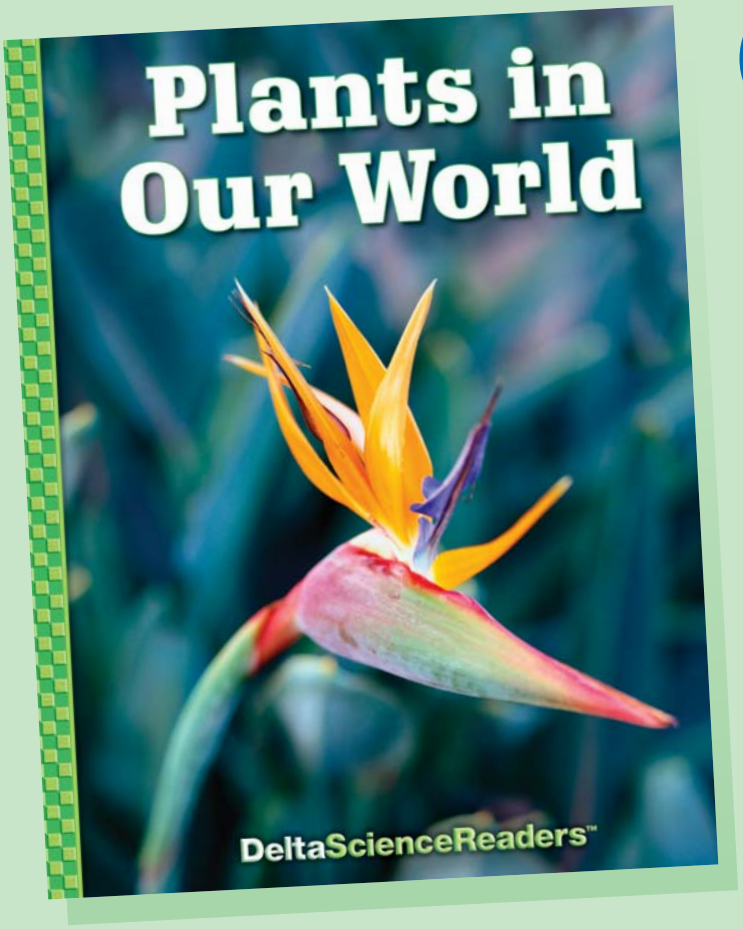
Delta Science Reader *Plants in Our World* Teacher's Guide



In the Delta Science Reader ***Plants in Our World,*** students find out about the wide variety of plants that make up the plant kingdom. They read about the characteristics that define an organism as a plant and how plants make food, get energy, reproduce, and respond to their environments. Then they compare and contrast the main categories of plants: nonvascular, seedless vascular, and seed plants. They also learn about the types, structures, and life cycles of each classification. Next, students are introduced to ethnobotanists, scientists who study the amazing ways that people use local plants. Finally, they find out how seeds get from a parent plant to places with optimum conditions for the new plant to thrive.

DELTA SCIENCE READERS for grades 6–8 are content-rich, 24-page informational texts that present key science concepts and vocabulary. They cover important science topics in an accessible, engaging format.

TEACHER'S GUIDES for Delta Science Readers for grades 6–8 contain general background information for linking science and literacy, assessment, and including all learners, as well as a comprehensive teaching plan. The teaching plan features three-step lessons and spotlight panels on science, literacy, and meeting individual needs.

Contents

INTRODUCTION

Delta Science Readers for grades 6–8 are content-rich, 24-page informational texts. Based on key science standards for the topic, they are used in conjunction with hands-on kits or as stand-alone texts.

As students reach middle school, their reading abilities and knowledge of literacy skills and strategies greatly affect their success in understanding informational text. Middle school readers often need guidance in reading for information, especially as the content load of the text increases and becomes more complex. This guide provides the middle school teacher with both science and literacy support to help students learn.

Science and Literacy

Delta Science Readers are outstanding resources for building both science knowledge and literacy skills and strategies. Students interacting with informational text are exploring language fully, exercising all four aspects of literacy: reading, writing, speaking, and listening.

Reading Informational Text

Reading to gain information is markedly different from reading for literary experience or to perform a task. Informational text is often read nonlinearly, or selectively. From section to section, the difficulty level, concentration of new vocabulary, structural pattern, and unfamiliarity of content may vary. Use the following guidelines to help your students get the most out of reading nonfiction text.

Prereading. Help students anticipate content and predict learning outcomes before they begin to read. Always preview informational text with students so that they can develop a focused purpose for reading and be able to answer the question, "Why am I reading this?"

