

Many Moons

Summary

Students will activate their prior knowledge about the moon. They will learn when the moon appears, how it looks, and how it changes over time.

Additional Core Ties

English Language Arts Grade 3

[Reading: Literature Standard 2](#)

Mathematics Grade 3

[Strand: NUMBER AND OPERATIONS - FRACTIONS \(3.NF\) Standard 3.NF.1](#)

Mathematics Grade 3

[Strand: NUMBER AND OPERATIONS - FRACTIONS \(3.NF\) Standard 3.NF.2](#)

Mathematics Grade 3

[Strand: NUMBER AND OPERATIONS - FRACTIONS \(3.NF\) Standard 3.NF.3](#)

Group Size

Large Groups

Materials

- Black construction paper for each student
- Regular lined writing paper or student notebooks
- Pencils
- White crayons
- Overhead projector or flashlight
- White Styrofoam ball on a skewer or white ball

Background for Teachers

The moon is a sphere. It revolves around the earth in a path called an orbit. It is lit by the sun's reflected light. The moon's appearance changes through its approximately 27 day orbit because of its relation to the sun and our visual vantage point on the earth.

When the earth is between the moon and the sun we see a full moon, when the moon is between the sun and the earth we see a "new" or dark moon. (The slight tilt in the moon's orbital path keeps us from having an eclipse every cycle.) The changes in the moon's appearance move from right to left.

Student Prior Knowledge

Students will have some idea that the moon's shape appears to change. They may have the common misconception that the moon is only visible at night. Students may have some understanding of what an orbit or revolution is. They will commonly misuse the terms revolution (to travel around another body in space) with rotation (to turn around a fixed point or axis).

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
 - a. Observe simple objects and patterns and report their observations.
 - f. Conduct a simple investigation when given directions.
 - h. Use observations to construct a reasonable explanation.
4. Communicate Effectively Using Science Language and Reasoning

b) Report observation with pictures, sentences, and models.

Intended Learning Outcomes Linked to Standards:

Students will make observations of the moon to determine how it looks throughout its cycle.

Students will use their observations to ask questions and develop theories about how the sun, moon, and earth move in space.

Students will explain that the moon is lit by reflected light from the sun. They will describe how the part of the moon that is visible from earth changes.

Instructional Procedures

Timeframe

Five class periods:

about 30 minutes: introduce lesson, read book, assign homework

about 30 minutes: review check students' moon charts, experiment, book

about 30 minutes: check students' moon charts, review understanding, video

about 30 minutes: check students' moon charts and review using fractions.

Assess learning

Instructional Procedures

Day 1: Introduction to the moon

Ask students to quickly draw the moon. Put the pictures away in their desk or notebook.

Read the book "Many Moons" by James Thurber. Discuss how the moon is described by each of the different advisors to the king and by the princess. What do they think about each person's explanations?

After reading the story ask students to share their own sketches of the moon. What did they draw and why? How far away do they think the moon is? Where does the moon get its light? Does it always look the same? Assess the prior knowledge your students have regarding the moon.

Explain to students that people have been observing the moon for thousands of years. Every culture has different stories about the moon.

Have students draw on their lined paper or notebooks three different views of the moon that they have seen. Why does the moon seem to change? Suggest that their responses are hypotheses or good guesses.

Explain the difference between casual observations and scientific observations. Give each student a piece of black construction paper and a white crayon or pencil. Have students fold the paper into four sections. Have them put today's date at the bottom of the first section. Add a date for each section approximately one week apart. Tell students they are going to make four observations of the moon and draw exactly what they see using the white crayon. It is very important that they draw everything facing the way they see it. Give an example on the board.

Send the paper home and have students return it as part of their homework.

Note: If you do not send homework, or if your students are unlikely to return it, you can make your observations at school, either outside if the moon is visible during daylight hours, or by using an Internet website such as [Farmer's Almanac - My Moon](#)

Day 2: Review, cultural enrichment, additional information

After reviewing what students drew on their homework papers, discuss what they saw. Give students a chance to thoroughly discuss their observations in small groups or partners. Did they all see the same thing? Why or why not?

Hold the ball up with the light to your back. (Students can cluster behind you if you use the overhead projector.) What do students see? (A full moon) Slowly move around, stopping occasionally to show the different phases until the light is facing you. What can students see now? (A new moon) Continue the process until you are back to a full moon again.

At their seats have students use their notebooks or other writing paper to explain what they saw. Have them draw pictures to illustrate their understanding.

