

VOCABULARY: NEEDED IF MORE CHILDREN ARE TO READ WELL

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Vocabulary has long been recognized as a strong determinant of reading success. Despite the importance of vocabulary knowledge, very little information is available about effective strategies for vocabulary instruction in elementary grades and there is a paucity of data on the relative merits of the different programs that are designed to promote vocabulary growth in elementary children. Available information indicates that, until they reach about grade three, children's vocabulary knowledge is largely determined by informal factors such as parental interaction and other incidental sources such as the TV. In this article, I will address the following topics: (a) individual differences in vocabulary acquisition, (b) the amount of vocabulary needed for successful learning, (c) the predictable sequence of vocabulary acquisition, (d) the need for direct instruction for vocabulary growth, and (e) promising methods for promoting vocabulary knowledge.

Vocabulary has long been recognized as a strong determinant of reading success. Despite this realization, not much research has been conducted on the effectiveness of elementary programs that are intended to promote vocabulary knowledge. As a result, it appears that vocabulary growth is largely determined by parental practices, particularly before third grade. In this article, I will outline available information on: individual differences in vocabulary acquisition, the amount of vocabulary needed for successful reading, how vocabulary is acquired in a predictable sequence, the need for direct instruction in vocabulary, and on some promising methods for promoting vocabulary growth. Much of the argument made

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in this paper is based on research published in a more technical study in the *Journal of Educational Psychology* (Biemiller & Slonim, 2001).

In recent years, there have been a growing number of studies that demonstrate that 1) identifying written words can be successfully taught to most children, and 2) that successfully mastering word identification does *not* always lead to greater reading comprehension for many children.

More than twenty years ago, Becker (1977) noted that teaching disadvantaged children to successfully identify words (i.e., decoding) was insufficient to have them reach reading comprehension beyond grade level *two*. He noted that disadvantaged children's declining reading comprehension in grades 3 and 4 largely resulted from lack of adequate vocabulary knowledge. Becker also noted that as a group, the same disadvantaged students proved capable of "grade level performance" in mathematics—a subject in which all necessary information was taught in school. Thus, lack of learning opportunities, not ability alone, were the probable cause of the low levels of reading comprehension of children in Becker's study.

More than a decade ago, Chall, Jacobs, and Baldwin (1990) made a similar observation—that disadvantaged students showed declining reading comprehension as their limited vocabulary came to constrain comprehension. More recent studies have reported similar results (Madden, Slavin, Karweit, Dolan, & Wasik, 1993; Pinnell, Lyons, Deford, Bryk, & Seltzer, 1994). Cunningham and Stanovich (1997) reported that orally-assessed vocabulary levels in first grade accounted for 30 percent of reading comprehension variance as seen in test scores in eleventh grade.

Consistent with these findings, it was found that by third grade, 95 percent of children (in a nonnative sample) could read aloud more words than they could understand (unpublished finding in the Biemiller & Slonim, 2001, study. All of this suggests that *vocabulary*, in addition to *word-identification*, is a major factor that limits reading comprehension. Similar findings are reported by Becker (1977), Chall et al. (1991), and Cunningham and Stanovich (1997). This view is buttressed by many studies that have reported strong correlations between vocabulary and reading comprehension (e.g., Beck & McKeown, 1990). In a recent study, I obtained a correlation of .81 (66% common variance) between oral vocabulary and

reading comprehension as assessed by the Canadian Test of Basic Skills (Hieronymous et al., 1982), across grades one through six. When a written vocabulary test was used, the correlation with reading comprehension rose to .93 (87%) (Biemiller, 2001a). In short, simple vocabulary knowledge and word identification skill account for almost the entire variance seen in reading comprehension. “Unexplained” variance of 13% is probably due to measurement error and factors such as reading experience.

What Affects Vocabulary Acquisition?

Is vocabulary simply a measure of some innate capacity of a child, very much like IQ is thought to be? Certainly “IQ” scores and other vocabulary scores correlate highly with each other (Knight & Gregg, 2001). However, there is substantial evidence that vocabulary and comprehension are influenced by both variations in home language support and school instruction. This strongly suggests that vocabulary size is *not* simply a product of some innate, underlying capacity.

