

Vocabulary Processes

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This chapter is about vocabulary processes and, in particular, vocabulary acquisition processes. Our focus is on how school children add words to their reading and writing vocabularies and how they learn the meanings of new words.

There continues to be a strong, if not increasing, interest in vocabulary among reading researchers, according to extensive reviews of recent research provided by Beck and McKeown (1991) in Volume II of the *Handbook of Reading Research*, as well as by Baumann and Kameenui (1991) and Ruddell (1994). A similar concern for vocabulary among second-language researchers is evidenced by several recent books (e.g., Coady & Huckin, 1997; Schmitt & McCarthy, 1997). This interest in vocabulary stems in part from the long-standing recognition that vocabulary knowledge strongly influences reading comprehension (Davis, 1944; Anderson & Freebody, 1981). Among practitioners, on the other hand, interest in vocabulary has varied and is currently not especially high. For the last 2 years, the International Reading Association reported on a survey of “hot topics” in literacy research (Cassidy & Wenrich, 1997, 1998). In both years, vocabulary was rated as “cold,” the bottom category. This low level of interest reflects an emphasis on instruction that is authentic, meaningful, and integrated, which stands in stark contrast to most traditional practices associated with vocabulary. To many, the word *vocabulary* may suggest a reductionist perspective in which words are learned by memorizing short definitions and sentences are understood in a strictly bottom-up fashion by putting together the meanings of individual words—a picture inconsistent with our current understanding of the reading process.

This piece counters a reductionist perspective on vocabulary in two ways. In the first section of the chapter we discuss the complexity of word knowledge. In the second section we discuss how children gain information about words from context, word parts, and definitions, noting the limitations as well as the potential of each of these sources, and emphasizing the role of metalinguistic awareness in vocabulary learning.

The Complexity of Word Knowledge

Any attempt to understand the processes by which children’s vocabularies grow must be based on a recognition of the complexity of word knowledge. Five aspects

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of this complexity that have long been recognized by vocabulary researchers are: (a) incrementality—knowing a word is a matter of degrees, not all-or-nothing; (b) multidimensionality—word knowledge consists of several qualitatively different types of knowledge; (c) polysemy—words often have multiple meanings; (d) interrelatedness—one’s knowledge of any given word is not independent of one’s knowledge of other words; and (e) heterogeneity—what it means to know a word differs substantially depending on the kind of word. We consider these in turn.

Incrementality

Word learning is incremental—it takes place in many steps. In her classic research on early childhood language development, Eve Clark (1973, 1993) provided a detailed picture of how children’s knowledge of word meanings is often initially incomplete but, over time, gradually approximates the adult understanding. Likewise, Susan Carey’s (1978) seminal work on children’s word learning distinguished between quick mapping (i.e., the initial establishment of a partial representation of a word meaning, sometimes on the basis of a single encounter) and extended mapping (i.e., the process of progressive refinement of word knowledge).

The incremental nature of word learning has sometimes been expressed in terms of a linear scale with several points. Dale (1965) proposed four stages: (1) never saw it before; (2) heard it but doesn’t know what it means; (3) recognizes it in context as having something to do with...; and (4) knows it well. A recent variation by Paribakht and Wesche (1997) is similar, but adds a fifth point: (5) I can use this word in a sentence.

Although such scales are a great improvement over an all-or-nothing picture of word knowledge, and serve as a useful basis for more sensitive assessments of word knowledge (Paribakht & Wesche, 1997), they are not intended to imply that there are only four or five discrete levels of word knowledge. In a series of experiments, Durso and Shore (1991) found that college undergraduates were able to distinguish between correct and incorrect uses of words, at a rate significantly greater than chance, even for words that they had previously judged not to be real English words at all. These results suggest that even at the lowest levels of word knowledge, within Dale’s stage 1, there are measurable differences in word knowledge. At the other end of the scale, in a series of studies of high-quality vocabulary instruction, Beck, McKeown, and their colleagues (Beck, Perfetti, & McKeown, 1982; McKeown, Beck, Omanson, & Perfetti, 1983; McKeown, Beck, Omanson, & Pople, 1985) found that up to 40 instructional encounters with a word (and high-quality instruction at that) do not bring students to a ceiling.

