

Day and Night

Description

Using a model, learners explore time zones and what causes day and night and how time zones change. Learners observe the position of the Sun in the sky at different times of day and relate those positions to the rotation of the Earth.

Suggested Grade Levels: 4–6

Lesson Objectives Connecting to the Standards

Content Standard A: Science as Inquiry

K–4: Ask a question about objects, organisms, and events in the environment.

K–4: Use data (observations) to construct a reasonable explanation.

5–8: Develop descriptions, explanations, predictions, and models using evidence.

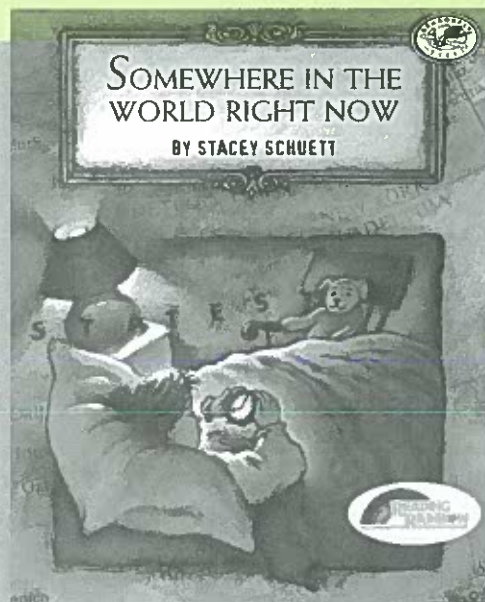
Content Standard D: Earth and Space Science

K–4: Understand that objects in the sky have patterns of movement. The sun appears to move across the sky in the same way every day, but its path changes slowly over the seasons.

5–8: Understand that most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.

Featured Picture Book

Title	<i>Somewhere in the World Right Now</i>
Author	Stacey Schuett
Illustrator	Stacey Schuett
Publisher	Dragonfly Books
Year	1997
Genre	Story
Summary	Describes what is happening in different places around the world at a particular time



Time Needed

This lesson will take several class periods. Suggested scheduling is as follows:

Day 1: **Engage** with read aloud of *Somewhere in the World Right Now*

Day 2: **Explore** and **Explain** with modeling with lamps and globes

Days 3–5: **Elaborate** with *Where Is the Sun?*

Day 6: **Evaluate** with *Make a Picture Book*

Materials

- Several clocks set at different times labeled with city and country
- Globes (1 per group)
- Lamps (1 per group)

Student Pages

- *Somewhere in the World Right Now*
- *Where Is the Sun?*
- *Make a Picture Book*

Engage

Before class, bring in several clocks set at different times around the world and label them with the city and country. You can find times of many cities around the world at www.timeanddate.com/worldclock.



Questioning

Introduce the author and illustrator of *Somewhere in the World Right Now*. Skip “A Note to the Reader” in the front of the book (this section will be used later to provide the scientific explanation for the students), and read the book aloud to students. Model the questioning skills of a good reader by asking the following types of questions as you read.

- ? Is it true that somewhere in the world it is already tomorrow?
- ? How can the Sun be rising and setting at the same time?
- ? How can all of these things be happening in the world right now?

Making Connections:

Text-to-Self

Ask students

- ? Do you know someone who lives in a different part of the country or world where it is a different time than it is here?
- ? Have you ever been to a place where you had to set your watch differently?

Have students examine the clocks set for different times for different places in the world. Determine students’ prior knowledge and misconceptions about Earth-Sun relationships by asking them to share ideas about how it can be so many different times at the same moment.

Explore & Explain

Modeling with Lamps and Globes

Provide each group of students with a lamp and a globe. Tell them they are going to use the lamp as a model of the Sun and the globe as a model of the Earth.

Before they begin the activity, ask students

- ? How does the Earth move? (It rotates on its axis and revolves around the Sun.)
- ? What do the movements of the Earth have to do with how we keep time? (One rotation is one day and one revolution is one year.)
- ? Which movement do you think causes day and night? (Earth’s rotation)

Then give students a few minutes to explore the following question with the model:

- ? How can it be different times in different places on the Earth?

After students have had time to explore the model, pass out the *Somewhere in the World Right Now* student pages. Tell students to use the lamp and globe to answer the questions on the student pages.

Discuss the student responses on the *Somewhere in the World Right Now* student pages. Have students share any observations, answers, and questions.



STUDENTS MODELING DAY AND NIGHT WITH LAMPS AND GLOBES

The correct answers for the student pages follow.

