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Vocabulary Learning

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This article addresses the question of how to account for the growth in vocabulary knowledge that occurs during the elementary school years. Areas examined include the ways that word meanings are communicated, direct teaching of meanings, vocabulary instruction as a part of reading instruction, and deriving and learning word meanings from verbal context. Taken singly, neither direct instruction of meanings nor learning word meanings from context seems to account all that well for the growth in vocabulary that is thought to occur.

The major question addressed in this article is how to account for the substantial growth in vocabulary knowledge that has been estimated to occur during the elementary school years. First we examine estimates of vocabulary size followed by a description of the ways in which word meanings are communicated. Then we examine the research on informal and formal instruction of word meanings, including the teaching of mnemonic strategies for remembering meanings. Teaching of vocabulary within commercial reading programs is also considered, as well as results of classroom observations of vocabulary instruction. We then review factors which influence whether an individual will successfully derive and learn the meaning of unfamiliar words from surrounding verbal context. Finally, we consider how well these types of vocabulary experiences (i.e., direct teaching and learning from context) account for the growth in vocabulary that takes place during the elementary school years.

Our thesis, plainly stated, is that some of the more obvious explanations for the rapid growth in vocabulary knowledge said to occur during the elementary school years do not stand up well under attempts to empirically verify them. Vocabulary instruction as part of reading instruction appears to be sparse and not particularly effective. Moreover, because of the time required to produce vocabulary learning and because of the number of words which individuals apparently learn, direct instruction

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of word meanings may not be a viable means for teaching large numbers of words. Incidental learning of vocabulary from written context does take place, but apparently not to the degree needed to explain large additions to individuals' vocabulary stores. Thus, some prevalent assumptions about vocabulary size, vocabulary knowledge, and the factors responsible for vocabulary acquisition will need to be reexamined.

ESTIMATES OF VOCABULARY SIZE

Estimates of vocabulary size vary widely depending on what is counted as a word. Liberal counts that credit derivatives and compounds as separate words result in larger estimates of vocabulary size than do restrictive counts which reduce the number of basic words in the English language to as low as 12,300 words. The latter estimate (Dupuy, 1974) excluded from the count of basic words all derivations, compounds, slang, foreign derivatives, and archaic and technical terms. Regardless of the method used to count words, however, vocabulary size is thought to approximately double between the third and seventh grades. To illustrate, Dupuy's (1974) extremely conservative word count resulted in an estimated average third grade vocabulary of 2000 Basic Words, compared with 4760 for an average seventh grade student. Terman (1916), using slightly less restrictive word counts, estimated average third and seventh grade vocabularies at 3600 and 7200 words, respectively, while Smith (1941), applying more liberal procedures, estimated third and seventh grade vocabulary at 25,000 and 51,000, respectively.

Another factor which could account for variations among word counts is the methodology by which numeric averages are assigned to different grade levels. At present, there is little research indicating whether or not the estimated averages are accurate. Nevertheless, we will go along with the estimates of previous researchers who have proposed that vocabulary approximately doubles between third and seventh grades.

HOW MEANINGS ARE COMMUNICATED

How does one account for this estimated doubling in vocabulary knowledge? Information about word meanings comes from a variety of contexts. Since exposure to unfamiliar words is a natural consequence of studying new subjects, school children in particular are likely to encounter words daily that they have never seen or heard before. Television and print reporting of news events regularly bring new sets of low-frequency words to the fore (recession, depletion, militia). Many words are probably not learned the first time they are encountered, but require multiple exposures. The entire range of experiences that accompany development, including the more controlled subset of experiences known as schooling, supplies these multiple opportunities to learn individual

words. Learning to read, for example, should substantially increase opportunities to learn word meanings by offering more exposure to unfamiliar words.

Within the more general contexts (e.g., schooling, television, and print) word meanings are acquired principally in one of four ways. The first involves explicit reference to a meaning, as when another person directly provides that information—for example, through a dictionary or through oral instruction ("altercation means argument"). A second way vocabulary is learned is through example, as when an object (e.g., a cello) or an event (e.g., an argument) is accompanied by a label, also referred to as deixis (see Mervis, 1983). However, learning word meanings from a labeled example can be difficult unless multiple instances are provided, since the learner cannot always be certain which features of the examples are referred to by the label.

The third way that word meanings are acquired is through verbal context, oral or written. Learning through context is similar to learning from labeled examples. On purely logical grounds, both require multiple examples (multiple contexts) for the learner to rule out competing interpretations. They differ from each other primarily in that labeled examples involve a deliberate attempt to communicate a meaning, and in that sense resemble explicit reference. While this difference may not seem very important, it probably has large effects on whether a word meaning will be learned. With labeled examples the individual is informed rather directly that learning is expected and that the provider of the examples believes that they contain sufficient information to communicate a meaning. In contrast, when encountering a novel word in verbal context, the reader or listener may not recognize the situation as a vocabulary learning opportunity. He may consciously or unconsciously ignore the word and concentrate instead on the gist of the overall message, or he may temporarily focus on the word, but not persist because of uncertainty as to whether sufficient contextual information is available to derive its meaning. Freebody and Anderson (1981), for example, found that fifth graders appeared to shift attention *away from* passage segments containing difficult words.

New vocabulary may also be learned in a fourth way, through morphological analysis of individual words. For example, after learning the meaning of *to predict*, a person may be able to formulate the meanings of *prediction*, *predictable*, and perhaps *unpredictable*, not to mention *predicted*, *predicting*, *predicts*, and *predictions*. However, with the exception of what they are expected to do on vocabulary tests, listeners and readers are rarely forced to make a totally decontextualized, morphological analysis. Ordinarily verbal context supplies clues to help readers recognize that an unfamiliar word shares meaning elements with a simi-

lar, more familiar word. Thus an interaction between morphological analysis and sentence context might result in greater vocabulary learning than would occur with either alone.

