UNIT OVERVIEW

Earth is our home. While we may not notice it, we are actually traveling through space at great speed. Earth is part of a system of fast-moving objects in space. The Earth, Moon, and Sun unit helps students understand that Earth rotates on its axis, Earth revolves around the Sun, and the Moon revolves around Earth. This unit also helps students understand how these movements affect important aspects of our daily lives, including night and day, our calendars, the availability of light and heat, and the appearance of the Moon and Sun in the sky.

Certain reading resources are provided at three reading levels within the unit to support differentiated instruction. Other resources are provided as a set, with different titles offered at each reading level. Dots on student resources indicate the reading level as follows:

- low reading level
- middle reading level
- high reading level

THE BIG IDEA

Humans have an ever-growing understanding of how Earth, the Moon, and the Sun move and interact. This understanding helps us make sense of what we see in the sky, both by day and by night. An understanding of our nearby space neighborhood can also inspire future exploration deeper into space, which may someday even include the discovery of life on distant planets.

Other topics

This unit also addresses topics such as: space exploration, satellites, constellations, eclipses, seasons, and life on different parts of Planet Earth.

SPARK

The spark is designed to get students thinking about the unit's topics and to generate curiosity and discussion.

Materials

- basketball or soccer ball
- flashlight

Activity

Ask students to describe some differences between day and night. They might identify differences in brightness and temperature, what they can see in the sky, or the activities they do during day and night. Then ask students to explain why they think we have day and night. Accept all responses.

Invite a volunteer to hold up a basketball or soccer ball in front of the class. Shut off the classroom lights and invite another volunteer to hold up the flashlight. Tell students that the flashlight represents the Sun and the ball represents Earth, which is the planet on which we live. Have the second volunteer shine the flashlight on the ball from one side, which will light up half the ball and leave the other half in the dark.

Ask students to explain which part of Earth would experience daytime and which part would experience nighttime in the present position of the flashlight and ball. Then ask students to explain what would have to happen for the other side of Earth to receive light from the Sun. (Either the flashlight would have to be moved to the other side of the ball, or the ball would have to spin around so that the opposite side is lit.) Encourage students to state which of these possibilities they think actually explains why we have day and night on Earth. Then tell students that they will find the answer to this and other questions about Earth, the Moon, and the Sun in the days to come.

Below are questions to spark discussion.

Does the Sun shine on Earth all the time or only during the day?

Is it possible for the entire Earth to be lit by the Sun at the same time? Why or why not?

When a flashlight shines on one side of a ball, the other side of the ball is in its own shadow. Do you think Earth casts a shadow, too?

How long does daytime last, and how long does night last? Why do you think this is so? Do these amounts of time ever change?

How can we find out how Earth and the Sun really move?

What else do you see in the sky besides the Sun? Are there certain things you can see only during the day or only at night?

Use this activity to begin an introductory discussion about astronomy. Tell students that they will read about how Earth, the Moon, and the Sun move, and they will find out why it is important to understand these movements. Throughout the unit, students will learn more about Earth, the Moon, and the Sun.

Many of the unit's vocabulary terms are related to the spark activity and can be introduced during the spark. For vocabulary work, see the Vocabulary section in this *Unit Guide*.

PRIOR KNOWLEDGE

Invite students to explain their understanding of how Earth, the Moon, and the Sun move.

Probing Questions to Think About

Use the following questions to have students begin thinking of what they know about Earth, the Moon, and the Sun.

- What do Earth, the Moon, and the Sun each look like?
- Why do we have night and day?
- Why doesn't the Moon always look the same?
- Why can we sometimes see the Moon during the day?
- Why can't we see the Sun at night?
- Where does the Sun go at night?
- What lives on Earth?
- What is it about Earth that makes it a good place to live?
- Does anything live on the Moon or on the Sun? Why or why not?
- Which is most important to you: Earth, the Moon, or the Sun? Why?

Tell students they will learn more about these topics soon.

UNIT MATERIALS

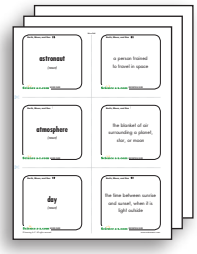
Each unit provides a wide variety of resources related to the unit topic. Students may read books and other passages, work in groups to complete hands-on experiments and investigations, discuss science ideas as a class, watch videos, complete writing tasks, and take assessments.

Resources are available for printing or projecting, and many student resources are also available for students to access digitally on Kids A–Z.

Selected unit resources are available in more than one language.

For a complete list of materials provided with the unit, see the Earth, Moon, and Sun unit page on the Science A–Z website.

