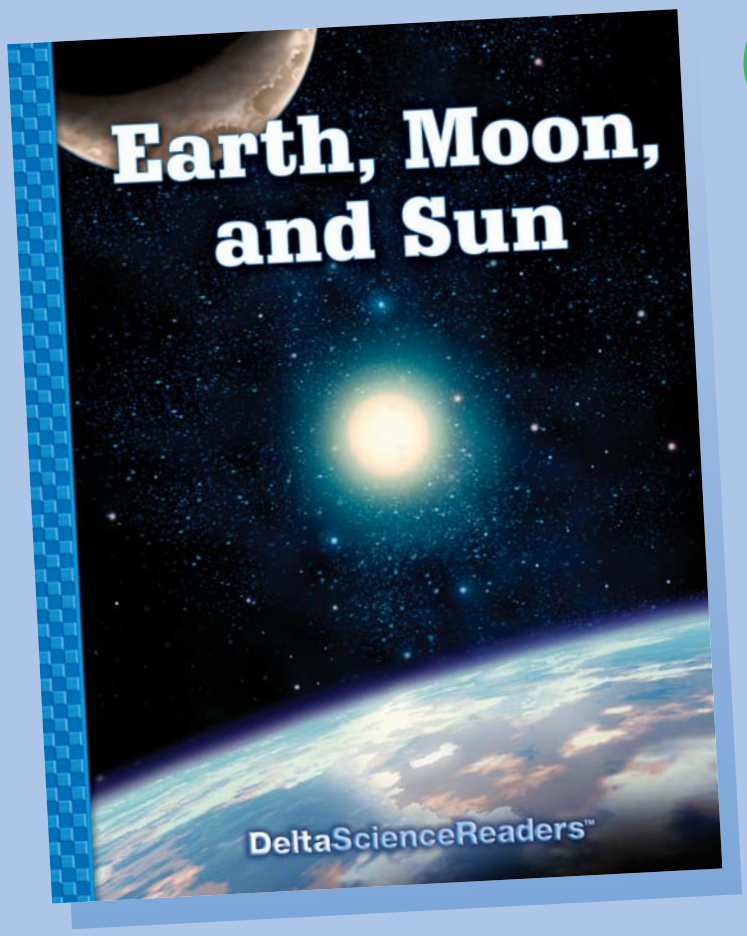
Delta Science Reader *Earth, Moon, and Sun*
Teacher's Guide



In the Delta Science Reader ***Earth, Moon, and Sun,*** students read about Earth's place in space, the forces that affect our planet, and the Earth movements that bring about day and night, seasons, and years. They discover how the Sun is similar to and different from other stars and find out about its composition and the source of its heat and light energy. They learn about Earth's nearest neighbor in space, the Moon, and how its motion relative to Earth produces Moon phases, tides, and eclipses. A biographical sketch introduces students to Copernicus and the heliocentric theory. Finally, a field guide to the planets summarizes important data and interesting facts about the planets in our solar system.

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 with 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** page, 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.

