



# Classroom Connections

## Moon Phases

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Classroom Connections, visit  
[www.nasa.gov/stemonstation](http://www.nasa.gov/stemonstation).

# Moon Phases

## Background



Grade Level: **3<sup>rd</sup>-8<sup>th</sup>**



Next Generation Science Standards (NGSS):

**5-ESS1-2.**

Earth's Place in the Universe.

**MS-ESS1.**

Earth's Place in the Universe.



Suggested Time: **60 minutes**

### **Teacher Background**

In this activity, students will create a model to demonstrate the phases of the Moon and will use this information while observing the Moon in their night sky. Astronauts aboard the International Space Station are currently observing different aspects of the Moon's appearance as NASA prepares to go forward to the Moon and on to Mars with the Artemis program. Although the space station is orbiting 250 miles above Earth's surface, astronauts are not much closer to the Moon than we are here on Earth as the Moon orbits approximately 238,855 miles away. This activity will allow students to understand the causes of the Moon's phases and give them the opportunity to observe the 30-day lunar cycle with their own eyes. It is recommended to select a dark room for the Moon Phase Model activity and move desks or other objects out of the way so students can move around freely. To see a full-length version of the modeling activity, visit <https://www.jpl.nasa.gov/edu/teach/activity/moon-phases/>.

### **Objective**

Following this activity, students will be able to:

- Discuss the different phases of the Moon.
- Explain what causes the phases of the Moon.
- Observe the phases of the Moon over the span of a month.

### **Materials**

- White Styrofoam ball - 3 inches or larger (1 per student)
- Light source (ex: a lamp with a bright, clear, incandescent bulb)
- Moon Phase Model Sheet (1 per student)
- Moon Observation Sheet (1 per student)
- String (8 inches per student)
- Metal Brad Paper Fastener (1 per student)
- Pencils

The eight Moon phases discussed in this activity are listed below:

New Moon  
Waxing Crescent  
First Quarter  
Waxing Gibbous  
Full Moon  
Waning Gibbous  
Last Quarter  
Waning Crescent



## **Procedure**

### • **Inquiry Activity Discussion**

Use this discussion to segue into the STEMonstrations: Moon Phases video. Start this activity by asking students the following:

1. What are some noticeable differences and changes between day and night? Do any of these changes differ between weeks? Months? Seasons?
2. What causes the changes in the Moon's appearance?
3. Why is the Moon not as visible in the daytime as it is during the nighttime?
4. If I am unable to see the Moon at night, what could be the cause?

### • **Watch and Discuss Video:**

Watch the video STEMonstrations: Moon Phases available at <https://www.nasa.gov/stemonstrations>

Discuss the demonstration of Moon phases shown by astronauts aboard the space station. Introduce the Moon Phase Model activity.

### • **Moon Phase Model:**

1. Step 1 – Place the lamp in the middle of the room.
2. Step 2 – Have each student poke a hole into their sphere with their pencil and hold the pencil, with sphere attached, in one hand. They should be holding what looks like a spherical lollipop.
3. Step 3 – Tell students the bulb is the Sun, while each of their spheres is the Moon and each student is Earth.
4. Step 4 – Rotate in place for each of the phases described below. Remind students what they are doing in 10 minutes takes the Moon about 30 days to do, complete one full circle around Earth.

### • **Student Procedure:**

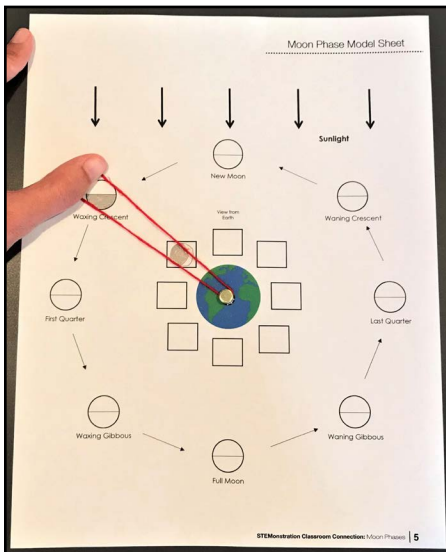
- New Moon: To begin, students should face the lamp and extend the sphere at a slight angle above the horizon in front of their face so they can also see the lamp. This view simulates a new Moon. As students look at their Moon, they will see the sunlight is shining on the far side, opposite their view of the Moon. From Earth, the new Moon is not visible. To simulate a solar eclipse, have students use the sphere to block the lamp.



