Making Craters - Student Instructions

Materials

- Student Worksheets (one per student)
- 1 pan (layered with All-Purpose Flour and cocoa powder)
- Impactors/Balls
- 1 metre stick (for measuring the drop height)
- 1 ruler (for measuring the diameter/depth of craters)
- 1 Sifter (shared with the other groups)
- 1 weighing scale (shared with the other groups)
- Protractors (if needed)

Definitions

- **Independent Variables** – variables that are changed or kept the same in a scientific experiment.
- **Dependent Variable** – the variable that is being tested and measured in a scientific experiment.

Memory Tip: How big/small the measurement (dependent variable) is **depends on what was changed (independent variable).*

Experiment Setup (if not already completed)

1. Fill each pan with ~10cm of white flour.
2. Without compressing the flour much, smooth the flour using a block or piece of cardboard to make the surface flat.
3. Using a sieve/sifter, uniformly dust the surface of the flour with ~2mm of cocoa, hot chocolate mix, or some sort of dark powder.
4. You can use tarps or tablecloths under the pans to protect the work surface and the floor from flour/cocoa powder. (Optional)

Experimental Design

1. Sketch a cross section of a crater and label the features, based on what you learned during the presentation.
2. Brainstorm possible independent and dependent variables.
3. With your partner or group, choose one *independent* variable to change and one *dependent* variable to measure.
4. Write an "If… then…" hypothesis statement. (eg. "If the impactor is more _____, then the crater will be _____."
5. Write the name and value for each variable you will keep constant (e.g. "Drop height = 30cm")
6. Write 6 different values for your independent variable in the Experiment #1 data table on your worksheet.

Experimental Method

7. Before performing your experiment, have your teacher check to make sure your proposed experiment is reasonable and possible given your resources.
8. Gather all the materials you need for your approved experiment. (See materials list)

You should have enough space to do at least 4 (and maybe all 6) "drops" in your pan

9. One trial at a time, drop your impactor/ball into the pan from your specified height.
    a. Record the measurement for your dependent variable in your data table for each trial.
    b. Record basic observations for other dependent variables that were not part of your main experiment. (Do any other crater features seem to get bigger/smaller as your independent variable changes?)
    c. If the pan needs to be resurfaced, just mix the cocoa into the flour, smooth, and dust the top again with more cocoa power.
10. When you are finished with Experiment #1, you may design and carry out a second experiment by following steps 3-9 again with a different independent variable.

Wrap-up

Once all trials are done and the materials are cleaned up, you can graph your results, answer the questions on your worksheet, and write your conclusions.