Home Influences on Vocabulary

Hart and Risley (1995) report that children whose working-class parents interact with them as much as do parents from advantaged families, have vocabulary levels as high as those of children from advantaged families. Children mainly use words parents use with them in conversation, and acquire larger vocabularies when their parents use more words (Hart & Risley, 1995, pp. 176–179). Similarly, Tizard, Cooperman, Joseph, and Tizard (1972) reported that two to five-year-old orphanage children who talked frequently with a single adult on a one-on-one basis, demonstrated vocabulary sizes similar to those of advantaged children. Conversely, orphanage children who had less intense adult contact developed much more limited vocabularies. Finally, Beals (1997) and Weizman and Snow (2001) also report that using and explaining “high-level words” was strongly associated with the acquisition of a larger vocabulary, even among children from disadvantaged families. (“High-level words” are any words that do *not* appear on Dale and Chall’s list of 3,000 common words (Chall & Dale, 1995). Additional infor-

mation on parent influences on children's language development is reported in *Beginning Literacy with Language* (Dickinson & Tabors, 2001).

School Instruction of Vocabulary

Examples of effective instructional intervention on vocabulary and comprehension in schools include methods by Beck, Perfetti, and McKeown (1982), and Elley (1989). Beck et al.'s study of fifth-grade children involved teaching 10 semantically-related words per week, and exploring how these words could be used. Results showed that over an 18-week period, direct vocabulary instruction led to direct gains of one word per day. In other words, children learned successfully about half of the words they were taught. In addition, participating in the program led to significantly greater gains in reading comprehension (from 35th to 45th percentiles). Control children showed no such gains. Even larger vocabulary gains were demonstrated by second graders in Elley's (1989) study of effects of reading to children with vocabulary explanations. In this study, stories were re-read three times with 8 or 9 different words being explained with each reading. As each target word was encountered in the text, the teacher would explain it by using 1 to 3 sentences. About 3 new words per day were acquired and retained *when the children found the book to be interesting*. Summarizing results from 41 studies of the impact of vocabulary instruction on comprehension, Stahl and Fairbanks (1986) reported an average effect size of .91—an effect size which would theoretically raise the comprehension of an average child from the 50th percentile to the 83rd percentile.

Thus, there is evidence that vocabulary differences affect comprehension, and that when the rate of vocabulary acquisition is increased, concomitant gains in reading comprehension are also obtained. The reverse is also true—increasing reading practice can increase vocabulary and comprehension (Shany & Biemiller, 1995; Cunningham & Stanovich, 1997; Stanovich & West, 1989).

The Size of Vocabulary to be Acquired

It is estimated that by the end of the elementary years, an average child has acquired around 9,000 root words.¹ This reflects acquir-

ing about 2.2 words per day from age 1 through age 8 (end of grade two) and 2.4 words per day during ages 9 through 12 (Biemiller & Slonim, 2001). In other words, an average child learns between 800 and 900 root words a year. This figure is close to the one obtained by Anglin (1993) even though this figure is substantially lower than the ones reported by Nagy and Herman (1987) and by Stahl (1999). The Biemiller and Slonim (2001) study mentioned earlier used English-speaking children from 3 schools. One of the three schools had about 40 percent of children from public housing. Another school served a well-to-do population. The third school served a more typical middle-class population. Children were chosen on the basis of their birth dates and gender. Children with learning disabilities from regular classrooms were also included in the study. This meant all the children with learning disabilities, since in the schools investigated, children were not placed in separate classrooms.

It is well known that there are substantial differences in vocabulary size among children by the end of grade two. In one of our studies, children from grade two, whose vocabulary size placed them in the highest quartile, had an average estimated vocabulary of 7,100 root words. In contrast, children from the lowest quartile had an average vocabulary size of 3,000 words. Children with the largest vocabulary had been acquiring over 3 root words per day since the age of one year; children in the lowest quartile had been acquiring about 1 word a day. Even by fifth grade, children in the lowest quartile had not learned 7,100 root words—the level reached by high-vocabulary children in grade two (Biemiller & Slonim, 2001). This indicates the importance of building vocabulary in the early years.

The Sequential Nature of Vocabulary Acquisition

There is evidence that vocabulary is acquired in largely the same order by most children. The existence of empirically secured vocabulary norms (as in the Peabody Vocabulary Test, Dunn & Dunn, 1981, and Dale & O'Rourke's, 1981, *Living Word Vocabulary*) indicates that some words are usually acquired later than other words. Slonim and I have found that when vocabulary data are ordered by children's vocabulary levels rather than their grade level, we can clearly identify ranges of words *known well* (above 75%), words

being acquired (known between 25% and 74%) and words *little known*. At any given point in vocabulary acquisition, a child is likely to be learning root words from about 2,000 to 3,000 words in a sequence of 13,000 to 15,000 words (Biemiller & Slonim, 2001). This makes the construction of a “vocabulary curriculum” plausible.