An incremental view of word learning helps explain how a great deal of vocabulary knowledge can be gained incidentally from context, even when individual encounters with words in context are not particularly informative (Schatz & Baldwin, 1986). Several studies have used tests representing multiple levels of word knowledge to measure the amount of word knowledge readers gain when encountering words in natural context (Nagy, Herman, & Anderson, 1985;

Schwanenflugel, Stahl, & McFalls, 1997; Stallman, 1991). If incidental learning from context could lead to only vague knowledge of words, one would expect the benefits of reading to be strongest for the most lenient criteria of word knowledge, and weaker or absent for more stringent criteria. However, in all three of these studies, the amount of word learning observed was not significantly different for different levels of word knowledge.

The research is clear in showing that word learning *can* be incremental—that one’s knowledge of a word can grow on the basis of almost infinitesimally small steps. Less is known about the extent to which word learning is *necessarily* incremental—that is, what limits may exist on the amount or type of knowledge that a learner can gain about a word on the basis of any single encounter. Although good instruction is unquestionably more efficient than chance incidental encounters for learning a specific set of words, there is still good reason to believe that there are practical, if not theoretical, limits to how much an individual can learn about a word on any given occasion. Even four instructional encounters of high quality do not lead to a level of word knowledge adequate to measurably improve comprehension of text containing the instructed word (McKeown et al., 1985). Other research on word learning (e.g., Gildea, Miller, & Wurtenberg, 1990) suggests that there are significant limitations on learners’ ability to integrate information from multiple sources on any given occasion.

Polysemy

Words often have more than one meaning, and the more frequent a word is in the language, the more meanings it is likely to have. The simple fact that a word can have two or more unrelated meanings (e.g., *bear* meaning animal and *bear* meaning carry) adds substantial cognitive complexity to the task of using a dictionary (Miller & Gildea, 1987). Even more troublesome, at least to the theoretician, is the fact that the multiple meanings of words range from being completely unrelated to being so close that the shade of meaning separating the two may exist only in the mind of a compulsive lexicographer (Anderson & Nagy, 1991). In fact, word meanings are inherently flexible, and always nuanced in some way by the context in which they occur (Green, 1989; Nagy, 1997). The meaning of a word one encounters must be inferred from context, even if the word is already familiar, as in the phrase “a soft distant symphony of rushing wind” (Polacco, 1996, p. 25). In many cases, the required inferences are easy and natural, but figurative language is certainly not without its pitfalls for students (Ortony, Reynolds, & Arter, 1978; Winner, Engel, & Gardner, 1980). If vocabulary instruction is to address this aspect of the complexity of word knowledge, students must not only be taught to choose effectively among the multiple meanings of a word offered in dictionaries, but to expect words to be used with novel shades of meanings.

Multidimensionality

Discussions of the incremental nature of word learning sometimes appear to assume that word knowledge can be expressed in terms of a single dimension. For

some purposes, it may be useful to conceptualize word knowledge in terms of a continuum ranging from “none” to “complete.” However, it has long been recognized that word knowledge consists of multiple dimensions (Calfee & Drum, 1986; Cronbach, 1942; Kameenui, Dixon, & Carnine, 1987; Richards, 1976). Nation (1990) offered eight aspects of word knowledge: knowledge of the word’s spoken form, written form, grammatical behavior, collocational behavior (what other words does this word commonly occur with?), frequency, stylistic register, conceptual meaning, and associations with other words. Other versions of such a list (e.g., Laufer, 1998) distinguish among different types of relationships between words, such as morphological relationships (prefixation and suffixation) and semantic relationships (antonyms, synonyms), and further subcategorize meaning into referential (denotative) and affective (connotative). Graves (1986) distinguished different kinds of word learning tasks—learning new concepts, learning new labels for known concepts, and bringing words into students’ productive vocabularies.

Various aspects of word knowledge might be reducible to a single continuum if one could show that there were strong implicational relations between them. However, it is unlikely that there are any absolute constraints governing the order in which different aspects of word knowledge are acquired. Everyday observation suggests that different facets of word knowledge are relatively independent: One student might know the definition for a word but not be able to use it properly in a sentence; another may use the word in seemingly appropriate ways and yet have a misunderstanding of its meaning. One person may recognize a word and yet have no understanding at all of what it means, whereas others (as was demonstrated by Durso and Shore, 1991) may not recall having ever seen a word before and yet have a partial understanding of its meaning.

In a recent study of learners of English as a second language, Schmitt (1998) found that one could not predict on the basis of one aspect of word knowledge what the learner’s knowledge of another aspect would be. Thus, word knowledge must be characterized in terms of a number of different aspects which are at least partially independent. Furthermore, each of these is itself likely to be best characterized as a matter of degree.