More than likely, most word-learning experiences involve a mixture of two or more categories—i.e., explicit reference, labeled examples, verbal context, and morphological analysis. For example, when consulting a dictionary a person might find a definition along with a sentence illustrating the use of the target word; in our terms this is a combination of explicit reference and verbal context. In addition, she might find morphological information in conjunction with etymological information. Also, direct vocabulary teaching in the classroom frequently combines explicit reference and specially designed “instructional” sentences containing the target word. In at least one reading program these latter categories are combined with morphological analysis to teach word meanings (Engelmann, Haddox, Hanner, & Osborn, 1978).

Each of these categories may occur alone or in combination during either formal or informal vocabulary instruction. The distinction between formal and informal teaching is one of intensity. Informal teaching involves a passing reference to a word’s meaning, employing one of the four principal means described earlier (e.g., explicit reference). Formal teaching, on the other hand, involves a more serious attempt to install the word meaning in the learner’s mental lexicon. Repetitions, opportunities to practice using the word, and review characterize formal vocabulary teaching.

In summary, the assumed growth in word knowledge during the middle grades occurs as a function of increased exposure to new words and repeated exposure to previously encountered, relatively unfamiliar words. Some of these exposures are accompanied by formal and informal teaching, others are not. In any event, the meanings are acquired through four principal means: explicit reference to meanings, labeled examples, verbal context, and morphological analysis, often occurring in combination. Although we have attempted to distinguish among four types of experiences with novel words which might result in a person’s learning their meanings, we recognize that the distinctions are primarily conceptual and that people’s experience often involves two or more categories. Other factors implicated in the acquisition of word meanings include individual differences in working memory and reasoning skills, both of which have their greatest influence when meanings must be derived from context. But before turning to learning from verbal context, we first take up the topic of direct teaching of word meanings.

DIRECT TEACHING OF VOCABULARY

No one really questions whether vocabulary can be taught, but some have wondered whether it should be. This question is not frivolous con-

sidering the number of words in the English language, the difficulty in knowing where to begin instruction, and the fact that people seem to learn words without explicit instruction. Indeed, these considerations are probably responsible for the absence of any systematic, large-scale, widely used vocabulary training programs.

However, because program developers lack confidence that enough important words will be learned in the absence of direct instruction, and because teachers are uncomfortable in assigning reading material for which they know students are unprepared (in that they lack knowledge of important vocabulary), those who design language arts programs and those who use them have settled on a compromise position somewhere between comprehensive and laissez faire vocabulary instruction. Thus, the practical question about vocabulary teaching is not so much whether it should happen, but how to perform this task most efficiently and effectively.

Several investigations have compared the relative effectiveness of various vocabulary teaching methods (Pany & Jenkins, 1978; Pany, Jenkins, & Schreck, 1982). In the latter investigation, the provision of paired associates practice on synonyms (drill) and definitions produced greater vocabulary learning than did merely informing students of the word meanings. Both of these treatments, besides giving a synonym for the unknown word, included an instructional sentence containing the word in a rich context that helped illustrate its meaning. While differing from each other in effectiveness, both treatments were superior to a third in which students were not told the word meanings, but had to infer them from context. Thus, compared to “instructional” sentence contexts alone, explicit reference to a definition appears to facilitate vocabulary learning. Referring back to our distinction between formal and informal teaching, the results of Pany *et al.* demonstrate that raising the intensity of instruction (in this case repetition of the word and its meaning) directly affects the amount of vocabulary learned. Although this result is not particularly surprising, it is a fact largely ignored by commercial reading programs, as we shall show later.

Methods of vocabulary instruction and degree of formal teaching are often confounded in studies of vocabulary learning. For example, Gipe (1979), who compared four methods of vocabulary instruction, noted that a treatment combining definitions and instructional sentence contexts was more effective than one in which children merely studied words with their definitions. Both conditions were superior to a categorization task in which children first saw the unfamiliar words listed with familiar words that were similar in meaning, and later practiced categorizing mixed lists containing both the familiar and unfamiliar words. Finally, the treatment combining definitions and instructional sentence contexts was superior to a dictionary task in which the children looked up the words, wrote their definitions, and composed original sentences using the words. Since

time was not tightly controlled in this study, it is difficult to separate the effects of the specific procedures from the intensity of instruction accorded by the different treatments. This is important only because Gipe concluded that the context treatment was the more effective. In contrast to these findings, Stahl (1982), who controlled for time, obtained different results in a study conducted along the same lines as Gipe's. Stahl found that definition-oriented instruction produced effects on vocabulary acquisition that were comparable to those of an instructional treatment which combined definition and context. Moreover, in a second study Gipe (Note 1) failed to replicate her earlier results, as did Levin, McCormick, Miller, Berry, and Pressley (1982). The latter investigators, who used Gipe's vocabulary and materials, found no advantage for a group exposed to words in context over a control group who studied the words and their definitions for an equivalent time.

Levin *et al.* (1982) did, however, find a highly significant effect for a group taught with the "keyword" method, a mnemonic procedure involving interactive imagery. This procedure has been used with a number of school-type memory tasks (e.g., learning states and capitals, foreign vocabulary, biographical information, cities' products) including vocabulary (Pressley, Levin, & Miller, 1981). Applied to vocabulary, the method employs two stages. In the first, students are taught to link an unfamiliar word with an acoustically or visually similar word (e.g., persuade—purse). Next the students are shown a picture which contains both concepts in an interactive display. For instance: Two ladies are pictured in a store. One states, "Oh, Martha, you should buy that *Purse*" (pointing to a purse), and the second replies, "I think you can *Persuade* me to buy it." Beneath the picture is the statement, Persuade (Purse)—when you talk someone into doing something. In several experiments, Pressley *et al.* (1981) and Levin *et al.* (1982) have demonstrated the relative advantage of the keyword procedure over other vocabulary teaching methods. Importantly, the keyword method, although clearly a mnemonic device, does not lead to an overly restricted understanding of the words taught. Following this training, adults could perform a variety of vocabulary tasks including giving definitions, discriminating appropriate and inappropriate word usage, and generating novel sentences that used the word.

