

Introduction to Impact Craters – Upper KS2 Lesson

Learning Objectives	Curriculum Links
<p>An impact crater is a depression on a rocky body (planet, moon, asteroid) formed by impact of a smaller body, usually a meteorite.</p> <p>Impact craters are found on all rocky bodies, including the Earth, the Moon, Mars and Mercury.</p>	<p>Science – Earth and Space (Year 5) Pupils should be taught to describe the movement of the Earth and other planets relative to the sun in the solar system</p> <p>Science – Forces (Year 5) Pupils should be taught to explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</p>
<p>There are four main crater features (rims, walls, floor, and ejecta), which form when the energy of the impact with a meteorite causes an explosion, with lots of rock being thrown out of the crater.</p>	<p>Science – Forces (Year 5) Pupils should be taught to explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</p> <p>Science – Working scientifically (Year 5-6)</p> <ul style="list-style-type: none"> recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
<p>Meteorite impacts can modify the bedrock – rocks can melt, get squashed or break.</p>	<p>Science – Rocks (Year 3) Pupils should be taught to compare and group together different kinds of rocks on the basis of their appearance and simple physical properties</p> <p>Science – Properties and changes of materials (Year 5) Pupils should be taught to compare and group together everyday materials on the basis of their properties, including their hardness.</p> <p>Science – Working scientifically (Year 5-6)</p> <ul style="list-style-type: none"> recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

Samples needed:

- 3D crater samples (samples 1-8)
- Impact rocks: bicolite (sample 22), Libyan desert glass (sample 23), suevites (samples 24, 25)
- Hand lenses
- Handouts

Lesson length: 45 minutes (including ~5 min optional module)

Lesson Plan

Type/Slide	Geology	Teaching/Learning activity	Time
Core/ 1-4	<p>An impact crater is a depression on a rocky body (planet, moon, asteroid) formed by impact of a smaller body, usually a meteorite.</p> <p>Impact craters are found on all rocky bodies, including Mars, Mercury and the Moon. We also have impact craters on the Earth (e.g. the Barringer crater in Arizona), but most of them are buried or erased (like the Chicxulub crater, made by the meteorite which killed the dinosaurs, which is buried).</p>	<p>Ask students what happens when a rock from space hits a planet? (Answer: it forms a crater)</p> <p>Play up to 1 minute of NASA video of the Moon, highlighting visible craters.</p> <p>Can they name a planet with craters?</p>	5 mins
Core/ 5-6	<p>There are four main crater features:</p> <ul style="list-style-type: none"> • Crater rims: the edges of a crater, which is elevated from the surrounding topography because of excavated material • Crater walls: the interior sides of a crater, usually steep • Crater floor: the bottom of a crater, usually flat or bowl-shaped • Ejecta: material excavated and thrown out of a crater, usually forming outward-radiating rays surrounding a crater 	<p>Activity 1: studying crater features</p> <p>Divide students into 3-4 groups and hand out tactile samples.</p> <p>Show images of craters on the slides.</p> <p>Ask pupils to identify main crater features (crater rims, walls, floor, ejecta rays), noting any feature that does not fit into one of these categories.</p> <p>Ask students to sketch a crater and label its features.</p>	10 mins
Core/ 7-8	<p>A crater is caused by a smaller object (like a meteorite) crashing into a bigger object (like a planet).</p> <p>The small object travels very fast, so when it hits, it creates an explosion, and rock gets thrown out from the impact site. This material forms rims, which are taller than the surrounding area. At the same time, the explosion causes a depression (hole) that's either flat or bowl-shaped. The flat or bowl-shaped bottom of the depression is called a crater floor, and the sides are called walls.</p>	<p>Show sketch or photo of a crater with features annotated. Explain how the features formed.</p>	5 mins

<p>Optional/ 7-8</p>	<p>The main complex feature of a crater is the central peak(s), which is a peak formed in the central area of a large crater. They form when the impact is very powerful – immediately after the initial impact, the rocks relax and lift back up, forming a peak in the middle (you can use a bouncy castle analogy, which is not perfect but may help them visualise the process better).</p> <p>Other features that they might notice are below, with explanations for reference. If they don't notice them, no need to bring them up.</p> <ul style="list-style-type: none"> • Multiple rings: Very large craters (termed impact basins) can have as many as 5 or 6 circular rings of mountain chains surrounding the main crater. Their formation is not fully understood, but one proposed theory is that the central peak is so large that it becomes unstable, collapsing to form several rings. An example of a multi-ring basin is Mare Orientale on the Moon. • Terraced walls (stair-like): sometimes, the walls become too steep to remain stable, so they form several terraces. 	<p><i>Ask students if they noticed any crater features other than the ones above?</i></p> <p><i>If the students don't have an answer, point out the central peak and briefly tell them how it forms.</i></p>	<p>5 mins</p>
<p>Core/ 9-11</p>	<p>In a powerful impact, the impacted rock undergoes changes due to the shock and heating. The changes often include impact melting (fast melting due to the heating from the impact) following by rapid redistribution of molten material, forming unique crystalline and glassy features. Rocks also get shocked and broken up, forming impact breccias.</p> <p>In this activity, students look at some rocks that come from impact craters on the Earth and make basic rock descriptions.</p> <p>Rocks can be described based on their physical characteristics, including:</p> <ul style="list-style-type: none"> • Colour(s) • Does it contain grains or crystals? • Size of grains/crystals • Any textures present 	<p><i>Ask students what do they think happens to a rock when it is hit by a meteorite?</i> <i>(Answers: it melts, it gets squashed, it gets broken up etc.)</i></p> <p><i>Activity 2: Impact rock handling</i></p> <p><i>Point out the five rock stations around the classroom. Ask pupils to walk around and handle each rock, making basic rock observations.</i></p>	<p>10 mins</p>

	<ul style="list-style-type: none"> • How heavy does it feel? <p>Grains: very small (less than a few mms) piece of mineral or rock. You can tell if a rock has grains if the small pieces are visibly different to the rest of the rock.</p> <p>Crystals: individual minerals which have grown in crystal form in a rock</p> <p>Clasts: pieces broken off a pre-existing rock, larger than grains and you can tell if a rock is made up of clasts if pieces are visibly different to the rest of the rock.</p> <p>Glassy: a rock that looks like a block of glass (doesn't need to be clear), there are no visible mineral crystals.</p> <p>Pitted: covered with lots of small shallow holes</p> <p>Mineral: a naturally occurring substance made up of elements</p> <p>Differentiation suggestion: If you are short on time, we recommend reducing the number of rocks to 1 impact glass and 1 impact breccia.</p>		
Core/ 12-16		<p><i>Start showing slides with the answers. For each rock:</i></p> <ul style="list-style-type: none"> • <i>Ask the students who looked at this rock to tell us their observations</i> • <i>Point out anything that they missed</i> <p><i>Say what the rock is, where it was found and how it formed</i></p>	10 mins

Did your students enjoy this lesson? Consider running our ~20-minute crater-making demo, provided in a separate document.