Interrelatedness

Words are often taught and tested as if they were essentially isolated units of knowledge. Clearly such practice is inconsistent with a constructivist understanding of knowledge that emphasizes the importance of linking what is learned to familiar words and concepts. How well a person knows the meaning of *whale* depends in part on their understanding of *mammal*. A person who already knows the words *hot*, *cold*, and *cool* has already acquired some of the components of the word *warm*, even if the word *warm* has not yet been encountered.

The potential extent of interconnectedness in vocabulary knowledge is underscored by the Landauer and Dumais (1997) simulation of word learning from context. In their simulation, the input was 4.6 million words of text (in samples

each about 150 words in length) from an electronic encyclopedia. A multidimensional vector was calculated for each word on the basis of its co-occurrence with other words in the sample texts. The simulation was evaluated by using the knowledge represented in these vectors to take a test of 80 items from the *Test of English as a Foreign Language* (TOEFL), a test commonly used to measure the English proficiency of international students studying in the United States. Interestingly, the Landauer and Dumais model got a score almost identical to the mean of a large sample of applicants to U.S. colleges from non-English-speaking countries.

One of the most striking findings of this study is the fact that as much as three fourths of the learning that resulted from the input of a segment of text was for words that were not even contained in that segment. At first glance, this finding seems counterintuitive. On the other hand, in the case of words obviously related in meaning, it is not difficult to understand how exposure to a text can contribute to one's knowledge of words not in the text. For example, reading a text about weaving might well increase one's understanding of the words *warp* and *woof* even if these words did not occur in the text. In the Landauer and Dumais (1997) simulation, computationally equivalent to a connectionist network, the information about any given word is represented throughout the entire network, and input about any single word can potentially change the configuration of relationships throughout the network. Although one must be cautious in extrapolating from this simulation to human learning, at very least it raises the possibility that the interconnectedness among words in human memory may be far greater than is commonly assumed, and certainly far greater than is represented in dictionary definitions.

Heterogeneity

Another type of complexity in word knowledge is the fact that what it means to know a word depends on what kind of word one is talking about. For example, knowing function words such as *the* or *if* is quite different from knowing terms such as *hypotenuse* or *ion*. The fact that the different dimensions of word knowledge are at least partially independent of each other also means that the same word can require different types of learning from different types of students, depending on what they already know about a word.

Implications of the Complexity of Word Knowledge

The complex picture of word knowledge we have outlined stands in sharp contrast to some of the traditional vocabulary instruction practices still being used in schools, although most of the points we have made have been acknowledged by vocabulary researchers for decades (e.g., Calfee & Drum, 1986; Cronbach, 1942; Richards, 1976). The knowledge that students have for many words is far more complex than could be attained through instruction that relies primarily on definitions. Not only are there too many words to teach them all to students one by one; there is too much to learn about each word to be covered by anything

but exceptionally rich and multifaceted instruction. Hence, the complexity of word knowledge further bolsters the argument that much of students' vocabulary knowledge must be gained through means other than explicit vocabulary instruction. In those cases when students are dependent on instruction to learn a word, if they are to truly gain ownership of that word, the instruction must provide multiple and varied encounters with that word (Stahl & Fairbanks, 1986).

Although we believe it is important to recognize that only a small proportion of words that students learn can be covered in explicit vocabulary instruction, we want to stress an even more basic point: that knowing a word cannot be identified with knowing a definition. This point was argued at length by Anderson and Nagy (1991) in Volume II of the *Handbook of Reading Research*. Here we want to emphasize the point that word knowledge is primarily procedural rather than declarative, a matter of "knowing how" rather than "knowing that." Admittedly, there is a declarative component to at least some types of vocabulary knowledge. This seems especially true in the realm of technical or content-specific vocabulary; for example, if someone is not able to explain what *carbon dioxide* is, it is questionable that he or she knows the meaning of the word. On the other hand, for much nontechnical vocabulary, it may be more useful to conceptualize word knowledge as being primarily procedural. That is, knowing a word means being able to do things with it: To recognize it in connected speech or in print, to access its meaning, to pronounce it—and to be able to do these things within a fraction of a second. None of these processes is anything like remembering a verbal definition. In most cases, knowing a word is more like knowing how to use a tool than it is like being able to state a fact. Word knowledge is applied knowledge: A person who knows a word can recognize it, and use it, in novel contexts, and uses knowledge of the word, in combination with other types of knowledge, to construct a meaning for a text.

