

Spinning in Circles: Earth's Rotation and Revolution

Overview

The Earth is tilted about 23.5 degrees on its axis, and this tilt is the cause of the seasons. As the Earth orbits the Sun, different parts of the globe are tilted toward the Sun, so varying amounts of solar energy are received around the world at different times of the year.

Grade Level/Discipline

Kindergarten through 8th grade

Objectives

The students will use balloons to demonstrate how the tilt and rotation of the Earth affects the environment.

- Understand why the Earth has seasons.
- Understand how the Earth is divided into Northern and Southern Hemispheres
- Understand why the polar regions have daylight for 24 consecutive hours in their summer and 24 consecutive hours of darkness in their winters.

Teacher Preparation for Activity

Materials

- A round balloon
- flashlight, marker
- wooden skewers (used for older children)

The balloon should be blown up to about the size of a small child's head and tied. The wooden skewers may be inserted into the balloon with out breaking it through the tail (place where you blew it up and tied a knot) area. (Do not put it through the area that you blew into but next to it.) Push the skewer all the way through to the opposite side (top) of the balloon where there is still rubber that is not stretched.

Time Frame

1 class period

Teaching Sequence

Engagement and Exploration (Primary Grades Student Inquiry Activity)

Hi, I'm Shackleton E. Bear. I had a great adventure last fall and I would like you to become a part of my adventure too. I got to fly in a large airplane for many hours to one of the coldest places on Earth. Yep, I got to go to North Pole! Did you know that the North Pole has Sunshine for 24 hours during May, June, and July? I went with a scientist who was studying the ice up there.

Would you like to have some fun and see why it is daylight all the time at the North Pole during summer? Just follow the directions below and you will discover all kinds of neat things about the Earth.

Explanation (Discussing)

Directions: 1. Get a round balloon and blow it up so it is about the size of your head. (Children from the third grade up, may like to stick a wooden stick through top and bottom of the balloon where the rubber is still thick.)

2. With the colored marker draw a line around the middle of your balloon, this will be the equator. The equator is an imaginary line that divides the Earth in half making the Northern and Southern Hemispheres. If you live on the North American continent, you live in the Northern Hemisphere where it is winter when the Southern Hemisphere has summer.

3. Now imagine dividing the top and bottom of your balloon into 3 parts on the top and 3 parts on the bottom. Draw lines with your marker on those imagined places. The top one closest to your equator is the Tropic of Cancer. This is an imaginary line on the Earth that the Sun appears to move to on the first day of summer. The top line that you created is the Arctic Circle. It is very cold up there and the North Pole is found in the middle of this circle.

4. The line below your equator is called the Tropic of Capricorn and the Sun appears to move here on the first day of winter. This is the farthest that the Sun appears to move south on the Earth while the Tropic of Cancer is the farthest north it appears to move. The circle at the bottom is the Antarctic Circle and Antarctica is found there. The Sun's rays do not make the area above the Arctic Circle and below the Antarctic Circle as warm as it does where you live so there is lots of ice and snow there.

5. The Sun does not really move from one place to another, instead the Earth, tilted at 23.5 degrees, moves around the Sun. As the Earth orbits the Sun, different parts of the planet are tilted toward the Sun, so varying amounts of heat occur around the world at different times of the year. This tilt is the reason we have seasons.

6. With your balloon and a flashlight and a friend, we will now try to see how this works. Hold your balloon so that your equator is between your two hands and the hands are at the 12 o'clock and 6 o'clock positions. Now tip your hands with your Earth so your hands are at the 2 o'clock and 7 o'clock position. This is almost just like our Earth is tipped as it goes around the Sun.

7. Have a friend hold a flashlight so it shines on your equator while you turn your Earth around by its' poles. Watch what happens with the Sun (flashlight) as your Earth moves.

Elaboration (Polar Applications)

That is how the southern and northern hemispheres have different seasons at different times. It also should tell you why it is dark some times all day in Antarctica and light other times. I hope you had fun. I did.

Questions:

1. What is the equator?
2. What happens at the Tropic of Cancer and Tropic of Capricorn?
3. What names do we give to the dates the Sun reaches the tropics or the equator?
4. What happens to the Sun's apparent position as it shines on the equator as the Earth revolves on its axis?
5. Why does the Southern Hemisphere have summer while the Northern Hemisphere has winter?
6. Why does the Earth have seasons?
7. What is the International Date Line? Where is it? Draw it on your balloon.

For Older Children:

1. What is the ozone hole?
2. Where is the ozone hole located?
3. What does ozone do for us?
4. List some hazards for working in the Arctic. Discuss ways of making it safer for people to work there.
5. Make a game of finding places using only the longitudes and latitudes of the place.

Authors

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