Environmental Science Institute
THE UNIVERSITY OF TEXAS AT AUSTIN

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Lunar Surface Investigation

Lesson plan for grades 6-12
Length of lesson: 30-60 minutes
Authored by Dr. Daniel Barth ©2011
Adapted by: Laura Sanders, Environmental Science Institute, October 2011

SOURCES AND RESOURCES:

- Stargazers Lounge, an astronomy forum from the UK: www.stargazerslounge.com
- Luna Society International: http://www.lunarrepublic.com/ [Please note, this site is used for the lunar atlas only in this lesson plan.]
- NASA www.nasa.gov

SAMPLES OF POTENTIAL TEKS ADDRESSED THROUGH THIS LESSON:

§112.18. Science, Grade 6: 11A, 11C
§112.19. Science, Grade 7: 9A, 9B
§126.33. Astronomy, Grades 11-12: 9A, 9B, 14A, 14B, 14C, 14D, 14E
§126.36. Earth and Space Science, Grades 11-12: 5D, 5E, 5F, 7A, 7B, 7C

PERFORMANCE OBJECTIVES:

Students will be able to:

- Measure, record and compare impact crater sizes
- Infer how impact craters were formed
- Explain the reasons for the differences in impact crater sizes

MATERIALS (per group of four):

- Binoculars
- Telescope with multiple eyepieces (up to 150x if possible)
- Science journal for recording observations and sketches

CONCEPTS:

The surface of the Earth changes so rapidly that very little of the exposed surface is more than a few million years old. Plant life and the activities of humans also make it difficult to see the active changes that occur in geologic time. Compared to the Earth, the Moon is an almost perfect geology laboratory. With no air or water to cause erosion, and no tectonic activity to destroy ancient surface features, the Moon's surface is almost three billion (3,000 million!) years old. Any change made to the surface lasts for millions, even billions of years – until other impacts from space erase it. In this investigation, binoculars, the telescope, and a lunar atlas are used to explore the Moon's geological changes.

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ENGAGE

- Divide the class into groups of four.
- Students are to work in their groups with NO assistance from phones, computers, or reference books – they may only use their own minds and group collaboration to brainstorm.
- How many dollar bills would need to be stacked vertically to reach from her in our classroom to the moon? In other words, how much money would we need to reach the moon? [Answer: A stack of 1000 one-dollar bills are 4.3 inches tall. The moon is 15,133,976,377.95 inches away. Therefore, 3,519,529,391 sets of 1000 bills would be needed, meaning a total of 3,519,529,390,221 bills. So much money! How much money would that mean if they were five-dollar bills instead of one-dollar bills? What if they were hundred-dollar bills?
- Note to teachers: This is purely an exercise to help students get excited about talking about the moon and to get their minds going. They are welcome to take dollars out of their pockets and try to measure their thickness, do whatever math they want, estimate how far away they think the moon is, etc. The point is the process more than the answer. They are not expected to know the correct answer. Other questions would work, such as "How many craters are on the moon?" The answer to this could lead into talking about fractals.

INVESTIGATION:

Note that the best time for this investigation is during the Moon's first quarter; that is, the first 10 days after New Moon when the Moon is easily visible in the early evening.

1. You will use a binocular to observe and sketch the entire disk of the Moon. Make note of and record Maria and major craters that you can see. Remember to use the ***Clock Method*** to help you sketch accurately!
2. Now move to a telescope. Find an area along the Moon's ***terminator***, and focus on it at high magnification (100-150x).
3. After you finish – Look up the region in a lunar atlas and identify as many features as you can – indicate what sort of geologic change these features represent.
4. Remember these Tips!
    a. Focus your attention on one small area and record as accurately as you can
    b. You will not be able to record everything! Don't stress – get what you can.
    c. Sketch the features that you see. – Look for signs of ***Geologic Change***!
        i. **Maria**
            1. **Lava Flows**
            2. **Lava color change**
        ii. **Craters**
            1. **Rim & Basin**
            2. **Rilles**
            3. **Avalanche / Slump / Landslide**
            4. **Central Mount**
        iii. **Mountains**
            1. **Associated w/ impact basins – can you find both?**

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