Everyone and everything has a shadow. Shadows 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.

**Materials**

- Chalk
- Outdoor drawing area
- Lamp
- Action figure and flashlight for each team of students

**Experiment**

One member is to play “statue” — holding still while the other team members trace the outlines of both 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 Earth. We perceive the Sun as rising, crossing the daytime sky, and setting. It is actually 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 Earth’s motion.)

**DEMONSTRATION**
To find the proper direction, place your right hand over your heart (the position for reciting the Pledge of Allegiance) 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 in the classroom 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” across the sky, from rising in the east to setting in the west, through a curved path over the paper.

**ANALYSIS**
What changes?

**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.

Students study how ancient people created stories about what causes day and night.

**NATIONAL SCIENCE EDUCATION STANDARDS**
- Content Standard in K-4 Earth Science (Objects in the sky, changes in Earth and sky)
- Content Standard in K-4 Science as Inquiry (Abilities necessary to do scientific inquiry)
Shadow Play

Subjects: Our Solar System

Grade Levels: K-5

Everyone and everything has a shadow. Shadows 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.

Texas Essential Knowledge and Skills

Science:
§112.11 kindergarten (b)-6(A) use the five senses to explore different forms of energy such as light, heat, and sound.
§112.11. kindergarten (b)-8(B) identify events that have repeating patterns, including seasons of the year and day and night.
§112.12. grade 1(b)-2(D) record and organize data using pictures, numbers, and words.
§112.12. grade 1 (b)-2(E) communicate observations and provide reasons for explanations using student-generated data from simple descriptive investigations.
§112.12 grade 1 (b)-(8)(B) observe and record changes in the appearance of objects in the sky such as clouds, the Moon, and stars, including the Sun.
§112.12 grade 1 (b)-8(C) identify characteristics of the seasons of the year and day and night.
§112.13 grade 2 (b)-8(D) observe, describe, and record patterns of [caused by] objects in the sky, including [shadows and] the appearance of the Moon.
§112.14 grade 3 (b)-3(C) represent the natural world using models such as volcanoes or Sun, Earth, and Moon system and identify their limitations, including size, properties, and materials.
§112.14 grade 3 (b)-8(C) construct models that demonstrate the relationship of the Sun, Earth, and Moon, including orbits and positions.
§112.15 grade 4 (b)-8(C) collect and analyze data to identify sequences and predict patterns of change in shadows, tides, seasons, [in the reflection of sunlight,] and [in] the observable appearance of the Moon over time.
§112.16 grade 5 (b)-8(C) demonstrate that Earth rotates on its axis once approximately every 24 hours causing the day/night cycle and the apparent movement of the Sun across the sky.