

Positions of the Sun

Strand	Interrelationships in Earth/Space Systems
Topic	Investigating the sun’s relative position in the sky
Primary SOL	1.6 The student will investigate and understand the basic relationships between the sun and Earth. Key concepts include b) the sun’s relative position in the morning is east and in the late afternoon is west.
Related SOL	1.1 The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which a) the senses are used to observe differences in physical properties; b) observations are made from multiple positions to achieve a variety of perspectives and are repeated to ensure accuracy; d) simple tools are used to enhance observations; f) inferences are made and conclusions are drawn about familiar objects and events; g) a question is developed from one or more observations; h) predictions are made based on patterns of observations; i) observations and data are recorded, analyzed, and communicated orally and with simple graphs, pictures, written statements, and numbers; j) simple investigations and experiments are conducted to answer questions.

Background Information

After only minimal observation it is easy to observe that objects change position (sun, moon, stars) in the sky over a period of time.

We can see that the sun seems to move across the sky starting in the east in the early morning and then toward the west as the day ends. How does this happen?

The sun does not move. It's Earth's rotation that gives us night and day. Earth rotates counterclockwise once in 24 hours. The spinning of the Earth around its own axis causes day and night. Sunlight shines only on the half of Earth facing the sun. That half has day and the other half is dark and has night. It takes 24 hours to complete one rotation. As Earth turns, it “appears” that the sun is moving across the sky.

Shadows caused by the sun move as Earth rotates counterclockwise on its axis. Shadows are long in the morning and late afternoon due to the position of the sun relative to a position on Earth.

Materials

- Student science journals
- Pencils
- Home Observations handout (attached)

- A large bulletin board space or a large wall display space
- Large labels for the bulletin board of North, South, East, and West
- One large empty cereal box
- One empty student milk carton from the school cafeteria (rinsed, dried, and taped or stapled shut) – one for each student
- Art supplies to decorate the cereal box and the student milk cartons (construction paper, scissors, markers, glue, etc.)
- One large “X” for the bulletin board display
- One playground ball
- Two index cards, each taped to a stick (e.g., popsicle sticks) – one card labeled with an “E” on both sides of the card for east and the other card labeled with a “W” on both sides of the card for west

Vocabulary

east, north, relative position, rotate, rotation, south, west

Student/Teacher Actions (what students and teachers should be doing to facilitate learning)

Prior to the lesson, collect enough empty student milk cartons at lunch so that each student will be able to have one. Rinse the milk cartons thoroughly and let them dry. Once they are dry, staple or tape them closed. During the lesson, each student will decorate a milk carton to be their home. Bring in one empty large cereal box that you will decorate to be the school. Determine ahead of time which side of the school faces north, which faces south, which faces east, and which faces west.

On a large bulletin board or wall space, label the top as North, the bottom as South, the right side as East, and the left side as West. Place the “cereal box school” in the center of the bulletin board, making sure that the side of the school you determined faces North is actually facing north on the bulletin board.

Introduction

1. Assess students’ knowledge about where the sun is in the sky in the early morning, where the sun is in the sky in the late afternoon, and why the sun appears to move across the sky during the day.
2. Tell students that they are going to conduct an experiment about the position of the sun in the sky. This experiment will take several days to complete.

Procedure 1

Student Sun Observations

3. Conduct the first student observations early in the morning.
4. Divide the class into two-person teams. Tell the student teams that they are going to select an observation spot outside where they are going to observe the location of the sun in the sky relative to the location of the school. They will make observations of the sun’s location from this same observation spot several times over the next week.
5. Have each student draw a picture of the school in their science journal. Explain to the students where in the schoolyard they will be observing the sun. Have them put an “X” on