Unfortunately, although these findings imply the existence of a well-defined sequence of word acquisition, a complete sequential listing of the 13,000–15,000 root words expected at the level of twelfth grade cannot now be furnished. The first 2,500 root words in Dale and O’Rourke’s (1981) *Living Word Vocabulary* are the first to be learned. Similarly, the last 2,500 words—known by about two-thirds of high school seniors, come very late. However, words at grade levels 4, 6, 8, and 10 as given in *Living Word Vocabulary* are not as well ordered when children’s word knowledge is tested directly (Biemiller & Slonim, 2001). Thus I can only recommend that teachers of children in grades one to three might emphasize words from *Living Word Vocabulary* grade-levels 4 and 6, while teachers of grades four to six might also include some words from grade-levels 8 and 10. By grade five, a majority of children will know more than 80% of words from grade-level 2, and about 65–70% from grade-level 4.

Schools and Vocabulary Development

We have seen that acquiring a normal vocabulary is prerequisite for reading comprehension. The impact of low vocabularies on reading comprehension only becomes apparent in grades three, four, and above, when the comprehension of written material begins to exceed many children’s vocabulary (Becker, 1977; Chall & Conard, 1991; Chall et al., 1990). We have seen that most individual *differences* in vocabulary knowledge develop before grade three, when there are large differences in rates of word acquisition (Biemiller & Slonim, 2001). By the end of grade two, children in the highest and lowest vocabulary quartiles differ by an average of 4,000 root words. In our study, the same extent of difference was seen from grade three through grade six. Unfortunately, slower learners do not “catch up.” If we could avoid the growing vocabulary gap during kindergarten to grade two, and possibly fill in some words already missing at the beginning of kin-

dergarten, reading comprehension, perhaps, could be improved. Thus, vocabulary instruction becomes an important factor in reading instruction for very young children.

Research by Cantalini (1987) and Morrison, Williams, and Massetti (1998) shows that in primary grades, vocabulary size varies with age, but not with grade. Consistent with Cantalini's and Morrison et al.'s studies, a study of a sample of one-third of the third-grade children in Ontario in 1997 ($N = 32,000$) showed that there is a significant difference in reading comprehension between children who differ by 9 months in age (Biemiller, Cantalini-Williams, & Eidlitz, in press). While many teachers may teach 100 or 200 word meanings in the course of a year, children need to acquire at least 800 word meanings a year. As noted above, by the end of second grade, children who have been acquiring words at the rate of one per day (the lowest quartile) rather than two per day (the average), are about 2,000 the highest root words behind average children and about 4,000 words behind children in the highest quartile. The low-vocabulary children have not learned many words already known to average or above-average vocabulary children.

After grade two, all children, including those in the lowest vocabulary quartile, apparently learn new root words faster—a rate of 2.4 words per day (Biemiller & Slonim, 2001). However, if low-vocabulary children are to move towards average levels, they will need to start leaning words at a faster rate—3.5 or 4 root words per day. At four words per day, low-vocabulary children could catch up with “average” children in five or six years. If the rate of vocabulary acquisition can be raised even higher, “catching up” could occur sooner.² Unfortunately, at present, there is little evidence that many primary school programs vigorously promote such accelerated vocabulary development.

Reading Disabilities and Vocabulary

There is evidence that many children with reading disabilities have lower-than-average vocabularies. This is due both to the effects of language problems (e.g., Gathercole, Hitch, Service, & Martin, 1997; Scarborough, 2001), and limited exposure to print, particularly that of older children. It has to be noted that Becker (1977)

and Chall et al. (1990) have noted that reading “problems” can occur in children with adequate word identification skills but limited vocabulary.

Need for a Teacher-Centered Approach to Building Vocabulary

During the past ten years, there has been increasing emphasis on teacher-directed instruction in word-identification skills. However, relatively less attention is given to research on the outcome of teacher-directed *vocabulary* instruction. There is evidence that reading books orally to children *several times* and *explaining 5–10 word meanings while reading* can be effective with primary level children. (See Biemiller, in press). For older children, this should also include morphological analysis which will require a program component on vocabulary.

I suggest that primary-grade teachers devote at least half an hour a day to developing vocabulary because building vocabulary is as important as learning to identify printed words. Suggestions for incorporating vocabulary instruction in school programs are described in *Language and Reading Success* (Biemiller, 1999b).