- Waxing Crescent: Keeping their arm extended at an angle in front of their face, have students turn their body counterclockwise about 45 degrees. They should face their spheres and observe what they now see. They should see the right-hand edge of the sphere illuminated as a crescent. The crescent starts very thin and fattens up as the Moon moves farther away from the Sun (as the student begins to turn in a circle). We say the Moon is waxing because we are seeing more of its surface illuminate.
- First Quarter: Have students continue turning left so their Moon and body are now 90 degrees to the left of their original position. The right half of the sphere should illuminate. This phase is called the first quarter.
- Waxing Gibbous: As students continue to turn, they see more and more illuminated surface.
- Full Moon: When students move their Moon so it is directly opposite the Sun, as viewed from Earth (the student), the half seen from Earth will illuminate. (Make sure they hold their Moon high enough so their head does not block the light.) To simulate a lunar eclipse, have students block the "sunlight" with their head.
- Waning Gibbous: As students continue to turn, they start to see less and less of the illuminated surface.
- Last Quarter: Keep students turning, with arms extended, so they are now three-quarters of the way around from their original position. This is the third, or last, quarter. They should observe the illumination of the opposite side from the first quarter Moon.
- Waning Crescent: Now the illuminated surface of the Moon is growing smaller and smaller, bringing it back to a new Moon.

- **Moon Phase Model Sheet:**

1. Distribute one Moon Phase Model Sheet to each student, along with the pre-cut string and a metal brad paper fastener.
2. Have students shade each Moon, keeping the side facing the sunlight white to represent the reflection of the Sun.
3. Allow students to wrap the string once around the paper fastener, leaving two 4-inch halves. Students can then secure the metal brad paper fastener in the center of Earth.
4. For each phase of the Moon, students will place the two halves of the string on each side of the Moon, determining the amount of shaded versus unshaded parts of the Moon to illustrate what someone would see from the perspective of Earth. Have students illustrate the view from Earth in the center boxes.



- **Final Discussion**

Revisit the initial inquiry discussion, guiding students to the correct responses if needed. Discuss the Moon Observation Sheet with students, explaining how they will have the opportunity to observe the phases of the Moon with their own eyes, similarly to how astronauts aboard the International Space Station are observing the Moon. Reiterate during inclement weather or cloudy nights students can make a note of the weather and use their Moon Phase Model Sheet to determine the phase.

