The Earth Is Flat

Summary

This lesson Standard will help students understand that the shape of Earth and the moon are spherical and that Earth rotates on its axis to produce the appearance of the sun and the moon moving through the sky.

Group Size

Large Groups

Materials

The Flat Spinning Earth

Polar Projection of Earth

Fender washer
Globe
Journal

The Flat Spinning Earth on an Axis

Pencil
Ping-pong ball
Pizza box
Aluminum foil
Glue stick
Crayons

Additional Resources

Media

Sun Dagger video, by BullFrog Films(info@bullfrogfilms.com); ISBN (DVD) 1-59458-089-8
Pop-Up Books, by Interact (Highsmith, 1-800-359-0961, Highsmith.com); Item number - 95474

Background for Teachers

The fact that Earth is not flat is not obvious to children. It is a sphere that is 7,926.41 miles (12,756.32 kilometers) in diameter at the equator. One of the first ways that we suspected that Earth was round was because we could see its shadow on the moon during an eclipse.

It would be helpful for the teacher to practice with the pencil top to find the best length for the pencil. Longer pencils do not work as well. In my observations it seemed best to have a pencil about 2 inches long.

Intended Learning Outcomes

- 1. Use science process and thinking skills.
- 4. Communicate effectively using science language and reasoning.

Instructional Procedures

Invitation to Learn

The Flat Spinning Earth

Hand each student a washer and ask them to identify ways that the washer and Earth are the same. Color and cut out the outline drawings of Earth and glue them to one side of the washer. Using a single light source, like the sun coming through the window or a desk lamp and a playground ball or globe as a backdrop, invite them to notice the different possibilities of shapes made by the washer and record them in their journal. Now pass out a ping pong ball and ask them to identify and draw as many different shapes as can be made by the ball. Are there ways the washer makes a circular shadow? Is it possible to make the washer continuously appear to make a circular shadow? Instruct the students to make a Venn Diagram in their journal comparing Earth and the moon. When we are outside, where and when can we see the shadow of the moon and Earth? Does this teach us about the shape of the moon and Earth? How? Take time to answer questions about eclipses.

Instructional Procedures

The Flat Spinning Earth on an Axis

"What do you do with a pencil that is too short to reasonably hold?" Ask the students to get the pencil that has been sharpened to within two inches of its life.

Insert the pencil into the hole in the washer far enough that friction will solidly hold it in place. Write the word "axis" on a small piece of tape and attach it to the pencil nearer the eraser end. Write the word "rotation" near the outer rim of the washer.

Practice spinning the "Earth top". If it wobbles try to figure out why. What makes it spin longer? Does it help if the washer forms a right angle to the pencil all the way around?

Discuss the axis as it relates to the map of Earth on the washer with others at your table. Does Earth really have a pencil stuck through it? Does Earth spin like the washer?

Spin the ping-pong ball. Is there a place it seems to spin around? How is the ping-pong ball like Earth? How is the pencil in the washer like Earth?

Set the ping-pong ball aside for use in a later activity.

Make a pocket in your journal to store your disassembled Earth axis (pencil) and rotation model (washer with the map).

Demonstrate pop-up doors and a stand up. Share some of the pop-ups the students have made.

Invite the class to create some pop-ups in their journal.

Extensions

Curriculum Extensions/Adaptations/ Integration

The rotation of Earth on its axis causes our day and night. The orbit of Earth around the Sun measures our years. Did the ancient Native American people have a way to keep track of the elapsed time of years and seasons? Show Chaco Canyon Fajada Butte Sun Dagger. Discuss that they understood about the apparent motion of sun across the sky and used it to measure lapsed time. Show an analemma and discuss how it shows lapsed time. Answer questions and ask if it could be used to show more than days and months. Could we expand it to show time of day, make it a sundial? Show and discuss the San Francisco "sundial". For your class it all begins with a small empty pizza box, some aluminum foil, paper, tape and a fine tipped marker or pen. Make a classroom solar calendar.

A block of wood with a three eighths diameter hole three inches deep will help the challenged learner get the right angle between the axis (pencil) and the rotation (washer).

Art: Earth on its axis model could be a colored pencil and then spun on a piece of black construction paper to add to other designs for fireworks display or to trace spiral type designs on other projects.

Family Connections

Send a washer home with the student and a map to apply to the washer. With a note asking the parents to allow the student to review what they learned.

Invite parents to help the student notice other places in life where there is an axis (like an axel on a wheel) and something rotates around it (the tire).

Assessment Plan

Prior to the lesson, as pre-assessment, spin a globe of Earth and ask "Is there some part of the globe where the spinning part is the smallest? Why do you think that happens?" (It is closest to the center of the spin, 'rotation'). We call the center of the spin, axis. The part that goes around rotation.

At random times during the year, after this activity, when the students are using their pencil for work, hold up a pencil and a washer and ask "When they are together the way we used them in Science what names did we give them?"

Spin a ball during PE and then ask "What is the ball doing that is like Earth?" "Where is the axis?"

Bibliography

Research Basis

Furner, J. M., Yahya, N., and Duffy, M. L., (2005). 20 Ways to teach mathematics: Strategies to reach all students. *Intervention in school and clinic*, Volume41, No. 1 (September 2005), Pages 15 -23. Even though this article is written with different approaches to teaching mathematics, the hands-on activities, heterogeneous grouping, charts, auditory, visual and kinesthetic approaches work well in nearly any setting or grouping. It is just good teaching.

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