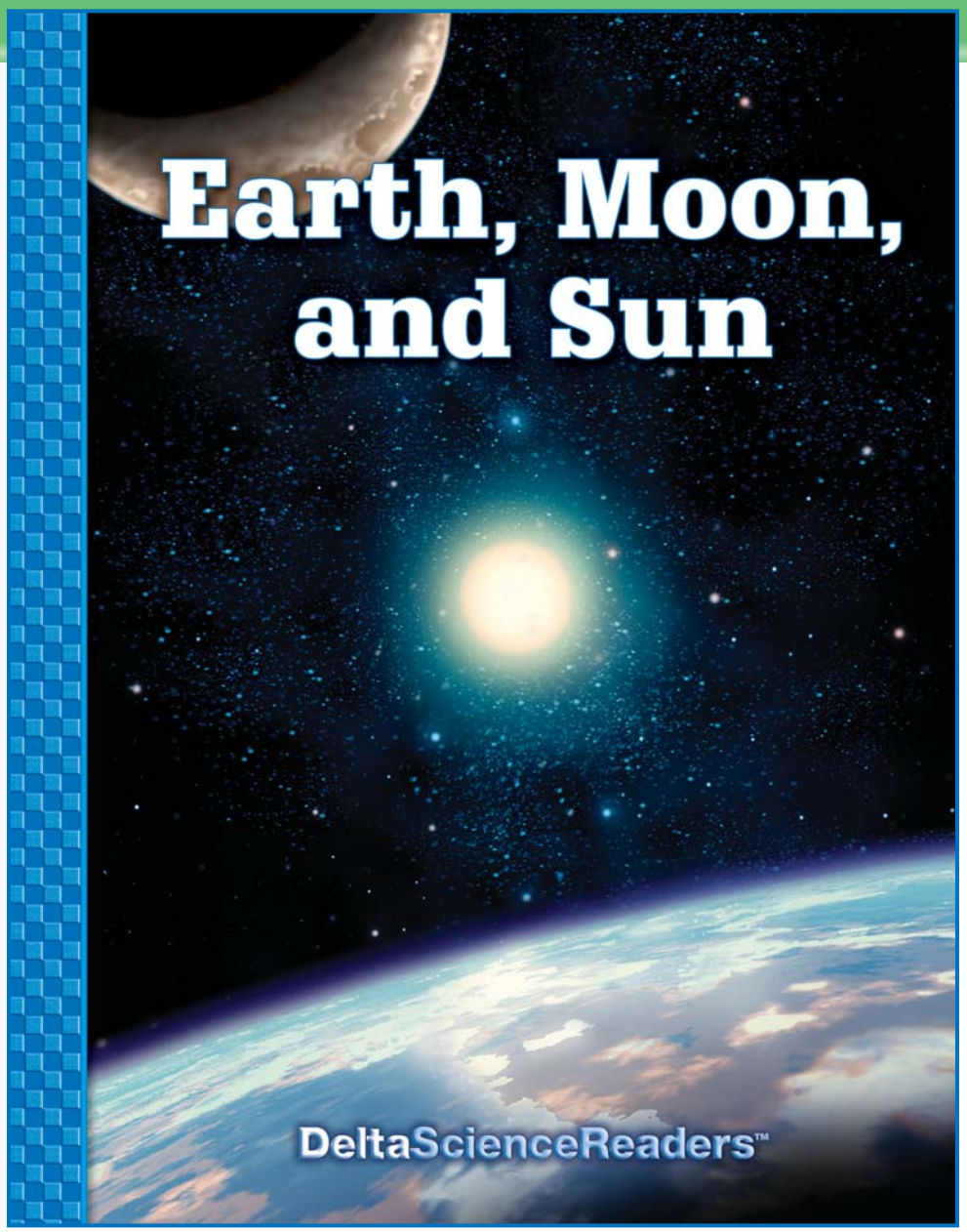
Science. Additional science background information, historical perspectives, and facts and figures of interest that support science instruction and can be shared with students as appropriate.

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 page provides many helpful vocabulary-building strategies.*

TEACHING *Earth, Moon, and Sun*



The Delta Science Reader ***Earth, Moon, and Sun*** presents the key science concepts related to Earth's place in the solar system; the characteristics of the Sun, Moon, and planets; and how the regular and predictable movements of these bodies cause phenomena on Earth such as days, years, seasons, tides, phases of the Moon, and eclipses. This 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 about the Earth, Moon, and Sun by displaying the front cover and discussing the title. Ask, *Which of these bodies is Earth?* (the one at the bottom of the photograph) *What does Earth look like from space?* (Accept all answers.) *Which of these bodies is the Moon?* (the one in the upper left corner) *What does the surface of the Moon look like?* (Accept all ideas.) *Why are parts of the Moon and Earth in shadow?* (Light from the Sun hits only the sides of objects that face it; the sides opposite the Sun are dark.)

Encourage students to share what they know about the features and movements of the Earth, Moon, and Sun from their personal experiences and from previous explorations in science. Stimulate discussion with questions such as these: *How do the Moon and the Sun appear to move in the sky? How does the Moon's appearance change as time passes? What do you think causes cycles such as day and night and winter and summer?*

Such discussions help students make connections between what they already know and new information that will be presented in this book.

Based on the title and cover, have students predict what they might learn about by reading this text.

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 *Earth, Moon, and Sun* 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.