Reading Strategically. A number of reading strategies support the comprehension of science text, in part because of the strong relationship between science and reading comprehension skills. The following comprehension skills are common to both reading and science:

- Identify main ideas and supporting details
- Compare and contrast
- Relate cause and effect
- Trace a sequence of events
- Draw conclusions based on evidence
- Demonstrate critical thinking
- Generate questions
- Summarize information
- Interpret graphics
- Recognize patterns and relationships
- Make predictions

Some of these skills are applied in the process of extracting and processing information. Others are applied in more demanding ways as students evaluate, analyze, interpret, and synthesize ideas.

Monitoring Comprehension. Help students read actively. Active readers think about the organization and presentation of information and monitor their own comprehension. Provide these tips: reread difficult passages; vary the pace of reading; stop and think about a passage; ask questions; think aloud while reading; take notes; make a prediction about what will come next; or paraphrase what has been read. Also, some students can process and share information better when paired with a reading partner.

Using Graphic Organizers. Graphic organizers are diagrams that show the relationships among ideas. Unlike traditional outlines, graphic organizers are visual representations. They show, rather than tell about, associations among important facts and supporting details. Encourage students to create their own graphic organizers. The most effective ones are those generated by students themselves as they interact with information. Useful formats include the KWL chart (see p. T1), concept web, T-chart, Venn diagram, flowchart, and cycle chart.

Keeping Science Notebooks. Responding to informational text in writing promotes higher levels of understanding. Students should use their notebooks for all writing related to the topic. This can include graphic organizers, vocabulary lists, predictions, questions, observations, labeled illustrations and diagrams, personal discoveries, activity sheets, and note taking.

Building Science Vocabulary

Studying science involves learning specialized vocabulary terms. It may also mean relearning familiar words that have different meanings in science. Help students acquire new science vocabulary through multiple activities. Examples include analyzing word parts, understanding word origins, identifying word families, crafting definitions in their own words, role-playing or illustrating definitions, connecting new words to known words, using context clues, and using science language as they write and talk about science topics.

Previewing Vocabulary. When previewing the boxed vocabulary words for each section, you may wish to focus on the terms most critical to your curriculum needs. You may also wish to have students work in pairs or in small groups to share their ideas about words and meanings.

It is important for students to keep written records of their growing science language in their science notebooks. You may begin this record during the vocabulary preview, using any of the following ideas or your own method:

- Have students sort the vocabulary words into lists of terms they know and don't know. As they read and learn, the "Know" list should grow and the "Don't Know" list should shrink.
- Ask a volunteer to read the words out loud so students can hear correct pronunciations.
- Group related words together in a chart.
- Identify words that have familiar roots, prefixes, or suffixes.
- Note familiar words that have a special or different meaning in science.
- Let students select one vocabulary word they know and illustrate it or use it in an original sentence.

Reading and Vocabulary Growth. Support the natural link between science and literacy by making your science classroom a library as well as a laboratory. Make available other kinds of reading material about the topic in addition to the Delta Science Readers. Examples include nonfiction trade books, newspaper and journal articles, computer printouts from validated and reliable sources, textbooks, reference books such as almanacs and encyclopedias, posters, CD-ROMs, and so on. Seeing science concepts and vocabulary used in other contexts reinforces understanding.

*See the **Glossary** pages, T23–T24, for many additional suggestions on building vocabulary.*

Assessment Features

Students' knowledge and skills should be assessed in as many modalities as they are taught so that all students can show what they know. This Delta Science Reader teacher's guide offers a variety of tools and strategies for measuring student achievement throughout the learning process.

Preassessment Preassessments take place prior to learning and provide information on students' awareness and experience regarding the topics.

- **Access Prior Knowledge**—informal assessments of students' entry-level understanding.

Ongoing Assessment Ongoing, formative assessments are integrated into the daily teaching and learning process. They not only measure ongoing student progress but also provide insights for reshaping and improving instruction.

- **Read to Understand Questions**—self-assessments or more formal evaluations of student mastery of key concepts. Suggested answers are provided.
- **Alternative Assessments**—additional choices, usually nonverbal, that provide other ways for students to demonstrate competencies.
- **Meeting Individual Needs**—teaching ideas that serve as assessments for students who have difficulty communicating fluently.
- **Answers to Caption Questions**—self-assessments related to student interpretation of graphic elements.
- **Notebooks**—student responses to science text and experiences that reveal growth in level of understanding and ability to organize ideas.

