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Instructional design is an integral part of a balanced approach to teaching vocabulary instruction. The goal of this paper is to reflect on several lessons using research-based vocabulary strategies, and to present think-alouds that detail the steps in matching instructional design with those strategies in order to reach the learning outcome. Vocabulary instruction should encourage students to make associations and accommodations to their experiences and provide them with varied opportunities to practice, apply, and discuss their word knowledge in meaningful settings. The ultimate goal of teaching vocabulary is for the students to expand, refine, and add to their existing conceptual knowledge and enhance their reading abilities (Rupley, Logan & Nichols, 1999). Students should be engaged in learning new words and expanding their understanding of words through instruction that is based on active processing. A key component of effective vocabulary instruction is thoughtful reflection about instructional design.

THROUGH OUR RESEARCH, observations, and discussions with students and classroom teachers over the years, the primary strategy used for vocabulary instruction is to focus on the memorization of an arbitrary set list of words. The instructional features typically include looking up the definitions of words in the dictionary, doing some type of skill work (e.g., writing sentences, definitions, word find), and taking a test at the end of the week. We imagine that this method of vocabulary instruction will also sound familiar to the readers of this text and begs the important question: "What instructional strategies will better enable students to learn, retain, and use their vocabulary knowledge rather than memorize words for a test and seldom use the words thereafter?"

Vocabulary instruction is an integral component of teaching children how to read both narrative and expository text. Students who are successful at decoding can, and often do, struggle with comprehension when they encounter too many words for which they have limited or no meaning. Not having access to the meaning of words representative of the concepts and content of what they read causes difficulty in children's comprehension of texts, limits their ability to make a connection with their existing background knowledge, inhibits their capacity to make coherent inferences, and impacts their ability to reason (Heilman, Blair, & Rupley, 2002). As noted by Joshi (in press), vocabulary is the connecting link between decoding and comprehension. Vocabulary knowledge that is rich and well developed contributes significantly to fluent reading (Cunningham & Stanovich, 1997); however, poor vocabulary knowledge hampers reading comprehension and reading development (Pinnell, Lyons, Deford, Bryk, & Seltzer, 1994; Madden, Slavin, Darweit, Dolan, & Wasik, 1993).

Readers' experiential and conceptual backgrounds are crucial in vocabulary development. Background experiences are what the learners rely on to develop, expand, and refine concepts that words encountered in speech and print represent. Since individuals' background knowledge development is continuous, refinement, elaboration, and acquisition occur throughout their lives. Therefore, the vocabulary that reflects this background knowledge is also in an endless state of development (Readence, Bean, & Baldwin, 1998). Direct and vicarious daily experiences with concepts constantly modify meanings for words as new

information is associated into existing concepts for the word, or the new experience with the word may have to accommodate an adjustment or modification to the concept itself.

Learning either a new word, or concept for that word, requires an active process of vocabulary development. Students learn and process new words to the extent the new word relates to other words and concepts already known by them. Connections between previously learned vocabulary words and new words encountered in reading help students begin to understand relationships among words. When instruction is based on strengthening these connections, students are not just asked to provide an abstract definition of a word, but instead are asked to make connections between the newly encountered word, their past experiences, and how these past concepts fit with the stories and informational texts they are currently reading (Rupley, Logan, & Nichols, 1999). Knowing a word in the fullest sense goes beyond simply being able to define it or getting some basic meaning for the word from context, instead it means being able to discuss, elaborate and demonstrate the meaning of the word in multiple contexts in which the word occurs.

Researchers Goerss, Beck, & McKeown (1999) support the use of instruction that encourages students to make associations and accommodations to their experiences and provides varied opportunities for students to practice, apply, and discuss their word knowledge as a means for students to learn and retain new vocabulary. Students should be engaged in learning new words and expanding their understanding of words through instruction that is based on active processing. Students must go beyond just memorizing definitions, to integrating the word meaning with their existing knowledge in order to build conceptual representations of vocabulary in multiple contextual situations. As students expand their experiential and conceptual backgrounds, they expand and refine their knowledge of words.

Furthermore, when reading instructional design is paired with appropriate vocabulary strategies, learners can further refine their vocabulary knowledge based on these experiences. Instructional activities that visually display new words while at the same time

allowing students the opportunity to compare and contrast these new words to already known words can be a beneficial means for increasing students' vocabulary knowledge. Biemiller (1999) has noted that students can learn two to three new words a day when the instructional strategies are based on active processing and applied in context. For this reason, vocabulary strategies such as concept wheels, semantic word maps, webbing, semantic feature analyses, and teaching relationships among words are effective tools that incorporate many of the guidelines for the active processing of vocabulary.

