

# Reading, Writing, *and* Comprehending



*Encouraging  
active reading  
in the science  
classroom*

—by George T. Martin—

I've always dreaded classroom lessons that include silent reading. Students miraculously become speed-readers, "finishing" moments after I give the assignment. Even in my better-performing classes, students do not take expository reading seriously. They skim over the text, ignoring sidebars and picture captions. Does this sound familiar?

To help enhance reading comprehension among my science students and to further my professional development, I

took a reading course titled “Improving reading in the content areas,” sponsored by Shenandoah University in Virginia, which fulfilled a state-mandated requirement for renewing teacher certification. Using videotapes, study team discussions, and challenging formative assessments, the course’s main focus was on the practical strategies teachers can use to plan lessons that incorporate essential literacy skills. I also attended a training session titled, “Reading and writing in the science classroom,” sponsored by the National Science Foundation (NSF) that specifically incorporated reading and writing skills in science. Taken as a whole, the courses outlined the following strategies teachers can use to improve reading comprehension and incorporate writing assessment in the classroom.

### Understanding the text

Science teachers should encourage students to routinely use the following tactics while reading in order to fully comprehend the text:

- ◆ Take notes to clarify ideas;
- ◆ Challenge or question the text;
- ◆ Stop occasionally to evaluate if the text is understood;
- ◆ Reread to revise understanding; and
- ◆ Predict what will come next (Armbruster et al. 1983; Collins 1994; Flavell 1981; Garner 1987; Tei and Stewart 1985).

A science teacher’s challenge is to make sure students are implementing the strategies. To help, a wide variety of before-, during-, and after-reading methods stimulate students to become better readers. Some approaches are more useful in expository text (for example, science books), while others are better suited for narrative text.

### Predicting the answers

I’ve found the Prediction Guide (Head and Readence 1992) to be one of the most effective methods in engaging students at all classroom levels before reading begins. To start off, science teachers pose about five true or false statements, based on facts from the text, to students. After recording their responses (without discussion), students read the text, then review and check their answers. A follow-up discussion led by the teacher clarifies and explains correct answers. This exercise can double as a pre-assessment to indicate students’ prior content knowledge. Teachers use an overhead projector to present the true or false statements.

### Agree or disagree

The Anticipation Guide (Head and Readence 1992) strategy can stimulate class discussion on a controver-

sial topic. Before the students start reading, science teachers challenge them to agree or disagree to a set of approximately five statements and justify their opinions in writing. An example statement is, “Global warming is destroying life on Earth.” A right or wrong response does not necessarily exist to any of the statements, but this approach is an excellent tool for soliciting students’ personal opinions on science topics. After students have written their responses, a class discussion follows. Students share their opinions and are engaged to read the text. Subsequent to reading the text, another discussion ensues—students react to the text and offer rationale for changing their answers and opinions. Teachers may prefer to skip the first discussion and go directly into the reading.

### More to follow

Little or no outside preparation is required for the Active Comprehension (Singer and Donlan 1989; Vacca and Burkey 1992) method, another useful approach used before reading begins. The teacher or student reads a brief section of the text, and the teacher asks the class, “What more would you like to know about . . . (for example, photosynthesis, Kepler’s Laws)?” After a number of student responses are taken, students are asked to finish the reading and consider the questions while they read. A discussion or assessment can follow. This engages students to think about and take an interest in the topic prior to their reading.

### Thinking about the text

A popular strategy that integrates reading and writing through the pre-, during, and post-reading phases—Survey, Question, Read, Recite, Review (SQ3R)—serves as a powerful tool to help students think about what they are reading. SQ3R requires no teacher preparation and helps students not only think about questions as they read but also predict and anticipate the type of material they will be reading. First, students survey the text by skimming through titles, summaries, headings, subheadings, and illustrations. Next, using boldface headings, students ask and record questions, such as “What’s the Thermosphere?” or “What is Newton’s first law of motion?” With these questions in mind, students silently read passages to find answers. After reading, students recite, or paraphrase, the main ideas in the form of written notes or an outline. Finally, in the review step, students answer their questions using the main points from the reciting step, and make major connections in the content. I first encountered this strategy while observing a sixth grade science class and noted how eager students were to follow steps and read the text.





titled “what I learned.” The teacher should observe that more reluctant learners may write nothing in the first two columns prior to reading. I’ve learned to set a minimum expectation with every class, such as four points of information in each column.

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### **Assessing what they’ve learned**

National standards and many state-mandated tests have stressed expository reading and writing across all curricula. The variety of post-reading assessments has broadened so much that the once-heralded simple question-and-answer response is only one of many methods in a science teacher’s repertoire. The following post-reading strategies should be included in a science teacher’s writing assessments:

◆ *Learning Logs* (Vacca and Vacca 1999). After reading a science piece, students record what they learned that day. I found that dedicating a definite period of time each class period to learning logs achieves better results from students. Otherwise, students may procrastinate and not record in their logs for several days. Teachers monitor the log on a daily basis or risk students falling behind and the log becoming useless.