- their picture in that location. The teacher should also place a large “X” on the bulletin board marking the location in the schoolyard where observations will be made.
6. Go outside. Have each team select their observation spot somewhere in the area that the teacher has designated for the observations. While standing in their observation spot, have them determine where the sun is located in the sky in relation to the school. Have them draw the sun on their picture in their journal where it is related to the school. Have them label the picture with “morning” and the day of the week (e.g., Monday, Tuesday, etc.).
 7. Conduct the next observation in the late afternoon of the same day. Have the student teams return to their selected observation location and determine the location of the sun in relation to the school.
 8. Using the same picture of their school which they drew in their journal that morning, have each student again draw a picture of the sun in relation to their picture of the school. Have them label the sun with “afternoon” and the day of the week.
 9. Discuss briefly with the class what they observed.
 10. On the second day, have the students draw the school again on a new page in their journal, make the morning observation, and record the results of their observation in their journal.
 11. Student teams will continue to make observations and record their observations each morning and each afternoon for at least one week.

Procedure 2

Home Observations

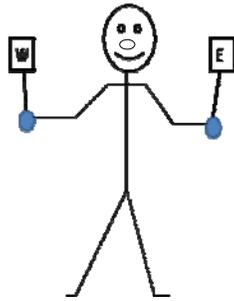
12. In the classroom, have each student decorate a milk carton to be their home. (Cartons should be taped or stapled shut. Cartons can be decorated by wrapping a strip of paper around the carton. Make sure each student at least includes his/her front door on their milk carton house.) These houses will be placed on the bulletin board after students have conducted their home observations and have determined which direction their front door faces.
13. Pass out the Home Observation pages. Explain that each morning and afternoon for the next week, they will make the same kind of observations of the sun’s location both in the morning and in the afternoon. They will record and label on their Home Observation pages where the sun is at each observation.

Procedure 3

Earth/Sun Demonstration

14. On the third day, gather the students to discuss what they have observed thus far about the sun’s relative location. Students may state that the “sun is moving across the sky” which is incorrect. Tell students that we are going to conduct an experiment in the classroom to model what is happening with the sun and Earth.
15. Have one student hold a playground ball. Tell them that the ball represents the sun. They are not going to move.
16. Have a second student represent Earth. Give the “Earth student” an “East” label to hold in their left hand and a “West” label to hold in their right hand. Have them hold their arms out so that their body looks like a “T.” Have the “Earth student” stand facing the “sun

student.” Explain to the students that the “Earth student’s” nose is where they are on Earth.



17. Have the “Earth student” rotate (turn) in a slow counterclockwise circle (without stepping out of their location) and have the class observe what is happening. Discuss what they observe.
18. Now have the “Earth student” turn one half of a counterclockwise circle and stop. Ask the students where the sun would be shining on Earth. (On the back of the “Earth student’s” head which would make it night on the “Earth student’s” nose where we are on the “Earth student.”) Have the “Earth student” slowly complete the counterclockwise circle and discuss where the sun would be shining now. (On the “Earth student’s” face which would mean it is now day on their nose.)
19. Now have the “Earth student” move slowly in a counterclockwise circle but stop when their right arm with the “West” label is facing the sun. Discuss where the sun would be relative to the “Earth student’s” face. (The sun would be in the western sky, simulating late afternoon.)
20. Continue to have the “Earth student” rotate $\frac{1}{4}$ turn counterclockwise and stop each time. Each time the “Earth student” stops, discuss where the sun would be shining in relation to the “Earth student’s” face. Be sure to discuss the fact that the “sun student” is not moving.
21. You may want to conduct the demonstration several times, letting different students be the sun and Earth.
22. Discuss how this demonstration relates to what they are observing outside. Emphasize that it is the Earth that moves (turns or rotates) every day, not the sun. State that the sun is in a fixed position.
23. Continue to make the morning and afternoon observations, but be sure to now relate what they are observing to what they observed in the model they saw of the sun and Earth. Make sure that students begin to relate that the sun’s relative position in the morning is in the east and its relative position in the afternoon is in the west.