VOCABULARY



Use the terms below for vocabulary development throughout the unit. They can be found in boldface in the *Nonfiction Book*, the *Quick Reads*, and/or other unit resources. These terms and definitions are available on *Vocabulary Cards* for student practice. Additional vocabulary lists are provided in the teaching tips for *Investigation Packs* and *FOCUS Books*.

Core Science Terms

These terms are crucial to understanding the unit.

atmosphere	the blanket of air surrounding a planet, star, or moon
Earth	the planet we live on
Moon	the huge ball of rock that travels around Earth

orbit	the path taken by one object in space circling around a larger object
planet	a very large object that travels in circles around a star
reflect	to bounce off something like a ball bouncing off a wall
revolve	to move in a circle around something
rotate	to spin around a center, or axis
star	a large, faraway object in space that makes its own light
Sun	the star that Earth goes around

Other Key Science Terms

The following vocabulary is not essential for comprehending the unit but may enrich students' vocabulary.

astronaut	a person trained to travel in space
day	the time between sunrise and sunset, when it is light outside
night	the time between sunset and sunrise, when it is dark outside
satellite	an object that orbits Earth or another object in space
space	the area between solid objects in the Universe
sunlight	light energy from the Sun

Vocabulary Activities

You may choose to introduce all the terms that will be encountered in the unit before assigning any of the reading components. *Vocabulary Cards* with the key science terms and definitions are provided. Dots on the cards indicate the reading levels of the *Nonfiction Book* or the *Quick Reads* in which each term can be found. If all level dots appear, the term may come from another resource in the unit. Students can use these cards to review and practice the terms in small groups or pairs. The cards can also be used for center activity games such as Concentration.

The *Word Work* activity sheets offer fun puzzles and practice with key vocabulary terms from the unit. For further vocabulary practice and reinforcement, you can choose from the vocabulary *Graphic Organizers*. To build customized vocabulary lessons with terms related to the topic, see Vocabulary A-Z.

Students can use the *Word Smart* vocabulary *Graphic Organizer* to organize information on the science terms. You may want to assign each student one to three words to share his or her *Word Smart* knowledge with classmates. Students who have the same word should first compare their *Word Smart* sheets with each other and then report to the larger group.

The science terms can be used in oral practice. Have students use each term in a spoken sentence.

As students read, encourage them to create a science dictionary by recording new vocabulary terms and definitions in their *SAZ Journal*.

BACKGROUND AND MISCONCEPTIONS

Use this section as a resource for more background knowledge on unit content and to clarify the content for students if misconceptions arise. Refer to Using the Internet below for more ways to extend the learning.

Q: *The Sun and Moon both travel across the sky, so doesn't that mean they both revolve around Earth?*

A: No. The Sun does not revolve around Earth; Earth revolves around the Sun. The Moon does revolve around Earth, but that isn't why we see it cross the sky every day. Instead, the Moon, the Sun, and all other celestial objects appear to cross our sky due to Earth's daily rotation on its axis. In earlier times, people looked at everything passing by in the sky and understandably believed that all celestial bodies revolved around Earth. But we now know better, based on centuries of observation and research.

Q: *Why doesn't the Moon stay in one place in the sky from day to day or night to night?*

A: The fact that the Moon revolves around Earth every 28 days accounts for why it appears in a different place in the sky every day or night. By the time Earth completes one daily rotation, the Moon has moved about 1/28 of the way through its orbit around Earth, making its position in our sky change (eastward). The Moon therefore rises and sets later and later as each day passes. This amount of time varies by the time of year and one's latitude.

Q: *Does the Moon change its shape every month?*

A: No. These apparent shape changes are due to the Moon going through phases. Understanding the phases of the Moon can be challenging, even for adults. This confusion is only compounded by art that depicts a crescent Moon as being all there is to the Moon, when in reality the rest of the Moon is still there—it just isn't lit up. On some nights, students may notice that they can still make out the entire disk shape of the Moon despite only part of it being lit up.

Q: *If Earth is spinning so fast, why don't I feel it? Why don't I fly off into space?*

A: If Earth were not spinning at all and then suddenly began spinning at its current rotational speed, we would surely be tossed into space. Fortunately, Earth's rotation is steady, so we don't feel it speeding up or slowing down. Students might compare this to riding on a school bus that is traveling at a steady speed; they won't feel the speed unless the bus speeds up or slows down. Earth's strong gravitational force also keeps us from flying off into space.

Q: *Am I really moving, even while I'm sitting still or lying down?*

A: Absolutely! You may be sitting still compared to objects around you on Earth, but we are all hurtling through space at a high speed. Earth is rotating on its axis, and it is revolving around the Sun even faster. Our entire solar system even revolves around the center of the Milky Way Galaxy at an amazingly high speed! And our galaxy itself is zipping through the Universe!

