



## MISSION CRATERING

### 5 E Lesson Plan for Mission Cratering

**Central Focus:** Students will learn about the formation of the moon, crater formation, lack of atmosphere/erosion on the moon compared to Earth, create their own craters, and identify cratering on The Giant Moon Map™.

### Content Standard(s):

#### North Carolina Essential Standards

- NC 6.E.1 Understand the Earth/moon/sun system, and the properties, structures and predictable motions of celestial bodies in the Universe.
- NC 6.E.1.2 Explain why Earth sustains life while other planets do not base on their properties (including types of surface, atmosphere and gravitational force) and location to the Sun.
- NC 6.E.1.3 Summarize space exploration and the understandings gained from them.

#### Next General Science Standards

- MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

### Overview:

Provided for this lesson is a video about the moon and craters for students to observe and a Mission Cratering Artifact which contains four sections (A, B, C, & D). Section A contains prompts to be answered while watching the video. Section B includes directions and questions pertaining to how to create craters. Section C includes instructions to find a location on The Giant Moon Map™ that depicts cratering and drawing what they see. Section D is an extension activity in which students go back to create their own craters in the sand and attempt to mimic what they located on the Map. This engagement can be done as a stand-alone engagement or with the following engagements developed by Wingate University (Mission Moon Geology, Mission Apollo, Mission Aerospace Professional, and Mission Space Timeline) that are designed to work as rotational stations. If working in rotational stations, the students engaging in this mission would be watching video and undergoing making their own craters just off the top portion of the map and then move to the left and/or right sides of the moons to locate areas on cratering (see rotational stations map below).



## MISSION CRATERING

### Materials:

- The Giant Moon Map™
- QR Code linking to Video or Video Link
- Wingate Mission Cratering Artifact
- Pan
- Sand (moist)
- Meter stick
- Balls of different sizes (i.e. Lacrosse, Golf)

### Prior Academic Knowledge and Conceptions:

- Know relative sizes of measurement units. Solve problems involving metric measurement. Measure to solve problems involving metric units: centimeter, meter.
- Add, subtract, multiply, and divide to solve one-step word problems involving whole-number measurements of length, mass, and capacity that are given in metric units.

### Lesson objective(s):

- Explain why Earth sustains life while the moon and other planets do not base on their properties (including types of surface, atmosphere and gravitational force)
- Describe how and why craters are formed and seen easily on the Moon
- Explain why the Moon does not have weathering and erosion like Earth
- Summarize space exploration and the understandings gained from them

### Differentiation strategies to meet diverse learner needs:

- Consult with English Language Learners to make sure directions are understood
- Highlight use of pictures to connect with content
- Strategic partnering when needed

### ENGAGEMENT

Students will watch a video about the moon and crater formation. Dr. Thompson, Assistant Professor of Physics and Astronomy at Wingate University provides a three-minute overview on how the Moon was formed, how and why craters are on the Moon, and how the lack of atmosphere and weather does not allow for weathering and erosion to occur like on Earth. Section A of Mission Cratering Artifact corresponds to the video.

### EXPLORATION

Students will complete a hands-on engagement following directions listed on Section B of the Artifact. Students will then create their own craters using different size balls and sand. Students will draw their crater formation and label the sequence. Students will then answer questions that connect their hands-on engagement to the video.



## MISSION CRATERING



### EXPLANATION

Students will stand on the Moon portion of The Giant Moon Map™ and locate where several craters are overlapping. The teacher will aid them in identification and discuss with students checking for misunderstandings. Students will be able to explain how craters form including: why do the craters' impressions remain the same over time; and how to identify which crater is oldest. Students should be able to identify cratering on the map and explain the sequencing of the craters. After identifying a location of cratering have the student draw the sequence including size differentiation and depth of craters that overlap.

### ELABORATION

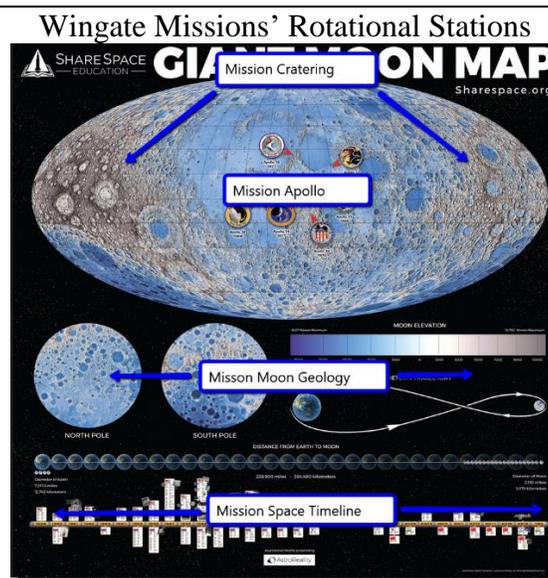
After the students have identified and completed a drawing depicting the size and sequence of their chosen location on The Giant Moon Map™, have the students go back to the ball and sand cratering stations and attempt to mimic what they see on the map. The students should use different size balls and change the height at which the balls fall through three separate trials.

