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Chapter 12

In Pursuit of an Effective, Efficient Vocabulary Curriculum for Elementary Students

Elfrieda H. Hiebert
University of California, Berkeley

She ran and she ran, until the blizzard became a whiteout. Then she could run no more. While Mick and the team took refuge in Galena, seven hours ahead, Akiak burrowed into a snowdrift to wait out the storm.

In the morning the mound of snow came alive, and out pushed Akiak.

—Blake, 1997

This 52-word excerpt contains 3 of the 22 words that are targeted for vocabulary instruction of the text *Akiak* (Blake, 1997) in the teacher's edition that accompanies the fourth-grade textbook of a basal reading program: *refuge*, *burrowed*, and *whiteout*. All three words appear only once in the story and in the entire fourth-grade program. Not only do these words occur infrequently in the program but also they are unlikely to occur with any frequency in typical instructional texts. According to Zeno, Ivens, Millard, and Duvvuri's (1995) analysis of 17.25 million words of school texts, *burrowed* and *whiteout* would be expected to appear less than once per one-million-word corpus and *refuge* three times. Of the 24 words that are highlighted for vocabulary instruction of this text in the teacher's edition, 11 would be expected to have one or fewer appearances per one-million-word corpus of school texts from kindergarten through college. Furthermore,

the number of rare words in this text is not limited to those that have been chosen for instruction. Within this 52-word sample, there are five additional words of this type: *blizzard*, *Galena*, *mound*, *snowdrift*, and the title and name of the protagonist of the story, *Akiak*.

This text illustrates the vocabulary demands that face American students. Nagy and Anderson (1984) estimated the number of distinct words in school texts used in Grades 3 through 9 to be approximately 88,500 different words and, according to Zeno et al. (1995), an additional 70,000 different words are part of the corpus of texts in Grades 10 through college. Which of these words should be taught? Is the choice evident in this teacher's edition to address rare words the appropriate one?

This chapter proposes that vocabulary curricula need to be derived from principles that are grounded in research and theory, if the many American students at or below basic standards on state and national tests (Donahue, Finnegan, Lutkus, Allen, & Campbell, 2001) are to read at acceptable levels. In this chapter, such principles are identified and applied. The current principles are not proposed as the only basis for a vocabulary curriculum. However, the feature of this chapter that is proposed as invariant is the application of a set of theory- and research-based principles to defining vocabulary curricula, especially when the recipients of those curricula are the students of an entire state or, in the case of textbook programs, students across the country.

The principles that are the focus of this chapter are aimed at identifying an "effective and efficient component" of a vocabulary curriculum for Grades 1 through 4. "Effective" in the phrase refers to a vocabulary curriculum that ensures experience for elementary students with words that are unknown to them but that account for a significant portion of texts in Grades 5 and beyond. "Efficient" refers to the emphasis in this curriculum on words that have the widest possible application within texts, such as words that are in semantic families with many members. Finally, "component" is an important part of this goal in that this curriculum is regarded as part of a larger vocabulary curriculum, not the entire vocabulary curriculum, in Grades 1 through 4.

THE UNDERLYING PRINCIPLES OF THE CURRICULUM

An Effective Vocabulary Curriculum

The authors of the textbook program from which the excerpt that introduced this chapter came have chosen to direct teachers' instruction to rare words and fairly common words. In addition to the 11 rare words

that were previously mentioned, 8 of the other 13 instructional words have frequencies of 100 or more per one million word corpus. Only a handful of the words are in the in-between range that Beck, McKeown, and Kucan (2002) have described as part of literate, written discourse. The words that Beck et al. have described as part of written discourse are illustrated in the following text that comes from the first unit of a second-grade science text: "Pollen, a powdery material, is made by one part of the flower. Pollen is needed to make seeds form." (Badders, Bethel, Fu, Peck, Sumners, & Valentino, 2000).

If students do not understand words such as *material*, *form*, and *part*, they may have difficulty understanding words that are likely new to second graders: *pollen*, *powdery*. The words *material*, *form*, and *part* occur with substantial frequency in written language: 153, 384, and 694 times per million-word corpus, respectively (Zeno et al., 1995). Young children do not necessarily know the meanings of these three words. According to Dale and O'Rourke (1981), the percentages of fourth graders—the youngest students in their study—who identified the chief meanings of *part* and *form* from several choices were 81% and 77%, respectively. The meaning of *material* was even more difficult, recognized by 91% of sixth graders but less than 67% of fourth graders. In the content areas, the meanings of such words are assumed and so it is not surprising that the teacher's edition of this science text does not direct teachers to attend to the words *material*, *form*, and *part*. An effective vocabulary curriculum is defined as one where the words that are used most often in literary and content area texts are taught—words such as *form*, *material*, and *part*.

