choose between four potential definitions of the word, whereas Shore and Durso's subjects only had to select between two potential uses of the word. Thus, it appears that whatever general semantic constraint knowledge the children in our study might have possessed for the words a priori was fairly easily disrupted by more difficult choices. In fact, further research by Durso and Shore (1991) suggested that knowledge that people possess for unknown words, including knowledge of general constraints, was easily disrupted by more difficult discriminations. However, the lack of an interaction between baseline Vocabulary Knowledge Level and the Story Reading condition suggests that vocabulary growth was incremental for both types of words for the children participating in our study.

The findings of our study also reveal that there is nothing especially difficult about setting up a mental representation for a new lexical item, as presumably children would have to do for unknown words. For example, for localist versions of connectionist viewpoints, it seems probable that one would first have to create a new lexical node before orthographic, phonological, and semantic information could become connected with it. Presumably, if instantiating a mental representation for a new lexical item was particularly difficult, we would expect to see that the development of knowledge for unknown words was slower than for partial-knowledge words because partial-knowledge words already have an existing lexical node with corresponding orthographic and phonological features but few semantic features.

The development best described by the present set of results most closely conforms with that described by a distributed memory model (Seidenberg & McClelland, 1989) of lexical representation. In these models, semantic, phonological, and orthographic features are stored separately (hence, are distributed in memory) and become unitized gradually through the presentation of the word in various episodic contexts. This would seem to predict gradual development of vocabulary knowledge for both unknown and partially known words, which was found in our study.

Our findings also show that the characteristics of the words being learned are more important than the characteristics of the texts in which the words appear for vocabulary learning. Specifically, two factors were of importance to the learning of partial-knowledge words: *word concreteness* and *part of speech*—particularly, the distinction between nouns and nonnouns. Schwanenflugel (1991) and others (Brown, 1957; McFalls, Schwanenflugel, & Stahl, 1996; Schwanenflugel & Noyes, 1996) have suggested that word concreteness is an important semantic characteristic that influences the entry of new words into a child's productive and reading vocabulary. There are several potential contributors to this effect. Concrete words typically have easier access to imagery; typically refer to things that one can see, taste, touch, or smell; and typically have greater accessibility to information stored in prior knowledge. It appears that the greater accessibility of various kinds of information associated with concrete words enables children to build upon existing lexical knowledge about the word. Unfortunately, we found no such relationship for unknown words.

Interestingly, we found that part of speech was also related to the growth experienced in vocabulary knowledge for partial-knowledge words. However, this relationship was directly opposite to that expected on the basis of studies of lexical development in young children. Golinkoff et al. (1994), Gentner (1982), and others have noted the predominance of nouns in young children's vocabularies. As a result, they have suggested that children possess a bias toward assuming that new words refer to objects (which would always be nouns) rather than verbs, adverbs, or adjectives. However, a more fine-grained examination of our items can assist us in understanding perhaps why nouns were harder to acquire in the present study than other parts of speech (verbs, adverbs, adjectives). Specifically, Golinkoff et al.'s *principle of object scope* asserts that toddlers first assume that new words refer to concrete whole objects as opposed to their parts or attributes. In our study, only three nouns clearly referred to distinct whole objects ("beacon," "dory," and "sorceress"). The others either referred to mass nouns or nouns without clear boundaries (e.g., "venom," "dale"), or abstract nouns (e.g., "vicinity," "tribute"). It may be that, for elementary children who are in the process of acquiring a sizeable vocabulary, violations of prior expectations regarding nouns may actually make it more difficult to acquire new nouns than words from other parts of speech.

On the other hand, we do not wish to overemphasize the potential relevance of research on the lexicon development for our findings. That literature is almost solely based on vocabulary acquisition in preschoolers and toddlers who may use different principles for acquiring new words than older children. Certainly, the kinds of nouns usually learned by fourth graders are likely to be comparatively abstract and comparatively non-objectlike (Schwanenflugel, 1991). Still, considering why the nouns in our study were so difficult to learn may provide us with some hints as to the factors that older children may use to learn new words.