Such vocabulary activities enable students to expand their vocabularies, understand relationships between the new word and existing concepts, and ultimately learn the meaning of the new word. These strategies when matched with the appropriate instructional design can become part of pre-reading activities, during reading activities, and post reading activities. When used as a pre-teaching activity these visual displays of words can activate and construct key concepts prior to reading, which help motivate and set a purpose for the reading task, while at the same time reinforcing the cohesiveness between vocabulary development and reading comprehension.

It is important that vocabulary instructional practices immerse students in language-rich activities that teach words as part of meaningful reading experiences. Vocabulary instruction that never allows students the opportunity to fully own new words, such as copying a list of words' definitions from a dictionary and flashcard activities provides no active or actual learning of the new concept associated with the word. Vocabulary instruction, whether it is focused on narrative or informational text, is most effective when it relates new words or derivations of words to students' existing vocabulary and background knowledge.

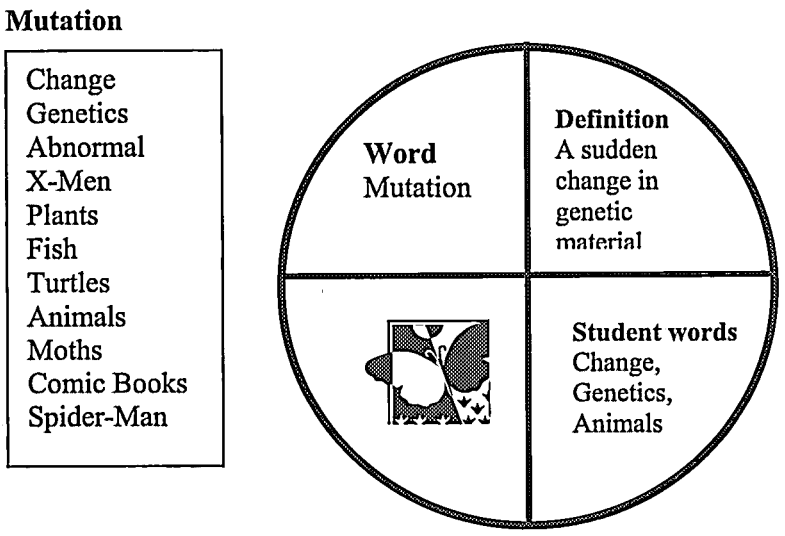
Using instructional guidelines that reflect active processing components (Blachowicz & Fisher, 1996; Blachowicz & Lee, 1991), we have attempted to walk through and think aloud how teachers might match instructional design with a vocabulary strategy in order to reach the learning goal. The following instructional techniques paired with an appropriate vocabulary strategy build on students' existing background

knowledge, encourage brainstorming and discussion and at the same time visually display the connection between previous conceptual knowledge and the new words being encountered. We will try to thoroughly describe and explain each of the strategies from the perspective of the classroom teacher.

Concept Wheels/Circles/Squares

Concept wheels provide students an opportunity to critically examine words and relate them conceptually to one another (Heilman, Blair, & Rupley, 2002; Rupley, Logan, & Nichols, 1999; Vacca & Vacca, 1999). This instructional procedure builds on students' background knowledge and stimulates brainstorming and discussion. When introducing this instructional vocabulary strategy to students, it is a good idea to have a pre-made list of the vocabulary words with space provided for brainstorming, and pre-made concept wheels that include a section for the vocabulary word, a section for the definition, a section for related words, and a section for the picture (Figure 1).

Figure 1. A Concept Wheel/Circle



The activity is best begun with a whole class focus and review of the content in which the new vocabulary words are located. Using the K of the KWL (Know, Want to Know, Learned) (Ogle, 1986), or another similar strategy, students should be asked to share everything they already know about the subject. For example if the unit was on adaptation and behavior, the teacher would start the lesson by asking students to share what they already know about adaptation and behavior as it relates to their science class.