Postassessment Postassessments, or summative assessments, are opportunities for students to demonstrate what they have gained as a result of the learning experience.

- **Review and Reflect**—summative assessments that show the degree to which students can recognize patterns and understand relationships in the overall subject matter.
- **Writing Links**—writing assignments that require students to apply and communicate knowledge.
- **Cover to Cover**—opportunity for students to synthesize learning by comparing and contrasting front and back cover photographs.
- **Unit Test**—selected-response and short-answer questions (with answer key), provided with this teacher's guide, that measure comprehension of key science vocabulary and concepts.

Including All Learners

All students can be active participants in the scientific process and can become scientifically literate citizens. Further, all teachers can successfully guide students to learn and enjoy science. Making science content universally accessible may require implementing different instructional strategies and accommodating multiple intelligences. The guidelines listed below will help you meet the challenges of your diverse classroom.

Hands-on Science

The science classroom is an ideal environment for diverse learners because of its reliance on hands-on exploration of the world. Research has shown that all students are highly motivated to learn science when actively engaged in hands-on activities. Hands-on investigations are therefore an essential component of science education. Hands-on, inquiry-based science helps extend the reach of instruction to all students while enhancing and reinforcing student learning.

English Language Learners

When reading informational science text, English Language Learners (ELLs) are confronted with the challenge of learning content while becoming proficient in English. They may have the cognitive ability to perform in class and understand scientific meanings, but they may be unable to communicate, by reading, writing, speaking, or even listening, with proficiency and confidence. Using effective strategies, teachers can make content more accessible while language learners improve their English.

- Reinforce reader content with hands-on activities.
- Simplify vocabulary, not content.
- Allow multiple opportunities to practice new vocabulary.
- Present information orally and visually.
- Allow ELLs to demonstrate science learning nonverbally.
- Assess science comprehension, not English fluency.
- Promote a classroom environment in which students are comfortable sharing ideas and taking risks.

Learners with Special Needs

Individual student needs, abilities, and disabilities vary widely, and the accommodations appropriate for each classroom will be unique. Begin with a student's individual educational plan (IEP). Tailor the presentation, classroom setup, teaching strategy, and materials to ensure student safety and to enable each student to participate as fully as possible.

- Present instruction in the context of real-world situations.
- Pair students who have difficulty reading with friends who read fluently.
- Allow extra time for completing activities.
- Assign one task at a time and give instructions in different ways.
- Introduce new vocabulary in different, meaningful ways.
- Review material more often.
- Repeat other students' comments and questions for everyone to hear clearly.

Advanced Learners

Advanced learners benefit from meaningful assignments that extend and enrich their knowledge of science. Encourage students who readily grasp the basics of science concepts and processes to deepen their explorations. Students performing above grade level can cultivate high levels of science thinking through further research, investigation, or other guided or independent projects.

- Provide enrichment opportunities for students who can and wish to work on independent projects.
- Ask questions that encourage creative or imaginative answers.
- Model thinking that leads to problem solving, synthesizing, analyzing, and decision making.
- Make available more sophisticated resources for exploring the topic.
- Invite students to present their research to the class in a format of their choosing.

*See the **Meeting Individual Needs** spotlight panels throughout this guide for specific suggestions for including English Language Learners, learners with special needs, and advanced learners.*

About the Teaching Plan

The format and content of the three-step lesson plans and spotlight panels for each ***Think About . . .*** section in the student book are described below. Use the suggestions and strategies as appropriate for your teaching style and the needs of your students.

Three-step Lesson Plan

The lesson plan for each section begins with a list of **learning objectives.** The final objective in each list highlights one reading skill that promotes science comprehension.

1 Before Reading Before-reading strategies set the stage for reading each section. Prereading efforts are particularly important with informational text because the reader will encounter new and complex ideas, different text forms and structures, and unfamiliar vocabulary. Make the process less daunting by accessing prior knowledge and previewing the section.

Access Prior Knowledge. These discussion prompts help you engage and motivate students by linking the main ideas students will read about to their existing knowledge and experiences. In some cases, it may be appropriate to identify and address common misconceptions about the topic at this point.

Preview the Section. This is a "walk-through" of the section content and vocabulary. Point out or discuss the boxed Read to Understand questions and vocabulary words. These indicate the main topics and key terms covered in the section. Also, look together at the section title and subheads. Based on the preview, students can generate questions, make predictions, and set a purpose for reading this section.

