

ME AND MY SHADOW

BENCHMARK AND TASK

SC.E.1.1.2 The student knows that the appearance of sunrise and sunset is due to the rotation of Earth every 24 days.

- The student creates a model to show:
 - the earth rotates on its axis.
 - the rotation of the earth on its axis causes night and day.
 - the sun can be seen only in the daytime because of the rotation of the earth on its axis.



KEY QUESTION

Why does the size of your shadow change as the time of day changes?

BACKGROUND INFORMATION

The earth rotates around an axis, which can be described as an imaginary line that passes through the center of the planet. One complete rotation of the earth, which takes about 24 hours, marks the passing of an entire day and night. Contrary to how it looks, the sun doesn't really move across the sky. The earth does the moving. It is actually incorrect to talk about the sun "rising and setting". Before people had clocks, one way they told time was by watching shadows on sunny days. Shadow lengths change during the day; the shortest shadow is always found in the middle of the day.

MATERIALS

Teacher

globe
flashlight
Bear Shadow by Frank Asch

Student

colored chalk
measuring tape
Body Shadow worksheet

TEACHING TIPS

1. This activity should begin early in the morning and will continue throughout the day.
2. A sunny, cemented area, which will not be used by other classes, will be needed to complete this activity.
3. Students can measure in centimeters or inches.

ENGAGE

1. Ask students the following questions:
 - What is a shadow?*
 - What would cause a shadow outdoors?*
 - Do shadows stay the same?*
 - What do you think makes them change?*
 - How do you think your shadow might change during the day?*
2. Read *Bear Shadow*.

EXPLORE

1. Take the students outside to the sidewalk or the identified concrete area and have them line up with their backs to the sun.
2. Tell them to look down and describe what they see.
3. Each student should select a “shadow buddy” and take turns tracing each other’s shadow on the sidewalk with chalk. In order to be sure that the students always stand in the same spot, the shadow buddies will trace their partner’s shoes and identify the shadow with the student’s initials. This will provide a reference point to enable them to stand on the same spot each time.
4. Students should measure the length of their shadow and record it on the shadow sheet along with the time.
5. Students should continue to check their shadows, trace and measure them at hourly intervals (using different colored chalk, or alternating colors will help to eliminate any confusion), and record the measurements (use chalk to write the time at the end point of each line as well as in the log).
6. After two or three hours, students should start to see a pattern. They should begin to place an X on the sidewalk to predict where the head of the shadow will be in the next hour.

EXPLAIN

1. Ask:
What did you notice about your shadows?
Did everyone’s shadow change the same way?
When was your shadow the shortest? The longest?
Were your predictions close to the actual results?
In what direction did your shadow move?
Can shadows be used to tell time?
2. Explain that the earth is constantly spinning or rotating on its axis as we move from day to day. Use the globe and a flashlight in a dark room to demonstrate this concept. From the earth, the sun appears to move across the sky. It seems as if the earth is standing still. Although it looks like the sun is moving, it is actually the earth that is rotating. The shadows change because of this rotation.

EXTEND/APPLY

1. Explain that long ago, people told time by using a sundial. You might display a sundial or make one for the students to use and discuss its accuracy.
2. Encourage small groups to select a small outdoor shadow (a pencil or wooden dowel in clay attached to poster board will work). Ask them to draw its outline on paper, recording the date and time. Do the results compare with the earlier explanation?

EXTENSION

Using a globe and flashlight, darken the room. Shine a flashlight on one side of the globe. Have students look on the dark side of the globe to determine which part of the world is experiencing night while it is daylight for us.

ASSESSMENT

It is important that students understand what they will be evaluated on during this investigation.

Tell them that you are interested in finding out:

- *How they go about finding out how their shadow changes throughout the day.*
- *How clearly they describe their observations.*
- *What conclusions they draw from their observations.*

Scoring Rubric (from written responses)

Low Response:

Some data about shadow changes may have been collected, but the report may not explain the observations clearly or tell when they were made. Conclusions drawn, if any, may not follow from the data, and the report may reveal some significant misconceptions.

Medium Response:

Some data about shadow changes have been collected, and the observations are clearly presented in the report. Conclusions drawn are fairly basic and may reveal some misconceptions.

High Response:

Detailed data have been collected, and the observations are presented clearly in the report. Conclusions drawn deal with patterns, trends, or generalizations in the data or offer cause-and-effect explanations for the phenomenon observed.

Student Scientists: _____

Shadow Sheet

Time	Length of Shadow

