



Graphing the Phases of the Moon

Understanding the Lunar Cycle

Grade Level: 6-8

Overview and Objectives:

Students often are unaware of the changing phases of the moon and the regular pattern of these phases. In this exercise, students will be able to identify the different phases of the moon by their appearance, place the phases of the moon in order of their changing appearance, and graph those changes using data regarding the percent or fraction of the moon illuminated. Students will also be able to determine how long it takes for one lunar cycle to be completed.

Materials:

pictures of phases of the moon, phases of the moon graph sheet, data of fraction of moon illuminated, large moon map (optional)

Teacher Preparation:

- Prepare cut out sets of small moon phase pictures. You may want to mark “north” on the moon for younger students.
- Moon phase pictures can also be prepared using the larger images, or by pasting the larger images onto the moon memory cards found in this packet.
- Obtain data of percent of moon illumination from the Naval Observatory’s website: <http://www.usno.navy.mil/USNO/astronomical-applications/data-services/frac-moon-ill>. You can enter any year for this data. The data sheet will list the percent of moon illuminated for every date of every month of that year on one sheet.

Lesson Plan:

- Begin by asking the students if they know whether or not the moon always looks the same every night of the year. Most will say the moon has different shapes at different times.
- Introduce vocabulary terms of full, new, quarter, crescent, and gibbous which are used to describe the shape or appearance of the moon.

- Continue the discussion by discussing how the moon appears to increase in size and decrease in size through the lunar cycle. Introduce terms of waxing (growing larger in appearance or more illuminated) and waning (appearing smaller in size or less illuminated).
- Distribute the sets of moon phase pictures to the students. Have the students work in pairs or small groups to place the pictures in the proper lunar cycle order. Have the students note features like the “rabbit in the moon” to help them with orienting the pictures in the proper way. A large moon map or image of the full moon via projector may help students with identifying direction.
- As students work together, assist them in seeing the logical pattern of increased and decreased illumination and the side of the moon (left or right) which appears lit.
- If necessary, provide students with a key of moon phases in the correct order. Discuss how the moon’s phases spell DOC going from first quarter to last (third) quarter.
- Discuss how we can quantify our observations of the moon by assigning a percentage number or fraction of the moon’s illuminated appearance. Samples of pie graphs or bar graphs can help illustrate this concept.
- Explain how a percentage is either described as a number or a decimal. For example, 50% can be expressed as 0.50. A value of 100% would be equal to 1.00.
- Distribute moon graph grid sheets and fraction of the moon data sheets to students. You may want students to each graph their own month of data, or graph that data in pairs or small groups. Each graph should be titled with the month and year of moon data graphed.
- After the moon data has been graphed and their graphs checked, ask the students to identify on the graph the location of the new and full phases of the moon. They should recognize that the new moon phase was as close to 0.00 and the full moon phase was as close to 1.00 as possible.
- Add in the first and last quarter moon phases drawn on the graph. Quarter moon phases should be recognized as having a percentage of 0.50. The first quarter moon phase should be placed on the graph between new and full. The third or last quarter moon should be placed between the full and new moon on the graph.
- Complete the illustrations on the moon graph of crescent and gibbous phases.
- When all graphs for the year are done, post them next to one another side by side for the students to view the lunar cycle throughout the year. This should appear as a long strip of data that looks like a sine wave.

Questions to ask students:

1. How long does it take to complete one lunar cycle?
2. Does each month begin with the same phase of moon?
3. Why was the moon used to mark time for people?
4. Are there always dates where the moon phase is exactly 50% illuminated?
Do these observations depend on a person's location on Earth?

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Phases of the Moon



Month

Year

