Teacher Guide

# THE REASON FOR SEASONS

**Key idea:** Earth's tilt on its axis causes the seasons.

**Time:** 30 minutes

**Objective**
Students use a lamp and a globe to model sunlight striking Earth. They monitor the temperature in the globe's Northern Hemisphere and Southern Hemisphere and apply their observations to understanding how the tilt of Earth's axis causes the seasons.

**Do the activity**
Divide students into groups and have them follow the steps on The Reason for Seasons Student Handout. Each group will need enough space on a table to place a lamp and a globe 70 centimeters apart. Caution students not to touch the light bulb when the lamp is turned on.

Remind students to make sure the equator line on the globe is at the same height above the table as the light bulb. They may need to set the globe on textbooks. Tell them to be sure the Northern Hemisphere is tilted away from the lamp.

Students will tape thermometers on the globe along the 15° north latitude line and 15° south latitude line. They will record the temperature on each thermometer. Then they will turn on the lamp, wait 5 minutes, and record the temperature on each thermometer again.

Students will determine how much the temperature changed in the globe's Northern Hemisphere and Southern Hemisphere. Then they will answer interpretation questions about how the tilt of Earth's axis affects the temperature at different places on Earth.

## Answer Key

### Interpret your results

1. Was the change in temperature in the globe's Northern Hemisphere different from the change in temperature in the Southern Hemisphere? If so, what was the difference? *[Temperature readings will vary. Sample answer: The change in temperature was different in the Northern Hemisphere and the Southern Hemisphere. The temperature in the Northern Hemisphere rose by 4° Celsius. The temperature in the Southern Hemisphere rose by 7° Celsius, 3 degrees more than in the Northern Hemisphere.]*

## STANDARDS ALIGNMENT

NGSS **3-ESS2.D:** Weather and Climate: Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.
**5-ESS1.A:** The Universe and its Stars: The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth.
**5-ESS1.B:** Earth and the Solar System: The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.
CCSS **W.3-5.2:** Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

## MATERIALS

*For each student group:*
> Lamp with an incandescent bulb
> Globe
> Meter stick
> 2 thermometers
> Masking tape

2. In your model of sunlight striking Earth, what was the season in the Northern Hemisphere? What was the season in the Southern Hemisphere? Explain your answer. *[In my model, it was winter in the Northern Hemisphere and summer in the Southern Hemisphere. The North Pole was tilted away from the lamp, which represents the Sun, so the Northern Hemisphere got less direct light and was not warmed as much. The South Pole was tilted toward the lamp, so the Southern Hemisphere got more direct light as was warmed more.]*

3. Why does your hometown receive a different amount of sunlight in summer than it does in winter? *[Sample answer: The same place on Earth receives a different amount of sunlight in summer than it does in winter because Earth's axis does not go straight up and down through Earth—it is tilted. So the North Pole is tilted toward the Sun for part of Earth's yearlong orbit and away from the Sun for part of the orbit. When the North Pole is tilted toward the Sun, my hometown in the Northern Hemisphere experiences summer. When the North Pole is tilted away from the Sun, my home experiences winter.]*