

Shadow Play

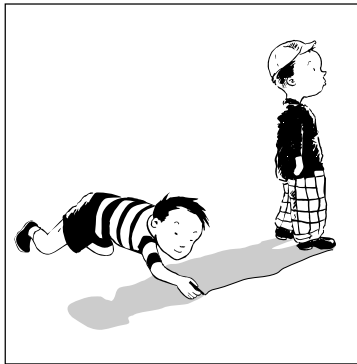
Everyone and everything have a shadow. Shadows are a good way to illustrate how three-dimensional objects can be viewed in two dimensions. Younger students can learn about the Sun's relative motion in the sky as they experiment with shadows.

ACTIVITY ONE

Begin by asking, "Where is the Sun at noon?" Depending on the age of the child, responses might be "straight up," "in the sky," "overhead," or "in the south." Ask "What is a shadow?" Accept responses.

Preparation. Divide the class into teams of two or three before going outside.

Experiment. One member is to play "statue" – holding very still in any position he or she chooses while

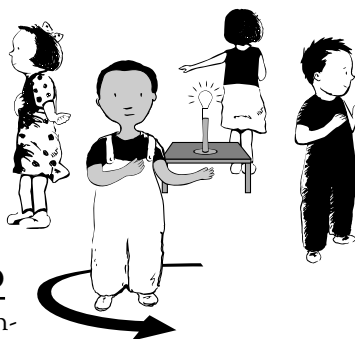


the other team members trace both the outline of the statue's feet and shadow on the pavement. When all the tracings are completed, the entire class can examine them. Wait about 30–60 minutes, then ask the "statues" to return

to their places (which is why they traced their feet) and hold the same position again.

Analysis. What has changed?

Answer. Students should notice that the length and position of the shadow have changed. Younger children may think that the "statue" changed position. Ask them to predict where the shadow will be in three hours. Repeat the tracings about once per hour until the end of the school day. Depending on the grade, students may measure the lengths of the shadows, or even graph the length versus time of day. Discuss the results.



ACTIVITY TWO

This activity demonstrates the daily motion of the Earth. We perceive the Sun as rising, crossing the daytime sky, and setting. It is actually the Earth that moves.

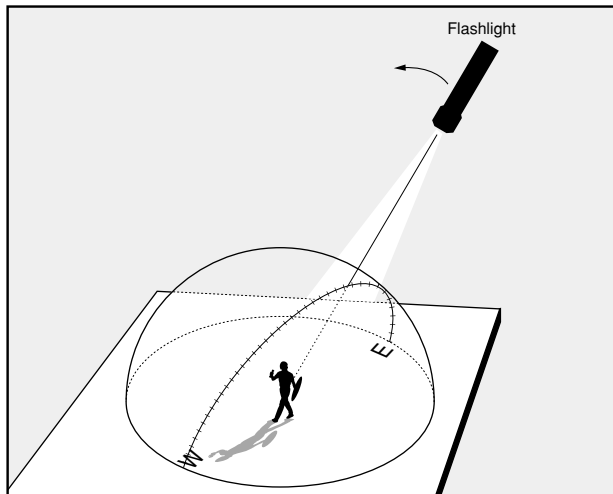
Preparation. Inside the classroom, arrange all the children in a circle around a lamp, which represents

the Sun. The teacher should demonstrate and then ask the children to "spin." (Young children prefer the term "spin" to "rotate" when thinking about the Earth's motion.)

Demonstration. To find the proper direction, place your right hand over your heart (the position for reciting "I Pledge Allegiance to the Flag") and rotate in the direction the fingers point. (As an extension, walk around the lamp to model Earth's annual motion around the Sun. Don't try to spin and walk at the same time; it takes 365.25 spins to make a year!)

Analysis. What has changed?

Answer. When children are facing the lamp, it is day. When they are facing away from the lamp, it is night.



ACTIVITY THREE

Preparation. Replicate the outdoor activity by placing an "action figure" (a 3-inch figure works well) on a piece of paper. Use a flashlight to represent the sun in the darkened room.

Experiment. Move the "Sun" from its position rising in the east to setting in the west through a curved path over the paper. For North America, the Sun never goes directly overhead.

Analysis. What has changed?

Answer. The position of the flashlight mimics the daily apparent motion of the Sun as Earth rotates.

Extension: Students draw pictures of why we have day and night.

Extension: Students study how ancient people made stories about the cause of day and night.

National Science Education Standards

Content Standard in K-4 Earth Science (Objects in the Sky, Changes in the Earth and Sky).

Equipment: chalk, outdoor drawing area, lamp, action figure, and flashlight for each team of students.