The current interest was to establish an effective vocabulary through fourth grade. As has frequently been recognized (Chall, Jacobs, & Baldwin, 1990), Grade 4 is a watershed in students' reading. The gap between the students who are reading well and those who are not is evident at this point. In an analysis of the Degrees of Reading Power readability system, Zeno et al. (1995) provided evidence of the demands on fourth graders. If 12th-grade vocabulary is considered as constituting 100% of a word corpus, fourth-grade texts demand that students know about 84% of the vocabulary. From Grades 4 through 10, the increase in the percentage of the total vocabulary is approximately 9% and from Grades 10 to 12 the final 7%. In all likelihood, these increases from Grades 5 through 10 and from Grades 10 to 12 are in the specialized vocabularies of content areas. However, to learn this specialized vocabulary, students need to have acquired the foundational vocabulary by the end of Grade 4. An effective curriculum for the elementary years from Grades 1 through 4 should support students in acquiring the foundational vocabulary that accounts for a substantial portion of academic, written discourse.

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federal). Furthermore, instruction is needed on strategies for figuring out the rare but context-rich words of literature such as *rambunctious* and *forlorn*.

METHOD: IDENTIFYING THE WORDS OF AN EFFECTIVE, EFFICIENT CURRICULAR COMPONENT

The process of identifying words for the proposed vocabulary curriculum occurred in two phases. The first was to identify the overall corpus that would be the focus of the curriculum; the second was to identify words within this overall corpora for inclusion in a vocabulary curriculum for Grades 1 through 4.

Choosing the Overall Corpus

Before designating particular words that might be taught, the overall corpus that underlay the vocabulary curriculum needed to be established. Decisions also needed to be made as to which portions of the corpus would be addressed.

Selecting a Database. With an underlying assumption that an elementary curriculum should address words that occur with frequency in written discourse, a search was conducted of studies that summarize word frequencies in written discourse. Beginning with Thorndike (1921), periodic efforts have been made to establish the words in texts read by children and adults. The most comprehensive and recent list of the frequencies of words in written text is that of Zeno et al. (1995). Zeno et al. established the U function of 150,000 words from a corpus of 17.25 million words that came from texts used in educating kindergarten through college students. The U function indicates the number of times a word appears per one million words of written discourse. Zeno et al. (1995) grouped words by U functions of 30,000, 10,000, 3,000, 1,000, 300, 100, 30, 10, 3, 1, and less than 1. Data on the number of words that share a U function, the proportion of total words for which the group accounts, and the proportion of the total word corpus accounted for by a single word within a group appear in Table 12.1. Inasmuch as Zeno et al. (1995) included college texts with highly specialized vocabularies in their analyses, it is not surprising to find that their list includes a higher percentage of words with frequencies less than 1 than was the case in the Carroll et al. (1971) analysis that had a smaller range of grade-level text (third through ninth grades).

Designating the Scope of a Curriculum From Grades 1 Through 4. Individual texts would not be expected to have profiles such as the one in Table 12.1. That is, a particular text at a particular grade level is unlikely to

TABLE 12.1
Definition of Word Zones

<i>Word zone</i>	<i>Appearances in 1 million words</i>	<i>Words per zone</i>		<i>Proportion of total of 1-million-word corpus</i>	<i>Single word's contribution to total corpus (%)</i>
		<i>New words</i>	<i>Cumulative</i>		
0	30,000	1	1	.07	7
	10,000	7	8	.21	2
	3,000	30	38	.37	.5
	1,000	69	107	.48	.16
1	300	203	310	.57	.04
2	100	620	930	.67	.02
3	30	1676	2606	.74	.004
4	10	2980	5586	.79	.002
5	3	5654	11240	.82	.0005
	1	8228	19468	.87	.0006
6	.99 and fewer	135473	154941	1.0	.0001

have 67% of its words with frequencies of 100 or more, 7% with words with frequencies of 30, and so on. But what words might be expected to be prominent in Grades 1 through 4?

To establish the vocabulary that accounts for a substantial portion of fourth-grade texts, released versions of the standards-based tests of three of the United States' four largest states¹ (Texas, New York, and Florida) and the 2002 National Assessment of Educational Progress (NAEP) were analyzed. The aim was to establish the group of words within these levels or zones that account for 90% of the vocabulary on these tests. Ninety percent was chosen because this level has typically been viewed to be the minimal level required for meaningful reading (Clay, 1985). In the frustration, instruction, and independent levels of Betts (1946), 90% designates the lower end of instructional level. Kuhn & Stahl (2003) have suggested that readers who can recognize 9 out of 10 words in a text automatically should have sufficient resources to use context to figure out the one unknown word in 10.

