

# Winter World Pre and Post Activities

## Reason for the Season

### Overview:

Students explore a model of Earth's daily rotation and annual revolution around the sun; then try to figure out at which point each season occurs in their part of the world.

### Materials:

Lamp, globe, masking tape, paper cut into star shape and one small paper circle.

### Vocabulary:

**Orbit:** the path of an object around a point in space. In this lesson, the path the earth travels around the sun.

**Revolution:** the Earth's journey around the sun.

**Rotation:** when a planet or moon makes a complete turn on its axis; spinning.

**Axis:** an imaginary line that passes through Earth's center and its North and South poles.

### Prep:

Prepare a simulation of the earth-sun system by placing a lamp on the floor or table to represent the sun. Use a globe to represent the earth, which will spin (rotate) on its axis and revolve around the sun. Cut a star shape out of paper, label it the North Star, and place it on the board. Orient the North Pole of the globe so it points toward it. Finally, place 4 Xs of masking tape on the floor on each side of the lamp, but don't tell students which season each X represents.

### Lesson:

Ask a student to find your city or state on the globe and tape a small paper circle on it or mark it somehow. Challenge them to keep an eye on this location and the light it receives, as they explore how the Earth and sun interact.

Introduce and explain (or review) the terms rotation and revolution. Have a volunteer demonstrate rotation with his or her body and then with the globe. The Earth rotates counterclockwise on its axis. Have another volunteer demonstrate this with the globe. Ask students to notice what happens to the light hitting the marked location on the globe. What does each rotation represent? (Each rotation represents a 24-hour day during which every location has daylight and nighttime.)

Ask another volunteer to show how the earth moves (revolves) around the sun (also counterclockwise). Explain the Xs represent different seasons and the Earth is not straight up and down on its axis, but always tilted (23.5 degrees) with the North Pole facing the North Star at all times. As the student walks around the sun slowly to represent the Earth's revolution, remind him or her to spin the globe quickly to also represent days passing. What do they think one complete revolution represents? (A year or 365 1/4 days.)

Invite a student to stand at one of the Xs and rotate the earth to show two days coming and going. Have another student take the globe and move counterclockwise to the next X and do the same, and so on with each season. Remind them to keep the North Pole pointing to the North Star as they revolve around the sun from season to season. As they do so, ask students to pay close attention to the sun's relationship to the point marked on the globe.

Which X is which season? Why? Discuss characteristics of each season on the marked area on the globe. Note temperature, sunlight, and so on. Prompt them to focus on the relationship between this point and the amount of sun it receives at each X. Earth's tilted axis and its revolution around the sun, are the reasons we have four seasons in Wisconsin.

Notes:

Summer: the Northern Hemisphere leans toward the sun in its revolution, there are more daylight hours and the sun's angle is more perpendicular to us than at other times of the year.

Winter: the Northern Hemisphere leans away from the sun, there are fewer daylight hours and the sun hits us at an angle, making it appear lower in the sky. There is less heating because the sun's angled rays are "spread out" rather than direct.

Spring and fall: Earth leans neither toward nor away from the sun. Daylight and nighttime hours are more equal and the temperatures are moderate.

Misconceptions:

Many people believe Earth is closer to the sun in the summer and further away in the winter. It's actually slightly closer to the sun in the winter, but the angled rays and shorter days do not give us much heat.

## Blubber Mittens

Overview:

Students better understand why body fat is important to animals during winter.

Materials:

Rubber or plastic gloves, rubber band, plastic bags, Crisco or shortening and a bucket of ice water.

Vocabulary:

Insulate: to prevent the loss of heat.

Blubber: a thick layer of fat between the skin and muscles, which keeps animals warm.

Lesson:

Working in partners, one student should put a glove on one of their hands. Their partner should cover the gloved hand with an even layer of shortening, using a spoon and cover it with another glove or plastic bag. It should be secured with a rubber band to prevent water from seeping into the glove. Ask the students to place both hands (gloved and ungloved) into a bucket of ice water at the same time. They should note which hand feels warmer. Allow time for the other partner to try the experiment.

Discuss which hand was warmer and why. Animals that live in arctic climates, such as polar bears, whales or walrus', have a layer of fat (blubber) under their skin. Blubber helps keep the animal's body warm by insulating its muscles and internal organs from the harsh environment. A polar bear's blubber layer can measure more than four inches thick! Animals that live in Wisconsin during the winter, such as beavers and otters, also maintain a relatively thick layer of insulative fat. This fat is considerably less dense than that of arctic animals, therefore cannot be considered blubber.

# Hibernation Experiment

## Materials:

Shallow plastic container, thermometer, bag of ice and spoon.

## Vocabulary:

Hibernation: The condition or period of an animal spending the winter in a dormant state.

## Lesson:

Explain the average body temperature for a mammal is 99°F, but a hibernating animal's temperature drops to 37°F. This is less than half the normal temperature and only 5 degrees above freezing! The lower temperature reduces the amount of energy the animal must use to keep warm. To demonstrate, fill a shallow, plastic container halfway with warm water and have students measure the temperature using a thermometer. Have them stir in one ice cube at a time and take a temperature reading after each addition, until the water reaches 37°F. Then invite them to place their hand in the water to experience the body temperature of a hibernating animal. Do they think they could sleep comfortably at this temperature?

## Notes:

True hibernation is an almost death-like state characterized by major changes. The animal's body temperature drops to around 37 degrees and their heart rate slows to just three or four beats per minute. They don't eat or go to the bathroom for months! True hibernation, is a radical energy-saving adaptation and is practiced Wisconsin by only a few Wisconsin animals: thirteen-lined ground squirrel, woodchuck, jumping mice (meadow and woodland) and some species of bats.

Bears do not truly hibernate, but they do enter a state of dormancy or torpor. Their body temperature only decreases slightly and they wake up periodically to urinate/defecate.