

# Building Scientific Literacy

Science, perhaps more than any other subject, involves complex informational and graphic texts. In addition, reading and understanding science places heavy demands on students because of the nature of scientific information. The challenges that students face include the following:

1. lack of background knowledge related to the text
2. dense text and new vocabulary
3. abstract concepts and processes that require deep thinking
4. many kinds of graphic forms that each require different decoding skills

In addition, creating a safe place for students enrolled in Applied 9 Science to read to one another and to the class can be difficult. Some students may not be independent readers. Some may be reluctant readers. Some will be both. Do not make assumptions about reluctant readers. Take the time to assess your students' reading abilities to establish who the strong readers in the class are. This might be best done in a one-on-one setting to give students the benefit of privacy. First-hand knowledge of your students' reading abilities will help you to establish student groupings and also to understand the support that will help students to grow on a daily basis.

We all want our students to be motivated readers who can effectively

- decode what they read
- feel a purpose for reading
- monitor the effectiveness of their reading
- analyze what they read to understand new concepts and processes
- draw conclusions by interpreting the content

*Science Links 9* has been written with a combination of an engaging science narrative; margin definitions, instructional graphics, and detailed captions; and embedded literacy strategies that support students as they work through the text.

The opening paragraph of *Think Literacy: Cross-Curricular Approaches, Grades 7–12* (2004) set the context for using reading strategies with great clarity:

“As students progress through school, they are asked to read increasingly complex informational and graphical texts in their courses. The ability to understand and use the information in these texts is key to a student's success in learning. Successful students have a repertoire of strategies to draw upon, and know how to use them in different contexts. Struggling students need explicit teaching of these strategies to become better readers.”

The focus here is for students to develop strategies. Students must have a repertoire of strategies to draw on in specific situations. For this reason, the headings “before reading,” “during reading,” and “after reading,” used alone, lack detail and are insufficient for communicating the purpose of the necessary skills that students need. Research on reading in the content areas, particularly the area of science, suggests that we need to provide a deeper focus on science-specific reading strategies to employ with students. The body of research touched on in *Think Literacy* has been synthesized in our text into a coherent scientific literacy program. Five categories of strategies, customized for Grade 9 science students, have been embedded in *Science Links 9*. These strategies, and their relation to before, during, and after reading, are shown below:

Category	Before	During	After
1. Preparing for reading	Y		
2. Reading effectively	Y	Y	Y
3. Reading graphic text		Y	
4. Word study		Y	
5. Organizing your learning		Y	Y

Within each category, *Science Links 9* provides students with a wide assortment of strategies that have a specific and clear purpose so that teachers can efficiently judge their applicability to their own contexts. These strategies are detailed here:

## 1. Preparing for Reading

- **Previewing text** involves flipping through the chapter to see how it is organized and how the features of the textbook support the main ideas in the chapter.
- **Making connections to visuals** involves relating visuals—such as photographs, illustrations, and graphic text—to personal experiences and to the text that accompanies each visual.

## 2. Reading Effectively

- **Asking questions** helps students engage actively in reading the text and gives them a purpose for continuing to read.
- **Identifying the main idea and details** helps students figure out what is the most important information in the text that they are reading. They can also use this strategy after reading, to help them organize what they have learned.

- **Making connections to prior knowledge** helps students relate what they already know to what they are learning.
- **Making inferences** helps students figure out the meaning of the text by combining information in the text with what they already know and by “reading between the lines.”
- **Monitoring comprehension** ensures that students stop from time to time as they are reading to ask themselves whether they have understood what they have read.
- **Skim, scan, or study** helps students alter their reading speed based on their purpose for reading.
- **Visualizing** helps students transform a chunk of text into an image in their minds to help them understand and remember details and comparisons in the text.

### 3. Reading Graphic Text

Reading tables, graphs, and diagrams is different from reading text. The three strategies below can help students identify elements that are specific to each type of graphic text so that they can interpret what the graphic text represents:

- **Interpreting diagrams** requires students to read and understand the parts of the diagram and then relate the parts to one another and to the concepts explained in the text.
- **Interpreting graphs** requires students to understand the organization and functions of the parts of a graph, such as axes, points, and lines. It also requires them to pay attention to the graph’s title and caption.
- **Interpreting tables** requires students to examine data that have been organized in rows and columns with explanatory headings.

### 4. Word Study

Science textbooks include many words that may be unfamiliar to students. Use the following strategies to help them determine the meanings of new words:

- Identify the **base word**. The base word is the main part of the word, which is distinct from a prefix, suffix, or combining part.
- Examine the smaller words that make up **compound words**.
- Create a **word map** to analyze a word beyond its definition—for example, by identifying its opposites and by listing its synonyms.
- Consider the **multiple meanings** of a word when it appears in different contexts.
- Identify the **suffixes** that change the meaning of a word. A suffix is a small word part at the end of a word.

- Analyze **word families** to understand relationships among words that have common parts, such as the same base.
- Look up **word origins** in a dictionary to deepen your understanding of a word.

### 5. Organizing Your Learning

Taking notes in class is only the first step in understanding a new concept. You may want students to organize what they have learned in a way that helps them remember key concepts and helps them study for tests.

- **Comparing and contrasting** involves identifying the similarities and differences between two or more concepts or things.
- **Identifying cause and effect** helps students understand why and how events occur, as well as their consequences.
- **Making study notes** means identifying the most important information and recording it in a way that makes sense to students.
- **Summarizing** involves stating the main ideas of a paragraph or a section of text in your own words. Students can summarize text using a list, a drawing, point-form notes, a table, or a graphic organizer.
- **Using graphic organizers** helps students organize information in a visual format.

### Using the Literacy Skills Toolkits

Beginning on page 377 of the student textbook, you will find five Literacy Skills Toolkits. These Literacy Skills Toolkits describe and provide examples of the study strategies described above. Early in the course, refer to the Literacy Skills Toolkits with your students. Model how you might use one of the strategies to help understand or analyze a chunk of text. Then, periodically through the course, return to the Toolkits, modelling other strategies and reinforcing those students have already seen. Some suggestions for doing this are provided in the Teaching Notes for each unit.

As a group, students come to class with a wide variety of reading and studying skills. For this reason, the design of *Science Links 9* recognizes teacher’s needs for strong literacy supports without imposing a literacy perspective on the text. The key is to find a balance that supports the development of strong literacy skills, and still allows the science to be a source of inspiration for students as they discover more about their world.