2 Guide the Learning Help students interact with the text, monitor comprehension, and integrate new ideas with existing knowledge as they read. A variety of grouping strategies is suggested so that students may benefit from collaborative learning.

Discuss and Explore. These questions elicit student responses that demonstrate comprehension of facts and concepts. The science and literacy skills developed during reading include

- relate cause and effect
- identify the main idea and supporting details
- trace a sequence of events
- compare and contrast
- describe
- predict

Critical Thinking. These questions challenge students to dig deeper and exercise higher-order thinking skills, such as

- infer
- draw conclusions
- interpret
- summarize
- generate questions

3 Assess After-reading assessments for each *Think About . . .* section include

Read to Understand Answers. Sample answers to the Read to Understand questions are provided. The questions can function either as informal self-assessments for students or as part of an ongoing written or oral assessment of student progress.

Alternative Assessment. These assessment opportunities, such as hands-on demonstrations or visual presentations, accommodate multiple learning and communication modes.

This teacher's guide offers opportunities for multiple measures of student progress. See ***Assessment Features,*** *p. Tiii, for additional tools.*

Spotlight Panels

Special feature boxes appear on each page to provide additional support.

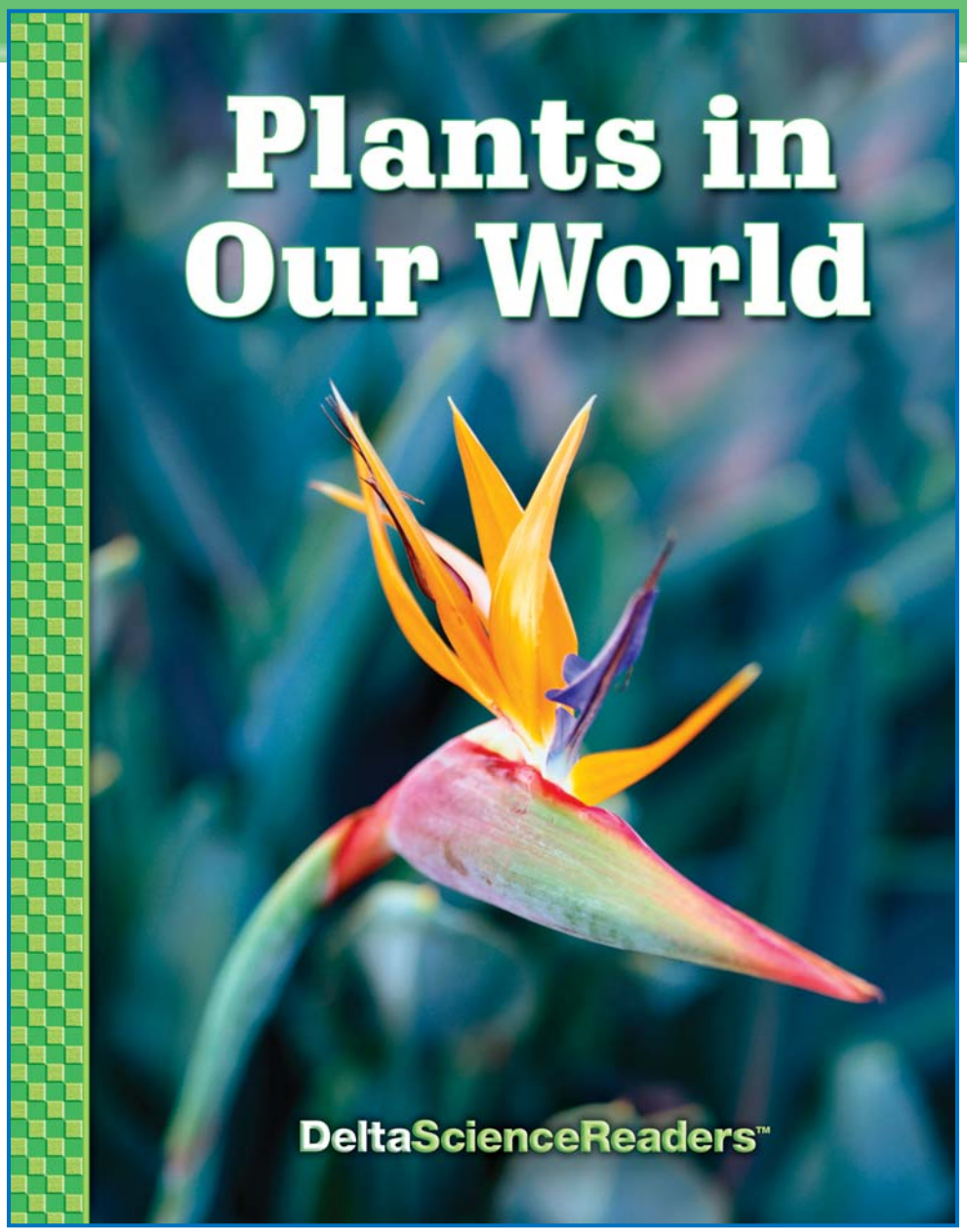
Science. Additional science background information, historical perspectives, and facts and figures of interest that support science instruction and can be shared with students as appropriate.

