



EduTrend Contents

W4C · ASTRONOMY & SPACE SCIENCE · MIDDLE SCHOOL

Crater Lab

What controls the size of an impact crater?

Ages 11–14

Level: Intermediate

60 minutes

Groups of 3 · up to 30

Activity 03

Inside: activity at a glance · step-by-step session plan · facilitator notes · 3 student worksheets · assessment checklist

ACTIVITY 03 · AT A GLANCE

Crater Lab

Students investigate impact craters like those on the Moon. They drop balls of different masses from different heights into a tray of flour topped with cocoa powder, measure crater diameter and ejecta, and look for relationships. They then link their results to impact energy and to real crater photographs.

Learning outcomes

By the end of the session students can:

- plan an investigation controlling variables;
- measure crater diameter accurately and take repeats;
- relate crater size to drop height and mass;
- explain craters using kinetic energy.

KEY WORDS

crater · impact · ejecta · kinetic energy · variable · mean · model

CURRICULUM LINKS

Science: space, energy, forces.

Maths: means, line graphs. Links to planetary science.

1**QUESTION**

What do we want to know?

2**OBSERVE**

Watch the sky

3**MODEL**

Build a model

4**MEASURE**

Take readings

5**COMPARE**

Model vs reality

6**EXPLAIN**

Use evidence

Materials (per group)

- Deep tray of flour with a thin layer of cocoa powder on top
- 3 balls of similar size but different mass (e.g. marble, ball bearing, ping-pong ball)
- Metre rule, ruler, balance
- Sieve to smooth the surface
- Worksheets 1, 2 and 3

Before the session

- Prepare trays; cover floors or work outside.
- Weigh balls in advance.
- Show photos of lunar craters and rays.
- Agree drop heights: 25, 50, 75, 100 cm.

SAFETY

Drop balls only from standing height, not from chairs. Avoid flour dust near faces; check allergies. Clean spills to prevent slips.

ACTIVITY 03 · SESSION PLAN

Step by step

Timings are for 60 minutes. Smooth the surface and re-dust with cocoa after every drop.

Time	What happens	Say or ask
0–5 min Hook	Show a close-up of the Moon. What made all these circles?	<i>“Why are there so many craters on the Moon but few on Earth?”</i>
5–15 min Plan	Groups choose to test height or mass and identify control variables.	<i>“What must stay the same?”</i>
15–40 min Test	Groups drop balls, measure crater diameter across two directions and take three repeats.	<i>“Why measure across two directions?”</i>
40–50 min Analyse	Calculate means and plot a graph.	<i>“What pattern do you see?”</i>
50–55 min Explain	Link to kinetic energy: faster and heavier objects carry more energy.	<i>“Where does the energy go?”</i>
55–60 min Compare	Compare model craters with lunar photos: rays, rims, central peaks.	<i>“How is the model different from a real impact?”</i>

CHALLENGE CARD (print or copy onto the board)

Predict the crater diameter for a drop from 150 cm using your graph, then test it.

ACTIVITY 03 · FACILITATOR NOTES

The astronomy in brief

When a meteoroid hits a surface, its kinetic energy is transferred to the ground, pushing material outwards and upwards. This forms a bowl-shaped crater with a raised rim and ejecta thrown out, sometimes in bright streaks called rays. Faster and more massive impactors carry more kinetic energy and make bigger craters.

The Moon has no atmosphere, weather or plate tectonics, so craters stay for billions of years. On Earth, erosion, vegetation and plate movement hide most craters. Real impacts happen at many kilometres per second, so they are far more energetic than the model and usually make circular craters even when the impact is at an angle.

Common ideas to listen for

- “Bigger balls always make bigger craters.” Mass and speed both matter.
- “Craters are made by volcanoes.” Most lunar craters are impact craters.
- “The model shows real speeds.” Real impacts are thousands of times faster.

Adapting the activity

Support

Test only three heights with one ball and provide a results table.

Stretch

Calculate the gravitational potential energy ($\text{mass} \times 9.8 \times \text{height}$) for each drop and plot crater diameter against energy.

WORKSHEET 1

Plan

Name: _____

Class: _____ Date: _____

Complete before testing.

Variables

Variable	What it is
Independent	
Dependent	
Control 1	
Control 2	

Prediction

WORKSHEET 2

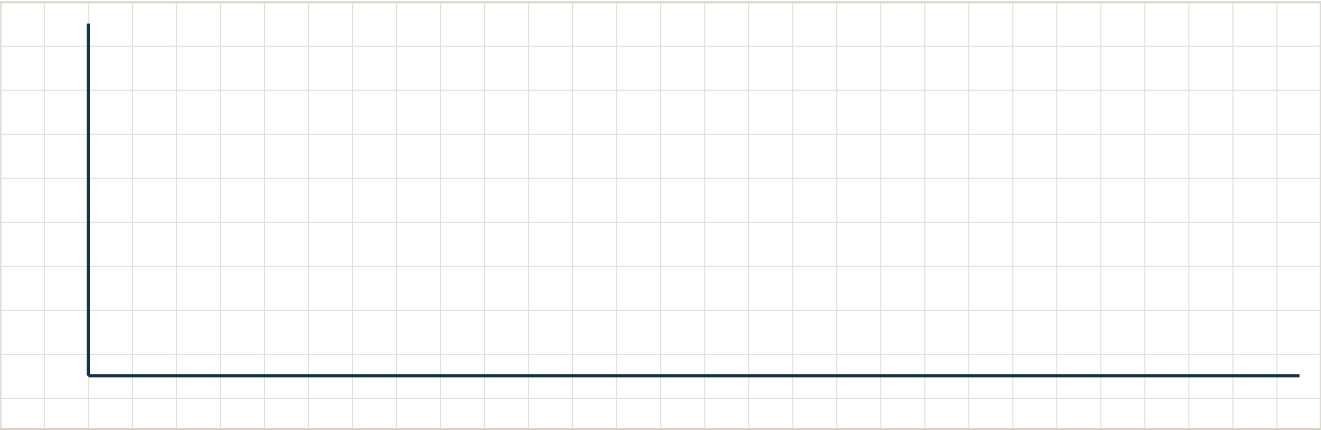
Results

Measure diameter in two directions and take the mean.

Data

Height or mass	Trial 1 (cm)	Trial 2 (cm)	Trial 3 (cm)	Mean (cm)
1				
2				
3				
4				

Graph



y-axis: mean crater diameter (cm)

x-axis: drop height (cm) or mass (g)

WORKSHEET 3

Explain and evaluate

Use the term kinetic energy.

Explain your results

Compare the model with real lunar craters

FOR THE TEACHER

Assessment checklist

Use during the session. One sheet covers up to eight students; copy as needed.

Student	Controls variables	Measures and averages	Explains with energy

Suggested codes: W = working towards · E = expected · G = greater depth

ABOUT THIS ACTIVITY

Crater Lab is a sample activity from the EduTrend Contents W4C Astronomy & Space Science programme (middle school, level: intermediate). Every activity in the programme follows the same format: a practical challenge, a clear session plan, facilitator notes and ready-to-print worksheets, so that teachers, club leaders and parents can run it without extra preparation.

Full 15-, 20- and 32-week programmes are available from EduStore at edutrend.org.

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