The results of the analysis of the passages on the fourth-grade assessments are summarized in Table 12.2. The data indicate that the three state tests and the NAEP have remarkably similar characteristics. An average of 92% of the unique words on all three state tests and the NAEP assessment

¹Sample items or passages from the standards-based assessment of America's largest state, California, are not available to researchers or teacher educators.

TABLE 12.2
Percentages of Unique Words in Word Zones:
Three Primary States and NAEP

<i>Word zone</i>	<i>FCAT, 2003</i>		<i>NY State, 2003</i>		<i>TAKS, 2003</i>		<i>NAEP (2002)</i>		<i>Average per zone(s)</i>
	<i>Cumulative</i>		<i>Cumulative</i>		<i>Cumulative</i>		<i>Cumulative</i>		
0-2	67	67	72	72	70	70	80	80	72.3
3	16	83	12	84	10.5	80.5	7	87	11.1
4	8	91	8	92	11	91.5	6	93	8.3
5	8	99	5.5	97.5	6	97.5	6.5	99.5	6.5
6	1	100	2.5	100	2.5	100	.5	100	1.6

was accounted for by words with U functions of 10 appearances or more per one million-word corpus. In light of this consistency across large-state assessments and the NAEP, it could be argued that the most effective curriculum through fourth grade consists of words with frequencies of 10 or more per million words of text.

Within a curriculum that moves fourth graders to proficiency with this corpus of words, words with particular U functions will be referred to as *word zones*. A first choice in establishing word zones was to exclude the first 107 words that have U functions of 1,000 or more from the developmental vocabulary curriculum. These words are ones that serve grammatical functions in written discourse (e.g., *the, of, and, a*) and, although first graders may be able to recognize them, most first graders (as well as proficient adult readers) may be hard-pressed to define these words. However, fluency in recognizing these words automatically is required for the initiation of a vocabulary curriculum. For lack of a better label, this zone will be identified as "0."

Vocabulary instruction would begin with word zone 1—those words that appear 300 times per 1 million words. This word zone is proposed as the target for instruction in Grade 1. Each subsequent frequency group is described as a word zone with the number of its corresponding grade level. By the fourth word zone (corresponding to Grade 4), approximately 80% of the entire word corpus through college (Zeno et al., 1995), 90% through ninth grade (Carroll et al., 1971), and approximately 92% of the words on the standards-based tests of prominent states and on the NAEP are accounted for.

The words with frequencies less than 10 occurrences per 1 million words are not a focus of the Grades 1 through 4 developmental curriculum. The numbers that correspond with these two zones—5 and 6—are not meant to

imply a focus for a particular grade. Hopefully, specialized vocabularies that are represented in these word zones would be taught in Grades 5 and above. The current work aims to establish a vocabulary curriculum that will support fourth graders in reading content area and literary texts with sufficient knowledge of frequent words to leave enough cognitive resources for figuring out unknown words.

Identifying the Target Words Within the Word Zones

The analysis of tests supported attention to particular zones of words. The next step was to establish which words within these zones should be the focus at a grade level. Two criteria were applied in establishing the appropriateness of words for instruction: (a) their semantic connections and (b) their known-ness to students at particular grade levels.

Semantic Families. The 5,586 words from zones 1 through 4 were analyzed for semantic families. To establish these semantic families, Nagy and Anderson's (1984) categorization scheme was used. In their investigation of the number of distinct words in printed English using the Carroll et al. (1971) word list, Nagy and Anderson (1984) developed a set of categories of semantic relatedness. These categories were formed to answer the question, "Assuming that a child knew the meaning of the immediate ancestor, but not the meaning of the target word, to what extent would the child be able to determine the meaning of the target word when encountering it in context while reading?" (Nagy & Anderson, 1984, p. 310).

Target words and their immediate ancestors from the 5,586 words are given in Table 12.3 for each of Nagy and Anderson's six categories. In their first category, a target word's meaning can be established immediately, if the ancestor of the family is known. The sixth and final category on Nagy and Anderson's (1984) semantic relatedness scale is described as having "no discernible semantic connection; the meaning of the immediate ancestor is of no use in learning or remembering the meaning of the target word" (p. 311). They classify the first three categories as semantically transparent and the last three as semantically opaque. The former refers to relationships where meaning of an unknown target word can be accurately ascertained based on knowing a related word, whereas the latter refers to relationships where the meaning of the unknown word is sufficiently different that the meaning of a known word is not useful or even distracts from the appropriate meaning. The current aim in identifying a first- through fourth-grade curriculum was to stay in the "semantically transparent" set of categories (Nagy and Anderson's first three) rather than semantically opaque (their last three).