Next, the teacher would provide the list of new vocabulary words to the students. Still in a whole class setting, the teacher would then allow students to brainstorm words that came to mind when they heard the new vocabulary word. For example, if the new science term were mutation, the teacher would ask the students to brainstorm everything that comes to mind when they hear the word mutation. The teacher then records the brainstorming session on the board or overhead. After about a minute per word of brainstorming, the students and teacher reflect upon the brainstormed list and the teacher directs a word sort activity. For example, because this is part of a science unit on adaptation and behavior, the teacher and students would organize the brainstormed words into two categories, words that seem to coincide to what the students already know about adaptation and behavior as it relates to science and words that seem to relate to something else. Using the example above (mutation), students might brainstorm words such as: change, genetics, abnormal, X-Men, fish, turtles, plants, comic books, etc. While all of these words may have something to do with mutation, certain words such as change, genetics, and abnormal seem to be critical to the understanding of mutation and words such as, fish, turtles, and plants, may be more relevant to the unit on science than words such as X-Men or comic books.

For some students the brainstorming activity provides the opportunity to activate their background knowledge around the new term. They make associations between the new word, and in many cases, already well-developed concepts regarding the word. For other students, such as struggling readers, it provides them with an opportunity to begin to accommodate and construct concepts in which the new term will be an additional component. For the students, who prior to brainstorming had

no idea about the word mutation, they now have an idea that it may have something to do with change in genetics, fish, turtles, plants and so forth. While the brainstorming is a critical part of this lesson, the concept wheel itself serves as a visual display in which the new vocabulary connections can be viewed and more correctly represented.

Once all of the words have been brainstormed and sorted, the teacher then provides the students with pre-made concept wheels with the word and definition already provided in two of the quadrants. Together the teacher and students examine the definition for the word and discuss how the brainstormed words fit the definition. Students then are instructed to complete their concept wheels by including words from the brainstormed list and a picture that will help them remember the definition of the new word.

Concept wheels can be modified in many different ways, for example instead of drawing a picture or listing words students can either create analogies, write sentences, use synonyms and antonyms, or some other technique that will help them make associations or accommodations for the new vocabulary word. The concept wheel can also be used as a review strategy by providing students with completed concept wheels and instructing them to add the new vocabulary terms to the completed organizer.

Semantic Word Mapping

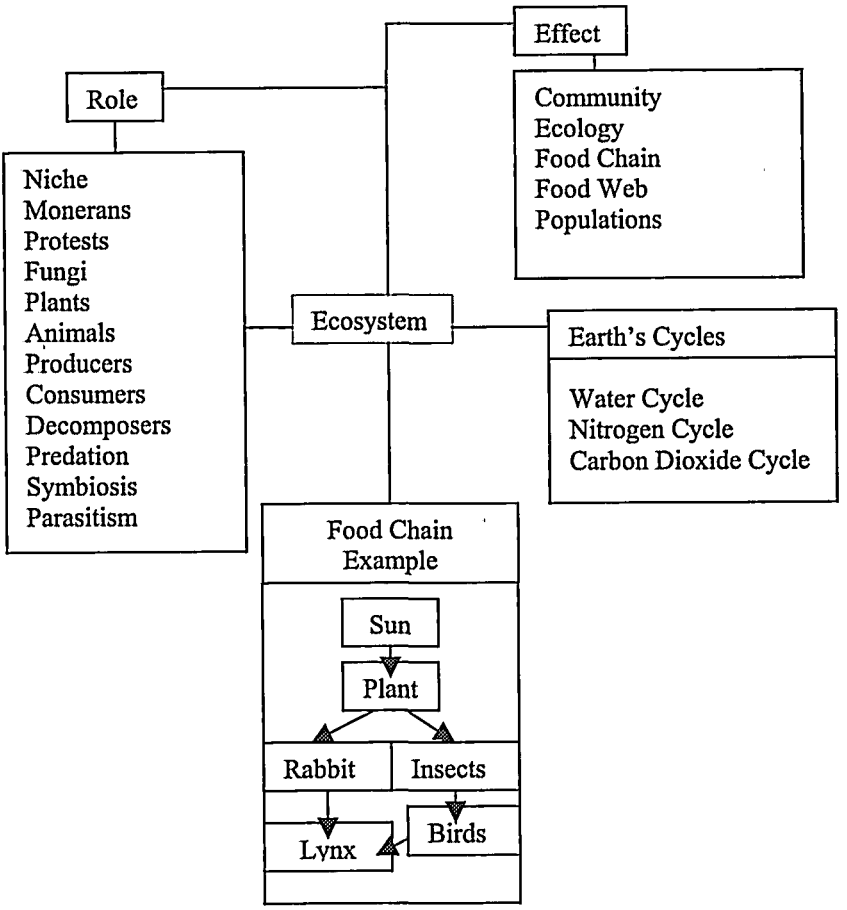
Semantic word mapping (Schwartz & Raphael, 1985) incorporates many of the recommended guidelines for vocabulary teaching, such as activating and building background knowledge, encouraging discussion about the attributes of words, and displaying visually the connections between the new word and existing concepts about the word. These instructional strategies enable students to enlarge their vocabularies, understand relationships between existing and new concepts, perceive multiple meanings of words, and become actively engaged in the learning process. Semantic word mapping allows structuring information into categories so that students can more readily see relationships between new words and concepts and their existing background knowledge. Heimlich and Pittelman (1986) define a semantic map as a

