TRB 6:1 - Activity 1 - It's Just a Phase

Summary

At the completion of this lesson plan students will have a better understanding of what causes the phases of the moon.

Materials

- phases of the moon cards (see attachments)
- 1 bright lamp without the shade (at least 75 watts)
- Styrofoam ball for each student
- craft (Popsicle) stick, tongue depressor, or sharpened pencil for each student
- observation chart for each student (see attachments)
- lunar diagrams chart
- scissors
- glue or tape

Additional Resources:

Branley, Franklyn M. The Moon Seems to Change. 1987.
Simple text, but good photos and drawings about the phases and movement of the moon. $4.50
Estalella, Robert. Our Satellite: The Moon. 1994.
General text about the moon,includes phases. Two page chapters, photo on one side, text opposite. 32 pages.$6.95.
Smith, P. Sean. Project Earth Science Astronomy. NSTA, Arlington, VA, 1998.
ISBN 0-87355-108-7
Sneider, C. I. Earth, moon, and Stars. Lawrence Hall of Science, Berkeley, CA, 1986.
The Universe at Your Fingertips: An Astronomy Activity and Resource Notebook.
Astronomical Society of the Pacific, San Francisco, CA, 1995.
ISBN 1-886733-00-7

Background for Teachers

The moon rotates on its axis at the same pace as it revolves around Earth. As a result,the moon always keeps the same side pointed toward us throughout its orbit. Astronomers call the side we see from Earth the "nearside of the moon," and the side we never see from Earth the "far side of the moon."

During the moon's cycle, the actual shape of the moon never changes. It is always a sphere.We only see the moon because sunlight reflects back to us from its surface; it has no light source of its own. What changes is the portion of the moon that can be seen from Earth. Half of the moon is always illuminated by the sun.The half of the moon facing the sun is always lighted;but the lighted side does NOT always face Earth. As the moon circles Earth, the amount of its disk facing us that is lighted by the sun changes, altering how much of the lunar surface appears bright and how much is in darkness. The changes are known as phases, and repeat in a specific cycle. These are the primary phases: New Moon, First Quarter, Full Moon, Last Quarter. (It takes 27-30 days to go from one New Moon to the next.)

During the time it takes to move from one phase to another,the amount of the moon's surface lighted by the sun changes gradually; it's not an abrupt change from one phase to the next. (Many times students get the impression that changes are abrupt because they are only shown diagrams of the primary phases.)

There are times during the cycle when the moon can be seen during the day. These times are predictable. The following chart gives the times when each phase rises and sets.

PHASE	RISES	HIGHEST IN	SETS

		SKY	
New Moon	Sunrise	Noon	Sunset
First Quarter	Noon	Sunset	Midnight
Full Moon	Sunset	Midnight	Sunrise
Last Quarter	Midnight	Sunrise	Noon

Earth's shadow plays no role in the moon's phases, but the shadow of Earth does darken the moon during a lunar eclipse. Earth revolves around the sun once every year. The moon circles Earth about once per month. The plane of the moon's orbit is tilted a little (5 °) from the plane of Earth's orbit. When the moon is on the side of Earth away from the sun (Full Moon), it passes very close to Earth's shadow; however, because its orbit is tilted, the moon usually passes just above or below Earth's shadow. About once every six months the moon goes right through the shadow of Earth, creating a lunar eclipse.

Student Prior Knowledge

This lesson is part of the Sixth Grade Science Teacher Resource Book (TRB3) http://www.usoe.org/curr/science/core/6th/TRB6/. The TRB3 is designed to be your textbook in teaching science curriculum to your students. This book covers all the objectives of each standard and benchmark. If taught efficiently, a student should do well on the End-of-Level (CRT) tests. The TRB3 is designed for teachers who know very little about science, as well as for teachers who have a broad understanding of science.