The first clustering of words into semantic families was on the basis of inflected endings. Whereas the focus of the semantic relatedness categories is

TABLE 12.3
Examples of Target Word and Immediate Ancestor
for Six Categories of Semantic Relatedness¹

	<i>Target Word</i>	<i>Immediate Ancestor</i>
0	automatically achievement	automatic achieve
1	Sunshine, sunlight, sunset shiny	sun shine
2	knowledge everyday	know every
3	password visualize	pass visual
4	apartment artificial	apart artifice
5	prefix peppermint	fix pepper

¹These categories were first identified by Nagy and Anderson (1984).

on suffixation, prefixation, and compounds of root words, inflected endings account for a substantial number of the members of semantic families. To establish semantic relatedness among words with suffixes, prefixes, and compounds of root words, meanings were confirmed with the Merriam-Webster Online Dictionary (2002). Although the aim was to stay with semantic families where connections across members were semantically transparent, the connections across words can become complex. The difficulties are evident in Nagy and Anderson's (1984) acknowledgement that "exact agreement on the 6-point scale was not achieved" (p. 312). Even in sorting between the two general categories of transparent and opaque, Nagy and Anderson (1984) reported an agreement level of 76.6%. Whereas each of the members of a semantic family is tied directly to the root word, connections between pairs of words in families can be less transparent. Take, for example, words related to *vision*. Nagy and Anderson give *visual* (ancestor) and *visualize* (target word) as illustrating semantic category 4—where the meaning of the target item includes semantic features that are not inferable from the meaning of the immediate ancestor without substantial help from the context. Although *visualize* is not among the 5,586 words, *visual*, *vision*, *visible*, and *invisible* are. All of these words are defined in relation to *vision* by Merriam-Webster (2002). Consequently, all of these words

are clustered into the same semantic family, even though the connection between *visual* and *visible* is not as transparent as that, for example, between *visual* and *vision* or between *vision* and *visible*.

A semantic family was assigned to the zone in which the first member of the family appeared. For example, *continued* appears in zone 2, whereas *continue* appears in zone 3. The latter is the ancestor of the former. However, the semantic family with these words (and others) was assigned to zone 2.

Word Known-ness. The vocabulary curricula of basal reading programs have been criticized as addressing known words (Beck et al., 2002). To ensure that the current curriculum was the most effective one possible, a measure was needed to establish "known-ness" of words. A chapter on defining a vocabulary curriculum should not be proposing the addition of new words to the lexicon. However, the various words that have been proposed to describe the construct of children's grasp of a word's meaning (e.g., familiarity, knowledge, understanding) do not convey the emphasis on words that students already understand. Consequently, the word *known-ness* is used to describe students' knowledge of word meanings.

To establish the appropriate range of "word known-ness," the key words from semantic families were vetted through two procedures: (a) eliminating words that are known by the overwhelming majority of a grade cohort and (b) moving words from a zone where they may be too difficult for grade-level students to an appropriate zone.

The Dale and O'Rourke (1981) *Living Word Vocabulary* (LWV) and Biemiller and Slocum's (2001) adaptations of it were used as resources for both procedures. The methods whereby the LWV was developed and the time frame within which it was validated make the LWV a less-than-ideal resource for use with students in the early part of the 21st century. At the present time, however, the LWV is the only comprehensive, existing database on students' familiarity with word meanings. It consists of 44,000 word meanings that have been assigned to grade levels based on at least 67% of a grade-level cohort correctly identifying a word's meaning from three choices. Dale and O'Rourke (1981) gathered information on students from grades 4, 6, 8, 10, 12, and young adults. Words that were recognized by more than 80% of an age cohort were given to students at the next lower grade level. As fourth graders were the youngest students tested, the words in the sample—11%—that were known to this group were assigned a Level/Grade 4 rating. Biemiller and Slocum (2001) identified these words as a Level 2. Biemiller and Slocum (2001) examined a small percentage of words from Level 2 with students ranging from kindergarten through sixth grade. Of the 20 Level-2 words that were tested, 80% or more of second graders knew half of the words. Even 80% of the first-grade cohort knew a quarter of the Level 2 words.

In addition to procedures used to establish the LWV, issues of cultural specificity of words for particular age cohorts and economic and linguistic groups leave numerous questions about the LWV. A word that was known by 69% of sixth graders according to Dale and O'Rourke (1981)—*shot*, as in an injection—was known by 83% of first graders and 94% of second graders in the Biemiller and Slocum (2001) sample. Other words may be specific to time periods, such as these words on the Dale-Chall (Chall & Dale, 1995) list: *boxcar* and *tiddlywinks*. Both words achieve Biemiller and Slocum's (2001) Level 2 status by virtue of being known by 80% of fourth graders that were sampled by Dale and O'Rourke (1981) over the two decades that preceded its initial publication in 1976.