diagram that groups related concepts through the use of a graphic organizer and allows the learner to visually display the connections between the concepts. According to Vacca and Vacca (1999) concepts create mental images and these mental images can be grouped by similar criteria or attributes. These visual representations of concepts can lead to a deeper understanding of the new word and allow the learner to see how the new word relates to the existing mental image of the concept. This is extremely beneficial to the struggling learner, who may already feel overwhelmed and be under the impression that each object, or event that is encountered is unique and not related to other concepts.

While semantic word mapping can be used for a variety of purposes and with a variety of texts, it seems to be vital for pre-teaching struggling learners difficult concepts and information for content area text. Upon completion of the semantic word map, the teacher discusses with the students how the new vocabulary words relate to words that they already know. Students thus understand better the content of the topic they will cover or the story they will read. Figure 2 presents an example of a semantic word map for a unit on ecosystems and illustrates how teaching certain words prior to reading can help students activate their background knowledge, relate existing knowledge to new concepts, and understand how new words and concepts are related.

The process should start in whole group by the teacher inviting class discussion by relating students' past reading and direct experiences to the semantic map. In discussing the semantic word map, students must think about the relationships between the target word and their experiences. In this case the target word would be Ecosystems. When using content that may not be familiar to the students, such as concepts found in many expository text, the teacher may want to consider allowing students a few minutes to survey the chapter so that background knowledge can be activated or built. Once students have had a chance to survey the material, they need to brainstorm and write down as many words that they can think of that relate to the central theme or topic.

Figure 2. A Semantic Word Map for Ecosystems



Next, have students form small heterogeneous groups and have the students sort the brainstormed list of words into categories and label these categories. Once this is completed move back to whole class, and focus on shared negotiation as the students and the teacher place these newly sorted categories around the central word or topic. At this point the teacher may want to add additional words essential to the topic. In the case of Ecosystems the teacher may need to add key vocabulary such as

niche, ecology, community, cycles, food chains, populations, etc. Make sure to provide time for discussion and questioning as it relates to the newly constructed semantic map.

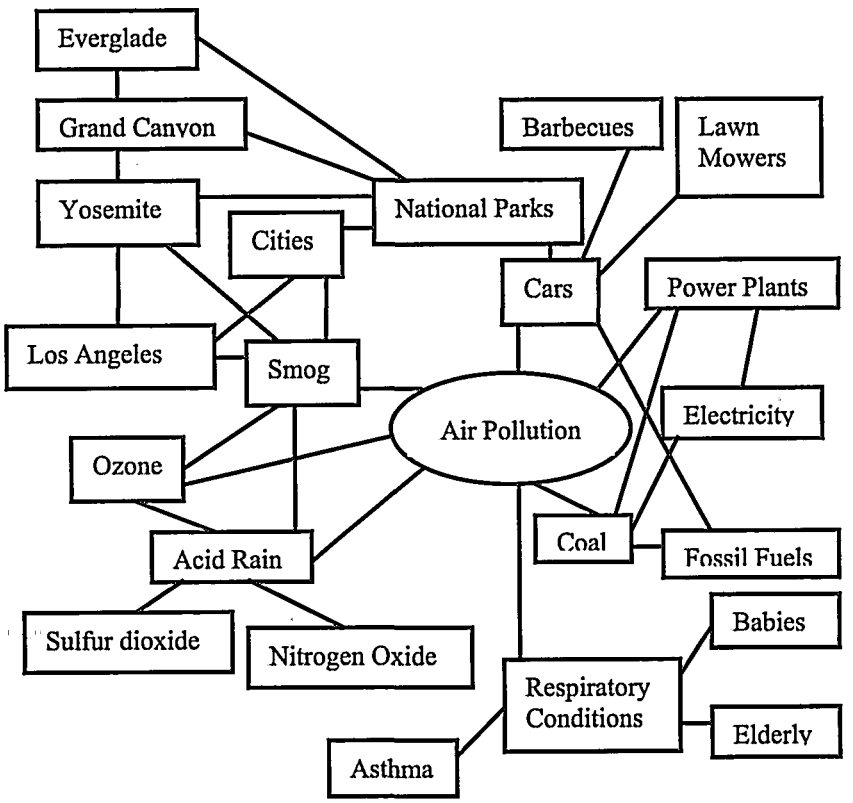
Once again, just as with the concept wheel, struggling learners, who prior to the semantic word mapping activity had a limited understanding of ecosystems, are now able to accommodate the new information into modified schemata. A semantic map used prior to reading gives the struggling learner a scaffold that facilitates comprehension of expository text, which provides the non-visual information that the struggling reader needs to free themselves from textual restraints.

