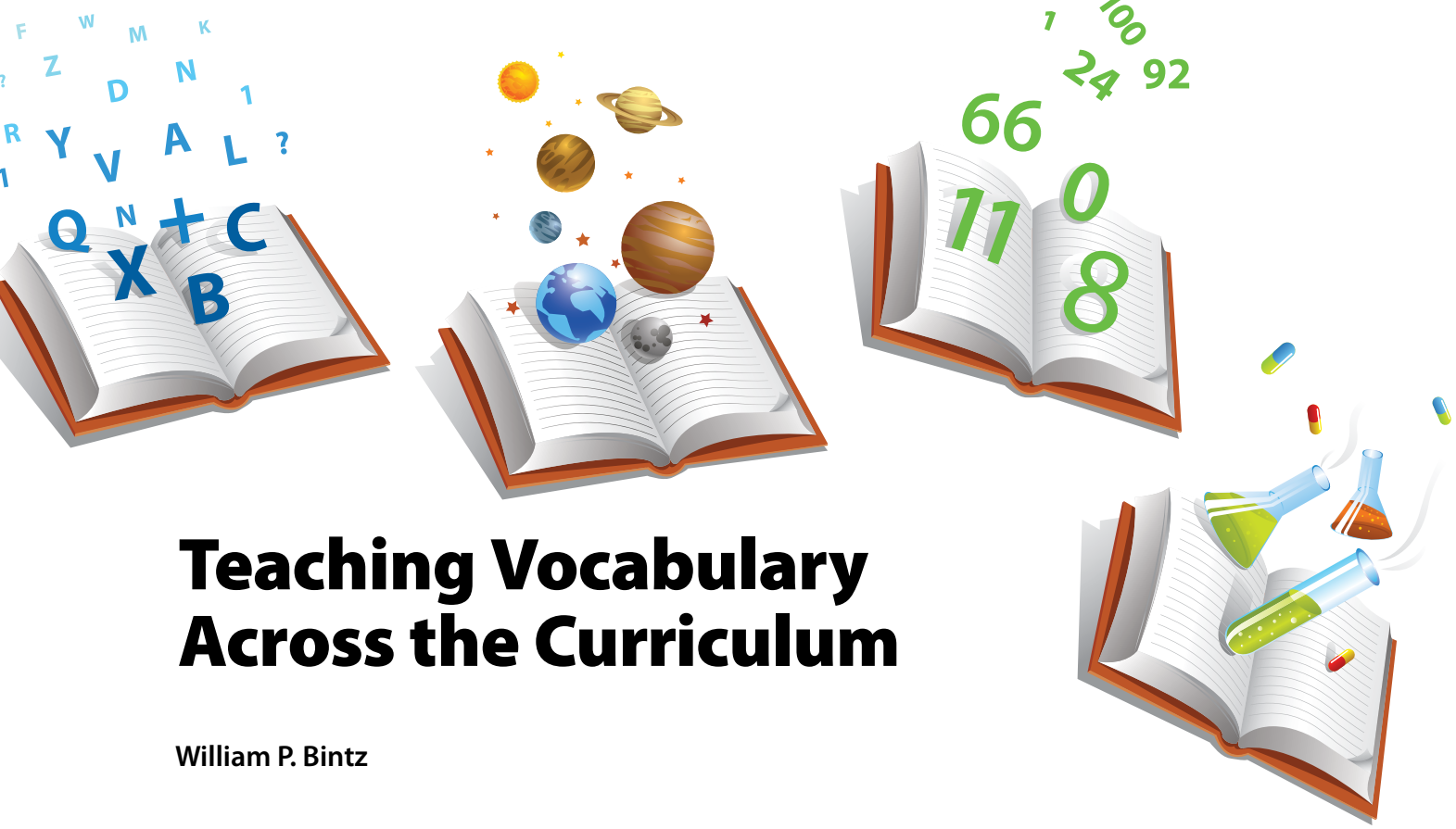


Teaching Vocabulary Across the Curriculum

William P. Bintz

Learning vocabulary is an important instructional aim for teachers in all content areas in middle grades schools (Harmon, Wood, & Kiser, 2009). Recent research, however, indicates that vocabulary instruction may be problematic because many teachers are not "confident about best practice in vocabulary instruction and at times don't know where to begin to form an instructional emphasis on word learning" (Berne & Blachowicz, 2008, p. 315).