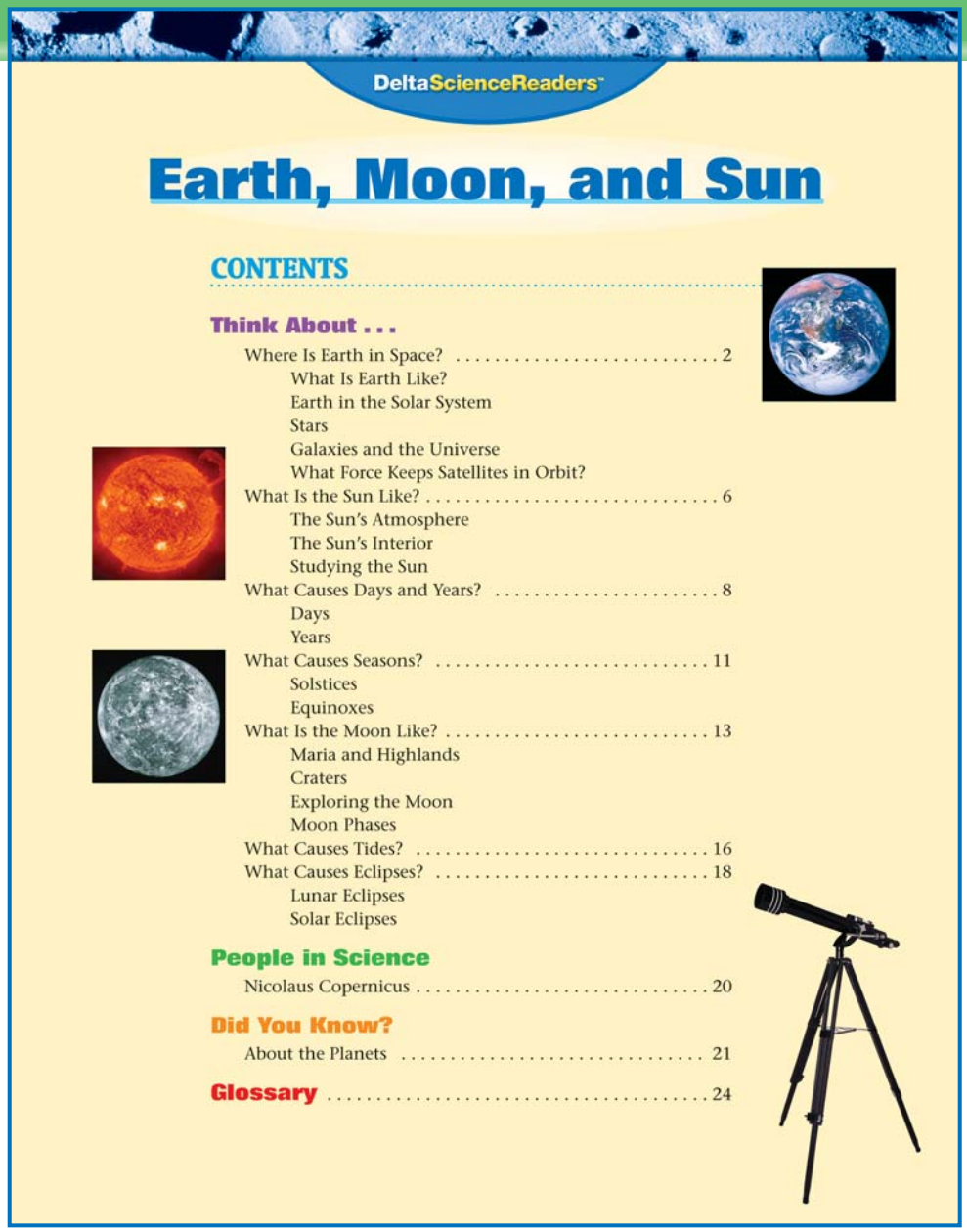


Table of Contents. Begin the preview with the table of contents. Think of the table of contents as an outline of the book. It lists the different parts of the book and the topics covered in each part. Page numbers are given for the main section headings. After students have skimmed the table of contents, 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, boldface words, and Glossary.

For each new feature students identify, have them ask questions: Why are these [*boxes*] here? What are the purposes of [*map keys*]? How do these [*boldface words*] help us understand the topic? What if the book did not have [*figure numbers*]?

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. Generating questions is an important critical thinking skill for responding to text and motivating more investigation.

Conceptual Framework

Help students make meaning of the content covered in *Earth, Moon, and Sun* by building a conceptual framework—a theme around which they can organize ideas and information. For this topic, such a framework might be **Objects in space interact.** The cycles of our everyday life—day and night, seasons, and years—are governed by motions and forces in the universe. Cosmic forces and distant objects also influence other natural phenomena, such as tides, Moon phases, eclipses, and our weather and climate.

Begin by discussing students' common experiences of observing objects in space in the daytime and nighttime sky. Where are these objects and how big are they in relation to one another? How do students think these objects affect one another? As students read, they can relate their learning about the Earth, Moon, and Sun to the framework. When possible, link the learning to current conditions in the changing sky.