Webbing

Another instructional vocabulary strategy based on graphic organizers and visual information is webbing. This method graphically illustrates how to associate word meaning and enables students to make connections between what they know about words and how they are related. Webbing makes it possible for students to see the relationship between words and concepts that they have already read or experienced. To help promote concept acquisition and vocabulary knowledge, teachers can leave the center word blank. Students can begin to understand the relationship of words in the web by choosing and discussing words that might complete the center word. The web in Figure 3 was done with a fourth grade teacher directing students to think of words that could be associated with air pollution. As noted in the web, their responses ranged from smog, cars, and cities to ozone and acid rain. Each time a child added a word to the web a new word was associated. For example, when one child said the word smog, another child immediately raised her hand and added the word city, which elicited another response Los Angeles. These students were obviously recalling previous information they had heard or read about smog. Of course these initial responses were just scratching the surface of the content on the science chapter dealing with air pollution. As the students gained more knowledge about air pollution through their interaction with the text and the activities conducted in class, they updated their web by adding other words, places and concepts such as national monuments and parks, electricity, coal, fossil fuels, respiratory conditions, asthma, sulfur dioxide, nitrogen oxide, etc.

The main difference between webbing and mapping is that webbing is more of a free association of words and is more student centered, while mapping imposes more teacher directed categorization of the new concept. Webbing can be used to introduce a lesson to determine students' vocabulary and concept knowledge, to summarize a lesson that reflects what students have learned, and as a follow-up activity in which students can expand and refine their own webs as they critically evaluate the web or use the web to assist in the writing of a report or short story. Cells can be linked by a variety of relationships, such as synonyms, antonyms, expanded concepts, connotations, and preciseness as illustrated in Figure 3.

Figure 3. A Semantic Web of Words for a Unit on Air Pollution



Semantic-Features Analysis

Semantic-features analysis (Johnson & Pearson, 1978) can help students improve their vocabulary and categorization skills, understand relationships among words, relate their background knowledge to the new words, and expand and retain content area vocabulary and concepts. Figure 4 is an example of a semantic-feature analysis on polygons used by a fifth grade teacher. Semantic-features analysis (SFA) is most appropriate for words related by class or common features.

Figure 4. A Semantic-Feature Analysis for Polygons

Features

Polygons	2 pair parallel sides	1 pair parallel sides	Right angles	Even # of sides	Odd # of sides	All sides equal	Some sides equal	Equal angles
Parallelog-ram								
Rectangle								
Square								
Rhombus								
Trapezoid								
Pentagon								
Hexagon								
Heptagon								
Octagon								
Nonagon								
Decagon								

Semantic Feature Analysis created by: Beth Swain, and Gillian Rai

For example, in order to develop students' understanding about basic geometric ideas most elementary grade math curriculum includes a study on polygons. While words such as parallelogram, rectangle, square, rhombus, trapezoid, pentagon, hexagon, heptagon, octagon, and so forth are very difficult for most elementary students to grasp when encountered in a math text, they all share a common characteristic in the fact that they are all polygons. Since part of the math curriculum states that it is important that students know the differences between these geometrical terms, a semantic-feature analysis would be a good instructional strategy to use.

In order to analyze these similar words it is best to start the semantic-feature analysis activity by once again combining this instructional strategy with another instructional strategy such as the KWL chart. While students are in a whole class setting, the teacher would ask students to share everything they currently know about polygons and shapes. Usually, when conducting this lesson, a student states that there are types of shapes, and on further prompting students generate the names of several types of shapes including circles, squares, rectangles, and triangles. As students share what they know about polygons they realize that shapes have different lengths and widths, different angles, and different amounts of sides. Upon the completion of the K of the KWL chart, the students are guided to discuss features associated with polygons. As the students suggest features, they are written across the top of the board or chart, creating a matrix that the students complete in terms of present (+), absent (-), and sometimes (0). As students broaden and define their concepts, the teacher adds words and features to the list and analyzes them. In order to facilitate comprehension of the text in which these words occur, the teacher may want to guide the selection of the features that will be used to analyze the selected vocabulary. In the example provided on polygons, the characteristics associated with the polygon types might be number of parallel sides, right angles, even number of sides, odd number of sides, all sides equal, some sides equal, and equal angles.