In this article, I summarize important research on vocabulary growth and development and share effective instructional strategies that middle school teachers can use to teach vocabulary across the content areas. My hope is that teachers will use these strategies to help students become verbophiles—"people who enjoy word study and become language enthusiasts, lovers of words, appreciative readers, and word-conscious writers" (Mountain, 2002, p. 62).

The importance of vocabulary

Vocabulary can be defined as "the words we must know to communicate effectively: words in speaking (expressive vocabulary) and words in listening (receptive vocabulary)" (Neuman & Dwyer, 2009, p. 385). An extensive body of research exists on teaching and learning vocabulary. This research clearly indicates that enlargement of vocabulary has always been and continues to be an important goal in literacy and learning (National Institute of Child Health and Human Development, 2004). Educators have long recognized the importance of vocabulary development. In the early 20th century, John Dewey (1910) stated that vocabulary is critically important because a word is an instrument for thinking about the meanings which it expresses. Since then, there has been an "ebb and flow of concern for vocabulary" (Manzo, Manzo, & Thomas, 2006, p. 612; see also Blachowicz & Fisher, 2000). At times, interest in vocabulary has been high and intense, and at other times low and neglected, alternating back and forth over time (Berne & Blachowicz, 2008).

Research on vocabulary growth and development

Vocabulary has long been an important topic in middle grades education, but today it could be considered a hot topic (Cassidy & Cassidy, 2003/2004). The National Assessment Governing Board, for example, has added a separate vocabulary component to gauge student achievement in reading nationwide (Manzo, 2004). This

This article reflects the following *This We Believe* characteristics: Meaningful Learning — Challenging Curriculum — Multiple Learning Approaches

focus is in response to recent research highlighting a decline in the vocabulary levels of college-bound 18-year-olds in recent years (Manzo, Manzo, & Thomas, 2006).

This section is a summary of findings from research on vocabulary growth and development organized around four questions: When does learning vocabulary start? What does learning vocabulary mean? How is vocabulary learned? What is the relationship between vocabulary growth and reading comprehension? These were selected because they represent fundamental and frequently asked questions about vocabulary, and these questions have been the focus for an extensive body of research that has produced key findings about teaching and learning vocabulary.

> **Vocabulary learning is a continual process of encountering new words in meaningful and comprehensible contexts (Harmon et al., 2009).**

When does learning vocabulary start?

One important finding from research suggests that vocabulary learning never stops (Smith, 1998); it is a natural and lifelong phenomenon. Vocabulary learning is a continual process of encountering new words in meaningful and comprehensible contexts (Harmon, et al. 2009). Consider how young children initially encounter printed text in their surrounding environments. When they walk through supermarket aisles, they can often recognize the name of their favorite box of cereal; or while riding in the family car, they can identify a McDonald's restaurant or a Toys-R-Us sign. Children do this easily, routinely, and usually without parents or other adults explicitly drawing their attention to print. In short, throughout the life span, people develop vocabulary effectively and almost effortlessly as long as they see words in meaningful contexts.

In addition, individuals learn new words at an amazing rate. During early childhood, children learn vocabulary at the rate of approximately 2,000 to 4,000 words per year (Brabham & Villaume, 2002; Nagy, Anderson, & Herman, 1987), or an average rate of seven words per day (Anderson & Nagy, 1991; Beck & McKeown, 1991). Amazingly, individuals learn new words at this rate "without conspicuous effort or organized instruction and without any forgetting" (Smith, 1998, p. 14). Ruddell and Shearer (2002) estimated that, in school, children will encounter in excess of 100,000 words in their reading. Students' vocabularies may increase by 3,000 to 5,000 words per year by reading, resulting in a reading vocabulary of nearly 25,000 words by the eighth grade and over 50,000 by the end of high school (Graves, 2000). Once again, whether in school or out of school, the key to learning words at this amazing rate is that individuals experience words in comprehensible and meaningful contexts (Allen, 1999).

