MUSEUM OF THE ROCKIES
MONTANA STATE UNIVERSITY

Lesson: Moon Cratering
(adopted from NASA's Impact Craters lesson)

Grade level: 2+
Activity duration: 60 minutes

Objectives:

1. Students will be able to name the various features created by a crater impact on the moon's surface.
2. Students will experiment with mass, and velocity variables and record their effects on impact crater size.
3. Students will differentiate between mass and volume when choosing impactors.
4. Students will use their data to predict the impact crater size for more massive objects.

Materials:

- Large aluminum pan
- Bag of impactors with varying masses and volumes
- Flour (provided by teacher)
- Cocoa powder or dry tempera paint (provided by teacher)
- Tape measure
- Scale or balance (provided by teacher)
- Worksheet: Moon Cratering Experiment

Context:

Take your students through the scientific method while exploring the variables that affect impact craters. The actual dropping of the impactors can be operated as a station students can rotate through so as not to crowd the impactor tray. This lesson can also be simplified for younger students, as suggested at the end of the Procedures section.

Preparation:
Fill aluminum pan 2/3 of the way full with flour, add a thin layer of cocoa powder or dry tempera paint on top. This top layer provides more contrast, highlighting some of the prominent features of impact craters. Create a crater as an example to point out crater features to students.

Procedure:

1. Introduce activity by asking students what they know about impact craters on the Moon. Do they also know that there are several impact craters on Earth as well?
2. Have students gather around the prepared aluminum pan and introduce the features of an impact crater (walls, floor, ejecta, rays, raised rim, central uplift).
3. Tell students that they will be studying impact craters by collecting data on craters they form.
4. Divide students into groups of four. One student will be the impactor dropper, one student will measure, one student will smooth the surface between impacts, and one will record data. Introduce the student roles in terms of the importance of consistency in scientific data collection.*
5. Have student groups choose two impactors (balls) of similar volume but different masses. Have students define mass and volume. What is the difference between mass and volume? Explain variables and why scientists only test for one variable at a time. If the impactors were different masses *and* different volumes, we wouldn't be able to tell which variable is causing the results.
6. Give the student groups time to develop their hypothesis. If needed, prompt them with the format, "_____ affects the _____ of _____."
7. If possible take the aluminum pan to a play structure so various heights can be achieved. If performing the experiment indoors, assign heights for the "height dropped from" column. Either allow students to choose their own heights or assign specific heights for the students to drop impactors from. Each impactor should be dropped from the same height at least once, but if time allows, the more trials, the more accurate the data will be.
8. Have student groups drop their impactors and record the crater measurements.
9. After the data has been collected, have students analyze their results and form a conclusion.
10. Debrief results as a class.
11. *Optional: If student groups tested their impactors separately, have students present their hypothesis and conclusions to the class.*

**Alternative procedure: Instead of dividing students into small groups, formulate a hypothesis as a class and have each student pick an impactor to test. Have one student take all the measurements and each student record his/her own data.*