Procedure 4

24. Look at the Homework Observation pages. Help each student determine, based on their observations, what direction their home’s front door is facing.
25. Using the observations that the students conducted at home, place each student’s “milk carton house” on the bulletin board (with tape on the bottom) so that the front door of their home is facing the correct direction.

26. Have students share what they have learned. Ask whether the sun moves in the sky. Reinforce that although the sun *seems* to move in the sky to someone standing on Earth, it is actually the Earth moving—turning, or rotating—that makes the sun seem to move.

Assessment

- **Questions**
 - What is the relative position of the sun in the morning? In the afternoon?
 - Explain how the movement of Earth makes the sun “appear” to move across the sky during the day.
- **Journal/Writing Prompts**
 - Draw a large sun on a sheet of paper in your science journal. Then, pretend you are the sun, and use words and drawings to tell what you would see during your day. Explain how the Earth would look throughout the day. Would it look the same all day, or would it change? Explain.
- **Other**

Extensions and Connections (for all students)

- Have students answer the following questions: Will they see the sun if it is raining? Is the sun still there? If so, would it still be in the same position relative to Earth? (Our view of the sun is blocked by the clouds but it is still there and is still in the same relative positions at the various times during the day.)
- Review SOL K.8, which introduces students to the concept of shadows, to help them understand the sun as a light source.
- Create a simple sundial, using a circle of cardboard and a pencil stuck through the center. Draw lines on the circle in the positions of the numbers on a clock face, and have students note what happens throughout the day to the shadow of the pencil made by sunlight. Explain that a device like this was one of the first things used to measure time. Discuss whether this measurement device could still measure time accurately today.

Strategies for Differentiation

- Use a K-W-L chart prior to the lesson to assess what students already know about the sun’s relative position in the sky.
- Use a video of the activity’s experiment, if going outside throughout the week is not an option.
- Mark items in the classroom N, S, E, and W for students to review and use as direction markers.
- For science journal entries, provide students with slot outlines in which they must fill in blanks with missing words and phrases.

Home Observations

Name: _____ Date: _____

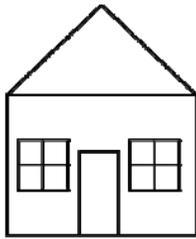
Parent Directions:

Please help your child determine which direction (north, south, east, or west) the front door of your home faces.

Please have your child select a spot outside by your home where he or she can make observations of where the sun is located in the sky based on the location of your front door. (For example: You determine your front door faces the north. Your child observes the location of the sun in the morning to the right of your front door. Your child observes the location of the sun to the left of your front door in the afternoon.)

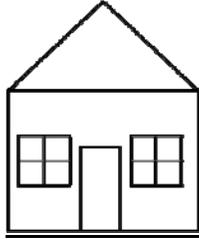
Please have your child observe the location of the sun in the sky from that same location for at least five days. Please have him or her make an observation in the morning and an observation in the afternoon each day.

Please have your child draw the sun where he or she observes it in relation to your front door during each observation. Please have him or her label his or her observations with the day of the week, with morning or afternoon, and with the direction the front door of your home faces.

Day: _____	Circle One: Morning Afternoon
	
The front door of my home faces _____.	

Day: _____

Circle One: **Morning** **Afternoon**



The front door of my home faces _____.

Day: _____

Circle One: **Morning** **Afternoon**



The front door of my home faces _____.

Day: _____

Circle One: **Morning** **Afternoon**



The front door of my home faces _____.

Day: _____

Circle One: **Morning** **Afternoon**



The front door of my home faces _____.

Day: _____

Circle One: **Morning** **Afternoon**



The front door of my home faces _____.

Day: _____

Circle One: **Morning** **Afternoon**



The front door of my home faces _____.

Day: _____

Circle One: **Morning** **Afternoon**



The front door of my home faces _____.

Day: _____

Circle One: **Morning** **Afternoon**



The front door of my home faces _____.

Day: _____

Circle One: **Morning** **Afternoon**



The front door of my home faces _____.