What does learning vocabulary mean?

Learning vocabulary is fundamentally about learning definition of words. Many teachers believe that defining words before reading a text is an effective instructional technique to support vocabulary growth and enhance reading comprehension; however, research indicates otherwise. For example, the popular practice of requiring students to find definitions of words and write those words in sentences before reading appears to have little apparent impact on their word knowledge and language use, and has not improved student comprehension of texts that contain those words (Kameenui, 1991). Similarly, Stahl and Fairbanks (1986) found that instructional methods that provide only definitional information about each word to be learned or that involve multiple repetitions of definitional information about a target word do not appear to have reliable effects on reading comprehension. Allen (1999) identifies three reasons why strategies that focus on word definitions are not effective: (1) a word can have multiple definitions and meanings depending on the geographic location in which a person lives, (2) a word can have a definition that may not be correct in a particular context, and (3) definitions of words often lack adequate information for students to use them correctly.

These findings suggest that learning vocabulary is more complex than simply memorizing definitions of words; rather, it involves seeing, hearing, and using words in meaningful contexts (Daniels & Zemelman, 2004, p. 13). Strategies that focus on word recognition and word use in meaningful contexts are most likely to positively affect vocabulary growth.

How is vocabulary learned?

While some vocabulary learning occurs in school, it is not just a school-based phenomenon. Many children begin formal schooling "with rich vocabularies but no formal vocabulary instruction" (Brabham & Villaume, 2002, p. 264), and while they are in school they may continue to learn vocabulary without much direct and explicit help from teachers (Carey, 1978).

For the most part, vocabulary growth in school occurs informally and incidentally rather than formally and intentionally (Nagy, Perman, & Anderson, 1985). Students learn vocabulary best in classrooms in which teachers read to them and highlight important and interesting words. In these classrooms, students regularly read independently and in groups and they discuss their understandings in literature circles during and after reading.

Informal and incidental vocabulary learning is quite efficient and effective. Twenty-five to fifty percent of annual vocabulary growth can be attributed to incidental learning from meaningful context while reading (Nagy et al., 1987). Leung (1992) found read-alouds seem to be a particularly powerful instructional strategy for supporting incidental vocabulary growth in the elementary grades. Stahl, Richek, and Vandevier (1991) explored indirect learning of vocabulary words with sixth graders and found that students were able to learn a significant number of vocabulary words from reading, discussing their reading, and listening to orally presented passages. Collectively, these findings indicate that vocabulary growth occurs when we "immerse students in words in a variety of ways and get them personally and actively involved in constructing word meanings" (Duke & Bennett-Armistead, 2003, p. 182).

Students learn a significant amount of vocabulary simply through the act of reading. photo by Ken Clutsam

What is the relationship between learning vocabulary and reading comprehension?

Two of the most important findings related to vocabulary learning are (1) that reading is the single most important factor in increased word knowledge (Anderson & Nagy, 1991) and (2) that a rich vocabulary increases comprehension and learning (Manzo, Manzo, & Thomas, 2006; Robb, 2009). In other words, students develop extensive vocabularies not by completing worksheets, memorizing word lists, or using a dictionary or glossary to define unknown words but by the act of reading (Weir, 1991). Nist and Olejnik (1995) investigated the impact of dictionary use on vocabulary growth and found that definitions in the dictionary were not very helpful to students and that they did not use them very productively, if at all. Allen (1999) and Robbins and Ehri (1994) contended that vocabulary growth is the result of the extensive amount of reading that occurs in a balanced reading program that includes read-alouds and think-alouds; shared, guided, and independent reading experiences; and fictional and informational book readings that focus children's attention on meanings of unfamiliar words in context.