Metalinguistic Demands of Word Learning

In traditional vocabulary instruction, students spend much of their time learning definitions (Watts, 1995). Such instruction is inconsistent with current understandings of the learning process. In the previous section of this chapter, we have outlined the dimensions of word knowledge that are rarely conveyed adequately in definitions. Another problem with memorizing definitions is the passive nature of the role it assigns to students. Teaching students new words by giving them definitions is the antithesis of a constructivist approach to learning.

If students are to take an active role in word learning, and assume increasing responsibility for their own vocabulary growth, they need at least some information about the nature of word knowledge and the processes by which it is acquired. That is, they need metacognitive and metalinguistic ability in the realm of word learning. In this section of the chapter, we describe some of the specific types of metalinguistic abilities that contribute to word learning.

Metalinguistic ability is the ability to reflect on and manipulate the structural features of language (Tunmer, Herriman, & Nesdale, 1988). It can be understood

as a subcategory of metacognition, that is, the awareness of and control over one's cognitive processes. Recently, much attention has been devoted to a particular kind of metalinguistic ability, phonemic awareness (i.e., the ability to reflect on and manipulate phonemes, the individual units of sound out of which spoken words are constructed). However, other types of metalinguistic awareness, such as morphological awareness and syntactic awareness, are also believed to play an important role in reading (Carlisle, 1995; Tunmer et al., 1988; Tunmer, Nesdale, & Wright, 1987; Warren-Leubecker, 1987; Willows & Ryan, 1986).

A number of vocabulary researchers (e.g., Anderson & Nagy, 1992; Baumann & Kameenui, 1991; Graves, 1986) have held up the idea of "word awareness" or "word consciousness" as an important goal of vocabulary instruction. However, the exact nature of such awareness has seldom been explicated. We believe that word awareness, like word knowledge, is a complex and multifaceted construct, and that there are many ways in which students' awareness of language impacts their word learning. Understanding the metalinguistic demands of the vocabulary-related tasks students encounter in school provides insight into the surprising difficulties students often experience with these tasks.

Metalinguistic Awareness and Word Parts

The importance of phonemic awareness has been highlighted in a growing body of research on learning to read. In an alphabetic language like English, in which letters generally map onto phonemes, it is crucial that children are able to segment spoken words into phonemes and learn the mappings between these phonemes and the letters that represent them.

Recently, however, the contribution of morphological awareness to reading has drawn the attention of some researchers. Morphemes are meaningful word parts; for example, the word *walks* can be divided into two morphemes, *walk* and *s*. In those places where English orthography deviates from the phonemic principle, it is often in the direction of giving consistent representations to morphemes. For example, *ed* is pronounced differently in the words *helped*, *poured*, and *pleaded*. The less regular relationship between spelling and sound allows for a more consistent link from spelling to meaning. Only by noticing the shared morpheme in *sign* and *signature* can one make any sense of the spelling of the former. The fact that many of the apparent irregularities in English spelling are motivated by morphological relationships suggests that awareness of these relationships may contribute to spelling and reading ability. And, in fact, it has been found that morphological awareness makes a significant contribution to reading ability, even when phonemic awareness has been taken into account (Carlisle, 1995; Carlisle & Nomanbhoy, 1993). Knowledge of morphology is likewise correlated with reading ability into high school (Nagy, Diakidoy, & Anderson, 1993).

It is hard to overstate the importance of morphology in vocabulary growth. Nagy and Anderson (1984) estimated that about 60% of the new words a student encounters in reading are analyzable into parts that give substantial help in figuring out their meaning. Anglin's (1993) study of children's vocabulary growth

showed that between first and fifth grade, the number of root words known by children in his study increased by around 4,000 words. In the same time period, the number of derived (prefixed or suffixed) words known by students increases by about 14,000 words. There is a veritable explosion in children's knowledge of derived words, especially between third and fifth grades. As Anglin noted, the bulk of this increase appears to reflect morphological problem solving, that is, interpreting new words by breaking them down into their component morphemes.

There is reason to believe that effective use of morphology in word learning depends on metalinguistic sophistication that continues to develop through high school. Most children presumably achieve the basic morphological insight—that longer words can often be broken down into shorter words or pieces that give clues to their meanings—before fourth grade (Anglin, 1993; Tyler & Nagy, 1989). However, word structure in English is complex, and there is development in children's knowledge of word formation processes at least through high school (Nagy et al., 1993; Nagy & Scott, 1990; Tyler & Nagy, 1989).