### **What do they know?**

Another strategy that makes students think about the topic before, during, and after the reading is the KWL method, which determines what the student knows, wants to know, and learns about a topic. Students make three columns on a piece of paper before reading begins. In the first column, students record what they know about the topic and in the middle column what they want to know. The teacher then brainstorms with students and records their responses on an overhead projector or chalkboard. This engages the students and provides a purpose for reading. Students read a passage and record answers to the questions in the third column,

- ◆ *Response Journals* (Martin 1992; Vacca and Vacca 1999; Fuhler 1994). Used mostly for narrative text, students read a passage then briefly record their personal thoughts.
- ◆ *Double-Entry Journals* (Vacca and Vacca 1999). This combines the two prior assessments. Students make connections between content of expository text and how it affects them personally. For example, students might define “global warming” in one column, and in a second column, relate how it might personally affect them.
- ◆ *Triple-Entry Journals* (Vacca and Vacca 1999). Like Double-Entry, except a third column is added for students to paraphrase the content information, such as paraphrasing the definition of global warming.

Students appreciate being able to read over learning logs and journals, revisiting the activities they enjoyed the most and making connections to the current topics of study.

### Informal writing strategies

Exploratory writing strategies also should be included in a teacher’s repertoire of post-reading assessments.

- ◆ In writing warm-ups, students are asked to write about prior information and knowledge of a current or new topic.
- ◆ Admit/Exit slips are brief comments the student writes about what they are studying. Admit slips are answers to questions, such as “What’s confusing you about global warming?” The exit slips relate to information covered that day, such as “Summarize the lesson of the day,” or “Where do you think we’re going from here?”
- ◆ A Point of View (POV) Guide requires students to put themselves in the place of someone or something and write about the experience. For instance, “Describe what you would have done if you were Galileo when he was on trial for his scientific beliefs.”

The admit/exit slips can be used as a pre- or formative assessment. I keep the cards as a record to determine how to plan lessons.

### Training opportunities

As educators, we have the responsibility of incorporating reading and writing into our daily lesson plans. To assist teachers with curriculum development, many school districts now offer a variety of

courses conveniently scheduled during the school year and in the summer to satisfy most teachers’ needs. Some districts offer partial reimbursement for the cost of graduate-level college courses. In addition, one- or two-day training sessions on specific topics are becoming commonplace, typically held after school at a central location. One great resource is teacher professional half or full days, where teachers can devote time to reading and writing strategies to encourage students to be successful readers and proficient in writing assessment. ~

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### References

- Armbruster, B.B. et al. 1983. *The Role of Metacognition in Reading to Learn: A Developmental Perspective*. Reading Education Report No. 40. Urbana, Ill.: Center for the Study of Reading.
- Collins, N.D. 1994. *Metacognition and Reading To Learn*. Report No. EDO-CS-94-09. Bloomington, Ind.: Indiana University (ERIC Clearinghouse on Reading, English, and Communication).
- Flavell, J.H. 1981. *Cognitive monitoring*. In *Children’s Oral Communication Skills*, ed. P. Dickson. New York: Academic Press.
- Fuhler, C.J. 1994. Response journals: just one more time with feeling. *Journal of Reading* 37(5): 400–405.
- Garner, R. 1987. *Metacognition and Reading Comprehension*. Norwood, N.J.: Ablex.
- Head, M.H., and J.E. Readence 1992. Anticipation guides: Enhancing meaning through prediction. In *Reading in the Content Areas: Improving Classroom Instruction*, eds. E.K. Dishner, T.W. Bean, J.E. Readence, and D.W. Moore, 227–233. Dubuque, Iowa: Kendall/Hunt.
- Martin, S.H. 1992. Using journals to promote learning across the curriculum. In *Reading in the Content Areas: Improving Classroom Instruction*, eds. E.K. Dishner, T.W. Bean, J.E. Readence, and D.W. Moore, 311–318. Dubuque, Iowa: Kendall/Hunt.
- Ogle, D. 1992. KWL in action: Secondary teachers find applications that work. In *Reading in the Content Areas: Improving Classroom Instruction*, eds. E.K. Dishner, T.W. Bean, J.E. Readence, and D.W. Moore, 270–282. Dubuque, Iowa: Kendall/Hunt.
- Singer, H., and D. Donlan. 1989. *Reading and Learning from Text*. Hillsdale, N.J.: Erlbaum.
- Tei, E., and O. Stewart. 1985. Effective studying from text. *Forum for Reading* 16(2): 46–55.
- Vacca, R.T., and L.C. Burkey. 1992. Metacognition and comprehension: Showing students how to learn from text. In *Reading in the Content Areas: Improving Classroom Instruction*, eds. E.K. Dishner, T.W. Bean, J.E. Readence, and D.W. Moore, 255–263. Dubuque, Iowa: Kendall/Hunt.
- Vacca, R.T., and J.L. Vacca. 1999. *Content Area Reading: Literacy and Learning Across the Curriculum*, 6<sup>th</sup> ed. New York: Longman.