Finally, it is unclear why text factors (contextual support and importance) played such a little role in the development of vocabulary knowledge in our participants. Beck et al. (1983) and many others have proposed that words with greater contextual support would be easier to learn. In contrast, Schatz and Baldwin (1986) have shown that context clues are unreliable predictors of word meanings. Nagy et al. (1987) similarly failed to find effects for strength of contextual support on learning from context. The failure of our study to find an effect of contextual support questions the importance of this factor on vocabulary development. Either way, suggestions to teach children context cues (see Stahl & Kuhn, 1996, for review), which are based on different amounts of contextual support, may not be as effective as more global exhortations to examine unknown words (Goerss, Beck, & McKeown, 1994).

Importance, similarly, has been proposed to affect vocabulary learning (e.g., Stahl, 1991), but vocabulary difficulty may have little effect on the development of a macrostructure (e.g., Stahl, Jacobson, Davis, & Davis, 1989). However, most of our targeted words only appeared once in their texts, and, therefore, may not have been sufficiently involved in the macrostructure of their texts to have enabled text importance to influence the development of the words' meanings. However, if the failure to find an effect for importance is replicated, it may suggest that vocabulary difficulty and macrostructure operations are fully independent.

Children acquire words from context slowly, developing partial representations and refining them until they have a full, flexible knowledge representation. In this study, we have found that students learn information about both unknown and partially-known words from reading texts. Gains were fairly similar for both levels of word knowledge. Word factors such concreteness and part of speech seem to influence that growth, but text factors such as importance or contextual transparency were not found to have an effect.

References

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, MA: MIT Press.

Anderson, R. C., & Freebody, P. (1981). Vocabulary knowledge. In J. T. Guthrie (Ed.), *Comprehension and teaching: Research reviews* (pp. 77–117). Newark, DE: International Reading Association.

Beck, I. L., McKeown, M. G., & McCaslin, E. S. (1983). All contexts are not created equal. *Elementary School Journal, 83*, 177–181.

Bleasdale, F. A. (1987). Concreteness-dependent associative priming: Separate lexical organization for concrete and abstract words. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 13*, 582–594.

Bloom, P. (1994). Syntax-semantics mappings as an explanation for some transitions in language development. In Y. Levy (Ed.), *Other children, other languages: Issues in the theory of language acquisition* (pp. 41–76). Hillsdale, NJ: Erlbaum.

Brown, R. W. (1957). Linguistic determinism and the part of speech. *Journal of Abnormal and Social Psychology, 55*, 1–5.

Carver, R. P. (1994). Percentage of unknown vocabulary words in text as a function of the relative difficulty of the text. Implications for instruction. *Journal of Reading Behavior, 26*, 413–437.

Dale, E., & O'Rourke, J. (1976). *The living word vocabulary: The words we know; a national* *vocabulary inventory*. Elgin, IL: Field Enterprises Educational Corp.

Durkin, P. (1991). Vocabulary acquisition in context reconsidered: The effect of word type and exposure level on the learning of unknown words. *Dissertation Abstracts International, 51*, 2691.

Durso, F. T., & Shore, W. J. (1991). Partial knowledge of word meanings. *Journal of Experimental Psychology: General, 120*, 190–202.

Gentner, D. (1982). *Why nouns are learned before verbs: Linguistic relativity versus natural partitioning* (Technical Report No. 257). Urbana, IL: Center for the Study of Reading, University of Illinois at Champaign-Urbana.

Gleitman, L. (1990). The structural sources of verb meanings. *Language Acquisition, 1*, 3–55.

Goerss, B. L., Beck, I. L., & McKeown, M. G. (1994, April). *Study to train remedial elementary students to become more sensitive to context clues*. Paper presented at annual meeting, American Educational Research Association, New Orleans, LA.