Re-assign the homework for week 2.

Ask students if they think moon is visible in the daytime. If possible, go outside to see the moon. Remind students that every culture has stories about the moon. For instance, in the United States they may have heard someone say the moon is made of green cheese, or that there is a "man in the moon" Read The Moon was at a Fiesta by Matthew Gollub. This Oaxaca tale is tied to pre-hispanic culture and students may recognize some things that remind them of their own culture's stories about the moon.

Day 3: Review for understanding and video extension

Review students' homework for the second week. How has the moon changed? To review their understanding of the process, ask students to briefly write why the moon has changed shapes in the sky. Ask what shape the moon actually is and what shape it appears to be when observed from earth.

Watch and discuss the video "Digital Science Online: Exploring Earth, Sun, and Moon" (available in [UEN's eMedia](#)) or "Bill Nye -- The Moon." (available in [UEN's UIMC+ eMedia](#)) Each explains the difference between rotation and revolution.

Re-assign homework for weeks 3 and 4. Students will make their week 3 drawing the day of Lesson 3. They will make their fourth observation the day BEFORE lesson 4 below.

Day 4: Review student understanding, review homework, final assessment.

Review students' completed homework sheets. In groups, have students discuss what they observed. Was there a pattern? Do they believe the pattern will continue? What will come next? Why?

Have students write under each picture they drew the fraction that represents that amount using fourths - $\frac{1}{4}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{4}{4}$. Ask them to represent the fractions on a number line. Can they think of another name for $\frac{2}{4}$? Why are they the same?

Have students write in their notebooks or on writing paper to answer the questions in #1. Have them tell what they learned during their observations. Remind them to use the proper science vocabulary as they write. This is the informal part of the assessment process. Use the rubric below to score.

Give the final assessment

Strategies for Diverse Learners

Vocabulary written in English with pictures (and another language where appropriate) is displayed in classroom.

Students work in teams to develop understanding.

Students who have difficulty writing or speaking are encouraged to show understanding through drawings.

Students are encouraged to bring in their own cultural stories about the moon, sun, and earth.

Teacher uses illustrations and hands-on activities to help all students gain understanding.

Extensions

Students can build a model earth and moon to show rotation and revolution. Use a small Styrofoam ball on a skewer for the earth (paint it to show understanding of earth's surface features) and a large bead or piece of clay on a toothpick (also painted) for the moon.

Students can write their own fable about the moon to explain why it moves across the sky or changes shape.

Students can create a book about the way the moon moves and present it to students in a lower grade to help build their background knowledge.

Students can draw a representation of the moon for every day during the 27.3 day cycle.
This lesson can be tied to third grade social studies standard 2 objective 2.

Assessment Plan

The pre-assessment is intended to be the informal discussion of students' prior knowledge as well as their drawing of the moon from lesson 1.

However, teachers may choose to use the final multiple choice assessment piece as a pre-assessment to determine growth. Students' written assignments and drawings serve as informal formative assessments throughout the unit.

The summative assessment includes the rubric below for assessing students' final writing piece and the attached multiple choice Moon assessment.

Writing Rubric: for final notebook entry. Score each item 1 through 5.

1 = no understanding of concept or vocabulary or not present

2 = incomplete or incorrect understanding of concept or vocabulary but working toward understanding

3 = fair understanding of concept or vocabulary, student can use the terms or concepts appropriately most of the time

4 = good understanding of concept or vocabulary, student shows strong knowledge of most of the important ideas and could move to the next concepts with support

5 = excellent understanding of concept of vocabulary, student shows superior knowledge of the important ideas and could easily move to the next concepts

Score the following concepts and vocabulary:

Rotate/revolve -- a rotation is the movement of a body around its axis, a revolution is the movement of a body around another body. The moon revolves around the earth. (It also rotates on its axis to show us the same face though this is not a third grade concept they must master, some may know it.)

Sphere -- the actual shape of the moon and the earth.

Appearance -- the moon appears to change shape because of its relation to the sun and the observer.

Pattern -- students explained the pattern of the moon's appearance over 27 days and could predict that the pattern would repeat.

Bibliography

Many Moons

by James Thurber

The Moon Was at a Fiesta by Matthew Gollub

Video (From UEN eMedia) *Digital Science Online: Exploring Earth, Sun, and Moon*

Video (From UEN eMedia) *Bill Nye -- The Moon*

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