Because of shortcomings in the LWV system, an additional resource was used for decisions of inclusion or exclusion on grade-level lists in the present study: The Ginn Word Book for Teachers (GWBT; Johnson & Moe with Baumann, 1983). To develop a listing of 9,000 words in the GWBT, Johnson et al. (1983) developed a composite rating of a word based on (a) word frequency in middle-grade texts (based on the Carroll et al. [1971] list), (b) word frequency in popular trade books for primary grades, and (c) words in the speaking vocabularies of first-grade students. These composite ratings were used to rank words and from these rankings, words were assigned to grade-level groups. For example, whereas the word *form* in zone 1 has a LWV rating of 77% for fourth graders, the GWBT places this word in the first half of Grade 1. As the GWBT is based on word frequencies through ninth grade (Carroll et al., 1971), primary-level trade books, and speaking vocabularies of first graders, this verification indicates that it is a word that has some applicability to first graders.

The percentages on the LWV were assigned numbers on a scale with the same number of points as the GWBT: 23. Category 1 encompassed ratings of 96% and higher at fourth-grade level on the LWV, and each subsequent point represented a span of five percentage points. The final point of 23 represented words that had ratings of 94 or lower at Grade 10 on the LWV.

A summary score was established by dividing the sum of the LWV and GWBT scores. The ranges for the word zones/grade levels were as follows: (a) Zone 0/Primer: 1–3; (b) Zone One/Grade 1: 4–6; (c) Zone Two/Grade 2: 7–11; (d) Zone Three/Grade 3: 12–14; and (e) Zone Four/Grade 4: 15–17. For example, the word *form* had a sum of 4.5 (5 for the 77% Grade 4 LWV rating plus the 4 rating in the GWBT). This meant that the word remained in zone 1, where the first member of the family appeared. Words with scores that were more than one level below a grade-level range (e.g., 5 for words in zone/grade 2) were eliminated, while words with ratings that were more than one level above a grade-level range (i.e., 13 for zone/grade two) were moved to the next word zone. The numbers of words within a particular zone/grade, those that were eliminated, and those that were moved to dif-

ferent word zones appear in Table 12.4. Table 12.5 provides examples of words from each of the four target word zones.

RESULTS: DESCRIBING THE VOCABULARY CURRICULUM

The summary of numbers of words in Table 12.4 and the illustrated words in Table 12.5 support several observations about the proposed vocabulary. The first observation pertains to the number of semantic families. Of the 5,586 words that are likely to appear 10 or more times per one-million-word corpus, approximately 10% represent a cluster of semantic relatedness within the corpus and are sufficiently unknown to a critical portion of an age cohort to merit instruction. Approximately 550 words taught over the course of four grades would seem to be a doable task, in light of previous projects (e.g., Baumann, Edwards, Boland, Olejnik, & Kame'enui, 2003; Beck, McKeown, & McCaslin, 1983). As the distribution indicates in Table 12.4, the numbers of words that need to be taught differ for different grade-level groups. At Grades 1 and 2, when children are developing the fundamental fluency that serves as the foundation for their reading, the number of words that require direct, varied, and rich instruction is substantially lower than in Grades 3 and 4. In Grades 3 and 4, the chief reading task changes from fluency building to vocabulary building. At this point, the number of words that require direct, varied, and rich instruction increases substantially.

A second observation is that each of these semantic groups accounts for, on average, 3 words in the 5,586 most-frequent words in kindergarten through college texts. That is, instruction in the 538 words of this designated vocabulary curriculum will address approximately 30% of the 5,586

TABLE 12.4
Curriculum Focus Words and Sources

<i>Word zone & grade</i>	<i>Total words</i>	<i>Semantic families</i>	<i>Semantic families with 2+ members</i>	<i>Unknown semantic families</i>	<i>Carryover</i>	<i>Zone-focus words</i>
1	203	160	124	49	8 to Zone 2; 1 to Zone 3	40
2	620	231	221	76	18 to Zone 3	86
3	1676	840	612	250	20 to Zone 2; 24 to Zone 4	225
4	2980	1233	332	163		187

TABLE 12.5
Illustrations of Words Within the Four Target Zones/Grades

<i>Word Zone/Grade</i>	<i>Words within Zone/Grade</i>
1	body
	important
	form
	believe
	example
2	nature
	scientists
	behavior
	considered
3	section
	defense
	express
	sample
	style
4	managed
	exposed
	minor
	tense
	associated
	merchandise

most-frequent words. Furthermore, these are words that have meanings that at least a core group of students are likely *not* to know.