Once the students have completed discussing the features of polygons, the teacher may want to discuss the etymologies of the

vocabulary words that the students will encounter as they attempt to complete the semantic-feature analysis chart. Providing students with the Greek etymologies for /tri-/, /penta-/, /hexa-/, /hepta-/, and /octa-/ can be beneficial to the students as they complete the chart.

After the completions of the K of the KWL chart, the discussion of the features, and the examination of the word origins, students attempt to complete the semantic-feature analysis on their own. Since most of these words are still unfamiliar to the students and because they are unsure of the features of the polygons the analysis usually takes a couple of minutes. Having each student attempt to complete the chart individually first establishes ownership of the activity and activates each student's individual knowledge about the words. After this initial struggle with the SFA (semantic feature analysis), place students in heterogeneous groups and have them reach a consensus and complete one SFA based upon what the group already knows about polygons. Placement of students in heterogeneous groups and allowing them the opportunity to deliberate and discuss what they know about the vocabulary terms increases their knowledge of the word, stimulates the active involvement in the reading activity, and provides peer scaffolding for the struggling learner in the classroom.

After several minutes in the groups, the teacher should pull the whole class back together to complete the W of the KWL chart. At this point the W may actually change from what I Want to know about polygons, to what I Need to know about polygons in order to complete the semantic-feature analysis chart. As the students work on the KWL chart, they determine what they need to know about polygons in order to differentiate between the polygons. For example, they realize that they need to know which polygons have which amounts of sides, which polygons have equal angles, and which polygons have parallel sides. All of the questions developed during the W of the KWL chart reflect the initial struggles that the students had while interacting with the SFA. These questions now become legitimate reasons for reading the text, thus setting a purpose for reading and facilitating comprehension of the text.

Each of these activities has been a pre-reading activity that activated background knowledge for the text and provided a purpose for reading. Most importantly, it enabled further vocabulary development for

concepts and knowledge about what they would read.

Students would now be ready to move to the math text and begin actively reading and interacting with the material in order to accurately complete the semantic-feature analysis and answer their questions presented on the KWL chart.

Upon completion of the during-reading-activity the teacher can pull all of the students back together as a whole class to have them discuss what they learned about polygons and create a whole class SFA that is agreed upon by everyone. This post reading activity helps students make connections between what they knew about polygons and shapes at the beginning of the vocabulary lesson and what they now know about polygons at the completion of the lesson, thus completing the L of the KWL chart.

In addition to content-area text, semantic-features analysis can be used with narrative reading materials to analyze characters, settings, plots, and so forth. It is also effective in the content areas when introducing new topics, reviewing topics, and integrating topics across different content areas.

Summary

The words that readers know represent the concepts and information available to them to comprehend and understand what they read (Anderson & Freebody, 1981; Brett, Rothlein, & Hurley, 1996). Readers who know a word in its fullest sense can associate experiences and concepts with the word. Vocabulary knowledge supports the reader's text processing and interaction with the author, which in turn promote the formation and validation of concepts and new learning.

Increasing one's vocabulary is much more than learning names to associate with experiences. Vocabulary knowledge closely reflects students' breadth of real-life and vicarious experiences. Students cannot comprehend and understand well without some knowledge of the concepts that are represented by the print. As noted by Rupley, Logan, & Nichols (1999), "Vocabulary is a shared component of reading and

writing—it helps the author and the reader to comprehend through the shared meanings of words" (p. 337).

Any instructional practice that fails to teach words so that students encounter the words in meaningful text and fails to immerse the students in vocabulary-rich activities must be called into question. Teaching vocabulary within the context of real books and teaching words that are functionally important within a particular content area can promote vocabulary development (Zechmeister, Chronis, Cull, D'Anna, & Healy, 1995).

Vocabulary emphasis should include direct/explicit instruction and appropriate practice in specific skills along with broad reading opportunities and other language activities. We support a position that recognizes both wide reading and explicit vocabulary instruction to:

- relate new words to background knowledge
- provide opportunities to encounter and learn new words
- focus on words that have utility in learning new concepts.

To enhance vocabulary learning, engage students in discussions about the words they are learning from their reading of literary and content-area texts.

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