

A LUNAR LAP



BENCHMARK and TASKS

SC.E.1.2.2 The student knows that the combination of the Earth's movement and the Moon's own orbit around the Earth results in the appearance of cyclical phases of the Moon.

- The student observes and records that the observable shape of the moon changes from day to day in a cycle that lasts approximately 28 days.
- The student models and describes the relative positions of the moon, earth, and sun during each of the phases of the moon.
- The student explains the causes of the phases of the moon.

KEY QUESTION

Why does the moon seem to change phases?

BACKGROUND INFORMATION

The **moon** is the earth's only natural satellite. It takes the moon approximately 29½ days to complete all of its phases. During the same time, the moon also rotates once on its **axis**; that is why we always see the same side of the moon from earth. Half of the moon's surface faces the **sun** and **reflects** the sun's light; the moon does not generate its own light. The other half of the moon faces away from the sun. As the moon revolves around the earth and the earth and moon revolve together around the sun, the relative positions of the earth, moon, and sun constantly change. The moon appears to rise in the east and set in the west, due to the earth's rotation from west to east.

We see different amounts of the moon's lit surface at different times of the month. This causes the moon to seem to have different shapes, called **moon phases**. There is no exact starting point for the lunar cycle, but the phases do follow each other in an exact order. The first phase is known as the first quarter moon, during which we see half of the side of the moon that is reflecting sunlight. The first quarter moon occurs when the moon has completed the first quarter of its trip around the earth – about six to eight days after the new moon. The second phase is the full moon, during which we see the full face of the moon that is reflecting sunlight because the earth is between the sun and the moon. The third phase is the third quarter moon, which occurs about three weeks after the new moon. The next phase of the moon is the new moon. When the new moon occurs, we seldom see any part of the moon from the earth. As the moon moves from new to full, it is said to be waxing. As it moves back to new moon again, it is said to be waning.

MATERIALS

Teacher

overhead projector
The Moon Book,
Gail Gibbons

Per group

one 4-inch Styrofoam ball
1 sharpened pencil

Per student

moon journal

TEACHING TIPS

1. Make sure every student has the opportunity to participate in the Explore part of the activity.
2. Moonrise and moonset information can be found online at the U.S. Naval Observatory website.

ENGAGE

Say: *I am thinking of a certain celestial body. I will give you some clues to help you guess what it is.*
(When a student thinks he has the answer, have him give the next clue rather than the answer.)

- It is relatively small.
- It could fit inside the country of Canada.
- It is the brightest and most easily seen object in the night sky.
- Neil Armstrong was the first human being to walk there.
- It looks different at different times of the month.
- It is the earth's only natural satellite.

Have you guessed what it is? We're going to find out more about the moon during the next activity.

EXPLORE (Part 1)

1. Students should ask their families to join them on a moon watch. Families can share a pair of binoculars outside in the evening when the moon is visible, using the binoculars to closely observe the moon's surface. Inform parents where in the sky to look and approximate times for the best viewing. Explain that the goal is for students to gain as much information as possible through direct observations.
2. Have students observe the moon during a one-month period and encourage them to keep a record of their observations and sketches in their journals. They should include the date, time, and position in the sky.

EXPLAIN (Part 1)

Use the journals to discuss how the observable shape of the moon changes from day to day in a cycle that lasts approximately 29½ days.

What did you notice about the changes in the moon phases from night to night?

EXPLORE (Part 2)

1. Instruct students to carefully poke the sharpened end of their pencil into the Styrofoam ball to create the moon model.
2. Explain that the students' heads will represent earth; the overhead projector will represent the sun; the Styrofoam balls will represent the moon.
3. Instruct the students to hold their Styrofoam balls slightly above their heads in a position as comfortable as possible while they face the overhead projector.
4. Darken the room and focus the projector light on the Styrofoam balls. **Students should keep their eyes constantly on the moon at all times, in order to see the phases.**



5. Ask, *How much of the moon is visible from earth when the moon is in this position?* (The moon is completely invisible when it is in this position; this is a new moon.)
6. Ask students to make a 1/8 turn slowly to the left (counterclockwise). Both the earth and the moon move counterclockwise. Ask: *What shape is the illuminated part of the moon?* (This is called the crescent moon).
7. Have the same students make another 1/8 turn slowly to the left. Ask: *How much of the moon is visible from earth now?* (about one-fourth; this is the first quarter moon)
8. Have students make another 1/8 turn and tell them this is the gibbous moon.
9. Have the students turn so that their backs are to the sun. Ask: *How much of the moon is visible from earth now?* (one-half) *What phase of the moon is this?* (full moon)
10. Have students continue turning 1/8 of a turn each time and continue questioning until the students have moved through the gibbous moon, the last quarter moon, the waning crescent, and back to the new moon.
11. Repeat the activity until every student has had a chance to participate.

EXPLAIN (Part 2)

Why does the moon shine? (Sunlight reflects off of it.)

When the moon was directly between the earth and the sun, why could earth not see the moon easily? (The sun's rays illuminate the far side of the moon only.)

What is this kind of moon called? (a new moon)

When did earth see a full moon? (When earth was between the sun and the moon, the sun's rays fell on the side of the moon nearest the earth.)

How long does it take for the moon to move through a complete lunar cycle? (approximately 29½ days)

How much of the moon is always illuminated by the sun? (one-half)

Why does the moon appear to "shine" even though it does not generate its own light? (Half of the moon always faces the sun and reflects the sun's light.)

Why does the moon seem to have different shapes? (The moon orbits the earth, and during this time, it looks as if it is gradually changing shape because we see different amounts of the moon's illuminated side as it orbits the earth.)

Can we ever see the moon during the day?

EXTEND/APPLY

Learn more about the moon in *The Moon Book* by Gail Gibbons.

EXTENSION

Students can research to learn the difference between a solar eclipse and a lunar eclipse. Have them sketch the earth, the sun, and the moon and explain how they are aligned during an eclipse.

ASSESSMENT

The student will draw and explain the phases of the moon in relation to the sun.