The amount of time students spend reading, especially free choice reading, is the best predictor of vocabulary growth and development (Anderson, Wilson, & Fielding, 1986). In particular, time spent on repeated readings of a story produces significant gains in vocabulary growth and development (Senechal, 1997). Similarly, spending time on storybook readings and interactive talk contributes significantly to gains in vocabulary (Dickinson and Smith, 1994), as does working with words, thinking about them, and seeing them in a meaningful and relevant context (Daniels & Zemelman, 2004).

In sum, an extensive body of research indicates that learning vocabulary is a lifelong process. Individuals learn new words at an amazing rate; vocabulary growth occurs more from seeing words in context rather than defining words in lists; individuals learn new words incidentally (especially by paying attention to the context in which they are used); and sustained, frequent reading

enhances vocabulary growth. As Nagy (1988) asserted, "What is needed to produce vocabulary growth is not more vocabulary instruction but more reading" (p. 3).

Research on vocabulary in middle grades education

Much research also exists on teaching and learning vocabulary in middle grades education. This research provides important findings that can be used by teachers to provide effective vocabulary instruction across the curriculum. One persistent finding is that expanding and extending vocabulary is a critical part of the literacy needs of all adolescents (Harmon, 2000). To a large extent, this is due to the fact that the need for extensive vocabulary knowledge grows in both breadth and depth as students get older. In school, this need becomes particularly important and challenging given the fact that students are required to comprehend and discuss increasingly sophisticated readings across the content areas as they progress through the middle grades.

Another challenge is that too many middle grades students are struggling readers who have poor reading histories and negative perceptions of reading. They may struggle because they can read words but cannot comprehend text and, as a result, they often end up as reluctant or resistant readers or, at worst, non-readers. They do not regularly and voluntarily choose to read and therefore cannot engage in actively creating meaning from text and discussing their understandings with others. Consequently, these students have limited vocabularies (Broaddus & Ivey, 2002). Their lack of word knowledge disrupts fluency in reading and interferes with reading comprehension because word meanings make up as much as 70–80% of comprehension (Pressley, 2002). In addition, these struggling readers have few, if any, strategies to learn new words, and the ones they do have are often ineffective (Harmon, 2002). Getting students to read more will certainly help them learn new words and new concepts, but they also need to develop strategy awareness and acquire specific strategic word learning abilities (Harmon, 2002).

Strategies for teaching vocabulary across the curriculum

Teachers can help students improve vocabulary by providing instruction that helps them see the value and relevance of word study and allows them to study interesting and important words that come from texts they read in the classroom. Teachers can also focus student attention on learning new words at both the literal level (i.e., dictionary or glossary definition) and the conceptual level; help them use new words in their speaking, listening, reading and writing (Dixon-Krauss, 2001); get them actively engaged in interactive word-learning experiences (Rosenbaum, 2001); focus their attention on learning clusters of words that share a common element or origin (Hennings, 2000); demonstrate to them how to learn vocabulary before, during, and after reading (Greenwood, 2004); and stress to them that learning new words is not an end in itself but a tool to enhance reading comprehension (Harmon, Wood, Hedrick, & Gress, 2008).