Third, many of the words have a high level of utility across the texts of several content areas. As part of their database, Zeno et al. (1995) provided a dispersion index that indicates the level to which a word appears across texts from different content areas. Altogether, texts from nine content areas were sampled in their corpus—language arts and literature, social science, science and math, fine arts, home economics and related fields, trade and technical fields, health and safety, business, and popular fiction and nonfiction. A word that appears in numerous content areas, such as *fact*, has a dispersion index of .99. Because of Zeno et al.'s (1995) sampling procedure (a relatively small sample of texts from numerous grade levels across numerous content areas), those words that appeared frequently would be

expected to have high dispersion indexes. This pattern was confirmed. Only a few words with frequencies of 10 or more per one-million-word corpus had lower dispersion indexes. These words are important but specific to a particular content area such as *acid*, a zone 3 word, with a dispersion index of .65 and *government*, a zone 1 word, with a dispersion index of .71. On average, however, words with appearances of 10 or more per one-million-word corpus had dispersion indexes of .88. That is, the words in this curriculum have high utility across content areas.

This utility across content areas also means that the majority of words have a range of meanings, often specific to particular content areas. For example, the word *style* in zone 3 is fairly typical of the group. It has 12 meanings, including ones that are part of literary language (distinction; manner; current fashion) and content areas (the part of a carpal between the stigma and ovary in botany; a projection on some insects in zoology; and a particular manner of dealing with spelling, punctuation in printing). Few of these meanings can be learned by a simple association with a known word. To understand these various meanings will not be a simple task.

Additional analyses are being conducted on the characteristics of these words such as parts of speech and imagery value. One characteristic of the words as a group that seems highly promising is the number of words that have a shared cognate with Spanish. Within a group of 50 words from the curricular list that were randomly selected, non-Spanish-speaking adults were asked to write the English equivalent of the word when given exposure to the Spanish word for a second (e.g., *aceptar/accept*, *horizonte/horizon*). They identified the corresponding English word for 53% of the corpus.

CAUTIONS, IMPLICATIONS, AND CONCLUSIONS

The proposed curriculum requires substantial validation before it can be established that it is, indeed, effective and efficient in increasing the reading comprehension of students in the middle grades. Caveats related to the principles that were chosen for this curriculum need to be addressed. But even with these caveats, the use of principles—the specific ones used in this project as well as others—should be the source of considerable discussion among policymakers and researchers. Furthermore, while the particular curriculum described in this chapter should be one of many, a set of guidelines can be useful to the many classroom teachers across the country who are aware that their students require vocabulary guidance that is substantially more disciplined than that which is currently available.

Cautions

A primary caution about the methodology that was used in establishing the effective, efficient vocabulary curriculum presented in this chapter was the criteria for known-ness. In particular, the systems available for establishing known-ness of words do not reflect the norms of early elementary students at the beginning of the 21st century. Both the Dale and O'Rourke (1981) and the Johnson et al. (1983) systems were developed with students and/or texts in the decades prior to an extensive immigration of speakers of languages other than English to American schools during the 1980s and 1990s. While the Dale and O'Rourke system has been examined with English-language learners to some degree (Biemiller & Slocum, 2001), numerous questions remain about the generalizability of this list to 21st-century students, especially those who speak Spanish as a native language. For example, native Spanish speakers may grasp the meanings of words where the common word in Spanish has a transparent Latin cognate for the English word more quickly than native English speakers.

Implications for Scholars

In choosing vocabulary for the elementary curriculum, a fundamental issue is the role of text in guiding the selection of vocabulary. The text excerpt that introduced this chapter is typical of literature where the number of rare words is high (Hayes et al., 1996). Literary writers, unlike those who write even the informational texts that are sold on the trade rather than textbook market (Duke & Kays, 1998), use many words a single time. When writers of narrative want to communicate a trait or an action of a character, they select words that are specific. This use of words by narrative writers is illustrated in the introductory excerpt from *Akiak* (Blake, 1997) where Akiak burrows into the snowdrift and pushes out of a mound of snow. The same nouns and verbs are not repeated as the writer selects words to communicate nuances of behavior or character traits.

Because an overwhelming portion of the texts of reading instruction consists of narrative literature from trade books (Duke, 2000; Hoffman, Roser, Patterson, Salas, & Pennington, 2001), the number of unique per total words is high in current textbook programs (Foorman, Francis, Davidson, Harm, & Griffin, in press). As is typical of narrative literature, an average of 40% of the unique words in the anthologies of first-grade basal programs appear a single time (Foorman et al., in press).