English and Spanish share many cognates—word pairs such as English *tranquil* and Spanish *tranquilo* that are similar in spelling, pronunciation, and meaning. Recognizing such relationships must depend on abilities similar to those required to recognize morphological relationships in English. Many pairs of morphologically related words in English likewise involve changes in spelling and pronunciation as well as shifts in meaning—for example, *divide/division*, *sane/sanity*, *combine/combination*, *respond/responsible*. Hancin-Bhatt and Nagy (1994) found that Spanish–English bilingual students' ability to recognize such relations increased far more dramatically between fourth and eighth grade than did their vocabulary knowledge in either Spanish or English. These results suggest that the ability to see morphological relationships that are partially obscured by changes in spelling and pronunciation may depend on metalinguistic sensitivities that develop, or at least increase substantially, after fourth grade.

It should also be noted that some aspects of morphological knowledge are closely related to syntactic awareness. In particular, learning the meanings of derivational suffixes (e.g., *-tion*, *-ness*, *-ly*) requires reflecting on the syntactic role of the suffixed word in the sentence (see Nagy et al., 1993).

Not surprisingly, there are differences of opinion about the contribution of morphological knowledge to reading and vocabulary growth. Some (e.g., Nation, 1990) note the irregularities of English morphology (what does *casualty* have to do with *casual*, or *emergency* with *emerge*?) and suggest that students should only consider morphological clues after they have first used context to make a hypothesis about the meaning of a word. However, the vast majority of words composed of more than one morpheme are semantically transparent—that is, their meanings are largely predictable on the basis of the meanings of their parts (Nagy & Anderson, 1984). The fact that some words (like *casualty*) are irregular indicates, not that word parts are useless as clues, but that readers must be strategic and flexible in their use of potential sources of information about words.

Metalinguistic Awareness and Use of Context

Context and morphology (word parts) are the two major sources of information immediately available to a reader who comes across a new word. Effective use of context, like effective use of morphology, requires some level of metalinguistic awareness.

Tunmer and his colleagues (Gough & Tunmer, 1986; Tunmer, 1990; Tunmer et al., 1988) argued that syntactic awareness (i.e., the ability to reflect on and manipulate the order of words in a sentence) contributes to reading ability in at least two ways. First of all, developing one's reading vocabulary depends on both phonological recoding and context, because phonological recoding alone cannot always uniquely determine the pronunciation of a word; context is sometimes necessary to determine which of several possible sounds a letter may represent. Effective use of context is, in turn, hypothesized to rely on syntactic awareness. Second, syntactic awareness may help the reader monitor comprehension.

Gottardo, Stanovich, and Siegel (1996), on the other hand, claimed that syntactic awareness does not make an independent contribution to reading, above and beyond the contribution represented by short-term, phonological memory. That is, correlations between reading difficulty and deficient syntactic awareness may arise as epiphenomena of deficiencies in phonological processing (p. 563). Although not denying the importance of phonological processing in reading difficulties, we believe that several types of evidence suggest a direct link between syntactic awareness and reading comprehension.

First of all, syntactic awareness training has been shown to improve reading comprehension (Kennedy & Weener, 1974; Weaver, 1979). Likewise, training studies in the use of context (e.g., Buikema & Graves, 1993; Jenkins, Matlock, & Slocum, 1989; see Kuhn & Stahl, 1998, for a review) have resulted in increases in children's ability to learn words. The relative brevity of most such interventions makes it likely that the benefits reflect increased metalinguistic and metacognitive awareness rather than gains in short-term phonological memory.

Second, it could be argued that the verbal working memory task used by Gottardo et al. (1996) includes a component of metalinguistic awareness. Subjects were asked to make true–false judgments about simple statements (e.g., fish swim in the sky), and their score on these judgments was incorporated into the verbal working memory score. After listening to a set of sentences, they were asked to recall the final word of each sentence in the set. To do this, subjects must pay attention to the surface form of the sentence, rather than its meaning, a task that requires conscious attention to word order, that is, syntactic awareness.

Third, there is evidence that the contribution of syntactic awareness and other components of metalinguistic awareness to reading comprehension, relative to that of phonological awareness, increases with grade level (Roth, Speece, Cooper, & De la Paz, 1996).

The most convincing evidence that syntactic awareness contributes to effective use of context comes from examining the protocols of students attempting to infer the meanings of novel words from context. In Werner and Kaplan's (1952)

classic study of inferring word meanings from context, children were given a series of sentences containing a nonsense word and asked to infer its meaning. Here are the responses from an 11-year-old boy (p. 16; the word *hudray* was intended to mean “grow” or “increase”):

Sentence 1: If you eat well and sleep well you will hudray.

Response: Feel good.

Sentence 2: Mrs. Smith wanted to hudray her family.