Literacy. Ideas for strengthening literacy skills in the areas of reading comprehension, vocabulary, notebooking, organizing ideas, and using the visuals.

Meeting Individual Needs. Suggestions for making science content and vocabulary accessible to English Language Learners and students with special needs and for including and challenging advanced learners.

Teaching pages for ***People in Science*** *and* ***Did You Know?*** *also offer suggestions for activating prior knowledge and building comprehension and include science spotlight panels. The Glossary pages provide many helpful vocabulary-building strategies.*

TEACHING *Plants in Our World*



The Delta Science Reader ***Plants in Our World*** presents the key science concepts related to plants: structures and functions of plant parts, what plants need to survive and how they reproduce, different types of plants, and the importance of plants to life on Earth. The book provides opportunities for students to engage in science inquiry by applying literacy skills and strategies to nonfiction text. Students explore science as they develop informational literacy.

Build Background

Front Cover. Access students' prior knowledge of plants by displaying the cover and discussing the title. *What does the photograph on the cover show?* (Students may recognize the tropical plant called a bird-of-paradise.) *Where do you think a plant like this might grow?* Invite anyone who has seen a bird-of-paradise plant to describe it. *What do you think of when you read the title* Plants in Our World? *What is a plant? What are some types of plants that are common in our part of the world?* (Accept all reasonable responses.)

Encourage students to share what they know about plants from their personal experiences and previous hands-on explorations in science. If possible, have several different kinds of indoor plants available for observation in the classroom while students are reading this book. Also, refer to any views of plants outdoors through classroom windows. Stimulate discussion with questions such as these: *Have you ever grown plants in your house or in a garden? Tell about what you did and about the plants that grew. Describe the most unusual plant you have ever seen or heard about. What are some ways people use plants and plant parts or plant products?*

Preview the Book

In a preview, students scan the book quickly to see the structure and to find the main topics and most important text features. Have students preview *Plants in Our World* before reading.

Roadmap for Reading. Tell students that previewing is like looking at a map before taking a trip. It helps us know where we are going! Using a preview to anticipate content increases student interest in the material to be studied. For that reason, a preview is a vital part of reading for information, or nonfiction reading. Use the preview to activate prior knowledge, make predictions about what the text will present, and set a purpose for reading.