As the instruction of vocabulary has typically occurred as part of reading lessons and in connection with the reading textbooks, these characteristics of school texts have consequences for the vocabularies students are

acquiring. This observation does not mean that a vocabulary curriculum should be disconnected from the texts of instructional lessons. The first criterion for the words in the present effective and efficient vocabulary curriculum was their frequency in text. In that the "dispersion" index of the words was used to confirm the choice of words for the vocabulary curriculum, few words are used in a single content area. This frequency in literate, written discourse is also evident in the literature used in the basal reading programs. When an analysis was done of the texts of the first unit of a fourth-grade basal program, which included *Akiak*, the 5,538 words that were the basis for this curriculum accounted for 82% of the unique words. Although this percentage was lower than that of the texts on the state and national standards-based assessments, the most frequent words of a literate, written word corpus also account for a significant percentage of words in literature. The difficulty for attending to the multiple meanings and derivatives of high-frequency words such as *associated* and *tense* in literature is illustrated by the examples from *Akiak*. The high-frequency words are present, but the percentage of rare words in children's literature is higher than is typical of fourth-grade assessments. Rather than needing to be able to attend to 1 unknown word per 100, the literature—at least of this widely used basal program (Cooper et al., 2003)—requires students to be able to figure out 2 unknown words per 100.

The question is whether the texts of instruction, especially the narrative texts that are now common to basal reading programs, should drive the "explicit" vocabulary curriculum. An alternative is suggested in the report of the National Reading Panel (2000): "A large portion of vocabulary items should be derived from content learning materials" (pp. 4–25). Not only does vocabulary instruction with content text prepare students for the texts that can be challenging for many students (Chall et al., 1990) but, as Duke and Kays (1998) have shown, vocabulary representing critical concepts is repeated in informational text. This repetition is evident in the writing of Gail Gibbons, a well-known author of informational trade books. When the word *cultivated* is first introduced in *The Berry Book* (Gibbons, 2002), Gibbons repeats it several times: "Some berries are grown in gardens. They are called cultivated berries. Cultivated berries also are grown in nurseries and on farms. Cultivated berries are harvested in different ways (pp. 13–14).

Implications for Policymakers and Publishers

The proposed curriculum requires substantial validation with students before it can have widespread dissemination. However, policymakers and publishers can apply this work's aim of using a principled approach to select vocabulary for instruction. The principles of effectiveness and efficacy have a strong foundation in existing theory and research. Other principles may

well be applied. One such construct that has a substantial foundation in theory and research is semantic connections (Marzano & Marzano, 1988). Marzano and Marzano (1988) organized 7,230 words that are commonly found in elementary school texts. They grouped these words into 61 superclusters of meaning—tied together by a common theme such as transportation or location/direction.

A thematic construct such as that suggested by the Marzano and Marzano (1988) superclusters is presumably what underlies the selection of literature—and subsequently vocabulary—in the textbook program from which the illustration that introduced the chapter came (Cooper et al., 2003). The story *Akiak* (Blake, 1997) is in a theme entitled “Journeys” with three other texts: *Grandfather’s Journey* (Say, 1993), *Finding the Titanic* (Ballard, 1993), and *By the Shores of Silver Lake* (Wilder, 1939). Attempts to organize the 85 words that are highlighted for vocabulary attention in the teacher’s manual did not result in discernible semantic categories, either from the Marzano and Marzano (1988) clusters or other groupings. However, when the 1,009 unique words in this unit were reexamined and the 246 words from zones 3 and 4 in the proposed vocabulary (words with probable appearances of 10 and 30 within a one-million-word corpus) became the focus, 36 words were readily sorted into five semantic categories pertaining to journeys. The results of this activity appear in Table 12.6. In examining the categories and words in Table 12.6, the usefulness and potential power of such a scheme for student learning are evident.

TABLE 12.6
Vocabulary From a Fourth-Grade Basal Reading Unit:
Clustered According to Semantic Categories

<i>Subcategory of Journeys</i>	<i>Vocabulary Words</i>
Feelings people might have on journeys	Amazed, anxious, confused, alert, excited, frightened, brave, miserable, satisfied, dangerous
Actions that might be part of journeys	Explored, escaped, disappeared, struggling, rescued, arrived, greet, arrived, fidget
Places that people might travel over/see on journeys	Valley, trail, deserts, harbor, creek, hotel
Descriptions of perilous places that might be encountered on journeys	Rugged, towering, steep, descent, slopes
People who might be encountered on journeys	Conductor, passengers, survivors, crew, pilot

This scheme illustrates that many principles could drive a vocabulary curriculum. The critical perspective, however, is that a vocabulary curriculum have an apparent set of underlying principles based on theory and empirical validation. The principles from scholarship that publishers have used to specify vocabulary in their programs need to be unveiled and examined by users in states and districts. In the same vein, the standards of states that give publishers guidance in choosing vocabulary need to be revisited. Do state standards provide teachers and publishers sufficient guidance to implement a vocabulary curriculum that is effective and efficient? At the current time, the vocabulary standards of most states and published reading programs are vague and nebulous. If students are to read with expertise and interest in the middle grades and beyond, vocabulary curricula must be clear and defined according to a set of principles drawn from scholarship.