Response: Mrs. Smith wanted to make her family feel good.

Sentence 3: Jane had to hudray the cloth so that the dress would fit Mary.

Response: Jane makes the dress good to fit Mary so Mary feels good.

These responses show that this child is willing to ignore the syntactic structure of the sentences (especially sentence 3) in order to maintain his original hypothesis about the word's meaning. McKeown's (1985) study of high- and low-ability readers learning from context likewise included examples of responses that appear to reflect lack of attention to the syntactic role of the target word in the sentence.

Does use of context to learn the meanings of new words always require metalinguistic awareness? Presumably not; the rapid vocabulary acquisition of very young children takes place at an age when many aspects of metalinguistic awareness are not measurably present. However, a distinction must be made between incidental learning of word meanings from context and deriving word meanings. The latter process is usually examined by asking students to come up with, or select, an appropriate meaning for an unfamiliar word with the context available. Such a task is likely to be more metacognitively and metalinguistically demanding than incidental word learning. This may account for the fact that studies of truly incidental word learning have often found no significant effects of verbal ability (e.g., Nagy, Anderson, & Herman, 1987; Nagy et al., 1985; Stahl, 1989; Stallman, 1991), whereas studies of deriving word meaning have generally found large ability effects (e.g., Jenkins, Stein, & Wysocki, 1984; Daneman & Green, 1986; McKeown, 1985; Sternberg & Powell, 1983).

The research on learning words from context clearly documents the fact that chances of learning very much about a word from any single encounter with that word in natural context are very slim (Beck, McKeown, & McCaslin, 1983; Nagy et al., 1987; Schatz & Baldwin, 1986). It is extremely important for teachers to recognize that although context may be a “natural” means of word learning, it is not especially effective in the short run. Likewise, it is important for students to have realistic expectations about the amount of information they can gain from context. Training students on artificially helpful contexts may actually decrease their effectiveness at using the contextual clues available in natural text (Kranzer, 1988).

Metalinguistic Awareness and the Use of Definitions

The chief strength of definitions is that they provide explicit information about word meanings that is normally only implicit in context. If you want a student to

know what a particular word means, explaining it is unquestionably more effective than waiting for the student to encounter it numerous times in context.

One of the chief weaknesses of definitions is their failure to provide information about usage that is accessible to school children. Miller and Gildea (1987) studied sentences children generated when given definitions of unfamiliar words, and concluded that this widely used task, although it reveals interesting things about children's processing of definitions, is pedagogically useless. Children's difficulty with this task may stem in part from the often convoluted language of definitions, but even clearly written definitions do not guarantee success. McKeown (1993) carefully revised definitions to make them both more accurate and more clear to students and found that the revised definitions were significantly superior to their original dictionary counterparts in terms of students' ability to apply knowledge of their meanings. There was also an effect on usage: Only 25% of the sentences generated from the original definitions were judged acceptable, whereas 50% of the sentences generated from the revised definitions were acceptable. This is a substantial increase, but it is also a striking demonstration of the fact that even definitions of very high quality are often inadequate as sources of information on usage.

Students sometimes have trouble extracting even a general idea of the meaning of a word from a definition (Scott & Nagy, 1997). Some of the difficulty may stem from lack of familiarity with the conventions of traditional definitions, but changing the format and style of definitions does not necessarily increase their usefulness to students (Fischer, 1990, 1994; Scott & Nagy, 1997). A bigger problem appears to be the metacognitive and metalinguistic demands of using definitions.

Scott and Nagy (1997), following up on Miller and Gildea's (1987) study, found that the difficulty experienced by children in interpreting definitions was primarily due to their failure to take the syntax, or structure, of definitions into account. Their errors could be best characterized as selecting a salient fragment of the definition as representing the meaning of the whole word.

There are two metalinguistic dimensions to these errors. One is a lack of sensitivity to syntactic structure. In analyzing think-aloud protocols of children attempting to integrate information from definitions with sentences containing the word defined, Scott (1991) found a common problem was failure to take part of speech into account. It wasn't clear whether the failure was in the analysis of the sentence, or in the analysis of the definition, but lack of attention to syntax was obviously a major factor.

Another aspect of metalinguistic awareness involved in children's understanding of definitions has to do with their concept of definition. Fischer's (1990; 1994) investigation of German high school students' use of bilingual dictionary definitions suggested that the students approached the task with the expectation of finding simple synonyms. It may be natural for students of a second language as similar to their first as English is to German to expect one-to-one mappings

between words. Language instruction may contribute to such expectations. However, true synonyms are rare, both within and between languages.

