

Earth and Moon Observations

Summary

In a small group setting, the Earth's counterclockwise revolution, counterclockwise rotation, tilt, day and night cycle, and the Sun's apparent movement across the earth are explored. Students, also, model the phases of the moon in groups of two.

Time Frame

1 class periods of 60 minutes each

Group Size

Small Groups

Materials

Materials based on a class of 30 students split up into groups of 6.

6 mini globes, delta-education.com, WYR070-4330, 11.40\$ each, can also use standard globes if they are already available

15, 2" or 3" diameter Styrofoam balls, from Michael's or other craft store

15 wooden skewers with a pointy end from the grocery store

15 flashlights

- [Phases of the Moon diagram](#)

Background for Teachers

Presented within the context of the lesson.

Intended Learning Outcomes

3a. Know science information specified for their grade level.

3c. Explain science concepts and principles using their own words and explanations.

4c. Use scientific language appropriate to grade level in oral and written communication.

Instructional Procedures

Pre-lab discussion:

Ask the students for some background information they already have on the Earth, Moon, and Sun. Clear up any misconceptions quickly. Review for them gravity and its effects on our solar system. Discuss that the Earth orbits the Sun because the Sun is much larger than Earth. The Moon orbits Earth because Earth is larger than the Moon. Explain that today they are going to model how the Earth revolves around the Sun, how the Moon revolves around Earth, and why the Moon appears to look different over the course of a month.

Instructional Procedure:

I. Earth -- The small globe represents the Earth and a flashlight represents the Sun. Use these models to demonstrate the following concepts.

It takes 365 days for the Earth to make one revolution around the Sun in a slightly elliptical orbit. One revolution takes one year. The revolution occurs in a counterclockwise direction if viewed from above the Earth. Our Earth is actually tilted at a 23.5° angle towards the North Star, Polaris. The earth revolves around the sun at a speed of 65,000 mph.

The Earth spins or makes one rotation on its axis once every 24 hours. It rotates in a counterclockwise direction towards the east.

One half the Earth is always lit up by the Sun, while the other half is in darkness. Demonstrate

this with the models. Because the Earth rotates, the side that is lit up by the Sun changes throughout the day. Use the flashlight and shine it on the globe. Notice which countries or states are lit up at any one time by the Sun. Who is having night and who is having day? Where does day begin (on the east side of the light) and where does night begin (west side of the light)? Demonstrate how the Sun's light will move across the United States over the course of a day. Demonstrate that the Sun does not move, ever! Show the students that the reason the Sun appears to be moving overhead throughout the day is because the Earth is rotating on its axis. Reinforce and quiz the students on the words revolution and rotation. The Earth's rotation and revolution give us our year and day lengths.

II. Moon -- The small Styrofoam ball will represent the Moon. Demonstrate these concepts using all three models. Approximately four Moons equal the size of our Earth.

Demonstrate that the Moon makes its counterclockwise revolution around the Earth. It takes 29 1/2 days for the Moon to travel around the Earth and we call that a lunar month.

The Moon rotates on its axis only once as it travels around the Earth. Its rotation time equals its revolution time. It also rotates and revolves in a counterclockwise motion as does the Earth. One half the Moon is always lit up by the Sun and the other half is in darkness. This is also true for the Earth. Demonstrate this with the flashlight shining on the moon. Reinforce that it is the Sun which lights up the Earth and Moon. They do not shine on their own.

Sometimes the Moon is seen during the day and sometimes it is not. Whether we see the Moon depends on where it is in its revolution around the Earth. At times it is just harder to see during the day because the sun is so bright.

The phases of the Moon are due to how we see the lit up side of the Moon during a monthly lunar cycle.

III. Phases of the Moon-- Use the Moon models and flashlight for the following experiment. Poke one wooden skewer into each Moon so that the students can hold the Moon up. Divide the students into groups of two. Make sure the students each get a turn looking at the moon and reciting the phases. The person holding the moon should call out the phases of the moon as they move to each new position. Give the person holding the moon the half page 'Phases of the Moon' sheet so they can compare what they are seeing to the name of the phase.

One student in each group holds the Moon model a bit above their head and about 1 foot in front of their eyes. The Styrofoam ball represents the Moon and the student's imagine there is a little person standing on their nose looking at the Moon.

The other student in the group holds the flashlight about two feet in front of the Moon and shines the light onto the Moon (not in the other student's eyes). The student who is holding the flashlight never moves or rotates their feet. (The Sun does not move!) Their job is to position the light rays from the flashlight onto the Moon each time their partner rotates to a new position.

This begins the monthly lunar cycle.

** The rest of these descriptions describe what the student who is holding the moon observes.

This student will see the phases of the Moon as they rotate with the Moon's revolution.

When the student who is looking at the Moon is in a direct line with the flashlight they will not see the lit up side of the Moon. The moon will be in shadow and we call this the New Moon.

The student who is holding the Moon turns their body counter clockwise at a 45° angle to the flashlight. (Each successive movement will be 45° counter clockwise so that all 8 phases of the moon are seen.) The student should keep the moon directly in front of them and a bit above their head. After the movement the student should see a small sliver of the Moon lit up. This is a Crescent Moon.

Keep turning another 45°, soon the student will see about half of the moon lit, this is the First Quarter Moon.

Keep the Moon above their head and turn another 45°. They will see most of the Moon lit by the

Sun. This is a Gibbous (chubby) Moon.

The student turns another 45° until their back is to the sun. Make sure the student holds the moon above their head so that they can see the Moon lit up. This is a Full Moon because they see all the lit side.

Keep turning 45° and they see most of the Moon lit again. This is another Gibbous Moon.

Turn again 45° until they see half of the moon lit. This is the Last Quarter Moon.

Turn until they are almost back to where they started and they should see a Crescent Moon.

When the student has made one complete revolution of the Moon around Earth they will be back at the New Moon and have seen all of the phases of the Moon.

IV. Using our bodies to review the concepts of the Earth and Sun. Put a table in the middle of the room. Have a lamp on the table with a light bulb in it but no lampshade. Turn off the classroom lights, close the window blinds, and have the students form a large circle around the lit lamp. The lamp represents the Sun and the students represent Earth.

Have the students form a large circle around the Sun. Students should face the Sun and answer the following questions. Act out the actions indicated. This performance assessment should help you judge whether the students understood the concepts from the lesson.

Touch your North Pole, South Pole, equator.

Does the sun ever move?

What time of day is it on your nose?

What time of day is it on the back of your head?

What would a rotation look like? Do it. Make sure it is counterclockwise and towards their left shoulder.

Face the Sun again. Rotate counterclockwise again but slowly. What does the sun appear to be doing? It appears to move but who is really moving? The Earth. (As they make all four 90° movements ask them what time of day it is. Start out at noon, then 6 PM, midnight, and 6 am)

Pick a corner of the room and tell the students that is where the North Star is. If that is the North Star what should they do towards it? Tilt.

What would a revolution look like? Do it. Make sure it is counterclockwise to the Sun.

Can you rotate and revolve? They might get dizzy!

Bibliography

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