- 1 List three locations that are experiencing night when it is daytime in your city. (Answers will vary but should be locations on the opposite side of the globe.)
- 2 Can the Sun be rising and setting at the same time? Explain. (Yes. It is always rising somewhere on the Earth and setting on the opposite side of the Earth at the same time.)
- 3 Where on the globe is the international date line? (It runs through the middle of the Pacific Ocean in a north-south direction.)
- 4 Why do you think the international community agreed to place the international date line in that location? (To have a date change in the middle of a country would cause too many problems for people living there. There aren't very many people living in the middle of the Pacific Ocean, so few people are affected by the change of date there.)
- 5 Which locations are first to begin the new day? (Places west of the international date line move into the new date first. Those locations include New Zealand, Russia, and Japan.)
- 6 Which locations are last to see the sunrise on that day? (Locations just east of the international date line are last to see the sunrise on a particular day. Those locations include Hawaii, Marquesas, and the Aleutian Islands.)
- 7 Which part of the United States is the first to see the sunrise, the East Coast or the West Coast? (the East Coast)

- 8 Think back to the book *Somewhere in the World Right Now*. On the lines below, explain how all of the events in the book could be taking place in the same moment. (All of those events were happening at the same moment because different places have different times based on location. Somewhere right now it is day and somewhere else right now it is night because the Sun lights up half of Earth at all times. As Earth rotates, different locations enter the sunlight at different times.)



Determining

Importance

Tell students you will be reading an informational page titled “A Note to the Reader” from the front of *Somewhere in the World Right Now*. Have students listen for answers to any questions they might still have about time zones, the international date line, and Earth’s rotation.

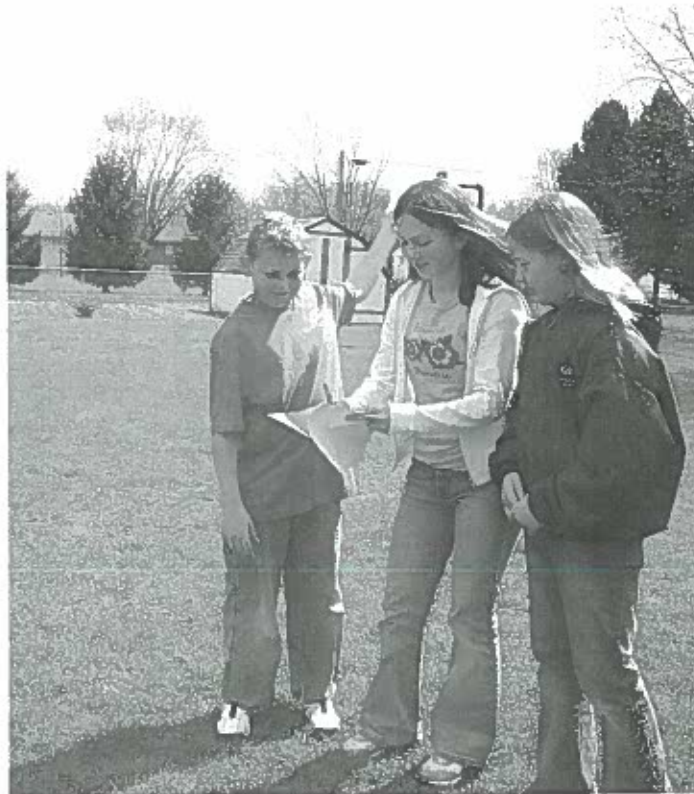
Elaborate

Where Is the Sun?

Distribute the Where is the Sun? student pages. Have students choose a location where they can face south and observe the Sun in the morning, at noon, and in the afternoon. Students will record the position of the Sun rela-

SAFETY

Never look directly at the Sun!
Looking at the Sun can
damage your eyes!



LOOKING FOR THE LOCATION OF THE SUN IN THE SKY

tive to a landmark at each of these times for three days.

After the third day, students can answer the questions on the Where Is the Sun? student pages. Have them revisit the lamp and globe model to reinforce their understanding of the abstract concepts they are learning with a concrete representation. Then discuss the questions from the student pages together.

- 1 Did you notice any patterns in where you saw the Sun in the sky each day? (Students should notice that the Sun is always lowest in the eastern sky in the morning, highest in the sky at noon, and lowest in the western sky in the afternoon.)
- 2 At what time of day did the Sun seem highest in the sky? (noon)
- 3 Think back to the globe and lamp you used to model day and night. Does the

Sun really move across the sky during the day? Explain. (No, in our model, the Sun stayed in the same place and the globe was rotating.)

- 4 How does the rotation of the Earth affect the appearance of the Sun in the sky in the morning, at noon, and in the afternoon? (In the morning, my location is turning toward the Sun. It appears in the east because of the direction the Earth turns. At noon, my location is turned all the way toward the Sun, so it appears to be right above me. In the afternoon, my location is turning away from the Sun. It appears in the west because of the direction the Earth turns.)

