REFLECTING ON MOONLIGHT

BENCHMARKS AND TASKS

SC.E.1.1.1 The student knows that the light reflected by the Moon looks a little different every day but looks the same about every 28 days.
SC.E.1.1.2 The student knows that the appearance of sunrise and sunset is due to the rotation of Earth every 24 hours.

- The student creates a model to show:
  - The earth rotates on its axis.
  - The rotation of the earth on its axis causes night and day.
  - The sun can be seen only in the daytime because of the rotation of the earth on its axis.
- The student records in a journal, observations of other objects in the sky.

KEY QUESTION

What is Moonlight?

BACKGROUND INFORMATION

Except for the sun, the moon is the brightest object in the sky. A full moon on a clear night can provide enough light to read by. Yet the moon produces no light of its own. Moonlight is simply reflected sunlight. The sun is the ultimate source of light. The sun produces energy which illuminates and provides warmth to the earth, moon, and nearby planets. These bodies, in turn, reflect the sun's light.
The moon is actually a very poor reflector of sunlight. It reflects only about seven percent of the sunlight that falls on it. The remaining 93% of the sunlight is absorbed by the lunar surface. Moonlight is only about two millionths as strong as sunlight. The quality of moonlight is also different. The sun's ultraviolet and infrared light help to give an object a true color. Moonlight, however, seems to drain the color from the landscape. At one time people believed that excessive exposure to moonlight would cause insanity. In fact, the word *lunatic* comes from *luna*, the Latin word for *moon*.
Even though the brightest moonlight is only about a quarter as bright as the light of a candle held one meter away, it is still bright enough to cast shadows. The absence of moonlight can make a night seem pitch black.

MATERIALS

Teacher
lamp or bright flashlight
stool or ladder
spheres for each student
posters of lunar phases

Per student
styrofoam ball on a dowel or pencil

TEACHING TIPS

1. Push a wooden dowel or pencil into the styrofoam ball and create one for each student.
2. Position the light source at student eye level. Tape down any cords so that no one trips.
3. Darken the room as completely as possible.
4. Display the moon phase charts.
5. Begin this activity after completing the *Day and Night* activity and after completing some of the *Moon Over Orlando* activity.

ENGAGE

1. Review the class observations from *Moon Over Orlando* and discuss the moon phases once again.
   Ask:
   Why do you think the Moon has different phases or shapes?
   Where does the light we see from the Moon come from?

EXPLORE Part 1

1. Have the students form a circle around the lamp (or whatever light source you use). They should be 5 to 8 feet from the lamp and at least an arm's length apart from each other.
2. Distribute the styrofoam balls attached to the dowels. Tell the students that the lamp represents the sun and that each student will represent earth. When they hold out the dowel, the ball on the dowel represents the moon.
3. Turn on the lamp. Tell the students to face the "sun" and hold the dowels out at arms length, a little over their heads.
4. Have the students slowly turn in place counterclockwise while holding their "moons" a little above their heads in front of their bodies. Have them observe the changes in the way the light from the "sun" falls on their "moon".
5. Check to make sure that all students are looking at the balls representing the moon, rather than at the lamp representing the sun. Tell the students to be careful to keep the shadows off of their heads and hands from striking the balls.

EXPLAIN

Stimulate discussion by asking:
What makes the "moon" light? (reflecting light from the sun)
Does the light from the "sun" ever fall on the whole "moon", or just on one side? (only one side receives light)
Why do you think that you turn around in this investigation? (Students should say because they represent the earth, they are turning to represent the earth rotating on its axis).

EXPLORE Part 2

Have the students form a circle around the lamp holding their styrofoam, wooden dowel "moons".
Ask the students to turn their bodies until their "moon" is new. (The students should turn so they directly face the light, since from earth only a ring around the moon is visible during a new moon.)
Ask the students to turn their bodies until their "moon" is full. (They should move so their backs are to the light and the ball is fully lit.)
Ask the students to turn their bodies so that half of the "moon" is lit. (They should move so that the light is at either their left or right.)
Ask the students to turn their bodies until they see a gibbous "moon".

Review with the students that the way the sun's light falls on the moon determines what the moon looks like from earth. Encourage them to make several turns until they understand why the moon looks different to us on earth at different times of the month.

EXTEND/APPLY

Ask:
If the earth is between the sun and the moon, what phase of the moon would you see?
If the moon is between the sun and the earth, what phase of the moon would you see?

EXTENSIONS

Provide materials, such as clay or smaller styrofoam balls, for students to use to make a tabletop model of what they are investigating. Place the moon and earth in position for each phase and make a drawing of the set up.

ASSESSMENT

Teacher assessment through observation should include the following criteria:

- Tasks have been completed by the student.
- Students demonstrate understanding through successful completion of the activity and creation of a representational model.
- Student answers to questions should show evidence of conceptual knowledge.
- Student questions should be probing, on task, or reflect the processing of an essential understanding.