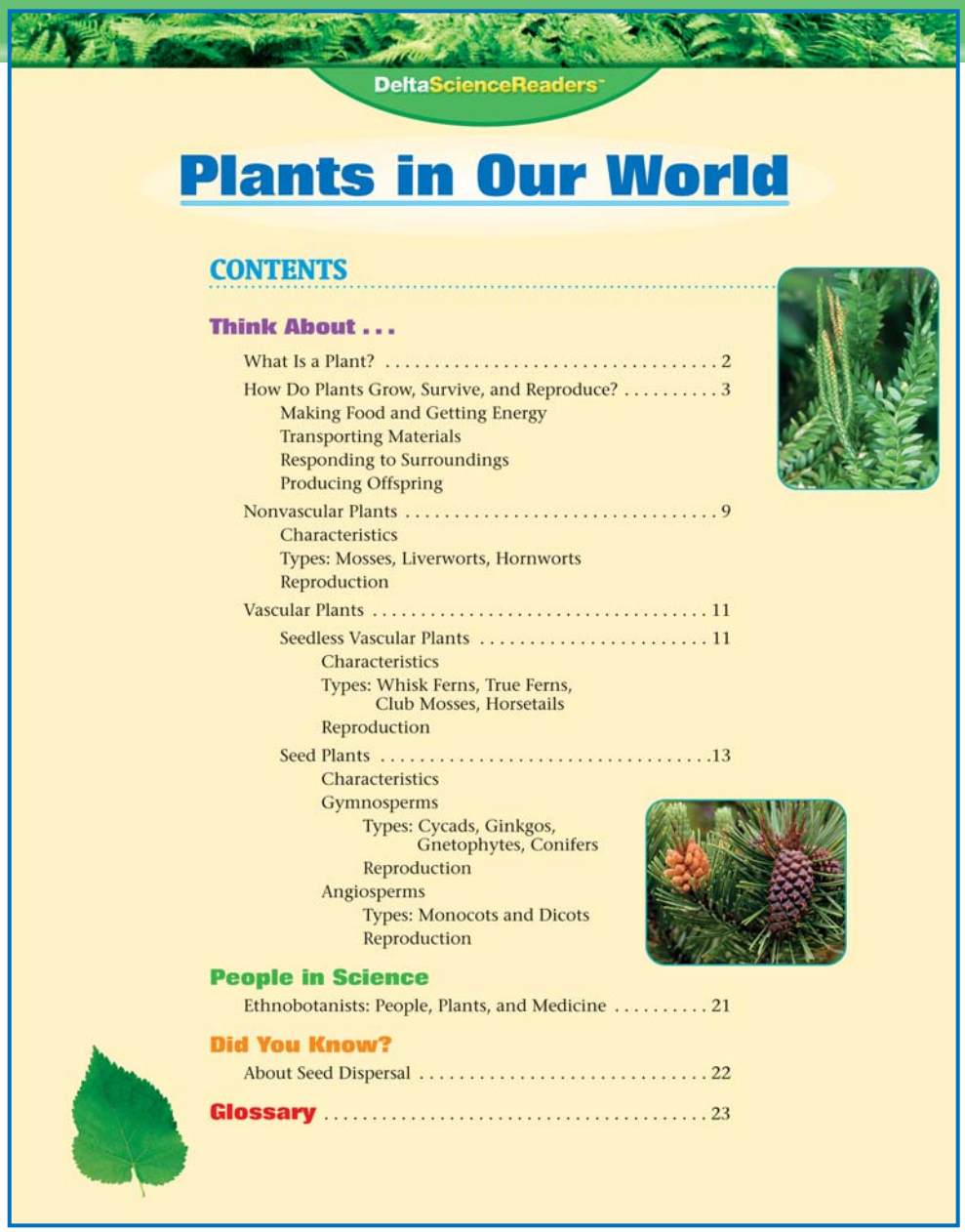


Table of Contents. Begin the preview with the table of contents. Think of the table of contents as an outline of the book. It lists the different parts of the book and the topics covered in each part. Page numbers are given for the main section headings. After students have skimmed the table of contents, ask if they have ever studied any of these topics before. Look at the photographs on the contents page. Can students guess where in the book they might find out about the objects pictured?

Text Features. Next, have students "walk through" the book. Ask them to look at the headings, subheadings, and graphics (photographs, diagrams, captions, illustrations, labels, graphs, and tables) and tell why they are helpful. Focus their attention on organizational features such as the boxed Read to Understand questions, boxed Vocabulary lists, boldfaced words, and Glossary.

Have students generate questions about the purpose of each feature they identify: Why are these [*vocabulary boxes*] here? What is the purpose of [*figure numbers*]? What if the book did not have [*headings*]? How do [*diagrams*] help us understand the text?

Start a KWL Chart

Have students make a four-column KWL chart in their science notebooks. Based on the book's title and their preview, have them fill in the first two columns—What I Know (K) and What I Want to Know (W). Have students fill in the third column, What I Learned (L), as they work through the book. After students have finished reading about each topic, they can fill in the last column with questions they still have about the topic.

Conceptual Framework

Help students make meaning of the content covered in *Plants in Our World* by building a conceptual framework—a theme around which they can organize ideas and information. For this topic, such a framework might be **The plant kingdom has unity and diversity.** Many different kinds of plants make up the plant kingdom, and yet all plants have some characteristics in common. All plants make their own food and so are the energy sources for other living things. Also, the cellular structure of all plants is similar, and all plants have similar needs for survival. Yet the 250,000 species of plants vary greatly in external features, internal processes, life cycles, habitats, and so on.

Begin by discussing students' common experiences with plants. For example, what plants did they observe at home or on their way to school today? How do they account for the many differences they observed? What do they think plants need to survive and grow? How do plants get and use what they need? As students read, they can relate their learning about similarities and differences among plants and the vital contributions of plants to our world to this framework.

OBJECTIVES
(page 2)

- **Understand what defines a member of the plant kingdom.**
- **Recognize the importance of plants as producers.**

1 Before Reading

Ask students to suggest examples of plants. (flower, bush, grass, tree, houseplant) Based on the responses, have students come up with a definition for *plant*. Then briefly preview this short section.