Evaluate

Make a Picture Book

Pass out the Make a Picture Book student page. Tell students they will be writing and illustrating a children's picture book that can be used to explain what causes day and night, and what causes the Sun to appear to move across the sky each day. Their finished products should include simple text, colorful illustrations, and clearly labeled diagrams.

Have available some picture books about astronomy written for young children, such as *The Sun is My Favorite Star* by Frank Asch and *The Moon Book* by Gail Gibbons. Share some examples of simple text, colorful illustrations, and clearly labeled diagrams.

Scoring Rubric for Make a Picture Book

4 Point Response	The picture book includes an accurate explanation of what causes day and night, a clearly labeled diagram showing what causes day and night, an accurate explanation of what causes the Sun to appear to move across the sky each day, a clearly labeled diagram of what causes the Sun to appear to move across the sky each day, simple text, and colorful, scientifically accurate illustrations.
3 Point Response	The student demonstrates a flaw in understanding of the concepts OR the book is missing one or two required elements.
2 Point Response	The student demonstrates a flaw in understanding of the concepts AND the book is missing one or two required elements; OR the student demonstrates understanding, but the book is missing three required elements.
1 Point Response	The student demonstrates a flaw in understanding of the concepts AND the book is missing three or more required elements; OR the student demonstrates understanding, but the book is missing four or more required elements.
0 Point Response	The book shows no understanding of the concepts AND is missing all required elements; OR the student did not make a book.

Inquiry Place

Have students brainstorm “investigatable” questions such as

- ? How does the length of daylight in summer compare to the length of daylight in winter where you live?
- ? How does the length of daylight in summer compare to the length of daylight in winter at the North Pole? How can you use a model to explain this difference?
- ? How do the direction and length of your shadow in the morning compare to its direction and length at noon or in late afternoon?

Students can select a question to investigate as a class, or groups of students can vote on the question they want to investigate as teams. Students can present their findings at a poster session.

More Books to Read

Branley, F. M. 1986. *What makes day and night?* New York, NY: HarperTrophy.

Summary: A simple explanation of how the rotation of the Earth causes day and night.

Dolan, G. 2001. *The Greenwich guide to day and night.* Chicago, IL: Heinemann Library.

Summary: Photographs, diagrams, and clear text answer questions such as: How long does it take for the Sun’s light to reach Earth? How can shadows help us tell time? What is a solar eclipse?

Dolan, G. 2001. *The Greenwich guide to measuring time.* Chicago, IL: Heinemann Library.

Summary: Photographs, diagrams, and clear text answer questions such as What do we call the length of time for the Earth to go around the Sun? How do astronomers use stars to tell the time? Why do we have leap years?

Fletcher, R. 1997. *Twilight comes twice.* Boston, MA: Houghton Mifflin.

Summary: Free-verse text describes the transition from day to night and from night to day, revealing the magic in these everyday moments.

Web Sites

Virtual Globe: Areas of Sunlight and Darkness Updated Every Five Minutes

www.anutime.com/globe/3Den.html

World Clock

www.timeanddate.com/worldclock

References

Asch, F. 2000. *The Sun is my favorite star.* New York, NY: Harcourt.

Gibbons, G. 1997. *The Moon book.* New York, NY: Holiday House.

Somewhere in the World Right Now

Place your lamp and globe about 50 cm apart with the lamp shining toward the globe. Use the lamp to represent the Sun and the globe to represent Earth.

- Find the arrow near the equator that shows the direction the Earth turns. Be sure to always turn your globe in that direction.
- Model daytime in your city.

1 List three locations that are experiencing night when it is daytime in your city.

- Model sunrise in your city by turning the globe so that your city is just entering the lamp's light.

2 Can the Sun be rising and setting at the same time? Explain.

- Find the international date line on your globe. This is where one day changes to the next.

3 Where on the globe is the international date line?

4 Why do you think the international community agreed to place the international date line in that location?

Name: _____

Somewhere in the World Right Now cont.

- Turn your globe so that the international date line is just entering the lamp's light (sunrise).

5 Which locations are first to begin the new day?

- Slowly turn your globe and notice each location turning toward the lamp.

6 Which locations are last to see the sunrise on that day?

- Model sunrise in the United States. Be sure you are turning the globe in the direction the Earth turns.

7 Which part of the United States is the first to see the sunrise, the East Coast or the West Coast?

8 Think back to the book *Somewhere in the World Right Now*. On the lines below, explain how all of the events in the book could be taking place at the same moment.



Where Is the Sun?