Intended Learning Outcomes

1-Use science process and thinking skills
2-Manifest scientific attitudes and interests
3-Understand science concepts and principles
4-Communicate Effectively Using Science Language and Reasoning

Instructional Procedures

Invitation to Learn:
Ask the students what they see when they look at the moon. As the students describe the various phases, give the appropriate phase card to the student. Teach the correct term for each phase; New, First and Last Quarter, and Full Moon. Include all the phases of the moon but do not name intermediary phases (waxing, waning, gibbous and crescent are not vocabulary words students need to learn). Have the students with the phase cards come to the front of the room. Assign the student to arrange the cards in the order they would see them during the moon's cycle. Start at New Moon and end with New Moon to emphasize that it is a cycle. Have the students tape the cards to the board in the order they have determined. Do not comment or evaluate the order at this time. Students will discover the correct sequence for themselves in the next activity.
This activity works best in a dark room with a bright light at student eye level.

Place the lamp in the middle of the room. Arrange furniture so there is enough room for the students to stand with arms extended in a circle around the lamp.
Distribute a Styrofoam ball moon model to each student. Stick a pencil or Popsicle stick into the ball to make it easier to hold.
Explain to students that the light represents the sun and their heads will represent Earth. They also need to imagine that all observations are being made by a person standing on the top of "Mt. Nose." Have all the students stand so that it is noon for the observer on Mt. Nose. (This can also be called "noses at noon" position.) Have the students rotate to the position where it is midnight on Mt. Nose (noses at midnight). Have the students rotate in the correct counterclockwise direction. (To help students remember how to rotate, it is helpful to have them

put their right hand over their hearts as if saying the Pledge of Allegiance and then use that hand to push themselves around.) Have the students extend their arms to represent the horizons for the observer on Mt. Nose. Allow the students to determine which hand represents the western horizon where the sun sets and which hand represents the eastern sky where the sun rises.

The students should hold the Styrofoam ball slightly above their heads to keep it out of their bodies' shadows. Have the students observe the moon in different positions as it rotates around their heads or Earth. Ask them how much of the moon is illuminated as it rotates. Make sure that the students understand that half the moon is always illuminated.

Start at New Moon position. Have the students observe that the illuminated side is away from them and the far side is visible. Have the students rotate 1/8 of the way around the circle. They should now be able to see a small crescent of the illuminated side. Have the students rotate another 1/8 of the way around the circle to the point where they see the First Quarter. Continue through the lunar cycle and back to New Moon.

Have the students go through the sequence again, this time saying the name of the phases New, First, Quarter, Full and Last Quarter as they pass through each phase.

Call out moon phases and have students move to that position. (Make sure that the students move in a counterclockwise direction to correctly model the moon's orbit.)

Distribute the Moon Observation Chart to the students. Assign them to observe the moon in the sky each day/night. Students should color the part of the visible circle that is illuminated yellow, and the part that is not illuminated black. Students should describe the appearance of the sky in their journals.

Extensions

Have the students work in pairs with one student holding the moon in the different phases. The other student should extend his/her arms and rotate to determine the time of day when each phase rises and sets.

Use the model to demonstrate lunar and solar eclipses.

Adaptations:

This activity can be done using an overhead projector to represent the sun. Have all the students stand opposite the projector.

Integration:

Read and discuss legends about the phases of the moon. Share poetry about the moon and have the students write a moon poem.

Assessment Plan

Distribute Oreo Cookies and a plastic knife to the students. Have the students separate the cookies and use the white frosting to represent the illuminated portion of the moon that we see during each phase. The chocolate cookie represents the portion of the moon that is not illuminated. The cookies could be placed on a calendar on the appropriate days to demonstrate understanding of the cycle. (Teacher will need to provide information on the phase for the day the activity is conducted.)

Given a specific phase, the students will determine what phase they will be able to see in 24 hours, in 72 hours, in 1 week, or in 2 weeks.

Have the students complete the worksheet to show level of individual understanding.

Bibliography

This lesson is part of the Sixth Grade Science Teacher Resource Book (TRB3) http://www.usoe.org/curr/science/core/6th/TRB6/. The TRB3 is designed to be your textbook in teaching science curriculum to your students. This book covers all the objectives of each standard

and benchmark. If taught efficiently, a student should do well on the End-of-Level (CRT) tests. The TRB3 is designed for teachers who know very little about science, as well as for teachers who have a broad understanding of science.

Authors

Utah LessonPlans