- **Extension Activity:**

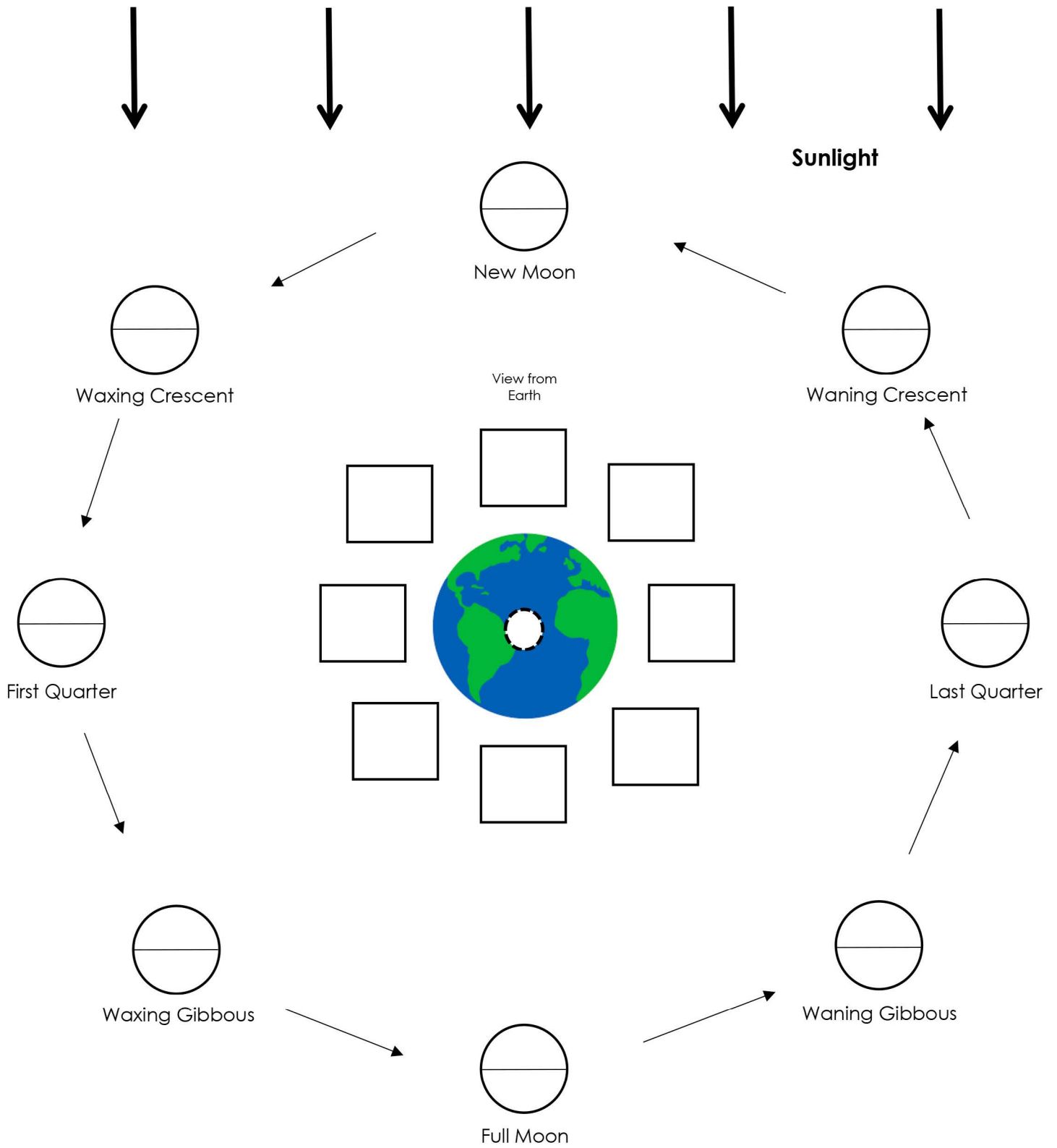
Allow students the opportunity to complete the [We are the Artemis Generation: Phases of the Moon digital badge](#) available through the Educator Professional Development Collaborative Badging System.

Badge Overview: As members of the Artemis generation, students will have many opportunities to support NASA's current endeavor in human spaceflight: returning to the Moon to build upon Project Apollo's considerable legacy. While the first female and next male astronauts begin training for their walk on the Moon's surface in 2024, the next generation of NASA explorers can follow along every step of the way. In learning more about Earth's nearest neighbor, you are preparing yourselves to play a role in NASA's next giant leap forward.



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# Moon Phase Model Sheet



# Moon Observation Sheet

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Name: \_\_\_\_\_

Date: \_\_\_\_\_

## **Directions**

Record the appearance of the Moon on each day. During inclement weather or cloudy nights, make a note of the weather and use your Moon Phase Model Sheet to determine the phase.

1.  Date: _____	2.  Date: _____	3.  Date: _____	4.  Date: _____	5.  Date: _____
6.  Date: _____	7.  Date: _____	8.  Date: _____	9.  Date: _____	10.  Date: _____
11.  Date: _____	12.  Date: _____	13.  Date: _____	14.  Date: _____	15.  Date: _____
16.  Date: _____	17.  Date: _____	18.  Date: _____	19.  Date: _____	20.  Date: _____
21.  Date: _____	22.  Date: _____	23.  Date: _____	24.  Date: _____	25.  Date: _____
26.  Date: _____	27.  Date: _____	28.  Date: _____	29.  Date: _____	30.  Date: _____