The Concept of Word

We have just described some of the ways that metalinguistic awareness contributes to students' independent word learning—their use of word parts, context, and definitions. However, metalinguistic awareness contributes to vocabulary learning at an even more fundamental level. Almost any conceivable vocabulary activity requires children to talk and think about words and their meanings; that is, it presupposes the metalinguistic concept of word. This concept is more complex and more problematic than is commonly recognized. In fact, research on the acquisition of this concept suggests that, even in the middle elementary grades, it cannot be taken completely for granted.

Roberts (1992) documented the gradual nature of children's development of the concept of *word*. Five-year-old preschoolers have trouble dissociating a word from its referent; when asked which is the bigger word, *caterpillar* or *dog*, they will usually answer *dog*. In Roberts's study, even third-grade students were not all at ceiling in her measures of their understanding of the concept of word.

Bowey and Tunmer (1984) pointed out that there are three requirements for full awareness of the concept of word: (a) awareness of the word as a unit of language, (b) awareness of the word as an arbitrary phonological label, and (c) comprehension of the metalinguistic term *word*. In a review of research on metalinguistic awareness, Gombert (1992) argued that there is no clear evidence for the existence of these abilities before the age of 7 years (p. 80). Likewise, there is evidence that some of these requirements are not fully present in children up to the age of at least 10. Piaget (1926) claimed that children did not recognize words as a simple sign (i.e., as an arbitrary label) until the age of 9 or 10. Berthoud-Papandropolou (1980; cited in Gombert, 1992), investigating children's ability to segment sentences into words, concluded that children younger than 11 did not consistently reach 100% accuracy.

Understanding the Function of Vocabulary in Decontextualized Language

The language young children most commonly experience is contextualized—that is, it is language about, and embedded in, a shared context. In a face-to-face conversation, the speakers share a physical context, use gesture and intonation, and make many assumptions about shared knowledge, experiences, and beliefs. They are able to communicate effectively in words that would not necessarily be understood by someone who had access only to a transcript of the conversation. Written language—and especially language written for an audience not present and not personally known to the writer—tends to be decontextualized; that is, the success of the communication relies more heavily on the language itself, and less on shared knowledge or context (Snow, 1991, 1994). What contextualized language accomplishes through gesture, intonation, and allusions to shared

knowledge and experiences, decontextualized language must accomplish primarily through precision in choice of words (Chafe & Danielewicz, 1987). This is one of the reasons why written language, which is typically decontextualized, tends to use a far richer vocabulary than oral language, which is typically contextualized (Hayes, 1988).

Not all oral language is contextualized. Storytellers use language to create a world distinct from the here-and-now context, in which the language alone carries most of the communicative burden. But many children, especially if they have not been read to very much, may come to school having had relatively little experience with decontextualized language. Not surprisingly, facility with decontextualized language is related to children's reading ability (Snow, 1991, 1994; Snow, Cancino, Gonzales, & Shriberg, 1989).

Because decontextualized language contains richer vocabulary, exposure to such language is important for children's vocabulary growth. However, we would like to suggest that children's vocabulary growth is benefited not just by exposure to decontextualized language, but by an appreciation of the role that vocabulary plays in such language. Precision of word choice is seldom crucial in everyday conversation, but it is the primary communicative tool of the writer. The motivation to learn the richer vocabulary of decontextualized language may depend on a student's feel for the difference between the communicative strategies of speakers and writers. Scott, working with a group of teacher-researchers, found that conscious attention to words and word choice helped students' writing, led to critical analysis of authors' writing, and changed the way teachers taught both reading and writing (Scott, Asselin, Henry, & Butler, 1997; Scott, Blackstone, Cross, Jones, Skobel, Wells, & Jensen, 1996; Scott, Butler, & Asselin, 1996; Scott & Wells, 1998). Research on the long-term impact of such instruction on students' vocabulary growth is still needed.

Conclusion

Any type of learning, if examined closely enough, looks so complex that one wonders how children can do it at all. In this chapter, we have tried to convey some of the complexity of the processes involved in vocabulary acquisition.