OBJECTIVES
(pages 2–5)

- Relate the unique composition of Earth to its ability to support life.
- Summarize the characteristics and movement patterns of the bodies in our solar system.
- Explain the shapes and composition of galaxies.
- Use the term *light-year* to describe distances in space.
- Understand that the force of gravity governs the motions of all objects in the universe.
- Use reading skills such as identifying the main idea and supporting details to achieve science comprehension.

1 Before Reading

Access Prior Knowledge
Ask students questions to elicit their ideas about celestial bodies and how they move in the sky. *What types of natural objects have you seen in the sky during the day? at night?* (Accept all answers.)

Where is Earth located in space? Work together to write the address of your school in the universe. (street, town, state, country, continent, planet, solar system, galaxy, universe)

Preview the Section
Use the Read to Understand questions to set a purpose for reading (answers on p. T5). Preview the Vocabulary words using one of the methods described on p. Tiii. Remind students that these important words appear in boldface type in the text and are defined in the Glossary. (See p. T24 for vocabulary-building strategies.)

Think About . . .

Where Is Earth in Space?

▲ **Figure 1** Earth is known as the blue planet because most of its surface is covered by oceans.

READ TO UNDERSTAND
- What functions does Earth's atmosphere serve?
- What is a satellite, and how do satellites stay in orbit?
- Why would your weight be different on another planet?

VOCABULARY

lithosphere	asteroid
hydrosphere	comet
atmosphere	star
meteoroid	light-year
planet	galaxy
orbit	universe
Sun	gravity
moon	law of universal gravitation
satellite	
solar system	weight

What Is Earth Like?

With its deep blue oceans, swirling white clouds, and brown and green land areas, Earth is home to a huge variety of living things. In fact, Earth is the only planet known to have the conditions necessary to support life as we know it. Earth is shaped like a slightly flattened ball or sphere. Scientists call Earth's rigid outer layer the **lithosphere.** The lithosphere is made mostly of the rocks basalt, granite, and peridotite. The rock material that makes up Earth gets hotter and denser with depth. Because of extremely high pressure and temperature, some regions deep inside Earth are actually made up of slowly flowing rock. The **hydrosphere** is all of Earth's water. About 71 percent of Earth's surface is covered by water (Figure 1). About 97 percent of this water is salty ocean water, and about 3 percent is fresh water. Only a tiny fraction of Earth's fresh water is in liquid form. Most of the fresh water is frozen in glaciers and the polar ice caps. Interactions among the water, land, and Sun cause Earth's weather to change constantly. The **atmosphere** is the thin layer

Note: Because of the vast size of our solar system, illustrations shown are not to scale.

2

LITERACY

Vocabulary: Word Parts Word parts are the building blocks of language. A root gives a word its core meaning. A prefix is added to the beginning of a root or a word, and a suffix is added to the end. Help students figure out the meanings of scientific terms such as *lithosphere, hydrosphere,* and *atmosphere* (introduced on p. 2) by breaking them down into parts. Ask students to use a dictionary to find the meanings of *litho-* (rock), *hydro-* (water), *atmo-* (vapor), and *sphere* (ball, globe) and to construct definitions based on the word parts. Have students write each word part on an index card, along with its definition, and file the cards in a divided box that they can add to while reading this book. (See p. T24 for more word parts used in *Earth, Moon, and Sun* vocabulary.)

Point out that the word *astronomy,* the science of objects in space, is formed from *aster* (star) and *-nomy* (knowledge of).

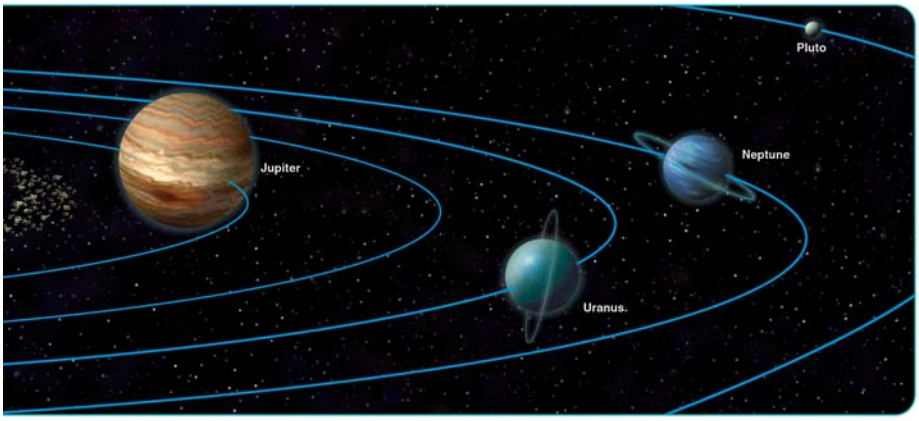
of gases that surrounds Earth. This layer contains oxygen, carbon dioxide, and other gases that living things need. The atmosphere helps regulate Earth's temperature and helps to block the Sun's dangerous rays. The atmosphere also protects Earth from space rocks called **meteoroids.** Each day, thousands of meteoroids enter Earth's atmosphere. However, most burn up in a streak of light called a meteor. The relatively few meteoroids that do reach the planet's surface are called meteorites.