2 Guide the Learning

Organize Ideas Discuss the scientific classification of living things, using the information in paragraph 1 and Figs. 28 and 29 on p. 23. Help students become familiar with the levels of organization from kingdom to species. Create a mnemonic to remember the hierarchy. (King David Came Over For Great Salsa) Let students invent a classification system for sports, music, or food.

Contrast Have students contrast plant and animal cells. (Only plant cells have chloroplasts and cell walls.) Then have them contrast the ways plants and animals get energy. (Plants are producers and get energy from the Sun to make food. Animals are consumers and must eat plants or other animals as food to get energy.)

3 Assess

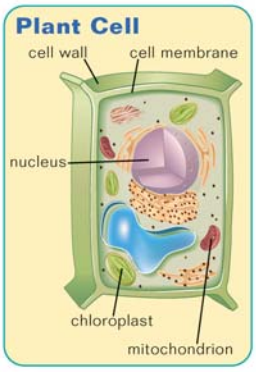
Read to Understand Answers

What are some of the main characteristics of plants? Plants can make their own food, have no nervous system, and do not move from place to place.

Why are plants called producers? because they make their own food

Think About . . .

What Is a Plant?



▲ **Figure 1** The different parts of a plant cell provide protection and support for the cell; help it make, store, and use food; and perform other life functions.

READ TO UNDERSTAND

- What are some of the main characteristics of plants?
- Why are plants called producers?

VOCABULARY

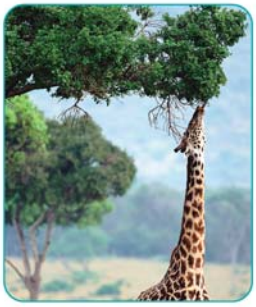
species	cell wall
genus	chloroplast
kingdom	producer
division	consumer
plant	

Many ancient cultures had basic systems to categorize, or classify, living things. In our modern classification system, a group of similar organisms that can reproduce among themselves is called a **species.** A **genus** is a group of closely related species. Genus and species are the lowest, or most specific, levels of organization. The highest, or most general, level of organization is called a **kingdom.** For plants, the level below a kingdom is called a **division.** Figures 28 and 29 on page 23 give more information about the classification of living things. In this book, we will explore the wide variety of plants in the plant kingdom.

What defines a member of the plant kingdom? **Plants** are multicellular, or many-celled, organisms that can produce their own food using sunlight, air, and water. Plants do not have nervous systems, and they do not move from place to place.

Plant cells have two main structures that distinguish them from animal cells. You may know that all cells are surrounded by a cell membrane. It keeps the parts of the cell inside and lets nutrients in and wastes out. But plant cells are also surrounded by a structure called a **cell wall** (Figure 1). The cell wall is stiff, and it supports the cell. Together, all the cell walls in a plant give the plant its shape. Also present in some plant cells, but absent in animal cells, are chloroplasts. **Chloroplasts** are the structures in plant cells where food is produced using the energy from sunlight.

Every living thing needs energy to live and grow. Energy is stored in food. Since plants can make their own food, they are known as **producers.** Plants do not depend on other organisms to survive. Animals and fungi, however, are known as **consumers.** They cannot make their own food. They get energy by eating plants (Figure 2) or other animals. If all of the plants on Earth disappeared, most animals and fungi would soon die out.



► **Figure 2** Most organisms depend on plants for food. More than 250,000 species of plants are known.

2

LITERACY

Vocabulary: Multiple-meaning Words Many words that are used in science also have common or everyday meanings. In science, a cell is the basic unit of structure and function in living things, and it is made up of parts such as a cell wall, a cell membrane, and a nucleus. Scientists must use microscopes to observe cells because most are too small to see with the naked eye. Ask students to name other everyday meanings of *cell* and discuss how all of the definitions are related. (The word *cell* can mean "a single room [prison cell]," "a box in a table [spreadsheet cell]," or "a small enclosed space [honeycomb cell or dry cell]." Each definition indicates a compartment with walls or sides surrounding a space for storage or other purposes.)

In 1665 English scientist Robert Hooke discovered cells while observing cork through a microscope. Because the tiny structures looked like "little rooms," Hooke called them *cells*.

How Do Plants Grow, Survive, and Reproduce?

Making Food and Getting Energy

Plants have one process to create food molecules that store energy. This process is called photosynthesis. Plants have a second process to break down food molecules in order to release energy. This process is called respiration.