For many children, of course, vocabulary growth appears to proceed with astonishing ease and rapidity. Beck and McKeown (1991), comparing previously published figures, estimated that average children learn words at a rate of something like 2,500 to 3,000 words a year. More conservative accounts put the figure at 1,000 words a year (Goulden, Nation, & Read, 1990; D'Anna, Zechmeister, & Hall, 1991). We have argued elsewhere at length (Anderson & Nagy, 1992; Nagy, 1998) why we consider these latter estimates unrealistically low. Anglin (1993) conducted a major study of children's vocabulary growth between first and fifth grade that helped clarify the nature of the differences between conflicting estimates. Given a conservative definition of vocabulary—counting only root words—Anglin found a rate of growth identical to that reported by Goulden et al. (1990) and D'Anna et al. (1991). However, using a more inclusive concept of “psychologically basic vocabulary”—including, for example, idioms and derived

words for which there was no evidence that children used morphological analysis—Anglin (1993) arrived at an estimate in the range suggested by Beck and McKeown (1991). In their commentary on Anglin’s work, Miller and Wakefield (1993) argued that Anglin’s figures should be doubled.

Regardless of exactly where the truth lies within this range of estimates, we are left with a paradox. At least some children learn 2,000 or more new words per year, most of these apart from explicit instruction. Is the complexity and difficulty of the vocabulary acquisition processes presented in this chapter illusory?

We believe not. The high rates of vocabulary growth seen in many children occur only through immersion in massive amounts of rich written and oral language. Students who need help most in the area of vocabulary—those whose home experience has not given them a substantial foundation in the vocabulary of literate and academic English—need to acquire words at a pace even faster than that of their peers, but by no means do they always find this process easy or automatic.

Vocabulary researchers concerned with second language learning have argued that “natural” vocabulary acquisition is simply not efficient enough to produce the desired rates of learning. Natural context is not an especially rich source of information about word meanings. If there are particular words one wants a student to learn, free reading is perhaps the least effective means available. However, presenting students with more concentrated information about words introduces another set of difficulties. We have outlined two major categories of such difficulties in this chapter. The first is the complexity of word meanings. Definitions, the traditional means of offering concentrated information about words to students, do not contain the quantity or quality of information that constitutes true word knowledge. Students can gain some word knowledge from definitions, but generally only if they are given other types of information about the word (e.g., examples of how it is used) and opportunities to apply this information in meaningful tasks (Stahl, 1986; Stahl & Fairbanks, 1986). Some types of words (e.g., verbs and abstract nouns) may be more difficult to learn from definitions than others (e.g., concrete nouns).

A second major type of difficulty is the metalinguistic sophistication that is presupposed by most vocabulary-related school tasks. Vocabulary activities at every grade level require metalinguistic abilities and awareness that cannot be taken for granted on the part of students. In the early elementary grades, even fundamental concepts about words as units of form and meaning are still in the process of being consolidated. Independent word learning strategies rely on metalinguistic knowledge that is still developing during the upper elementary grades.

A recent study on the development of phonemic awareness (Scarborough, Ehri, Olson, & Fowler, 1998) shows that this aspect of metalinguistic awareness, which impacts the earliest stages of formal reading instruction, does not appear to reach a ceiling among college students. Given the complex nature of word knowledge, we feel safe in predicting that the various aspects of metalinguistic awareness involved in word learning will not be fully present even in many adults.

We believe that the role of metalinguistic awareness in vocabulary growth offers a promising area for future research. Although there is substantial research support for the broad outlines of the picture of vocabulary processes that we have drawn in this chapter, there are also large areas of uncharted territory. Roberts's (1992) article on children's development of the concept of word is one of the few examples of research explicitly addressing the metalinguistic foundations of vocabulary learning in the literature on literacy research. No one, to our knowledge, has addressed the effects of varying levels of metalinguistic awareness on children's ability to profit from different types of vocabulary instruction or from different types of information about words. There is also need for research examining the effects of instruction that fosters word consciousness on students' vocabulary growth.

If students are to become active and independent learners in the area of vocabulary, they need to have some understanding of the territory that they are operating in. Such an understanding depends on explanations by teachers who themselves have some grasp of the complexity of word knowledge. Students' understanding of words and of the word learning process also depends on the type of vocabulary instruction they experience. A diet of synonyms and short glossary definitions runs the danger of failing to produce usable knowledge of those words, and creates simplistic beliefs that can interfere with future word learning. The quality of vocabulary instruction must therefore be judged, not just on whether it produces immediate gains in students' understanding of specific words, but also on whether it communicates an accurate picture of the nature of word knowledge and reasonable expectations about the word learning process.

QUESTIONS FOR REFLECTION

1. What are the potential dangers of a traditional mode of vocabulary instruction in which teachers assign definitions and students learn them?
2. How does morphological and syntactic awareness contribute to vocabulary growth?
3. How does decontextualized language improve children's vocabulary growth?

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