Q: *Is it dangerous to look at the Sun?*

A: Yes, it is extremely dangerous! Despite the Sun's great distance from Earth, its energy is still very strong by the time it reaches us. If one looked at the Sun, the powerful light would be focused through the very narrow pupils of the eyes and would burn the retinas. This burning can cause serious vision impairment or even complete blindness. Sunglasses protect our eyes from the bright glare of daylight, but they do not provide nearly enough protection to allow us to look directly at the Sun. Even astronomers must use strong filters to look at the Sun through a telescope or to take pictures of it.

Q: *Will it also hurt my eyes if I look at the Moon?*

A: No, it is not dangerous to look at the Moon. The light we see on the Moon is reflected light from the Sun, which is considerably weaker than the light that comes directly from the Sun. The Moon absorbs much of the Sun's light before it reflects the remaining light in other directions, including our own.

Q: *When I'm riding in a car, it seems as if the Moon travels along with me. Why is this?*

A: Although the Moon is moving through space, it is so far away that its movement is hard to perceive, especially if we are also moving. Our progress down the road covers an insignificant distance compared to the distance between Earth and the Moon, so the Moon stays in a fairly fixed location in the sky. Meanwhile, while driving in a car, everything in the foreground is whooshing by and appears to be passing the Moon quickly as well. Thus, it may seem as though the Moon and the car are traveling together, but this is an illusion.

Q: *Is it possible to see the Moon moving?*

A: Yes, and it's actually very easy! Instruct students to try sitting still on a clear night or day and have them line up their view of the Moon so that it is passing a wire, a tree, the horizon, or another stationary object. With patience, they will observe the Moon passing the object from east to west.

Q: *Is there a "dark side of the Moon"?*

A: There certainly is, but it may not be what students think. Just as Earth is half sunlit and half dark (in its own shadow) at any given time, so is the Moon. But the half that is lit varies as the orb rotates on its axis. The Moon rotates on its axis in the same amount of time it takes to revolve around Earth. As a result, the same side of the Moon faces Earth at all times. Sometimes this side of the Moon is lit up in our sky (full moon), and sometimes it is dark (new moon). The famed "dark side of the Moon" more likely refers to the far side of the Moon (the side opposite Earth), but it receives light just as frequently as the side facing Earth does. During a full moon, the opposite side of the Moon is, in fact, dark.

Q: *Is there really a "Man in the Moon"? Is the Moon made of green cheese?*

A: No and no. These are popular myths or idioms, but they are not real. Students may think they see a face when they look at the Moon, but this is similar to creatively identifying shapes in clouds. The Moon has dark and light areas, including the vast seas (mares) that might look like a human face, but other people may see other shapes. As for the green-cheese myth, it may have begun when people joked that they could convince a gullible person that the Moon is made of green cheese. But thanks to missions to the Moon during which moon rocks were collected and analyzed, we now have tangible evidence that the Moon is made of rock, not cheese.

EXTENSION ACTIVITIES

Using the Internet

Most search engines will yield many results when the term *Earth, Moon,* or *Sun* is entered. Be aware that some sites may not be educational or intended for the elementary classroom. More specific inquiries are recommended, such as:

- diagram of Earth, the Moon, and the Sun
- sunrise calendar/moonrise calendar
- revolve vs. rotate
- how to safely view the Sun
- phases of the Moon
- Earth, Moon, Sun model
- astronomy for kids
- photographs of the Sun

Projects and Activities

- **Arts:** Cover a wall or door with black paper and allow students to create a mural depicting Earth, and the Moon, Sun, and stars.
- **Project:** Have students create board games or sports related to traveling through space or landing on the Moon.
- **Project:** Place students in groups and have each group plan and then present a skit in which the characters include Earth, the Moon, and the Sun.
- **Project/Home Connection/Guest:** On a clear night, hold a star party on the school playground in which students and their families can look at the Moon and other celestial bodies through telescopes. Invite amateur astronomers to bring their equipment and share their astronomical expertise with students.
- **Field Trip:** Bring students to a planetarium or science center to learn about the tools of space exploration and to view displays on space features, including the Moon and Sun.
- **Math:** Help students use manipulatives or create scale models to develop their understanding of large numbers used in this unit, such as the distances from Earth to the Moon and to the Sun, or the relative size of each.
- **Writing:** Encourage students to write or dictate a creative story about traveling between Earth, the Moon, and the Sun. For extensive writing instruction, visit Writing A-Z.
- **Research/ELL:** Provide students with a map of the Moon's surface. Challenge them to identify similarities between names of places on the Moon and familiar words or names.
- **Research/Home Connection:** Students can conduct research as a family/home project or in the library/media center to extend the learning about a topic in one of the *Quick Reads* or other unit resources.