

Crater Maker

Grade Level: 4, 5, 6

Duration: 45 minutes

Classification: Classroom

Subject(s): Astrology, Geology

Categories (STEM): Science, Math

Keywords: Impact, Crater, Meteor

Introduction

- **Summary:** Students will learn how to make a crater in flour by dropping a marble from fixed lengths. Students will understand what will happen to the ground when asteroids and meteors fall to make craters.
- **Description:** Impact craters are important for helping scientists learn about a planet's geological history. During an impact, buried material is ejected while outward pressure pushes the rock at the crater's edge upward, forming a rim. This activity will explore what a crater will look like on a miniature scale. Students will visualize and learn what geological scientists see and learn from craters when students make their own miniature model craters.

** Be aware that flour is used in this activity and would be harmful for any students with celiac or gluten intolerance.*

Online Resources:

- <https://www.beyondthechalkboard.org/activity/crater-maker/>
- <https://www.lpi.usra.edu/education/explore/LRO/activities/craterCreations/>
- <https://www.sciencebuddies.org/stem-activities/creating-craters#instructions>

Vocabulary

- **Impact Crater:** a crater on a planet or moon caused by the impact of a meteorite or other object, typically circular with a raised rim.
- **Asteroids:** a small rocky body orbiting the sun
- **Meteor:** a small body of matter from outer space that enters the earth's atmosphere
- **Meteoroids:** a small body moving in the solar system that would become a meteor if it entered the earth's atmosphere.
- **Meteorite:** a meteor that survives its passage through the earth's atmosphere such that part of it strikes the ground.
- **Comets:** a celestial object consisting of a nucleus of ice and dust and, when near the sun, a "tail" of gas and dust particles pointing away from the sun.

- **Potential Energy:** Energy that is stored and ready to be used. All objects have potential energy or stored energy if they are placed in a certain position.
- **Mass:** a measurement of how much matter is in an object.

Materials

Material	Quantity	Reusable?
Large marbles	1 bag	Yes
Medium marbles	1 bag	Yes
Small marbles	1 bag	Yes
Meter stick	1 per every 4 students	Yes
Flour	Around 2 cups per every 4 students	No
Brown paper grocery bag	1 per every 4 students	No
Newspaper	1 sheet per every 4 students	No
Scissors	1 per every 4 students	Yes
Pencils	1 per every 4 students	Yes
Calculator	1 per every 4 students	Yes
Expo markers	3 per class	Yes
Predictions handout (2 pages)	1 per every student	No

Directions

- Form groups of 4.
- Hand out supplies to each group.
- Have each group of students lay the bag flat and cut off a long side of a grocery bag to make a tray with sides about 12 centimeters tall.
- Have groups move the tray (grocery bag) and paper onto the floor.
- Have each group set the tray on a sheet of newspaper and fill the tray (grocery bag) with flour and spread the flour evenly.
- Have the teams choose a member of the team to be the recorder, measurer, observer, and dropper.
- Ask all the students to predict what will happen to the craters as each ball size falls from different heights. They will write their predictions down on their predictions handout sheet.

- Have the groups drop each ball size from a height of 70 cm. They should measure the width of the impact and record the length and observations on the predictions handout.
- Have the groups repeat the drop from a height of 140 cm and a height of 210 cm with all three ball sizes recording their results on the predictions handout. This will result in 9 trials.
- Ask the students to discuss whether their results matched their predictions.
- Each student will then calculate the potential energy of each ball size at each height. Each number for the calculation to be given to the students is below:

Small marble mass = 0.005kg
 Medium marble mass = 0.05 kg
 Large marble mass = 0.5kg
 Gravity = 9.81 meters per second squared
 Height = 70 cm, 140 cm, and 210 cm

- Students will work out the math problem on their predictions handout. If students are confused work out the first problem with them on a white board.
- Explain to the students that they should see that the more potential energy they start with, the larger the crater. (higher mass and higher height makes a larger crater).
- Compare this simulation and potential energy to the size of meteors, asteroids etc. (vocabulary words from the beginning).

$$E_p = mgh$$

E_p = Potential Energy
 m = Mass
 g = Gravitational Field Strength
 h = Vertical Height

Discussion Questions

- (Tell the students they are a space geologist looking for craters.) What clues would help you find a meteor crater? **Look for the imprint.**
- (Rain is not the only kind of weather that wears down craters.) Tell the students to imagine an impact crater in the desert or the arctic. What kind of storms and weather events might wear craters down in these locations?
- How do you think the craters on the Moon formed? **By large impactors — asteroids or comets — striking its surface.**

What is happening?

- Students learned the impact craters can make on ground surfaces by dropping a marble in flour at different heights.

Applications:

- Majors
 - Geology
 - Astronomy

- Soil Science
- Jobs
 - Geologist
 - Astronomer
 - Soil Scientist
- Hobbies
 - Rock collecting/skipping
 - Tracking animal prints in wildlife
- Real-World applications
 - Craters impact the surrounding environment
 - Erosion
 - Thumbprints, shoe imprints, tire tracks, other trace evidence used for forensic identification



This activity was last updated in fall 2020 by Student Role Models.