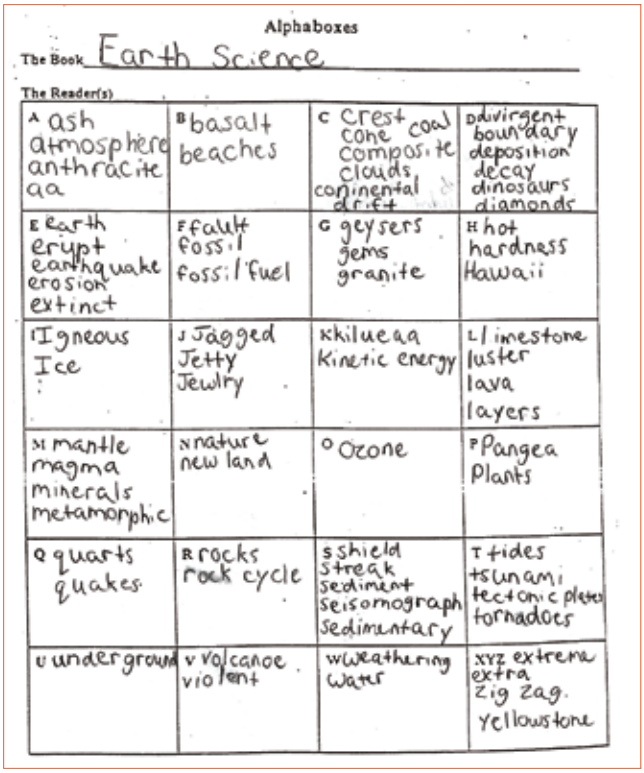
Teachers can also display an attitude of excitement and interest in words and language (Bromley, 2007). This can be a catalyst for students to actively, and even playfully, engage in learning new words, as recommended by Nilsen and Nilsen (2002). Using the thesaurus to develop synonym games and puzzles is just one way teachers can accomplish this (Mountain, 2008).

While there are certainly many ways to teach and learn vocabulary (see Beck, McKeown, & Kucan, 2002), it is important to note that there is no single best way (Blachowicz, Fisher, Ogle, & Watts-Taffe, 2006). Teachers should keep four factors in mind when they consider strategies to teach vocabulary: (1) the students they are teaching, (2) the nature of the words they decide to teach, (3) their instructional purposes in teaching each of those words, and (4) the strategies they employ to teach the words (Flanigan & Greenwood, 2007). In this section I will describe eight research-based instructional strategies teachers can use to teach vocabulary across the curriculum: alphaboxes, word questioning, linear array, polar opposites, story impressions, word sorts for narrative and expository texts, and anticipation guides.

Alphaboxes

Alphaboxes (Hoyt, 1998) is a strategy that uses the 26 letters of the alphabet to record important concepts about a specific topic or theme. Figure 1 illustrates one example of an alphabox for a unit integrating literacy and earth science. Throughout the unit, students read a variety of texts and record important concepts on earth science on their alphaboxes sheet.

Figure 1 Alphaboxes in earth science



Alphaboxes

The Book Earth Science

The Reader(s)

A ash atmosphere anthracite aa	B basalt beaches	C crest cone cool composite clouds continental drift	D divergent boundary deposition decay dinosaurs diamonds
E earth erupt earthquake erosion extinct	F fault fossil fossil fuel	G geysers gems granite	H hot hardness Hawaii
I gneous Ice	J Jagged Jetty Jewlry	K kilueaa Kinetic energy	L limestone luster lava layers
M mantle magma minerals metamorphic	N nature new land	O Ozone	P Pangea Plants
Q quarts quakes	R rocks rock cycle	S shield streak sediment seismograph sedimentary	T tides tsunami tectonic plates tornadoes
U underground	V volcanoe violent	W weathering water	XYZ extreme extra Zig Zag. Yellowstone

strategy that illustrates "visual representations of degree … that depict gradations between related words" (Allen, 1999, p. 52). They help students make connections between words, see subtle distinctions between words, and realize that all words have shades of meanings (Nilsen and Nilsen, 2002).

Figure 3 illustrates a linear array based on the trade book *Tight Times* (Hazen, 1983). After reading, students complete the array with words that showed gradations from the word *complaining* on the left, to the word *understanding* on the right. In this instance, each array is based on the dimension of the main character's behavior toward his parents.

