Making Craters - Teacher's Notes

Impact craters are formed when objects fall from height (from space or even from volcanic eruptions) and crash into the surface of a planet. In this activity, students will create and take measurements of impact craters. Since there are different objects that may cause these craters, for this activity, we'll call these objects 'impactors'. There are several options for variables to change in creating the craters – size of impactor, angle of impact, height of drop, etc.

Materials

- Large tray or box (a new kitty litter tray, student desk tray or an A3 paper box is ideal) per group
- Clean sand to fill the tray or box and balloons (see below)
- A selection of balloons filled with different amounts of sand or different size balls (eg. golf ball, cricket ball, shot put) to represent different impactors.
  NOTE: Since the balls are all made of different materials, you could discuss with the students whether using these truly represents a fair test.
- Funnel to fill balloons
- A ruler or tape measure per group
- OPTIONAL ADDITIONAL MATERIALS:
  - Plank of wood or metre rule
  - Protractors to measure impact angle
  - Flour or another fine powder (enough to make a thin layer on the surface)
  - A sheet of ice or toffee to fit the size of the tray or box to represent different surfaces
  - Different types of sand to represent different surfaces on Earth
  - Plaster of Paris to make moulds of impact craters

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- Camera to photograph or film impacts (slo-mo videos are great!)

Method

To be prepared in advance:

1. Fill the tray with sand and flatten the surface. It should be firmly packed but not compacted too much. Making the surface of the sand a little damp helps keep the shape of the craters, to allow time for measurement.
2. If using the sand filled balloons, fill four balloons with different amounts of sand and tie them to form roughly spherical shapes that will be your impactors. (Suggest using 80g, 120g, 160g and 200g of sand). To fill the balloons, put the funnel in the neck of the balloon, add a small amount of sand and work it to the bottom of the balloon, stretching it as you go.
3. If using flour, sprinkle a thin, even layer over the surface of the sand in the tray.

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4. If using an ice or toffee layer, carefully place on top of sand just before starting the experiment. NOTE: It is probably best to only use these layers when testing hard or heavy impactors as the balloons filled with sand are unlikely to form craters in these substances.

To be investigated by students:

Option 1: Changing the size of impactor

1. Select four impactors of different size (sand filled balloons OR balls).
2. Decide on a set height to drop the impactors and record this height on the worksheet (a height greater than 30cm works best).
3. *If videoing your experiment, set up the camera, ready to record.*
4. Drop the smallest impactor and carefully remove it from the tray, trying not to disturb the crater formed.
5. Measure the diameter of the crater it forms. Note any other observations of the craters appearance. Record these values on the worksheet.

Optional:

- *Photograph the crater*
- *Create a cast of your crater using Plaster of Paris*

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6. Smooth the sand over, filling in the crater.
7. Repeat the test with the different sized impactors, recording all data on the worksheet provided.

Variables
In this experiment:
We will **change** the size of the impactor (**independent** variable)
We will **measure** the diameter of the crater formed (**dependent** variable)
The things we will keep the **same** (**controlled** variables) are: impactor drop height, material in tray/box (e.g. sand), the way the diameter is measured and method of dropping impactor.

Other variables that could be changed

Changing the height of impact
Select one size of ball OR a balloon filled with sand (suggest about 120g of sand) that will be your impactor. Drop from different set heights (independent variable) and measure the diameter of the crater (dependent variable) or the depth of the crater.

Changing the angle of impact
Select one size of ball OR a balloon filled with sand (suggest about 120g of sand) that will be your impactor. Hold a plank of wood or metre rule at an angle above the surface of your sand. You might need to rest the plank against something or use a clamp to secure it. Measure the angle with the protractor and record it on the worksheet (independent variable). Roll the impactor down the plank/rule then measure the diameter of the crater it forms (dependent variable). Repeat the test, changing the plank angle.