6: Moon Phases

The Moon is an astronomical wonder that can be viewed anywhere in the world. Glowing bright, the Moon orbits Earth and functions as a natural satellite. The regular daily and monthly rhythms of the Moon’s orbit has guided timekeepers for thousands of years, and the Moon’s patterns impact cycles here on Earth (such as the ocean tides). Scientists and astronauts, have spent years researching, studying, and exploring the Moon; they have not only conducted investigations from Earth but have also propelled themselves into the universe to land on the Moon. While it may be invisible to our eyes down here on Earth, the Moon is full of various landscapes: covered in light areas known as highlands, darker areas known as maria or basins, craters, and rocks of different compositions and ages. Also, did you know that we always see the same face of the Moon? NASA scientists know we see the same face of the Moon because the Moon is spinning on its axis at the same speed that it is going around Earth! However, have you ever noticed a change in how much of the Moon’s face we can see? Have you looked outside one night to see only a sliver of the Moon, while another night it appears as a full circle? This is because the Moon goes through a cycle approximately each month, and based on the Moon’s position between the Earth and the Sun during its orbit, we see different phases of the Moon.

Reading Recommendations:

Children
1. *The Moon* by Seymour Simon
2. *The Unicorn and the Moon* by Tomie De Paola
3. *When You Look up at the Moon* by Allan Fowler
4. *The Moon Might be Milk* by Lisa Shulman
5. *Moon Man* by Tome Ungerer
6. *Under the Moon* by Dylan Sheldon
7. *Goodnight Moon* by Margaret Wise Brown
8. *Moonshot* by Brian Floca

Juniors
1. *Moon Landing: The Race for the Moon* by Carole Stott
2. *Dark of the Moon* by Sara Teasdale
3. *The Girl Who Drank the Moon* by Kelly Regan Barnhill
4. *Where the Mountain Meets the Moon* by Grace Lin
5. *Full Moon Stories* by Eagle Walking Turtle
6. *Landmark History of the American People form Appomattox to the Moon* by Daniel Boorstin

**Teens**

1. *Thirteen Moons* by Charles Frazier
2. *From Earth to the Moon and Round the Moon* by Jules Verne
3. *Keeping the Moon* by Sarah Dessen
4. *Lost Moon: The Perilous Voyage of Apollo 13* by Jim Lovell
5. *Rocket Men* by Craig Nelson

**Activity:**

**Materials:**
- 2 large clear plastic cups
- 1-inch diameter yellow circle (cut out from yellow construction paper, or regular paper colored in yellow)
- black permanent marker
- black piece of construction paper
- ruler, glue, tape, and scissors
- printed out moon phases (not necessary but good for reference to complete the activity)

**Procedure:**

In this activity you can explore the different phases of the moon and see how the moon changes its appearance, so next time you are outside at night, take a look up at the sky and use your knowledge to think about what is the Moon’s phase?

1. Start, by measuring the height of the plastic cup. Cut a rectangular piece of black construction paper with the height of the plastic cup as the length of the paper.
2. Then take you cut out yellow circle and glue or tape on your cut-out black construction paper.
3. Roll the black paper up with the yellow circle facing out; and make sure that the yellow circle is not covered by the black paper. Insert the roll of black paper into one of the plastic cups. Secure the black paper onto the cup.
4. Put this plastic cup with your black paper and yellow circle INTO the second plastic cup.
5. Now, it is time to draw on the second plastic cup that does not contain the black construction paper and yellow dot.
6. First locate the yellow circle and write the name “full moon” under the yellow circle.
7. Imagine the cups like a clock, with the full moon as the 12’o clock position, turn the cup so that the yellow circle is now in the 3’o clock position. Trace the outline of the left half of the yellow circle and fill in with the black marker. The left half of the yellow circle will be covered and the right half will appear as a half moon or “first quarter moon.” Write the name below.
8. Now turn the cup so that the yellow circle is in the 6’o clock position. Using the black permanent marker pen, trace the outline of the yellow circle and fill in completely
with the black marker. The yellow circle will be covered and will look like the “new moon.” Write the name new moon below.

9. Turn the cup so that the yellow circle is now in the 9’o clock position. Trace the outline of the right half of the yellow circle and fill in with the black marker. The right half of the yellow circle will be covered and the left half will appear as a half moon or “third quarter moon.” Write the name below.

10. Turn the cup so that the yellow circle is now in the 1:30 clock position. Trace a crescent on the left of the yellow circle and fill in with the black marker. The right uncovered part of the yellow circle will appear as the “waxing gibbous moon.” Write the name below.

11. Turn the cup so that the yellow circle is now in the 4:30 clock position. Trace a gibbous (less than the full circle, but larger than the semicircle shape) on the left of the yellow circle and fill in with the black marker. The right uncovered part of the yellow circle will appear as the “waxing crescent moon.” Write the name below.

12. Turn the cup so that the yellow circle is now in the 7:30 clock position. Trace a gibbous (less than the full circle, but larger than the semicircle shape) on the right of the yellow circle and fill in with the black marker. The left uncovered part of the yellow circle will appear as the “waning crescent moon.” Write the name below.

13. Turn the cup so that the yellow circle is now in the 10:30 clock position. Trace a crescent on the right of the yellow circle and fill in with the black marker. The left uncovered part of the yellow circle will appear as the “waning gibbous moon.” Write the name below.

14. NOTE: To make sure you have enough space for all 8 phases of the moon, you can draw the “full moon,” “new moon” and the “first quarter moon” and “third quarter moon” first. Then you can easily draw in the “waxing gibbous,” “waning gibbous,” “waxing crescent,” and “waning crescent.”

15. With all of the phases drawn on your outside cup, its time to explore the phases! Holding the cups as one, turn the inside cup with the black paper and yellow dot; as you turn the cup watch the yellow dot be covered and uncovered based on the phase.

Dive Deeper:
After reading and/or completing the activities, does this topic peak your interest?

Check out these websites to further explore the topic of space and the moon:
1. NASA and the Moon — https://moon.nasa.gov

Check out these videos and films to visually learn more:
1. Tour of the Moon — https://www.youtube.com/watch?v=2iSZMv64wuU
2. Crash Course Astronomy: The Moon —
https://www.youtube.com/watch?v=mCzchPx3yF8
3. Earth Without a Moon — https://www.youtube.com/watch?v=6MP920xMC0Q
4. Gravity (2013 Film)
5. Hidden Figures (2016 Film)
6. The Martian (2015 Film)
7. Apollo 13 (1995 Film)

To stimulate the brain and engage in active learning, ask these questions:

Looking to build upon writing skills? Share your responses to these questions in a personal journal or brief paragraph essay.

Looking to build upon verbal communication and discussion based skills? Share your responses around the dinner table at night with family members; each person can contributes to the conversation with their own perspectives.

Looking to visually demonstrate your ideas? Share your responses by drawing and labeling a diagram, creating a storyboard with pictures, construct a 3D model, or acting out a scene.

1. Would you want to travel to the Moon? If yes, how long would you want to stay here and what would you do for fun? If no, why would you rather stay here on Earth?

2. Do some additional research on the Moon’s features and environment. How is the surface of the Moon different or similar to Earth? Based on these findings, do you think the moon could be livable and colonized by humans?

3. Is Earth the only planet with a moon? What other planets have moons and are these planet’s moons similar or different to our Moon?