



Lesson Title

Earth's Attic: The Moon

LESSON THEME – Description

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

OBJECTIVES

- 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.
- Demonstrate how the stratigraphy of lava flows is produced by multiple eruptions.

NASA SUMMER OF INNOVATION

UNIT

Earth and Space Science - Earth Moon System

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 Standards

- Earth in the Solar System
- Origin and evolution of the earth system
- Structure of the Earth system

History and Nature of Science

- Science as a human endeavor

Common Core State Standards for Mathematics (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

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 groups 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 areas 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 rocks 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 (or other object)

Maria – layers of dark basaltic lava flows that cover about 16 percent of the Moon's total surface

Stratigraphy - the study of rock layering

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

Students study how lunar surface material is created.

http://www.nasa.gov/pdf/180567main_ETM.Regolith.Formation.pdf

Reaping Rocks

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

http://www.spacegrant.hawaii.edu/class_acts/RRocks.html

Lava Layering

Students learn about the stratigraphy of lava flows produced by multiple eruptions.

http://www.nasa.gov/pdf/180574main_ETM.Lava.Layering.pdf

MATERIALS

Moon Crater and Regolith Activities

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

Reaping Rocks

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

Lava Layering

- Paper cups, 4 oz. size; some cut down to a height of 2.5 cm
- Cafeteria tray or cookie sheet, 1 for each eruption source
- Tape
- Tablespoon
- Baking soda
- Measuring cup
- Vinegar
- Food coloring, 4 colors
- Playdough; same four colors as food coloring
- Plastic knife, string, or dental floss to slice through layers of playdough

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.

[Lithograph Set](#)

Lunar and Planetary Institute

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

DISCUSSION QUESTIONS

Set the stage by telling students to 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 students' 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 and lava layering 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.