

THE BARRINGER METEORITE CRATER

www.barringercrater.com

Teacher Lesson 1: From Above or Below? Volcanic vs. Impact Craters

Overview

The debate over the origin of the Barringer Meteor Crater focused on two possible causes: volcanism or an impact. How do planetary scientists studying craters on other planets differentiate between a volcanic or impact crater?

PURPOSE

- To explain how volcanic and impact craters are different.
- To understand what clues scientists use to identify the origin of craters when they are studying planets.
- To understand why planets and moons have more craters than Earth

COMPLETION TIME

1 class period/hour

LEARNING OUTCOMES

- Students will be able to communicate the difference between volcanic and impact craters by identifying features of each.
- Students will use real images of craters from Google Mars and Google Moon to identify volcanic and impact craters
- Students will gain knowledge about how scientists use evidence to answer questions.
- Students will learn how impacts alter Earth.

TOOLS/MATERIALS

- Computer online access
- Student Data sheet “From Above or Below?”

Procedure

BEFORE THE ACTIVITY

- Copy the Student Data sheet “From Above or Below?”

ON THE DAY OF THE ACTIVITY

1. Ignite Curiosity about Craters (10)

- Distribute the student data sheet “From Above or Below.”
- Begin the class by showing image #1 and image #2 (links on Teacher Key and images on student handout)
- Ask the students: What do you see? (craters, etc)
- Ask students to write down a few specific characteristics they notice on their handouts.
- Ask: If I asked you how these were formed, would you be able to tell me if it was made by volcanism or an impact? (accept all responses)

2. Activate Prior Knowledge of Craters (10 minutes)

On the board write...

Volcanic Crater

Impact Crater

Shape:

Materials Around Crater:

Crater Floor Level (high or low?)

Other Details:

- As a full class, ask the students to brainstorm the different characteristics of volcanic craters and impact craters. Write answers on board, changing them if a reasonable counter argument is made.
- Ask them to describe the shape of the crater, the depth of the hole (above or below the surrounding terrain), the surrounding materials, and any other defining features they can think of.

3. Lecture: New Information on differences between volcanic and impact craters (5 minutes)

- Edit board answers and review images - Confirm image 1 Volcanic, 2 Impact Crater
- Have students write the correct differences between volcanic and impact craters on the data sheet (2nd page)

For volcanic craters

- The crater is above the surrounding terrain.
- Sometimes circular, sometimes irregular in shape.
- Located at or near the top of a volcanic structure
- Evidence of lava flows, near or around the crater

For impact craters

- A circular shape.
- A crater floor lower than the surrounding terrain.
- An ejecta blanket surrounding the crater. (ejecta = material flung up and out of the crater on impact)
- Possibility of inner and outer “rings”

- Explain that scientists studying craters look for clues such as those listed to help them identify crater origins. While there are characteristics common to both, there are differences that can be used to discern a crater’s origin.

4. Apply Criteria to Analyze Crater Images on Mars and Moon (25 minutes)

- Students work in groups to look at images of the surface of Mars and the Moon.
- Students write findings on Student Data Sheets.
- Tell them they will now use their keen powers of observation to examine specific Google Mars and Moon examples and use the features listed to determine which craters are volcanic and which are impact.
- Discuss what they observed, what they learned, and questions they now have.

5. Activate Prior Knowledge of Weathering and Erosion on Earth (10 minutes)

- Show the globe, map or image of Earth.

- Ask “Can anyone see all of the impact craters on Earth? If no, “Why not?” (accept all answers)

- Ask What obstacles may make it hard for sciences to correctly identify a crater’s origin on Earth?

Answer: Processes such as erosion, metamorphism, tectonics, and superposed craters affect their appearance and challenge scientists trying to identify them. (You may want to briefly define these terms if new to students.)

- Ask “Why can we see the craters on the moon so easily? How are the Moon different from Earth?” Share how the Moon lacks water, an atmosphere, and tectonic activity.

7. Next Lesson: A Scavenger Hunt to Identify Craters on Earth!

ASSESSMENT CRITERIA

- Was the student able to name characteristics common to volcanic and impact craters?
- Was the student able to apply the criteria of volcanic and impact craters for his/her evaluations of crater images?
- Did the student navigate Google Mars and Google Moon with minimum help?
- Was the assignment completed on time?

Links

- More on impacts at the Lunar & Planetary Institute:
http://www.lpi.usra.edu/education/explore/shaping_the_planets/impact_cratering.shtml

Activity design by Lollie Garay in collaboration with Dr. Carolyn Ernst.

Copyright 2016, The Barringer Crater Company. This work is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License. Materials may be duplicated or reproduced for classroom use. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-sa/3.0/>