

Shadow Tracing Quick Facilitation Guide

This guide is adapted from the PBS Learning Media activity, [Shadow Tracing](#)

Safety Warning: Alert participants to never look directly at the Sun because it can harm their eyes.



Ages

Pre-K, Early Elementary, Family

Activity Time

20-40 minutes

Patrons explore the Sun's position in the sky by tracing shadows on the ground with sidewalk chalk. The Sun appears to shift position in the sky as the Earth rotates (*the Sun itself is not actually moving*). This results in the Sun's rays hitting objects on Earth's surface at different angles throughout the day, changing the appearance of shadows.

Move the activity indoors by using a light source (*such as a lamp or flashlight*) to cast shadows onto drawing paper to trace.

What's the Point?

- ★ As light travels away from its source, it typically moves in a straight line until its path is altered. If an opaque (*non-transparent*) object blocks the light's path, a shadow will appear on the surface behind the object since the light cannot travel through it.
- ★ Outdoor shadows directly relate to the Sun's position in the sky. As the position of the Sun appears to shift, so will the appearance of shadows.
- ★ Shadow size changes based on how far or close an object is to the light source. Shadows appear bigger when an object is closer to the light source because more light is being blocked. Shadows appear smaller when the object is farther away from the light source, since less light is being blocked.

Materials

Outdoor Activity

- ★ Sidewalk chalk

Indoor Activity

- ★ Drawing paper
- ★ Markers
- ★ Light source, such as a desk lamp (*one per group of 3-4 patrons*)

Preparation

- ★ Find a safe, clean, large sunny area with a smooth surface outside (*such as a patch of sidewalk*) to carry out the outdoor portion of the activity.
- ★ If conducting the activity indoors, set up some tables with lamps, drawing paper, and markers.

Activity Instruction

1. Share Ideas

- ★ Introduce yourself. Help participants learn each other's names (*if they don't already*) through an ice breaker activity.
- ★ Ask the group:
 - ★ How are the Sun and our shadows connected?
 - ★ Has anyone ever played with their shadows before? Turn and talk with a neighbor about a time you've observed an outdoor shadow that changed in size or position.
 - ★ Has anyone ever seen a solar eclipse? What happens during a solar eclipse? (*A solar eclipse occurs when the Moon passes between the Earth and the Sun, partially or totally blocking the Sun*)
- ★ Explain that they will be working together to draw each other's shadows and explore how the position of light sources (*either the Sun if it is nice outside or using lamps if doing the activity indoors*) affect their shadows.

Facilitation Tips:

When discussing the Sun's position in the sky, be sure to explain that it is actually the Earth rotating that makes the Sun appear to move so as not to foster misconceptions that the Sun is moving across the sky.

2. Shadow Fun!

- ☀ Take patrons outside to the designated area, or to the tables with lamps and drawing paper.
- ☀ Invite patrons to partner with a friend or family member and let them decide who will be the shadow maker and who will be the shadow tracer.
- ☀ Instruct the groups to begin tracing each other's shadows, either with sidewalk chalk (*if outside*) or markers and paper (*if indoors*).

“Guide on the Side” Facilitation Tips:

If outdoors, ask participants:

- ☀ How do you know where the Sun is in the sky when you look at the direction of your shadow?
- ☀ How do you think your shadow would change if it was morning/noon/evening? Why do you think that is?

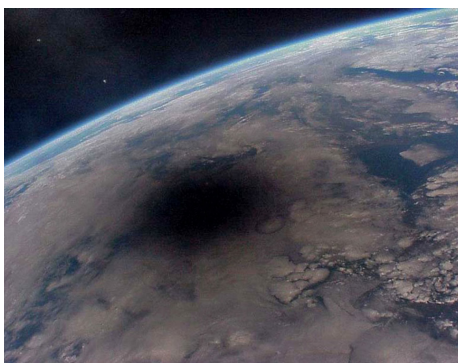
If indoors, ask participants:

- ☀ What do you predict will happen if you move your hand/object away from the light source? What will happen if you move it closer to the light source? Why do you think that is? Let's test it out!

3. Conclude

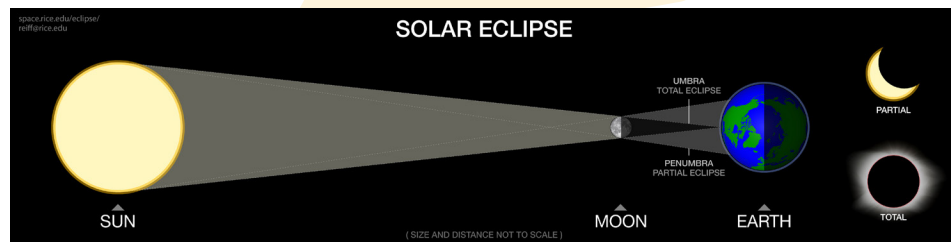
As participants finish tracing their shadows, invite them to share their observations. Ask participants:

- ☀ What is one new thing you learned about how the Sun affects shadows on the ground?
- ☀ How was this activity similar to a solar eclipse?
- ☀ During a solar eclipse, the Moon is between the Sun and the Earth, casting a shadow upon the Earth.



Left image: Moon's shadow from orbit (actual photo). Credit: Patricia Reiff, Rice University

Credit: space.rice.edu/eclipse



Safety Alert:

During a total solar eclipse, you need eye protection while only part of the Sun is covered by the Moon. During the few minutes of totality, when the Sun is completely covered, you may take off your protective glasses for a short time. There is never a safe moment to look at the Sun without protective glasses during an Annular eclipse.

Next Generation Science Standards

Science and Engineering Practices

- ★ SEP.7.g: Making a claim about the effectiveness of an object, tool, or solution that is supported by relevant evidence.
- ★ SEP.1.b: Ask and/or identify questions that can be answered by an investigation.
- ★ SEP.3.d: Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.
- ★ SEP.3.b: Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.

Disciplinary Core Ideas

- ★ PS4.B: Objects can be seen if light is available to illuminate them or if they give off their own light.

Crosscutting Concepts

- ★ Cause and Effect: Simple tests can be designed to gather evidence to support or refute student ideas and causes.