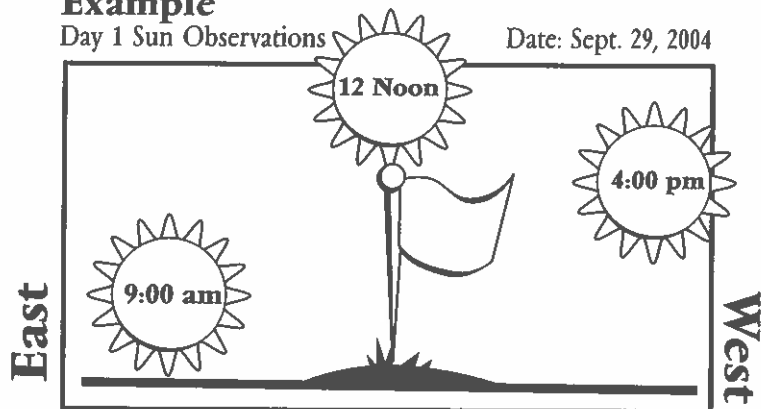
- 1 Choose a spot to observe the position of the Sun and face south.
- 2 Locate a landmark (tree, flagpole, building, etc.) and draw it in each box. Be sure to use the same landmark all three days.
- 3 Draw the position of the Sun relative to the landmark in the morning, at noon, and in the afternoon for three days. Be sure to stand in the **exact same location**, facing south each time.
- 4 Write the time of day inside each picture of the Sun.

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Example

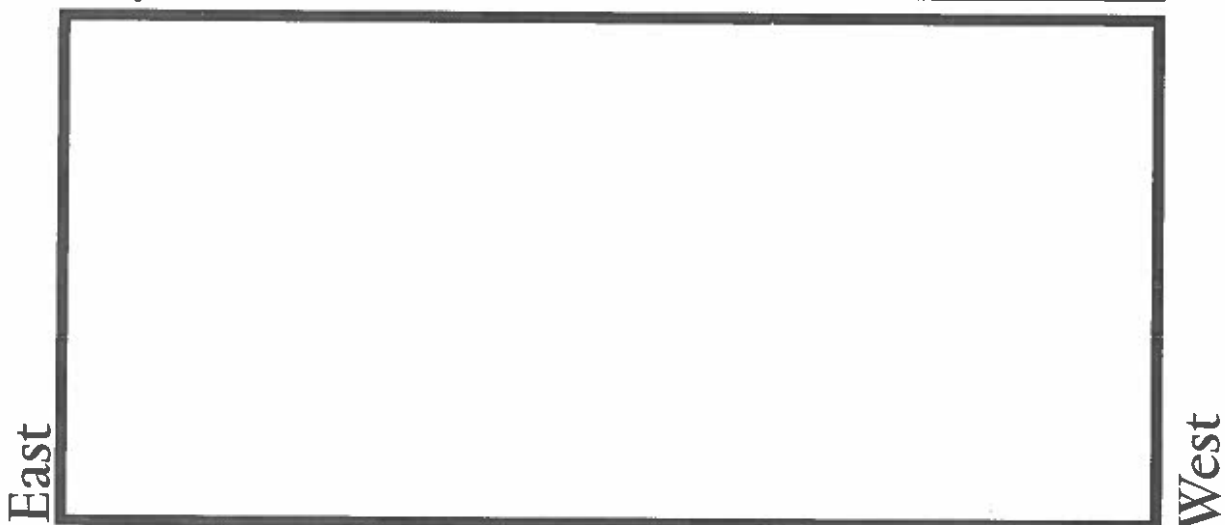
Day 1 Sun Observations

Date: Sept. 29, 2004



Day 1 Sun Observations

Date: _____





Name: _____

Where Is the Sun? cont.

Day 2 Sun Observations

Date: _____

East

West

Day 3 Sun Observations

Date: _____

East

West



Where Is the Sun? cont.

Questions:

1 Did you notice any patterns in where you saw the Sun in the sky each day?

2 At what time of day did the Sun seem highest in the sky?

3 Think back to the globe and lamp you used to model day and night. Does the Sun really move across the sky during the day? Explain.

4 How does the rotation of the Earth affect the appearance of the Sun in the sky in the morning, at noon, and in the afternoon?



Name: _____

Make a Picture Book

Write and illustrate a children's picture book that can be used to explain what causes day and night, and to explain what causes the Sun to *appear* to move across the sky each day.

Books should include:

- 1** An accurate explanation and clearly labeled diagram showing what causes day and night.
- 2** An accurate explanation and clearly labeled diagram of what causes the Sun to *appear* to move across the sky each day.
- 3** Simple text a young child could understand.
- 4** Colorful, scientifically accurate illustrations.

Be creative! Have fun!