Polar opposites

A companion strategy to linear arrays is polar opposites (Yopp & Yopp, 2009). From an English language arts perspective, this strategy helps students analyze and evaluate characters in a text by rating them on a variety of dimensions along a three-, five-, or seven-point continuum. After reading, students place a check mark on one of the blanks along the continuum to indicate their understanding and interpretation of a character based on a particular dimension. They can also include examples from the text to justify their ratings and discuss

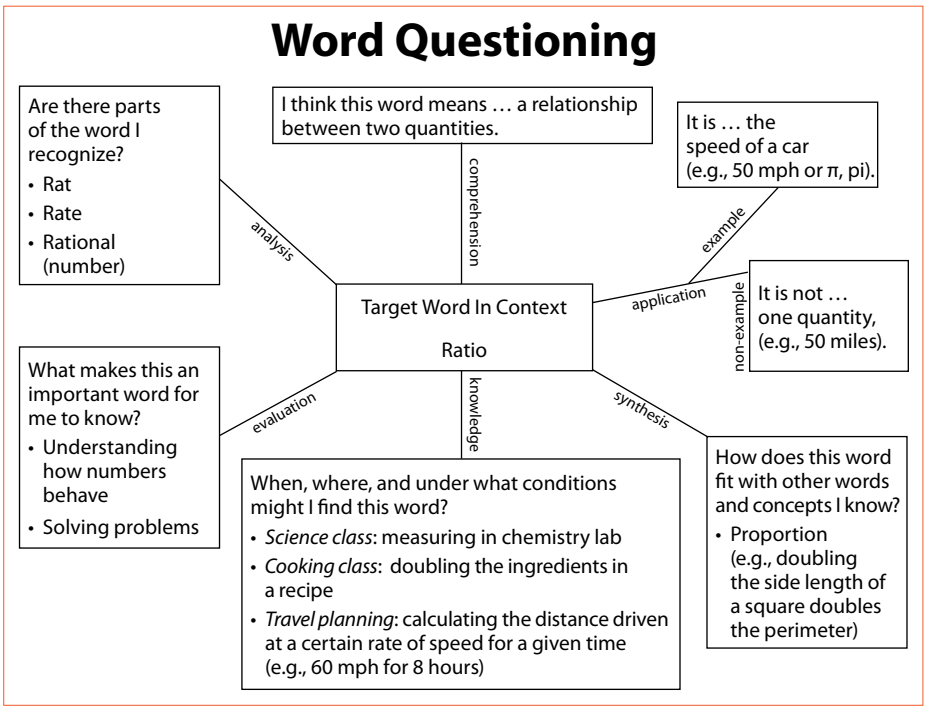
Word questioning

Word questioning (Allen, 1999) is a strategy that teaches vocabulary and promotes critical thinking. It challenges students to define, analyze, synthesize, and evaluate target words in their readings. Figure 2 illustrates a completed word questioning strategy for teaching the word *ratio*. This strategy teaches vocabulary as part of a unit integrating mathematics and literacy.

Linear arrays

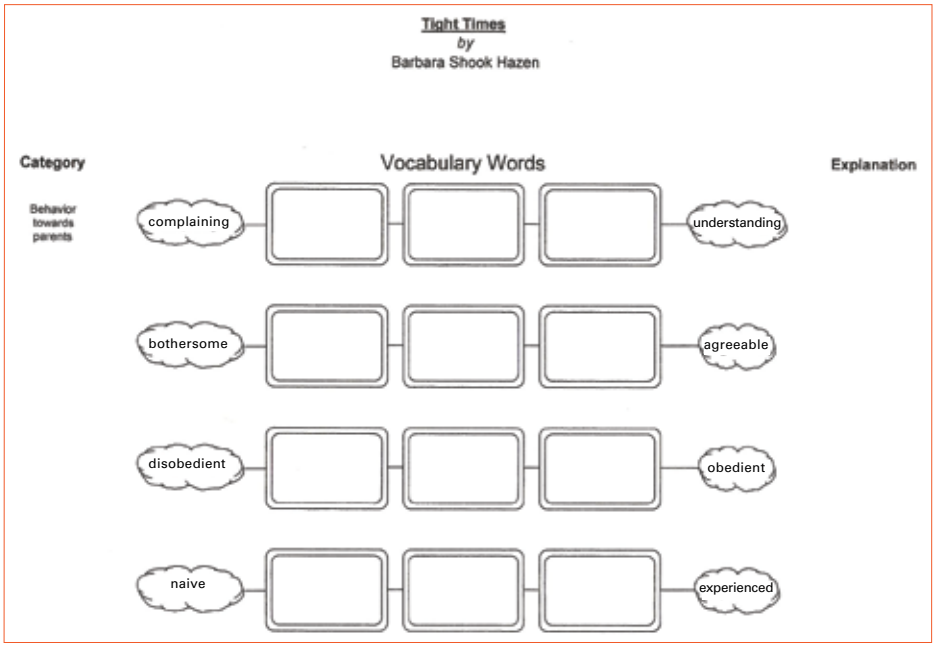
Focusing on word relationships is one of the most frequently cited successful instructional strategies for teaching vocabulary (Berne & Blachowicz, 2008; Nilsen and Nilsen, 2003). Linear arrays are a