### EVALUATION

Students will respond to the Mission Cratering Artifact prompts and submit a drawing of craters. We suggest students verbally respond to the engagement by: reflecting on what they observed; can they pose a hypothesis; does the Moon have an atmosphere; how lack of atmosphere preserves the crater formation. If they have completed the Wingate Mission Apollo engagement, ask if they can explain why Neil Armstrong's footprint is still visible.

### Written by:

*Rebecca Smith Cottenoir, M.S. and Melanie G. Keel, Ph.D., Thayer School of Education, Wingate University, 2020*





## MISSION CRATERING

QR Code for Moon & Cratering Video



URL: <https://youtu.be/DpjaTFSBiMA>



## MISSION CRATERING



Student Name: \_\_\_\_\_

### A. During the video, answer the following questions

1. What do we call the molten inside of the moon?

\_\_\_\_\_

2. What happens when a large space rock impacts the moon?

\_\_\_\_\_

\_\_\_\_\_

3. Which crater is the oldest crater?

\_\_\_\_\_

\_\_\_\_\_

4. How come we can see craters on the moon?

\_\_\_\_\_

\_\_\_\_\_



## MISSION CRATERING



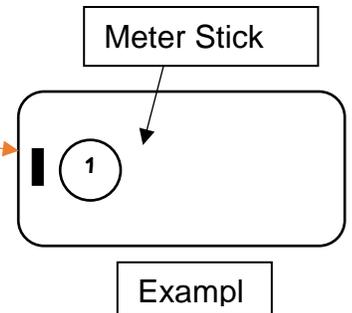
### B. Create your own Crater. You will be creating your own craters to see how they overlap like the mail envelopes in the video.

Step 1: Flatten sand

Step 2: Put the meter stick in the sand upright near Edge (**Look at Example**) Someone must hold it at top.

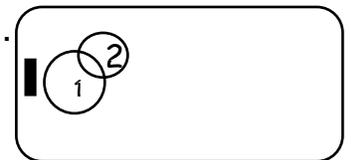
Step 3: Drop Lacrosse ball from 80 cm, **then Remove Ball**

Step 4: In Red Rectangle below, draw a circle where it Landed. **Label this circle as "1"** See Example.



Step 5: Drop the White golf ball from 80 cm, then Remove Ball.

Step 6: In Red Rectangle below draw a circle where it landed. **Label this circle as "2"** See Example.



Step 7: Drop Yellow/orange golf ball from 80 cm, remove ball.

Step 8: In rectangle below draw a circle where it landed. Label it as "3".



**Each ball dropped creates a crater in the sand. Which circle labeled in the drawing represents the oldest crater?**

Underline the correct answer:    Circle 1    Circle 2    Circle 3



## MISSION CRATERING



**How is the envelope example from the video like the cratering from above?**

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### **C. Find a Crater**

Step 1: Go to the Moon portion of The Giant Moon Map™ on either sides of the Apollo Missions. Locate an area where you can identify Cratering.

Step 2: Determine what may be the oldest crater, second oldest and third oldest.

Step 3: Have teacher check to ensure you or your team has correctly found a proper location and have sequenced it correctly.

Step 4: Draw in box below what your location looks like. Include how the craters are different sizes and depths.

A large, empty rounded rectangular box with a black border, intended for drawing the location of craters on the Moon.



## MISSION CRATERING



### D. Go to “Create your own Crater” station.

Step 1: Try to recreate the location that you chose on The Giant Moon Map™. Use different size balls and adjust the height by which you drop the balls to change the depth of the craters.

Step 2: Record the heights that you dropped the balls from in centimeters and the different size or type balls that they used at each drop. Circle the trial that best recreated the location you chose on the Map.

#### Trial 1:

Ball size \_\_\_\_\_

Height: \_\_\_\_\_ cm

Ball size \_\_\_\_\_

Height: \_\_\_\_\_ cm

Ball size \_\_\_\_\_

Height: \_\_\_\_\_ cm

#### Trial 2:

Ball size \_\_\_\_\_

Height: \_\_\_\_\_ cm

Ball size \_\_\_\_\_

Height: \_\_\_\_\_ cm

Ball size \_\_\_\_\_

Height: \_\_\_\_\_ cm

#### Trial 3:

Ball size \_\_\_\_\_

Height: \_\_\_\_\_ cm

Ball size \_\_\_\_\_

Height: \_\_\_\_\_ cm

Ball size \_\_\_\_\_

Height: \_\_\_\_\_ cm



## MISSION CRATERING



These triangles can be cut out and used for Section C, Find a Crater on The Giant Moon Map™

