

## 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 MS-ESS3.A.1:** The Universe and Its Stars: Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models.

**MS-ESS1.B:** Earth and the Solar System: The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year.

**CCSS RST.6-8.3:** Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

**W.6-8.1:** Write arguments to support claims with clear reasons and relevant evidence.

#### 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.]*