Figure 2 Word questioning in mathematics



Adapted from Allen (1999)

Figure 3 Linear array in language arts



both with others in literature circles. Figure 4 illustrates this strategy using "degree of reflection" as a dimension to understand the traveler in Robert Frost's famous poem "The Road Not Taken."

Figure 4 Polar opposites in English language arts

Polar Opposites
Based on degree of reflection, the traveler was…

thoughtful	_____ _____ _____ _____ _____	impulsive
timid	_____ _____ _____ _____ _____	courageous
disappointed	_____ _____ _____ _____ _____	content
realistic	_____ _____ _____ _____ _____	unrealistic
a follower	_____ _____ _____ _____ _____	a leader

Story impressions

The story impressions strategy (McGinley & Denner, 1987) arouses students' curiosity and enables them to use "clue words associated with the setting, characters, and events in the story to help them write their own versions of the story prior to reading" (Vacca & Vacca, 2008, p. 189). Clue words and phrases taken directly from a story are arranged in a list in the order in which they appear. The intent of the list is to trigger an overall impression of the story. Students use this impression to write a story prediction that anticipates the major events in the story. After reading, students compare their versions with the original story. Figure 5 illustrates a story impression in science based on the story of Galileo Galilei and the award-winning trade book *Starry Messenger* (Sis, 2000). This strategy, when used with nonfiction texts, is called text impressions.

Figure 5 Story impression in science

Story Chain	Story Prediction
tradition	
Ptolemaic System	
Earth as center of universe	
Copernican System	
Earth moves	
Galileo's Italy	
religion	
telescope	
observations	
discoveries	
heresy	
the Pope	
inquisition	
imprisonment	
blindness	
pardon	

Word sorts for narrative text

Word sorts for narrative text (Allen, 2007; Hoyt, 2000) is a before-, during-, and after-reading strategy in which the teacher creates a collection of important words and phrases from a story on index cards. This collection is prepared in advance of the lesson. Working individually

or in pairs before reading the text, students arrange the cards in an order that supports the telling of a story and then use the cards to tell the story to the class. After this step, the teacher reads the story aloud, stopping at two or three points so students can rearrange their cards to reflect their ongoing understanding of the story. They use the new arrangement to retell the story up to that point. This procedure continues until the story is completed. After reading, students arrange their cards in an order that best supports a retelling of the story as the author intended.

Figure 6 Word sorts for expository text in science

mountains	hot spent vent	Earth's crust
sandblasting	Earth's climate	faults
underwater mountains	steam	collide
heat and pressure	glaciers	sedimentary rock
deltas	magma	cinders and ash
fault-block mountains	folds	growing mountains
continents drift	dissolve	erosion
volcanoes	lava	plates
mountains slow dance	erosion mountain	plateaus
folded mountains	ranges	eruption

Word sorts for expository text

Word sorts for expository text act as a companion to the word sort strategy used with nonfiction text (Hoyt, 2002). This strategy involves a collection of words and phrases from an expository text with each word or phrase written on an index card. Students review the cards, develop possible categories, name each category, and rearrange cards in the appropriate categories. The teacher should remind students that categories need to reflect relationships between words and phrases and that students need to explain these relationships. Students then use categories to make predictions about the expository text. Students can ask themselves: What might be the title? What might be the theme? What will this text be about? Students then read the selection and, after reading, rearrange the cards and create new categories so they can more accurately retell and discuss the selection. Figure 6 illustrates a word sort for expository text in science based on the trade book *Mountain Dance* (Locker, 2001).