The most systematic, long-term classroom investigation of vocabulary teaching was undertaken by Beck and her colleagues (Beck, McCaslin, & McKeown, 1980; Beck, Perfetti, & McKeown, in press). Teaching activities included "defining tasks, sentence generation tasks, classification tasks, oral production tasks, game-like tasks completed under timed conditions, and tasks that take advantage of the semantic or affective relationship among target words and previously acquired vocabulary" (Beck *et al.*, 1980, p. 13). Target words were taken from the Ginn reading pro-

gram and grouped by semantic category (e.g., People—accomplice, rival, virtuoso; Eyes—gape, spectator, binoculars). Each semantic category consisted of 8 to 10 words which were taught over a 5-day cycle, 30 min daily, with all words introduced on the 1st day of the cycle. In addition, Beck *et al.* (in press) selected a subset of words for spaced reviews beyond the regular 5-day cycle. These words reappeared on 2 or 3 days in review exercises which emphasized speeded performance, yielding another 16–22 exposures for each word in this subset. The purpose for including this special review treatment was to test the notion of automaticity of lexical access. The thinking was that students would learn the reviewed word set to a higher degree; thus, when they encountered these words at a later time (e.g., during reading or listening activities) they would be able to access meanings in an automatic fashion, without deliberate or conscious effort. Automatic access to meanings, compared to slower, more deliberate, conscious processing of words and their meanings, is seen as being particularly advantageous during reading because it allows the person to devote more mental resources to comprehending the overall text, rather than the individual words.

Using a quasi-experimental design involving intact classrooms assigned either to the experimental program or to the regular language arts program, the investigators found significant differences on several vocabulary measures favoring the experimental program. Moreover, the reviewed word set (automaticity condition) was better learned than the nonreviewed set, and on a lexical decision task the students performed faster on the reviewed word set. Although less clear, results on a speeded sentence verification task, in which students judged whether target words were used appropriately, fell into line with the others favoring the reviewed words. More surprising, however, were the results of a standardized vocabulary test that did *not* contain words taught in the program. Here again the experimental students outgained the control students, suggesting to Beck *et al.* a generalized effect from the vocabulary program. The investigators speculate that this generalized effect may have resulted from an increased "word consciousness" on the part of the experimental students, who in the course of the program had been reinforced for finding and using target words outside of class.

The investigation by Beck *et al.* is impressive not only because it provides a practical, classroom-based model incorporating a wide variety of vocabulary teaching procedures, but also because it demonstrates program effects over a range of vocabulary knowledge and usage measures, including measures of reading comprehension. On a less optimistic note, however, this investigation may have brought to light a disturbing fact about vocabulary instruction—namely, that it seems to require a lot of time and energy. Their program—in which 30 min a day was devoted to

vocabulary instruction, which taught only 104 words over a 5-month period, and these to a criterion level of 77–86%—should give pause to those who advocate intensive vocabulary instruction for purposes of improving reading comprehension. Addressing this concern, Nagy and Anderson (Note 2) state, “the vocabulary program suggested by Beck and her associates could not hope to cover half the new words children actually encounter in their school reading.” Later, commenting on the automaticity notion as applied to vocabulary knowledge, Nagy and Anderson (Note 2) continue, “It may well be, of course, that automaticity of access is the key factor in the relationship of word knowledge to reading comprehension; but the puzzle that must be solved by those who propose to produce automaticity using word drills is how to do it in the available time, not just for four or five thousand words, but thousands or even tens of thousands of less frequent ones” (p. 78).

In summary, research on vocabulary instruction shows that some procedures—namely, keyword, massed drill, and expanded teaching with reviews—are more effective than others—namely, informal references to meaning, categorization and dictionary tasks, and specially constructed sentence contexts in the absence of definitions. It also reveals a notable lack of systematic, long-term studies (except for Beck *et al.*, 1980), and no convincing demonstration that a large number of words, approximating that which students encounter in the reading materials, can be efficiently and practically taught in the time available.

VOCABULARY AS PART OF READING INSTRUCTION

In this section we look at investigations that have focused on the level and effectiveness of vocabulary instruction as it occurs in several widely used commercial reading programs. By way of introduction we can state that deliberate efforts to improve vocabulary are neither impressive nor prevalent. We begin with descriptions of the worst and the best. In examining the fourth grade level of one popular basal reading series, Economy’s Keys to Reading (Harris, 1975), we found no lists of vocabulary identified for emphasis, no lessons specified for teacher-led instruction, nor any exercises expressly designed to teach word meanings (Jenkins, Beck, & Anderson, Note 3).

Of the other programs we examined, the one which devotes the greatest effort to vocabulary teaching was Allyn and Bacon’s Pathfinder Series (Rudell, 1978). The series’ developers identify several words for each unit (covering approximately a 1–2-week segment), and provide pre- and post-tests for a subset of these words. Instructional recommendations contained in the Teacher’s Manual generally involve dictionary work or writing a definition on the board, along with a vocabulary workbook page, which is another version of the pretest. The Teacher’s Manual cautions that

some words may already be familiar to students (e.g., garbage, jazz, moss), so the teacher need only present selected vocabulary—those words which students would not be able to read (and understand) independently. Thus the tests, teaching activities, and worksheets are all considered optional.