Implications for Teachers

Although the responsibility for identifying a core vocabulary should not be placed on the already heavily laden shoulders of classroom teachers, many classroom teachers will recognize the need and usefulness of an effective and efficient vocabulary curriculum. For those who cannot wait until state agencies and committees have identified principles and applied them to a vocabulary curriculum, three questions can guide the amount of time that teachers spend on particular vocabulary. The first question a teacher can ask in examining the critical vocabulary in a text is: Which unknown words might students know by association with known words? Graves (1984) hypothesized that there are many words for which students already have a concept. They simply do not have this particular label for the word. A simple association can be made to the new vocabulary when the known label is elicited. For example, two of the three words that are highlighted for vocabulary instruction from the text excerpt that introduced this chapter—*burrowed* and *whiteout*—can be treated in this manner. Students are familiar with the word *dig*, which defines *burrowed* in this context, while *whiteout* is easily defined in relation to a snowstorm. The word *refuge*, by contrast, could merit a more extended discussion. In the context of this text, *refuge* is used as a protected spot. The word is used in different content areas with sufficiently distinct meanings that this word and the derivative, *refugees*, could support the development of a rich vocabulary among students.

A second question is: Which words in the text have derivatives that are frequent in students' reading and writing? In considering the text that introduced this chapter, consider this sentence: "Six hours after Mick and the team had left, Akiak padded softly, cautiously, into the checkpoint." The word that is singled out for vocabulary instruction in this sentence is *checkpoint*, a word that occurs infrequently and can be identified through associa-

tion with the roots in this compound word. The word *cautiously*, on the other hand, is part of a family that has members that can be expected to appear frequently and in a range of subject areas: *cautious*, *caution* (-s, -ed, -ing), and *cautionary*. Furthermore, the reason for Akiak's cautionary approach merits discussion as part of the story.

Third, with which words might students need support because of the multiple meanings of the word? Again, drawing from the text *Akiak*, consider the following two sentences: "Screaming winds threw bitter cold at the team as they fought their way along the coast." and "'That old dog will never make it!' he laughed at Akiak across the biting wind." Neither *bitter* nor *biting* is targeted for vocabulary attention in the teacher's edition. Both words, however, are within zone 4 families (words that appear with frequencies of 10 to 29 times per one-million-word corpus). These two words are not members of the same semantic family, at least when the criterion is semantic transparency. However, they do have the same historical root and both have multiple meanings and are used across subject areas (their dispersion indices are .8). Both words deserve attention in this context because the author's use differs from their most common definitions. Furthermore, both words are used in numerous metaphors. Not only is *bitter* used to describe the attitude of characters in narratives but things are described as *bitter-sad* and someone waits until *the bitter end*. Similarly, several phrases use the word *bite*, as in *bite the bullet* and *bite off more than can be chewed*. Selecting vocabulary based on answers to these three questions can go a long way to developing a broad and also deep vocabulary.

Conclusions

Among the most pressing questions that empirical investigations of the proposed curriculum need to address is the nature of instruction that best supports learning of these words. The National Reading Panel (2000) summarized the need for both direct instruction and exposure to many, varied texts. The latter has been viewed as the means for incidental learning of vocabulary (Anderson, Fielding, & Wilson, 1988). Anderson et al. (1988) reported that the amount of vocabulary that fourth- and fifth-graders acquired through after-school reading of text was reflected in comprehension scores on school tests. The nature of fluency with complex and abstract words as a result of differing amounts of school reading has not been considered. Although after-school learning cannot be manipulated in school investigations, the amount of in-school reading can be. If the goal of a million words of reading (the amount of out-of-school reading done by Anderson et al.'s [1988] most prolific readers) is applied to school reading from Grades 1 through 4, students would have had exposure to the words on the target curriculum a minimum of 20 times each. This minimum number re-

flects the manner in which words in the curriculum were chosen: (a) only words with frequencies of 10 or more per million were addressed (through zone 4) and (b) only semantic families with two or more members were included. In that available research indicates that middle graders need to see words in texts from six to 12 times to use them knowledgeably, students will have had sufficient exposure to these words—many of which may require even more exposure because of their abstractness. How differing amounts of extended reading and of direct instruction affect students' understanding of the complex vocabulary that has been identified here should be a focus of future study. Yet, although many questions remain about this particular curriculum, there can be little question that systematic attention is needed to vocabulary curricula on state and national levels. If the trajectories of the substantial portion of American students who are not now reading at designated levels are to change, vocabulary instruction will need to be effective and efficient.

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