Golinkoff, R. M., Hirsch-Pasek, K., Mervis, C. B., Frawley, W. B., & Parillo, M. (1995). In M. Tomasello & W. E. Merriman (Eds.), *Beyond names for things: Young children's acquisition of verbs* (pp. 185–221). Hillsdale, NJ: Erlbaum.

Heibeck, T. H., & Markman, E. M. (1987). Word learning in children: An examination of fast mapping. *Child Development, 58*, 1021–1034.

Kintsch, W. & van Dijk, T. A. (1978). Toward a model of text comprehension and production. *Psychological Review, 85*, 363–394.

McFalls, E. L., Schwanenflugel, P. J., & Stahl, S. A. (1996). Influence of word meaning on the acquisition of a reading vocabulary in second-grade children. *Reading and Writing, 8*, 235–250.

McClelland, J. L., & Rumelhart, D. E. (1981). An interactive activation model of context effects in letter perception: Part I. An account of basic findings. *Psychological Review, 88*, 375–407.

Nagy, W. E., & Anderson, R. C. (1984). How many words are there in printed school English? *Reading Research Quarterly, 19*, 304–330.

Nagy, W. E., Anderson, R. C., & Herman, P. A. (1987). Learning word meanings from context during normal reading. *American Educational Research Journal, 24*, 237–270.

Nagy, W. E., & Herman, P. A. (1987). Breadth and depth of vocabulary knowledge: Implications for acquisition and instruction. In M. G. McKeown & M. E. Curtis (Eds.), *The nature of vocabulary acquisition* (pp. 19–36). Hillsdale, NJ: Lawrence Erlbaum Associates.

Nagy, W. E., Herman, P. A., & Anderson, R. C. (1985). Learning words from context. *Reading Research Quarterly, 20*, 233–253.

Omanson, R. C. (1982). An analysis of narratives: Identifying central, supportive, and distracting content. *Discourse Processes, 5*, 195–224.

Paivio, A. (1968). A factor-analytic study of word attributes and verbal learning. *Journal of Verbal Learning and Verbal Behavior, 7*, 41–49.

Rice, M. L., Buhr, & Nemeth. (1990). Fast mapping word-learning abilities of language-delayed preschoolers. *Journal of Speech and Hearing Disorders, 55*, 33–42.

Schatz, E. K., & Baldwin, R. S. (1986). Context clues are unreliable predictors of word meanings. *Reading Research Quarterly, 21*, 439–453.

Schwanenflugel, P. J. (1986). Completion norms for final words of sentences using a multiple production measure. *Behavior Research Methods, Instruments, & Computers, 18*, 363–371.

Schwanenflugel, P. J. (1991). Why are abstract concepts hard to understand? In P. J. Schwanenflugel (Ed.), *The psychology of word meanings* (pp. 223–250). Hillsdale, NJ: Erlbaum.

Schwanenflugel, P. J., & Noyes, C. R. (1996). Context availability and the development of word reading skill. *Journal of Literacy Research, 28*, 35–54.

Seidenberg, M. S., & McClelland, J. L. (1989). A distributed, developmental model of word recognition and naming. *Psychological Review, 96*, 523–568.

Shore, W. J., & Durso, F. T. (1990). Partial knowledge in vocabulary acquisition: General constraints and specific detail. *Journal of Educational Psychology, 82*, 315–318.

Stahl, S. A. (1991). In P. J. Schwanenflugel (Ed.), *The psychology of word meanings*. Hillsdale, NJ: Erlbaum.

Stahl, S. A. (1983). Differential word knowledge and reading comprehension. *Journal of Reading Behavior, 15*(4), 33–50.

Stahl, S. A., Jacobson, M. G., Davis, C. E., & Davis, R. L. (1989). Prior knowledge and difficult vocabulary in the comprehension of unfamiliar text. *Reading Research Quarterly, 24*, 27–43.

Sternberg, R. J. (1987). Most words are learned from context. In M. G. McKeown & M. E. Curtis (Eds.), *The acquisition of word meanings* (pp. 89–106). Hillsdale, NJ: Lawrence Erlbaum Associates.

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