Vocabulary learning differs in several crucial ways from learning other reading-related skills. There are some crucial but limited sets of literacy skills that, once learned, can be used throughout life. These include *word identification* (phonemic awareness plus decoding), *morphological analysis* (applying knowledge of suffixes and prefixes to extend word knowledge), and simple *dictionary skills*. Unlike phonics and other literacy skills, building basic root word vocabulary requires *continuing* support, especially for less advantaged and lower-vocabulary children. If we are to increase vocabulary knowledge of children, there must be an ongoing effort to introduce and explain new vocabulary, from kindergarten at least through grade six. Unlike phonics and morphological analysis, both of which can be taught in two or three years, vocabulary instruction is a never-ending effort.

Vocabulary instruction can occur both through *direct explanation* of words (words encountered in oral and printed text and making them meaningful); and *in response to questions about words*, and through use of dictionaries and computerized data bases. Simple provision of narrative or expository texts with explanation

of 8 or 10 words per reading can be sufficient for children at all vocabulary levels to gain two or more new words per session (Biemiller, in press; Brett, Rothlein, & Hurley, 1996; Elley, 1989; and Senechal, 1997).

What Words Should be Introduced?

As noted earlier, root words appear to be learned in roughly the same order by most children. To some degree, this word order can be predicted from *Living Word Vocabulary* grade-levels. It is possible to identify words which should be known by certain grades, though understandably, all students may not progress at the same rate (Biemiller, 1993). This may be especially useful for teaching children *before* they are reading fluently—in kindergarten and grades one and two. For example, it is estimated that by the end of grade two, average children understand most Level 2 words, about half of Level 4 words, and about a third of Level 6 words from the *Living Word Vocabulary*. It would be worth trying to bring most children to this level of vocabulary achievement. Examples of Level 4 and Level 6 word meanings from Dale and O'Rourke's (1981) *Living Word Vocabulary* are shown in Table 1.

I stress teaching the words children commonly encounter, rather than uncommon and complex words. It appears that children need this body of familiar words so that they can read new and even advanced text. (Note that "readability," as assessed by

TABLE 1. Sample Level 4 and Level 6 Words from the *Living Word Vocabulary*

Level	Word	Meaning
4	accident	unexpected injury
4	ache	steady pain
4	language	words
4	stroke	a sudden attack
4	stroke	arm movement
6	absorb	take all one's time
6	accent	way of speaking
6	intention	purpose
6	limp	not stiff
6	look	to appear
6	reckon	to think

Chall & Dale, 1995, yields a “fourth-grade text” when 15% of words in a text are not from Level 2 and a “sixth-grade text” when 20% of words in a text are not from Level 2). I also recommend that teachers keep track of words that have been introduced, the words that were retained by children, and then determine what new words from each level should be introduced. Once about two-thirds of the words from a *Living Word Vocabulary* level have been introduced, the teacher can make an effort to include many of the remaining words from that level.³

We really do not know how many new root words per day a child can learn and retain. Over the long term, we have not seen groups of children acquiring more than 3 words per day (Biemiller & Slonim, 2001). Obviously, there are individual differences among children and statements of this kind are, of course, generalizations.

Teaching Children to Ask about Unfamiliar Words

In addition to introducing vocabulary in context, children have to be encouraged to *ask about words they don't know*. In my experience, children from grades five and six can learn to ask, if asking about unknown word meanings is encouraged, and failing to ask about unknown words is unapproved. Preliminary investigations suggest that this method works well.

It is not known whether children below grade three can identify the words they don't understand, separate them from the words they know, and then approach the teacher for help.

Conclusion

Current practice emphasizes word recognition skills in early primary grades, and assumes that children will fill in necessary vocabulary once they learn to read. As discussed earlier, this instructional policy is inadequate to bring the reading comprehension skills of disadvantaged and low vocabulary children to grade level. By grade three, the gap in reading skills becomes too large for many children to “catch up.” We cannot leave vocabulary acquisition to incidental factors such as oral language, chance, and TV. Some children doubtless require more assistance and direct instruction in learning new words than other children do. Acquisition of vocabulary knowledge is no different than acquiring phon-

ics skills, spelling, and learning math. The fact remains that we ought to do our best to bring each child to adequate levels of vocabulary knowledge.

Notes

1. Actually, this refers to acquiring 9,000 root word meanings. In the *Living Word Vocabulary*, there is more than one meaning associated with a root word form.
2. The situation of second-language children may be somewhat different. If these children have a large vocabulary in their first language, acquiring vocabulary in the second language is probably faster. However, I have found an average two-grade deficit in many second-language children by the time they reach the fifth and sixth grades (Biemiller, 1999a).
3. There will be some words at every level which are archaic. Teachers can omit such words.

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