For this program we calculated the rate of vocabulary introduction, or content coverage, based on recommendations in the Teacher’s Manual. If a teacher were to follow these guidelines, which appear reasonable, and teach *all* the target words (many of which were considered optional because of prior knowledge), then he would introduce 1.7 new words per day or 8.5 words per week. If students learned *all* the words, they would increase their vocabularies by a little over 300 words per year or, extrapolating, 1224 words over the 4 years spanning third through seventh grades. Admittedly, these are rough calculations which extrapolate to 4 years of reading instructions using a one-semester base in fourth grade, and which ignore vocabulary teaching that may occur outside of reading instruction. Since the rate at which vocabulary is introduced and taught is likely to increase with grade level, and since subject matter instruction also incorporates vocabulary teaching (e.g., compounds, molecules, atoms, neutrons, electrons), our calculation undoubtedly underestimates the amount of direct vocabulary teaching that takes place. On the other hand, our research showed that an average fourth grade class using this particular reading series already knew approximately one half of the target words before they were introduced, and that after experiencing the complete array of tests, worksheets, and teacher-led instruction, the students did not increase their knowledge of the words by an appreciable amount.

As part of the same study, we also examined vocabulary instruction as prescribed in the Scott, Foresman Reading Program (Aaron, 1981). Each unit in this program lists vocabulary words that appear in the glossary at the end of the student textbook. The teacher is instructed to encourage students to refer to the glossary as they encounter unfamiliar words contained in this list. The students are never formally tested on the glossary words, nor do they encounter them on subsequent worksheet activities.

In addition to the glossary words, the authors identify a set of “other introduced words” which appear in the text, but not in the glossary. In contrast to the glossary words, these are accompanied by instructional sentences along with suggestions that the teacher encourage students to use context to figure out meanings of the target words. The teacher is also directed to promote discussion about the various words and their meanings. Some “vocabulary instruction” can be found in the student’s text where words are directly defined and their meanings illustrated.

At the fourth grade level, Scott, Foresman introduces 281 glossary words and another 222 “other words.” In the fifth grade edition, 393

glossary words and 245 "other introduced words" appear. Recall that direct teaching activities are prescribed only for the "other word" category. At this rate, direct vocabulary teaching would occur for around 900–1000 words over the 4-year span between 3rd and 7th grades. If glossary words were included, this estimate would approximately double. However, classroom observations suggest that children rarely use their glossaries outside of prescribed exercises which require them (e.g., locating the guide words on a glossary page that contains a particular target word).

Thus, knowing that a reading program targets 200–300 words for vocabulary instruction may not permit strong predictions about how much vocabulary *learning* will occur. Given that some target words may be already known, and given the less than impressive figures on the effectiveness of vocabulary teaching in at least one of the programs examined, it is entirely possible that direct vocabulary instruction results in the learning of far fewer words than the number which the program targets. In the absence of better data on program effects, one can only speculate about the relation between vocabulary teaching efforts and vocabulary learning. Not to be ignored, however, is the apparently substantial discrepancy between estimates of vocabulary growth during the elementary school years and the intensity and effectiveness of direct vocabulary teaching efforts. Growth estimates reach as high as 26,000 words over the third–seventh grade span, in contrast to our tentative estimate of 900 to 1200 words directly taught, which include some that are already known.

Other vocabulary researchers, notably Beck, McKeown, McCaslin, and Burkes (1979), have made observations similar to ours—that vocabulary teaching as practiced in the schools lacks both intensity and scope. To illustrate, these researchers reported that vocabulary instruction in Ginn 720 consisted of three types of exposure. Before reading the story, students might be given target words embedded in instructional sentences designed to reveal their meaning: e.g., "The *emperor*, who is ruler of this land, loves the people dearly." The students' task is to propose definitions or to find words in the sentence that tell the meaning of the target word. Sometimes they are requested to generate a novel sentence using the target word. Next, students read the stories where the target words appear in natural sentence contexts. As often as not, these natural contexts contain insufficient clues to permit even an adult to guess their meaning. Finally, after reading the selection, students are given one more encounter with the target word in an independent seatwork exercise. The target words are never again reviewed once students proceed onto the next selection.

Beck and her associates noted that as meager as Ginn's vocabulary instruction appeared to be, it significantly outstripped that in Houghton

Mifflin. In the latter program no vocabulary teaching was scheduled prior to story reading, and although a set of target words was subsequently taught, it had nothing to do with the story. Beck *et al.* (1979) summarize the best and worst cases of vocabulary instruction in these two programs.

Let us now for a moment consider the best case of vocabulary instruction that can occur as students are exposed to new vocabulary in the better (for teaching vocabulary) of the two programs we studied. A new vocabulary word is presented in a sentence that elucidates the meaning of the new word; the word is encountered in the text selection and the student looks it up in the glossary if s/he does not remember its meaning; the word appears a third time in an independently completed, after-reading activity. Remember, this is the *best* instance of new word experience that we encountered in the two basal programs. It does not necessarily occur with any regularity.

At worst, a new word appears solely in a selection and the student skips over it because s/he either does not recognize it as an unknown word or does not want to be bothered with the disruptive glossary step (p. 5).

Taken together, the analyses of Beck *et al.* (1979) and Jenkins *et al.* (Note 3) reveal that the level of vocabulary teaching prescribed in commercial reading programs ranges from virtually zero to modest, at best. Most of these efforts overlook some of the most elementary principles of teaching and learning—e.g., multiple examples, repetition, and review. Program developers seem not to rely much on direct teaching to produce growth in vocabulary knowledge. Rather, they appear to believe either that vocabulary learning is an unimportant aspect of schooling, or that it occurs chiefly through incidental learning (i.e., derivation from verbal context), and thus needs only modest attention from teachers and from instructional programs.

There is another potential explanation for these program's relative inattention to vocabulary as Asher (personal communication) has pointed out. Program designers may assume that teachers routinely provide vocabulary instruction during the school day; consequently, the programs themselves need not emphasize this aspect of language comprehension. Such an assumption on the part of program developers appears to be ill advised, however. Durkin (1980) who observed 4469 min of reading instruction in fourth grade classrooms noted that teachers spent a mere 19 min giving vocabulary instruction and only 4 min reviewing word meanings previously taught. Indeed the majority of teacher's involvement with vocabulary lessons (94 min) consisted of monitoring students workbook/worksheet exercises supplied with the commercial program.