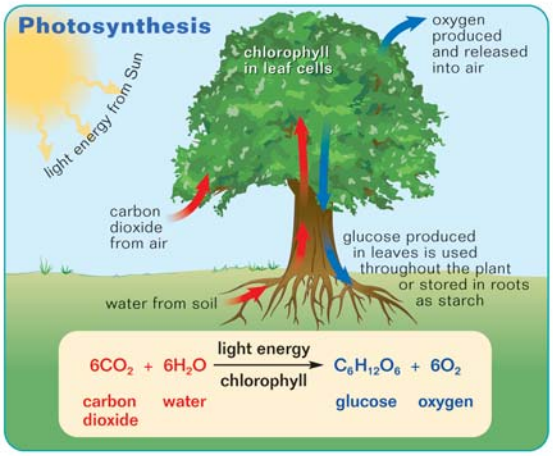
Photosynthesis The process plants use to make food is called **photosynthesis.** *Photo* comes from the Greek word meaning "light," and *synthesis* comes from the Greek word meaning "to put together." The chemical reactions involved in photosynthesis require energy. That energy comes from sunlight. This is the "photo" part of photosynthesis. Inside the chloroplasts of a plant's cells, the chemical **chlorophyll** captures the energy from sunlight. Then the chloroplasts use that energy to chemically combine carbon dioxide (CO_2) and water (H_2O) to form the simple sugar glucose ($C_6H_{12}O_6$) and oxygen (O_2). This is the "synthesis" part of photosynthesis. Glucose is an energy-rich carbohydrate that serves as a food source for the plant. Glucose molecules are stored mostly in the plant's roots as starch. The oxygen that is produced during photosynthesis is given off through openings in the plant's leaves. Figure 3 shows the chemical equation for photosynthesis.

READ TO UNDERSTAND

- Through which two processes do plants make and use food?
- What is the main difference between vascular and nonvascular plants?
- How do responses such as dormancy and tropisms help plants survive?
- What are the two main stages of a typical plant life cycle?

VOCABULARY

photosynthesis	sperm
chlorophyll	fertilization
pigment	zygote
accessory pigment	embryo
respiration	offspring
vascular plant	chromosome
nonvascular plant	diploid
transpiration	haploid
dormancy	asexual reproduction
tropism	spore
phototropism	regeneration
gravitropism	runner
thigmotropism	rhizome
sexual reproduction	grafting
gamete	layering
egg	sporophyte
	gametophyte



◀ **Figure 3** During photosynthesis, a plant uses light energy from the Sun to change carbon dioxide and water into glucose and oxygen.

MEETING INDIVIDUAL NEEDS

English Language Learners Have students figure out the meaning of *chloroplast* (p. 2) and *chlorophyll* (p. 3) by breaking down the words into parts. Ask students to use a dictionary to find the meaning of *chloro-* (greenish yellow), *-plast* (small structure, particle), and *-phyll* (leaf). Have students relate the word parts to the Glossary definitions of the words. (A chloroplast is a structure in a leaf that contains green chlorophyll.)

Learners with Special Needs Have students write an equation for photosynthesis using the word labels and symbols from the chemical equation in Fig. 3. Ask them to use their equations and the information in Fig. 3 to trace and explain the process of photosynthesis.

Note: Use the Meeting Individual Needs ideas as teaching or assessment strategies for the whole class, if appropriate.

OBJECTIVES

(pages 3–8)

- Summarize the processes of photosynthesis, respiration, and transpiration.
- Describe how materials are transported within plants.
- Explain how plants respond to external stimuli.
- Use reading skills such as identifying the main idea to achieve science comprehension.

1 Before Reading

Access Prior Knowledge

Ask students questions to elicit ideas about what plants need to live and grow.

Preview the Section

Use the Read to Understand questions to set a purpose for reading (answers on p. T8). Preview the Vocabulary words using one of the methods described on p. Tiii. Remind students that these words appear in boldfaced type in the text and are defined in the Glossary.

2 Guide the Learning

Discuss and Explore

Main Idea and Supporting Details

Have students read p. 3 and state the main idea presented about photosynthesis. (Photosynthesis is the process by which plants use chlorophyll and energy from sunlight to make food from carbon dioxide and water.)

What supporting details give more information about this main idea? (Photosynthesis is a chemical reaction. Chlorophyll is the chemical in plant cells that takes in energy from sunlight. The food plants make is a sugar, or carbohydrate, called glucose. The reaction also produces oxygen.)