Anticipation guides

An anticipation guide is also a before-, during-, and after-reading strategy. It is particularly suited for use with nonfiction and reference texts, such as textbooks (Merkley, 1997). This strategy highlights the importance of anticipating meanings of a text before reading, thinking and rethinking these meanings during reading, and reflecting and taking a position on confirmed meanings after reading.

Figure 7 illustrates an anticipation guide on the topic of congruent angles in mathematics. This guide includes nine statements about the nature and function of congruent angles. Some of these statements are mathematically correct, others are not. Before reading a chapter on this topic, students respond to each statement by recording an A (agree) or D (disagree) in the "response before reading" column and share their responses with others. Students then read to a predetermined point in the selection, such as halfway. At this point, students respond to each statement again in the "response during reading" column and share why they continue to either agree or disagree with the statement, or why they have changed their minds. They can also share evidence from the text that supports why they have changed their minds. Students finish reading and respond to each statement again in the "response after reading" column and discuss their position on each statement. As a culminating event, students can add additional statements they feel are important for learning congruent angles but were not included in the original list.

Final thoughts

The document *Teaching Literacy in the Turning Points School* calls for middle grades schools to "develop a coherent, school-wide approach to literacy education" (National Turning Points Center, 2001, p. 51). Vocabulary instruction is a good place for schools to begin developing building- and district-wide approaches to literacy across the curriculum. Furthermore, researchers need

Figure 7 Anticipation guide in mathematics

Anticipation Guide for Congruent Angles

Instructions: Before we discuss the next chapter on congruent angles, think about what you learned earlier about congruency and the function of angles. Then, respond to each statement three times: once before reading, once during reading, and once after reading.

_____ Write A if you agree with the statement.

_____ Write D if you disagree with the statement.

Response Before Reading	Topic: Congruent Angles	Response During Reading	Response After Reading
	1. If two angles are complements of congruent angles (or the same angle), then the two angles are congruent.		
	2. Vertical angles are not congruent.		
	3. Congruence can be determined by laying one triangle on top of another.		
	4. If two angles are supplementary, the sum of their measures is 360 degrees.		
	5. If two lines are perpendicular, they meet at right angles.		
	6. If two lines do not intersect, they are parallel.		
	7. We can tell an isosceles triangle by the sum of its angles.		
	8. An equilateral triangle has two congruent sides and a right angle.		
	9. The sum of the measures of the interior angles of a triangle is 360 degrees.		
	10.		
	11. *(Include several blank spaces for students to add statements.)*		
	12.		

to give more attention to vocabulary learning in the middle grades. In this article I summarized key findings on vocabulary learning and described instructional strategies based on this body of research. While this body of scholarship is robust, at least three limitations remain. First, much of this research has focused on strategies that have been used to teach vocabulary in a single content area. Further research should investigate how teams of teachers can teach vocabulary through an interdisciplinary approach. Second, much of this research has focused on teaching vocabulary in individual classrooms. More research is needed on how teams of teachers can develop and implement a coherent school-wide or district-wide program for teaching vocabulary across the curriculum (Flanigan & Greenwood, 2007). Finally, much of the existing research has been experimental and quasi-experimental and conducted under highly controlled conditions. More research is needed that is qualitative and classroom-based. Teachers at all levels and across all disciplines should use these and

other strategies in their classrooms as part of teacher-as-researcher or action research projects that investigate the teaching and learning of vocabulary across the curriculum. Such findings would help narrow the gap between theory and practice, support the notion of teachers as learners and inquirers, and provide real-life examples from real teachers in real classrooms.

Extensions

How can you improve vocabulary learning across the curriculum in your school? Are you already using some of the strategies described in this article? Which strategies do you plan to implement?

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