



Lesson Title

Earth's Attic: The Moon

LESSON DESCRIPTION

This lesson combines a series of activities to help students understand the physical characteristics of the moon.

OBJECTIVES

Students will:

- Create a simulation to model how craters and regolith are formed on the moon.
- Practice mathematical principles to determine lunar crater formation characteristics.
- Predict the origin of lunar rocks by first collecting, describing and classifying neighborhood rocks.

NASA SUMMER OF INNOVATION

UNIT

Earth and Space Science

GRADE LEVELS

7-9

CONNECTION TO CURRICULUM

Earth Science, Astronomy

TEACHER PREPARATION TIME

2 hours

Complexity: Advanced

NATIONAL STANDARDS

National Science Education Standards, NSTA

Earth and Space Science

- Origin and evolution of the Earth system.
- Structure of the Earth system.
- Earth in the solar system.

History and Nature of Science

- Science as a human endeavor.

Common Core State Mathematics Standards, NCTM

Ratios and Proportional Relationships

- Analyze proportional relationships and use them to solve real-world and mathematical problems

Expressions and Equations

- Understand the connections between proportional relationships, lines and linear equations.

U.S. National Geography Standards, NCGE

The World in Spatial Terms

- How to use mental maps to organize information about people, places and environments in a spatial context.

The ISTE NETS and Performance Indicators for Students, ISTE

Creativity and Innovation

- Apply existing knowledge to generate new ideas, products or processes.

Critical Thinking, Problem Solving and Decision Making

- Use multiple processes and diverse perspectives to explore alternative solutions.

MANAGEMENT

These activities require that students work in learning groups of two or four to allow them to make observations while others hold measuring devices and record data. It is important to provide enough preparation time and supply each learning group the needed materials for these activities.

CONTENT RESEARCH

The activities within this lesson are based upon having some common knowledge of the moon's surface like lunar craters, lunar surface characteristics, and rock formation. In addition, understanding how to measure surface area of a circle, sphere and volume is required using common mathematical formulas.

VOCABULARY

Crater -- an indentation of a planetary surface resulting from an impact of an asteroid, meteorite, or volcanism

Regolith -- rock debris resulting from the systematic processes of bombardment from meteorite impact; the breakup of rock due to heating and cooling; or from the process of larger rocks colliding with smaller rock as a result of these actions.

Angle of attack -- the geometric degree that a projectile, such as a meteorite, travels as it collides with the moon

LESSON ACTIVITIES

Moon Math: Craters! Supplemental Educator Guide

Students investigate various determining factors that create different sizes and shapes of lunar craters.

http://lcross.arc.nasa.gov/docs/MM_Suppl_Guide_v1.pdf

Regolith Formation

Allow students to study how lunar surface material is created.

<http://ares.jsc.nasa.gov/education/activities/ExpMoon/Regolith.pdf>

Reaping Rocks

Students have a chance to become "CSI rock investigators" by making predictions about the origin of lunar rocks by first collecting, describing and classifying neighborhood rocks.

<http://ares.jsc.nasa.gov/education/activities/expmoon/ReapingRocks.pdf>

RELATED RESOURCES

Solar System Lithograph Set

This lithograph set features images of the planets, the sun, asteroids, comets, meteors and meteorites, the Kuiper Belt and Oort cloud, **and moons of the solar system**. General information, significant dates, interesting facts and brief descriptions of the images are included.

http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Our_Solar_System_Lithograph_Set.html

MATERIALS

Moon Crater and Regolith Activities

- Assortment of pans
- Low-cut boxes
- Flour
- Small rubber balls
- Powder drink, chocolate
- Tape measure/ruler
- Printouts of data record sheets from lesson URL.

Reaping Rocks

- Assortment different types/classes (igneous, sedimentary, etc.) of small rocks
- Printouts of data record sheets from lesson URL.

Lunar and Planetary Institute

<http://www.lpi.usra.edu/>

CORE

The Central Operation of Resources for Educators, established in cooperation with Lorain County Joint Vocational School, serves as the worldwide distribution center for NASA-produced multimedia materials.

For a minimal charge, CORE will provide a valuable service to educators unable to visit one of the NASA Educator Resource Centers by making NASA educational materials available through its mail-order service.

<http://www.nasa.gov/offices/education/programs/national/core/about/index.html>

DISCUSSION QUESTIONS

Set the stage by letting students share their present knowledge on how the moon influenced cultures, civilizations, religions, and the arts. This can lead into a discussion of why all these factors may have contributed to humans journeying to the moon.

ASSESSMENT ACTIVITIES

Provide students an opportunity to discuss findings they discovered from the activities, paying close attention to the student's vocabulary and the context of how the words are used in their description of what they learned about our moon. Assign groups of students to develop a 5 minute PowerPoint presentation, incorporating digital pictures and video from the activities done in the cratering and regolith formation activities.

ENRICHMENT

Ask a local astronomy club or high school astronomy teacher to speak to students about what can be seen on the moon through a simple telescope. Arrange a field trip to a local planetarium