



IT DOESN'T PHASE ME

Subject Matter: Science

Grade Levels: 3-5

Time Allotment: One 50-minute class session

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Overview

Through video and Web resources, this lesson provides students with both hands-on and visual models of the phases of the moon. They will use this knowledge to create a drawing showing the moon in its various phases, i.e., new moon, first quarter moon, full moon, last quarter moon.

Learning Objectives

Students will be able to:

- Recognize that the positions of the sun, moon and Earth affect the phases of the moon.
- Observe and draw the phases of the moon.

Oregon Standards Available at:

<http://www.ode.state.or.us/cifs>

Science - Earth and Space Science

Understand physical properties of the Earth, how those properties change and the Earth's relationship to other celestial bodies.

The Earth in Space

- Describe the Earth's place in the solar system and the patterns of movement of objects within the solar system using pictorial models.

Media Components

Video

Check the link at <http://www.opb.org/edmedia/trs/> to find access to the video(s) from unitedstreaming™ referenced in this lesson plan.



- “Junior Space Scientist: Voyage to the Moon” (10:02)
 - **Clip:** “Moon Facts and Fun” (01:48)

Web

- **Moon Phases**

This is a great site for viewing an animation of the phases of the moon.

<http://www.astro.wisc.edu/~dolan/java/MoonPhase.html>

Materials

Per Student:

- A light-colored sphere of some sort that can be placed on the end of a pencil, such as a 5-centimeter or larger white Styrofoam ball. Golf balls would also work.
- Paper for drawing the phases of the moon

Per Class and/or Group:

- A light source to use as the sun, such as a lamp with a bright bulb (400 watts) with the shade removed
- A dark room

Prep for Teachers

Bookmark the Web site you will be using to conclude the Learning Activities.

Download and preview the video. Note helpful points at which to pause for student fact sharing.

When using media, provide students with a **Focus for Media Interaction**, a specific task to complete and/or information to identify during or after viewing of video, Web sites or other multimedia elements.

Make sure the video clip, “Moon Facts and Fun” (01:48), from the video, “Junior Space Scientist: Voyage to the Moon” (10:02), is ready to play either by adding it to your playlist and streaming it or downloading the clip and saving it to the desktop or a shared server space.

Introductory Activity

Step 1: Initiate a conversation about the moon and what makes it “shine.” Ask how many shapes it has and what causes each shape. Use Think-Pair-Share to facilitate student discussion. Think-Pair-Share is a cooperative learning structure where you ask the students to *think* about a topic, turn to a partner (*pair* up) and discuss the topic, and finally ask members of the class to *share* with the whole group. (About 3 minutes)

Step 2: Make sure the video clip, “Moon Facts and Fun” (01:48), from the video, “Junior Space Scientist: Voyage to the Moon” (10:02), is ready to play.

Step 3: Before playing the video, provide students with a **Focus for Media Interaction** by asking them to listen for facts they didn’t know about the moon.

Step 4: **Play** the video. **Pause** after the narrator says, “... it orbits a planet ...” (00:12) and ask how a moon differs from a planet. Call on a student to answer. Correct answer: *Instead of revolving around a sun as planets do, moons orbit planets.*

Step 5: **Play** the video and **pause** after the narrator says, “... it’s reflecting light from the sun ...” (01:06). Ask where the moon gets its light from. Call on another student to answer. Correct answer: *The light from the moon is reflected off of its surface from the sun.*

Step 6: **Play** the video and **pause** when the narrator says, “... these changes take just over 27 days ...” (01:32). Ask the students how long it takes for the moon to go through all its phases one time. Again, call on a different student to answer. Correct answer: *Just over 27 days.*

Learning Activities

Step 1: Provide each student with their own Styrofoam ball.

Step 2: With the lamp in the center of the room, have each student place the ball at arm’s length between the bulb and their eyes. They should hold the pencil in their left hand. The bulb is the sun, the ball is the moon, and they are Earth.

Step 3: At the start, the “moon” is blocking the “sun.” (This demonstrates a total solar eclipse, which is very rare for any given location on Earth.) Usually the moon passes above or below the sun as viewed from Earth. Have each student move their moon up or down a bit so that they are looking into the sun. As they look up (or down) at their moon, they will see that all of the sunlight is shining on the far side, opposite the side that they are viewing. This phase is called “new moon” (like “no moon”).

Step 4: Each student should now move their hand towards the left, about 45° ($1/8$) of the way around counterclockwise. Have them observe the sunlight on their moon now. They should see the right-hand edge illuminated as a crescent. The crescent will start out very thin and fatten up as the moon moves farther away from the sun. (**Note:** Although the moon is closer to the sun during new and crescent phases, it is still 400 times closer to Earth; i.e., the sun is VERY far away in reality.)

Step 5: When their moon is at 90° to the left, each student will see the right half of the moon illuminated. This phase is called “first quarter.” Remember that one half of the sphere is illuminated at all times (except during lunar eclipses), but the illuminated portion that we observe changes as the moon changes position.

Step 6: As they continue to move counterclockwise past first quarter, the moon goes into its “gibbous” phase (more than half but less than fully illuminated), which grows as the moon moves towards 180° .

Step 7: When the moon reaches the position directly opposite the sun, as viewed from Earth, the half viewed from Earth is fully illuminated (unless the student’s head is causing a lunar eclipse). Of course only half of the moon is illuminated. It has taken the moon about two weeks to move from new to full. This growth in illumination is known as “waxing.” The moon chases the sun across the (day and night) sky.

Step 8: Each student should now switch the pencil to their right hand and face in the general direction of the sun. Starting with the moon at full, students should continue the moon’s counterclockwise motion. They will observe the reverse of the moon’s phases seen so far with the left portion of the moon illuminated.

Step 9: After the gibbous phase diminishes, the moon will reach the 270° position, straight out to the right. This is “third” or “last quarter.” It is followed by a thinning crescent and a return to new moon. From full to new, the moon has been “waning” and leading the sun.

Step 10: Before viewing the “Moon Phases” Web site, provide students with a **Focus for Media Interaction** by asking them to watch for the position of the moon in relation to the sun and Earth during each moon phase.

Step 11: Go to the moon phase Web site you have bookmarked at <http://www.astro.wisc.edu/~dolan/java/MoonPhase.html>. While viewing this Web site, put the “Point of View” on “both.” **Pause** the animation when the moon reaches the new moon stage. Discuss the positions of the moon, sun and Earth. **Play** the animation again, **pausing** for discussion when the moon is at the first quarter, full moon and last quarter stages.

Culminating Activity

Check for comprehension by having each student draw and label the four main phases of the moon on their drawing paper. More capable students should include the sun and Earth in their drawings. If you have more time, ask students to work in teams to build three-dimensional models that demonstrate the relationships among the sun, Earth and moon.

Cross-Curricular Extensions

Art

- Make pictures of the night sky over the course of a month and ask students to specifically note the phase of the moon and other prominent objects in the night sky.

Language Arts

- Imagine you crashed on the moon and write about what happens. What difficulties would you encounter? What would the Earth look like from the moon? Would the Earth have phases if viewed from the moon?

Language Arts/Technology

- Pretend that a company has started offering vacation trips to a luxury resort on the surface of the moon and they have contracted with you to create travel brochures highlighting the reasons why such a vacation would be worth taking.

Community Connections

- Ask a representative from a local observatory to visit your classroom to discuss the moon and other objects in our solar system. Better yet, schedule a field trip so students can see for themselves.
- Invite a community member with a good telescope to join your class for an evening of sky watching.