WORD MEANINGS COMMUNICATED BY VERBAL CONTEXT

Conventional wisdom points strongly to the conclusion that vocabulary learning occurs predominantly through context, but the evidence supporting this conclusion is not direct. The argument for learning from

context can be expressed as follows. During the elementary school years the size of children's vocabulary undergoes a marked expansion. This expansion is of such magnitude that direct teaching of vocabulary could not easily account for it, unless that teaching were intensive, efficient, and economical. However, none of these descriptors apply very well to the way that vocabulary instruction is designed or delivered. Moreover, if the estimates of the number of words which occur in printed school English are taken seriously, then it may be foolish to even consider attempting to directly teach a major portion of the words which students are likely to encounter. Nagy and Anderson (Note 2) estimate that over 88,000 basic "word families" are present in printed school English, and this figure does not include proper names, homographs, and compound entries. That is a lot of words. To attempt teaching them may be analogous to the efforts of the Mrs. Partington who tried to fight back the Atlantic Ocean with a mop. Thus, follows the argument, if direct vocabulary teaching cannot account for the expansion in word knowledge, then children must acquire the majority of word meanings from verbal context.

The case for learning from verbal context is further bolstered by evidence which shows children can *derive* word meanings from context. Such demonstrations are important because the argument that children learn (and remember) meanings for new words which they have encountered only in verbal context rests on the assumption that they are able to derive word meanings under these conditions.

Children's ability to infer meanings from context follows a developmental pattern. Werner and Kaplan (1952), using a task which required children to infer the meaning of a word from a series of sentences that used the unknown word, found a marked increase in performance between 10 and 11 years of age. Carnine, Coyle, and Kameenui (Note 4), with findings corresponding to these results, showed significant improvement across grade levels when they tested children from Grades 4-6 on a task requiring them to derive meaning for unfamiliar words embedded in paragraphs. Improved reasoning ability and changes in knowledge about textual conventions resulting both from incidental learning and from direct instruction are probably responsible for such increases. Marshalek (1981, reported in Sternberg & Powell, in press) found that subjects with low reasoning ability were poor at inferring word meanings. Since reasoning ability improves with age, Marshalek's results might help explain the observations of developmental changes in the ability to derive word meanings reported by Werner and Kaplan, and Carnine *et al.* (Note 4). That increases in knowledge about textual conventions play a role in improved ability to derive word meanings was demonstrated by Jenkins, Haynes, and Stein (Note 5) who found that brief instruction about the

function of appositive constructions resulted in significantly improved meaning derivation using this type of context clue.

Nevertheless, the conclusion that increases in vocabulary knowledge are principally the result of learning meanings from context is based on a default argument, where the evidence is entirely indirect. Before examining the smattering of direct evidence on learning from context we first take up evidence for *how* this might occur.

DERIVING MEANINGS FROM CONTEXT

In addressing how learning from context might occur, Sternberg and Powell (in press) offer the most detailed analysis of factors that might influence this process. This section relies extensively on their work. Two major categories of variables are seen as important. These are the particular types of context cues, and the conditions which mediate their use. Sternberg and Powell propose eight classes of context cues, some of which are illustrated in the following paragraph which contains the unfamiliar word *trok*.

Ann wiped the morning sleep from her eyes, leaned against the sink and lifted her trok from its holder. She squeezed some paste onto its bristles and wet it, but just as she put the trok in her mouth, the phone rang.

This brief paragraph provides multiple cues about the meaning of *trok*. Some are temporal (morning, after arising from sleep) hinting when troks might be used; some spatial (near a sink, probably bathroom, kept in holder); one cue is a description of physical properties of troks (bristles); and three cues relate to the functional properties of troks (pasted, wetted, and placed in a person's mouth). In addition to the four cue types illustrated above—i.e., temporal, spatial, functional, and stative descriptive (size, color, shape, parts)—other types of cues delineated by Sternberg and Powell include value (worth or desirability of *x* or the affect aroused by *x*); causal/enablement (what brings *x* about); class membership (cues suggesting a superordinate classification of *x* or members for which *x* is a superordinate); and equivalence (cues such as synonyms, partial definitions, or antonyms).

In this model, context cues are composed of these eight kinds of information carried by surrounding text. In addition to the cues themselves, Sternberg and Powell propose a second major category of mediating variables which affect how and whether a reader will apply contextual information to figure out a word's meaning. The *number of occurrences* of an unknown word and the *variability of the contexts* in which an unknown word occurs are two such mediating variables. In general, multiple occurrences of an unfamiliar word, particularly in variable contexts, in-

crease the number and kinds of meaning cues available to the reader. They can also heighten awareness of the word and stimulate an attempt to actively recall and integrate information from previous contexts.

The *presence of relevant cues* is an obvious factor affecting the success a reader will have in apprehending the meaning of an unknown word. Of course, not all cues are equally relevant to a word's meaning. When a reader infers the meaning of a temporal concept (e.g., perennial), surrounding context that supplies temporal cues is clearly more helpful to her than context cues providing spatial, functional, or value information, all of which could be misleading. Likewise in attempting to infer the meaning of *altercation* the reader would obtain little help from surrounding context that provided temporal or spatial information because it would refer to incidental features of the event. More helpful would be information on stative descriptive features (loud voices, two or more individuals), enabling conditions (conflicting goals), class membership (multiple events for which altercation would be a superordinate label, such as altercations that involve physical contact vs those limited to verbal exchanges; or information which indicates that an altercation is a member of a larger class—i.e., disagreements), value cues (altercations are somewhat undesirable), and equivalence cues (the presence of a synonym, such as argument). Of course, the reader's problem is to determine which cues are accidental and which are central to the concept.

When present, the *proximity of relevant contextual cues* to the unknown word may be important. Proximity should raise their salience and increase the likelihood that a reader will recognize them as information that is relevant to the unknown word.