Earth in the Solar System

Astronomers—scientists who study space—have learned much about Earth's position and motion. For centuries, most people believed that Earth stood still and that everything they saw in the sky traveled around Earth. About 500 years ago, scientists began to doubt that idea and, in time, proved it was untrue.

Earth moves quickly through space at a speed of about 108,000 kilometers (about 67,000 miles) per hour. Earth is one of nine **planets** that travel in a path called an **orbit,** around the sphere of hot, glowing gases we call the **Sun** (Figure 2). Many of the planets have smaller bodies called **moons** orbiting them. Earth has one moon, but Jupiter has more than 60. Any object in space that orbits a larger object is called a **satellite.** Most people think of satellites as the artificial objects placed in orbit by humans. However, the term *satellite* also includes natural objects in space, such as moons orbiting planets or planets orbiting the Sun.

The Sun and all of its satellites make up the **solar system.** In addition to the Sun, the nine planets, and their moons, the solar system contains meteoroids, asteroids, and comets. **Asteroids** are rocky objects much smaller than planets but larger than meteoroids. Hundreds of thousands of asteroids revolve around the Sun in the region between Mars and Jupiter called the asteroid belt. **Comets** are chunks of ice, rock, and frozen gases that orbit the Sun.



▲ **Figure 2** Scientists' investigations suggest that our solar system may have formed from a spinning cloud of dust and gas about 4.5 billion years ago. Mercury, Venus, Earth, and Mars are known as the inner planets because they are closest to the Sun. Jupiter, Saturn, Uranus, Neptune, and Pluto are the outer planets.

SCIENCE

History Ancient peoples were deeply interested in the movements of astronomical bodies. Many ancient ruins are thought to be types of calendars based on astronomical observations. Temples and other structures often were constructed to align with events in the sky. For example, Stonehenge in England is a 5,000-year-old circle of huge stones that marks sunrise on the longest day of the year. Medicine wheels built by the Plains Indians also marked solar events. Some pyramids in Egypt contain shafts, leading to tombs, that align with certain stars and constellations, such as Orion. The Aztec Pyramid of the Sun in Mexico is oriented to the movements of the Sun and once contained a massive "Sun Stone" calendar. The study of astronomy began to accelerate with the development of the telescope around 1600. Since then, technologies to explore the universe have developed rapidly.

2 Guide the Learning

Discuss and Explore

Interpret Graphics: Figure 2
Instruct students to study Fig. 2 before reading Earth in the Solar System. As they read about an object in space in the text, they should find the object in the illustration and trace its motion in the solar system.

Main Idea/Supporting Details
The main idea of a reading selection is the most important point. Supporting details provide more information about the main idea, give examples, or explain it further. Ask students to write one sentence stating the main idea about our solar system. (Response should focus on the Sun having many orbiting satellites.) Beneath the sentence, have them write a list of details about the objects in the solar system.

Critical Thinking

Draw Conclusions *Why is water conservation important if most of Earth's surface is covered with water?* (Most of the water on Earth is undrinkable because it is salty, and most of the small fraction that is fresh is frozen in the polar ice caps. If fresh water resources run low or are polluted, it will be very difficult to obtain enough fresh water to support Earth's ecosystems.)

Infer *The surface of Mercury is covered with craters; the surface of Venus has very few. What can you infer about the atmospheres on these planets based on this information?* (The atmosphere of Venus may be thick enough to cause most meteoroids to burn up before they hit the surface. It may also produce weather, causing erosion on the planet's surface. The atmosphere of Mercury may be thin enough to allow most meteoroids to pass through and hit the surface, forming craters.)