

Phases of the Moon

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This activity demonstrates why the Moon has phases. Because it is hands-on, the students should remember it more easily than if you simply try to explain the reason to them. This is not just for children. Even adult audiences will learn something from this demonstration.

Materials:

- Lamp (with a single bright light bulb and no shade)
- Tennis Balls (one for each student)
- Slides showing the different phases of the Moon (optional, but preferred)
- Calendar showing the phase of the Moon when New, First Quarter, Full, and Third Quarter (optional)
- Flag of Algeria and Turkey (optional)

You should be able to get all the tennis balls you need by calling a local tennis or athletic club. Tennis balls wear out and places like this are always throwing old ones away. Tell them who you are and why you need them and you should get as many as you can use. I called three places and each one said, "yes." Now I have about five hundred old tennis balls in a big box.

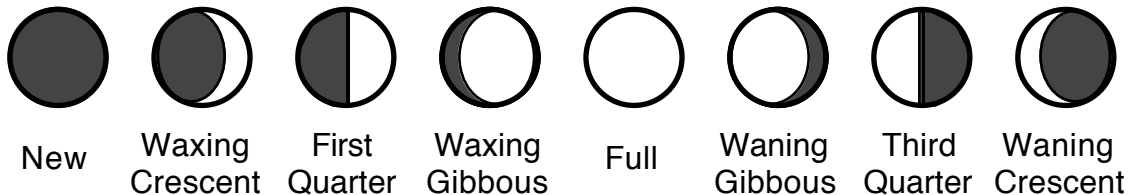
If you would like, drill a finger-sized hole in the tennis balls. This will make it easier to hold up for the demonstration. It will also make them less bouncy, in case the children want to play.

Background

Most people do not understand the Moon or its phases. They may believe that it goes through all the phases in one night, or in 24 hours. Many (especially children) may even believe that the Moon actually changes shape. This misconception is strengthened by artwork and consumer goods that show the crescent Moon with stars between the horns.

The Activity

It's good to start out the demonstration by showing the phases of the Moon and giving their names. If you don't have slides to show this, simply draw a series of circles on the chalkboard or large sheets of paper. Then, shade in the darkened parts of the circles to indicate the phases.



Ask the students, "Why is it called 'First Quarter' if only half the Moon is visible?" Also ask, "Why is there a 'Third Quarter' when there isn't a 'Second Quarter'?" Then tell them that the best way to explain it all is with a demonstration.

Pass out the tennis balls, one per student. Of course, admonish the class to not bounce, throw, or otherwise play with them. Explain that the tennis ball is the Moon, and your head is the Earth. Set up the

lamp at the front of the room and turn it on. This will be the Sun. Finally, turn off all other lights in the room. you are now ready to begin.

NOTE: Your room might not be able to be darkened because it has outside windows or some other reason. If so, you will need to find another place to do this demonstration. It really will not work unless the lamp is the only source of light.

Have all the students look carefully at their “Moons.” Note how half of the Moon is always lit by the Sun, and half of it is always dark, no matter where it is. Explain that when we see different phases, we are just looking at the lit portion from different angles.

You and your students should do this next part together. Stand and hold up your “Moon” so that it is between the “Earth” and the “Sun.” This is the new moon phase. We see the side of the moon that is currently dark, while the farside of the moon experiences daylight.

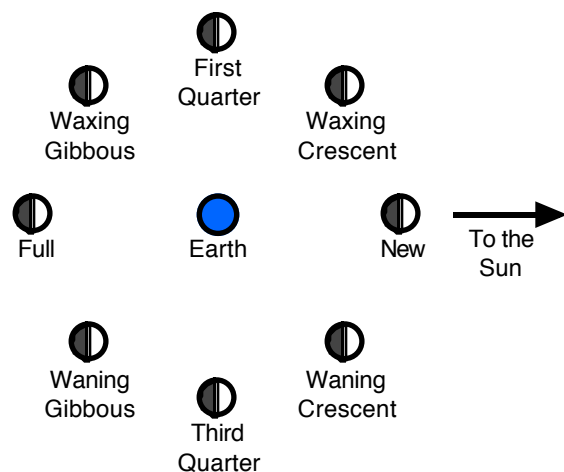
Slowly move your arm so that the moon “orbits” to the left. This is the actual direction that the real Moon travels in as it moves around the Earth. You should see a thin crescent of lit tennis ball appear. This is the waxing (growing) crescent phase.

Continue moving the moon to the left, and you will see it change from waxing crescent to first quarter. At this point, the angle between the Sun and the moon, as seen from Earth, is 90°. This is one **quarter** of a circle, the **first quarter** of the orbit as the moon travels through its cycle. Make sure that the students see and understand this.

Keep moving your arm to the left. You will go from first quarter through waxing gibbous, to full. You will need to hold the moon up a bit to prevent an “eclipse”. The moon has now moved through two quarters of a circle. Therefore, you could call this the “second quarter moon”. Of course, nobody does.

Move on around the orbit. the lit portion of the moon begins to shrink. It will pass through waning (shrinking) gibbous phase to third quarter. Point out that the moon has now traveled through **three quarters** of its orbit.

Finally, orbit your moon through the last part of its orbit. You will see it pass from third quarter through waning crescent phase, and back to new once again.



Extras

Use the calendar to show how long it takes for the Moon to complete one orbit. It takes roughly one “Moonth”. Make sure your class understands that this is where we get the term “month”. It comes from the Moon. Show them that it takes about one week (one quarter of the month) to go from new moon to first quarter, or from first quarter to full. Another thing to try involves the flags of Algeria and Turkey. They both have a crescent moon with a bright star near the horns. However, Algeria’s flag has the star between the horns of the moon, which is not physically possible in the real sky. Turkey, on the other hand, has the star close, but still outside the horns. Explain why you can never see a star between the horns of the crescent moon, even though this is often depicted in art. It would also be a good idea to reassure the class that you are not making fun of Algeria because of their flag. Remember, the American flag has 50 stars in a big square. That particular constellation doesn’t exist either.