The reader's perception of the *importance of the unknown word* to understanding the sentence or passage should influence whether she allocates resources to figuring out the word's meaning. She may perceive as unimportant an unfamiliar word that occurs in the description of a setting (e.g., scudding clouds) before the introduction of any characters or events, and unless the reader is curious about the word, she is unlikely to expend much conscious effort in deriving its meaning, even if context cues are plentiful (e.g., a windy day, a changing sky). On the other hand, when a word is judged as central to an author's message, then context cues may be searched out, examined, and tested.

The *density of unknown words* in a passage may also affect cue utilization. In passages containing a relatively high number of unfamiliar words, context provides less information about the meaning of any single word, because the context for unknown Word X may contain Words Y and Z. Moreover, a high density of unknown words tends to increase passage difficulty, which in turn may function to discourage the reader from de-

voting much time and energy to the passage. Thus, even though present, potentially informative context clues may be overlooked.

The meaning of some words is more difficult to grasp than the meaning of others. For example, words that have *concrete referents* are in general easier to comprehend than ones with abstract referents. Likewise, concrete contexts are probably more useful than abstract contexts in determining the meaning of an unfamiliar word.

Depending upon an individual's *prior knowledge* about a topic, the text surrounding an unfamiliar word may be more or less helpful in his comprehending its meaning. Context may be rich in clues, as when appositive constructions are present, synonyms are expressly given, or multiple clues (temporal, functional, or class membership) are provided. However, individual differences in prior knowledge about the cued information may determine how and whether different people take advantage of the available cues. For example, a writer's attempt to clarify the meaning of *arcane* by supplying the near synonym *obscure* might succeed for readers familiar with the latter, but would offer little help to those who do not know the meaning of *obscure*.

To Sternberg and Powell's list of mediating variables, we propose the addition of three more conditions which may affect learning from context. The first is an expansion of the notion of *prior knowledge*. For elementary school children, the referents for many unfamiliar terms (e.g., legislature, caucus, gerrymandering) are difficult to infer despite the quality of surrounding context, because the concepts themselves are unfamiliar entities or events. In contrast, referents for other unfamiliar words (e.g., furtive, altercation, garret) should be simple to infer, given relevant context, because they refer to common events, entities, or states of affairs, all having an existing synonym in the reader's lexicon—i.e., sneaky, argument, and attic.

Given that prior knowledge of a *word* means something different from prior knowledge of a *concept*, or referent for a word, four conditions that face the learner can be identified, based upon the relationship between the existence of synonyms that are simpler than the unknown word and the student's knowledge of referents.

Condition 1: The unknown word (e.g., altercation) has a simpler synonym (argument), and the student knows the concept referred to by the simpler synonym.

Condition 2: The unknown word (e.g., arcane) has a simpler synonym (obscure), but the student does not know the concept referred to by the simpler synonym.

Condition 3: The unknown word (odometer) does not have a simpler synonym, but the student reliably recognizes instances of the concept

(e.g., the thing on the speedometer that tells how many miles you've gone).

Condition 4: The unknown word (legislature) does not have a simpler synonym, and the student indicates no knowledge of the concept referred to by the word.

These four conditions each imply different learning. Condition 1 implies relabeling. Condition 2 implies learning a new concept and either one or two labels that go with it, depending on the goal of the instruction. Condition 3 implies learning that a given label fits a known concept. And Condition 4 is much like 2—a new concept and its accompanying label must be learned. These different dimensions of prior knowledge (and therefore different learning requirements) are certain to affect the difficulty of deriving meanings from context. Condition 4 involves two stages, formulating the concept and attaching the name. Condition 1, in contrast, requires only that a new name be assigned to an already known concept. When deriving a word meaning from context, it should be easier to arrive at a known concept rather than one which is not known.

More importantly, these different dimensions of prior knowledge will likely interact with context clues in different ways. Clues which more than adequately facilitate a renaming task may completely obfuscate the distinctions between critical, variable, and irrelevant features of an unknown concept. Any set of clues may influence concept learning differently from label or relabel learning. Thus individual differences in background knowledge will determine whether a given instance of vocabulary learning consists of renaming familiar events, of acquiring novel concepts, or some combination of these.

Our second addition to Sternberg's list of mediating conditions is the *proximity of recurrence* of the unknown word. Assuming that each occurrence of an unknown word is usually accompanied by some relevant contextual information, and assuming that the context available in a single encounter with an unknown word rarely provides information sufficient for figuring out the word meaning (an exception being when a known synonym is given), then the reader's ability to integrate cues from multiple occurrences will be enhanced by closer instances. That is to say, when readers encounter multiple appearances of an unknown word, each accompanied by unique context clues, they are more likely to integrate contextual information from multiple occurrences that occur closely enough to permit comparisons. For example, an unfamiliar word may appear in conjunction with clues relevant to its meaning along with a number of accidental or peripheral clues which invite a mistaken inference. A second instance of the same word, appearing near the first, would permit comparison of context clues for both instances, thereby facilitating

elimination of some hypotheses about the word's meaning, and acceptance of other hypotheses consistent with both sets of context clues.

The final mediating variable, *the number of meanings of the unknown word*, includes homonyms and other cases of polysemy. Many words (bank, flat, tear, rose) have multiple meanings. If anything, the extent of polysemy is underestimated, judging from the number of words for which dictionaries list more than one referent. Developers of basal reading series often alert students to this fact by providing exercises that require the student to use sentence context to select an appropriate meaning for a word which has two or more common meanings.

Why should polysemy affect a reader's ability to compute the meaning of an unknown word? We have assumed that to derive the meaning of an unknown word readers usually need more than one encounter with the word and its surrounding context, because any single instance of context carries too little information about the word. Readers then must be able to integrate information from multiple contexts (multiple encounters) in order to extract the meanings of an unknown word. Polysemy should disrupt this integration process when the student encounters the same unfamiliar word in contexts which indicate different referents for the word.

To reiterate, Sternberg's and Powell's theory of learning word meanings from context postulates two major classes of variables: the different types of context cues and the conditions which mediate their use. To test the explanatory power of this theory, Powell and Sternberg (1982, cited in Sternberg & Powell, in press) gave high school students brief passages, written in various literary styles (e.g., newspaper, historical), containing one or more unfamiliar words (e.g., oam, ceilidh). Upon reading these passages, the students attempted to write a definition for the unfamiliar words. The independent variables were ratings of the number and quality of context cues along with the aforementioned mediating factors delineated in the model. Together these factors accounted for between 72 and 92% of the variance in deriving definitions from context, depending upon the particular literary style of the passage.

As impressive as these figures are, the empirical foundation for this theory still has some way to go. Based on the description of this investigation by Sternberg and Powell (in press), it was not possible to determine which mediating factors made significant contributions to the explained variance, or if all factors were present and had an equal opportunity to operate. Moreover, their investigation points out an important distinction between an individual's ability (competence) to derive meanings for unfamiliar words from context and whether or not an individual will derive meanings from context (performance). The Powell and Sternberg investigation identified factors that affected students' ability to de-

rive meanings, not those which influenced students to attempt meaning derivation. The task for these students was clear—inferring the word meanings. However, under natural reading conditions, individuals face a very different task—i.e., forming a plausible interpretation of the author's message. The ability to infer meanings for unfamiliar words should in theory contribute to successful performance in interpretation, but it clearly is not the reader's central chore. In most investigations that have varied the familiarity (frequency) of vocabulary in text, the results suggest that passages containing familiar words are comprehended about as well as passages with unfamiliar words (Foster, 1931; Kueneman, 1931; Clarke, 1933—all cited in Chall, 1958; Nolte 1937; Freebody & Anderson, 1981; Pany, Note 6; Stahl, 1982; see Kameenui, Carnine & Freshi, 1982, for an exception). These results suggest to us that readers can often get by without figuring out a word's meaning, and thus may not bother to try.

In their model, Sternberg and Powell distinguish between competence and performance. They offer their list of mediating variables (e.g., importance of an unfamiliar word, frequency of occurrence, and variability of contexts) in an attempt to account for the probability that a reader will be inclined to derive meanings from context and will be successful at the task. However, the Powell and Sternberg experiment did not address the competence–performance issue.

It is important to distinguish between *deriving* meanings for unfamiliar words and *learning* those meanings. It stands to reason that factors that encourage a reader to derive meanings for unfamiliar words should also facilitate learning the word's meanings. However, merely because readers attempt to compute a meaning does not necessarily mean that they will learn the meaning, even if they successfully figure it out. That is, a reader might successfully compute a word's meaning, utilize that information in comprehending the text, and promptly forget the word's meaning.

Another distinction relevant to understanding the role played by verbal context in learning word meanings involves the way contexts are constructed and the way they are presented to the learner. That is, it may be useful to distinguish between learning word meanings from natural verbal contexts vs learning them from instructional sentences that are purposely designed to teach meanings. Demonstrating that children can learn word meanings from instructional sentences during explicit vocabulary instruction (Gipe, 1979; Pany *et al.*, 1982) does not indicate that they will learn word meanings in more naturally occurring texts. For learning from context to become a serious contender in explaining the estimated doubling of vocabulary during the middle grades would require a strong demonstration that children actually retain meanings for unfamiliar words, after they have encountered them in relatively definitive verbal contexts, under natural reading conditions which do not directly call for vocabulary learning.

LEARNING MEANINGS FROM CONTEXT

What then is the direct evidence for learning, as opposed to deriving, meanings from context? Findings from a recently completed experiment are relevant to this question. Jenkins, Stein, and Wysocki (Note 7) had children read unfamiliar words under relatively natural reading conditions; i.e., emphasis was not placed on vocabulary learning. The main independent variable was the number of encounters students had with the unfamiliar words.

Brief passages were constructed, each containing a target word whose meaning was not likely to be known by elementary aged students (e.g., *altercation*, *incarcerate*). Each passage also contained a synonym for, or words which strongly cued, the meaning of the target word. Eighteen low-frequency target words were divided into three sets of six which were counterbalanced across conditions. An example of a passage (with target and synonym underlined) follows:

The neighbors were at it again. We could hear the screaming and the banging of pots and pans all the way down the block. We thought the noise was from another of their altercations. But then we remembered that it was New Year's Eve and that they were not arguing, but just having fun.

Ten such passages were constructed for each word. Under the different exposure conditions students read either two, six, or 10 passages for each of the six target words. Students in the 10-exposure condition read six passages (one for each target word) per day over 10 days. Students in the six-exposure condition read six passages spread over 10 days, while those in the two-exposure condition read six passages on Days 1 and 10. Thus the distribution of passages for the three-exposure conditions controlled for recency effects prior to posttesting.

Various vocabulary measures were created. Two were definitional tests, one requiring students to choose a correct definition or synonym from several alternatives, the other requiring students to supply a suitable synonym or definition for a target word which appeared in a sentence with minimal context clues.

Two other measures involved word usage. One was a sentence anomaly test which required students to state whether a sentence made sense. One sensible sentence and one nonsense sentence were created for each word, comprising a 36-item test with the sentences for the same target word scattered throughout the test. The other usage measure was a sentence completion test. For each target word a sentence stem was created which included the target word followed by four choices, only one of which was correct.

The learners in this study, 108 fifth graders, were randomly assigned to one of three exposure conditions. In addition, to obtain a zero-exposure control, students were also tested on nonexposed word sets, creating a within-subject comparison between nonexposed and exposed word sets.

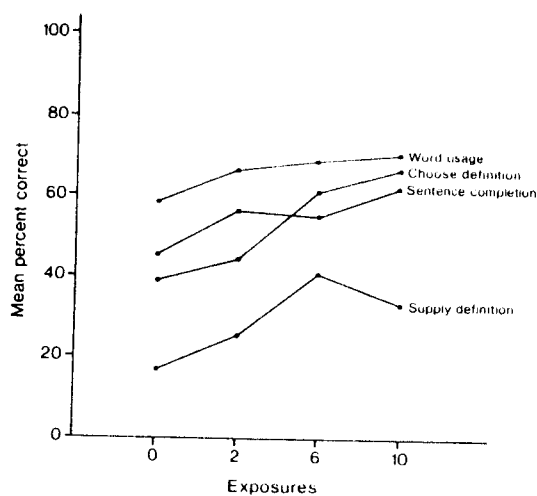


FIG. 1. Performance on four vocabulary measures after different numbers of exposures.

Analyses of variance were computed for the between-subjects exposure conditions (two, six, ten). These revealed significant effects on both of the definitional measures (supply and choice), but no effects were observed on the two usage measures (sentence anomalies and sentence completion). To determine how many exposures were required to produce vocabulary learning, dependent *t* tests were computed between the zero-exposure condition and each of the other levels. While the means for two exposures were generally higher than for no exposures, this difference did not reach statistical significance on any of the vocabulary tests. However, zero exposures did differ significantly from six exposures on all but the sentence completion test, and from 10 exposures on all four measures.

Figure 1 shows the means obtained for the two definitional measures at each of the exposure levels. These results show clearly that children can acquire word meanings from context. For this to happen, however, the words must be encountered several times, even when each encounter is accompanied by strong context clues.

The clearest picture of learning is given on the supply definition measure, because this test, relative to the others, minimizes the likelihood that students will answer correctly by guessing. Examination of scores for those word sets which students had not encountered during the experiment revealed that they already knew 17% of the nonexposed words. When they received six to 10 additional exposures on different words, these fifth graders were able to supply definitions for between 33 and 41% of the words, an increase of only 24%. This increase is comparable to the 27% increase observed to occur between zero and 10 exposures

on the choice of definition measure (39–66%). On an absolute scale these increases are not particularly large, given the number of exposures to the words and the strength of the supporting verbal context. More noteworthy than the anticipated finding that children could acquire word meanings from context are findings that this learning does not come easily, that several (more than two) exposures may be required, and that the amount learned is less than imposing, given the facilitating circumstances under which students encountered these novel words.

ACCOUNTING FOR VOCABULARY GROWTH

Returning to the question of how to account for the growth in vocabulary knowledge, we can summarize the state of affairs as follows. Vocabulary researchers have placed sizable estimates on the amount of vocabulary growth that occurs during the middle elementary grades. Other researchers have observed that the amount of direct vocabulary teaching that occurs during reading instruction is somewhere above zero, but far below the level that would be necessary to account for the large gains made in vocabulary knowledge. In most programs the rate at which new vocabulary is scheduled for instruction is slow, the recommended teaching procedures are weak and inefficient, and the programs overlook not only relevant research findings pertaining to effective vocabulary instruction but even some of the most rudimentary and important principles of learning. Other researchers have observed that elementary school students are not particularly adept at deriving and learning word meanings from natural verbal context, and there is some question as to whether their reading programs teach them to perform these skills.

Something does not wash. Either the estimates of vocabulary growth during the elementary school years have been seriously exaggerated, or effective vocabulary instruction is occurring somewhere outside of "reading instruction" (e.g., through content subjects, families, educational television), or students are far better at learning word meanings from natural printed contexts than current data suggest, or large numbers of word meanings are learned incidentally through oral context (e.g., television, conversations). On the average, elementary school children watch 26 hr of television each week (Wartella, 1980), probably resulting in some vocabulary learning. At this juncture we suspect that no single source of information about word meanings accounts for the majority of variance in vocabulary learning. Nevertheless, the fact that great variation in vocabulary knowledge exists among individuals and the fact that this variation is also reflected in reading scores suggest that efforts to locate and amplify the factors responsible for vocabulary learning may reap healthy benefits in comprehension.

Ample opportunities for research and development are available in the area of vocabulary instruction. It would be useful to know, for example, if large amounts of vocabulary can be learned in an economical time frame, if direct teaching of morphological analysis skills will enhance vocabulary growth, and if effective procedures can be designed to teach children to derive meanings from context and remember them. Perhaps more importantly, more refined answers are needed to questions about the relationship between knowledge of word meanings and listening and reading comprehension. In addition, fundamental questions remain pertaining to the measurement of vocabulary knowledge: how many words are actually learned (and how many should be taught), what kinds of learning are involved, and what kinds of tests are indicative of these learnings?

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On the Goals, Functions, and Knowledge of Reading and Writing

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In considering current theories of reading and writing, one of the first questions that must be posed focuses on the definition of skilled reading and writing. Exactly what does it mean to be a skilled reader or writer? Although the question is simple, the answers are complex and often include dimensions that do not necessarily overlap with one another. For example, in the reading domain, one common definition describes the skilled reader as one who can construct a representation of a text that corresponds directly to the one conceived of by the author of the passage. A second definition focuses more on the goals that the reader sets during the act of comprehension. Here, the reader's primary goal is to construct a meaningful representation of the text in terms of what she knows about a particular passage. Implied in this definition is the recognition that the reader may impose her own goals on how the passage is to be interpreted, rather than adhere to the goals the author had in mind.

A parallel discrepancy exists in current definitions of skilled writing. One common definition assumes that the skilled writer always communicates his intentions clearly and composes a text that is fluent and easy for a reader to understand. There is a coherent organization to the written work, with an overall plan evident throughout the structure of the text. No false starts are included, and there are no incongruities, no lapses in logic, and no irrelevant material.

A second definition of skilled writing focuses on learning and the reorganization of existing knowledge in the writer's head. The writer is thought to use existing knowledge to generate new information, which is then incorporated into current knowledge structures. In the process of doing this, a new organization of existing information is often constructed, enabling the writer to understand events in a new or different

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