

Lesson 4: Volcanoes

Lesson Plan

Use the *Volcanoes* PowerPoint presentation in conjunction with the Lesson Plan. The PowerPoint presentation contains photographs and images and follows the sequence of the lesson. The I, to accompany this lesson also explains some of the key points in more detail.

Key questions and ideas

- To understand more about the structure of the earth.
- What is the role of plate tectonics in forming volcanoes?
- To understand that volcanoes come in many shapes and sizes, but primarily occur at the boundary between tectonic plates.
- What is the difference between constructive, destructive and transform plate boundaries?
- Why and how do volcanic eruptions happen?
- To understand the structure of a volcano and be able to recognise this in cross section.
- To be able to name and locate some of major volcanoes in North and South America and the UK and Ireland.

Subject content areas

- Locational knowledge: Using maps to focus on North and South America, concentrating on key physical characteristics
- Place knowledge: Understand geographical similarities and differences through the study of physical geography of a region within North and South America. Understand the processes that give rise to key physical geographical features of the world, how these are interdependent and how they bring about spatial variation and change over time.
- Physical geography relating to volcanoes and mountains.
- Geographical skills and fieldwork: Use map and digital/computer mapping to locate countries and describe features studied.

Downloads

- Volcanoes (PPT)
- Factsheet for teachers PDF | MSWORD

Starter

Pupils take part in an 'Around the World' challenge.

The object of the game is for a pupil to correctly answer a question posed by the teacher before one of their classmates. By answering questions they get to travel 'Around the World', which in the context of the game means around the classroom. The questions should focus on the learning from the previous three lessons.

- Pupil A stands behind Pupil B who is seated.
- The teacher asks them a question. No one else is allowed to answer.
- If Pupil A answers first, they can continue to travel 'Around the World', standing behind the next seated pupil, ready for another question.
- If Pupil B answers first, they get the chance to travel 'Around the World' while Pupil A takes their vacated seat.
- The winner is the pupil who answers the most questions, therefore travels the furthest.

Suggested questions include:

How high is Mount Everest?

Who were the first men to successfully climb Mount Everest?

How high is the Death Zone?

If I was suffering from altitude sickness how could I cure it?
What is the name of the highest mountain in South America?
Name Earth's major tectonic plates.
Is Mount Rushmore in North America an example of a fold, fault block or dome mountain?
How is the height of land shown on a map?
If contour lines are close together is the land steep or flat?

The teacher can tailor questions to suit their own class and the needs of individual pupils.

Main Teaching

The word volcano is derived from the name Vulcan, the Roman God of fire. Today the pupils will be volcanologists.

The structure of the Earth: Pupils should already be familiar with the structure of the Earth (the inner core, outer core, mantle and crust). Consolidate this understanding if necessary.

Plate tectonics: Then, remind pupils that the Earth is not a smooth sphere, but has a crust divided into eight major tectonic plates. These tectonic plates move constantly through the action of convection currents in the mantle. Each year the Earth's plates move 1-10cm.

Plate boundaries are important: Volcanoes are usually formed at the boundary between two tectonic plates.

For an interactive map of the world detailing the major tectonic plates, volcanoes and earthquakes visit the Geological Society website: <http://www.geolsoc.org.uk/Plate-Tectonics>

Constructive plate boundaries:

Show pupils the image of a constructive plate boundary and explain that when two plates pull apart molten rock (magma) rises and erupts as lava. This lava then hardens to form new crust. The eruptions that happen at constructive plate boundaries are relatively gentle.

Iceland is formed on the constructive boundary of the North American plate and the Eurasian plate (see the *factsheet for teachers* for more details). Show pupils the photograph of Eyjafjallajökull, the Icelandic volcano that, in 2010, caused travel disruption for several weeks across Europe, as huge plumes of ash entered the atmosphere. A 3d cut out model is also available to download from the British Geological Survey website: <http://www.bgs.ac.uk/discoveringGeology/hazards/volcanoes/models/iceland.html>

Destructive plate boundaries: Show pupils the image of a destructive plate boundary and explain that two plates can also collide or converge. In this case one plate is pushed under the other. The plate underneath then melts and the crust becomes molten rock (magma). This magma then forces its way back to the surface to form a volcano. The eruptions that happen at destructive boundaries tend to be violent because the converging plates do not simply glide under one another but undergo tremendous pressure, which can also cause earthquakes. Chile, in South America, has active volcanoes, formed at the destructive boundary of the Nazca and South American plates. Show pupils the photograph of Villarrica in Chile.

Why does an eruption happen? Magma is a mixture of molten rock and gas. Huge pressure is placed on the magma when it is deep underground. When the magma rises through a volcano's vent this pressure is released. Lava and gas then erupt from the vent. Some of this lava cools before it lands (small lumps are called cinders, larger lumps are called bombs), but some of this lava flows down the sides of the volcano and onto the surrounding area.

When lava cools it forms igneous rocks such as basalt, granite and pumice. Show pupils examples of these rocks if they are available.

Volcanoes come in different shapes: The shape of a volcano depends on the type of eruption that occurs and the type of lava present. Two main types of volcano are the shield volcano and the composite volcano.

Shield volcanoes: Shield volcanoes have very runny lava (they are not viscous); because of this they do not have an 'explosive' eruption. Lava spreads quickly across the landscape. With each eruption a new layer of rock is built on the previous one. Gradually a wide dome of rock is built up. It is called a shield volcano because it looks like a curved shield lying on the ground (or an upside down dinner plate). The slopes of a shield volcano are very gentle. The Hawaiian islands are a chain of shield volcanoes (see the *factsheet for teachers* for details). Show pupils the photograph of Mauna Loa in Hawaii as you talk through the case study. You might want to locate Hawaii using either Google earth or an atlas.

Composite volcanoes: Composite volcanoes are the most common type of volcano. When you think of a volcano you are probably picturing the classic shape of the composite volcano. They are formed by hardened layers of lava and ash from successive eruptions. The lava is viscous (therefore thicker than with shield volcanos) and it cools and hardens before spreading very far. The eruptions tend to be very violent. Mount Etna in Sicily, Italy is an example of a Composite Volcano.

The structure of a Volcano: Discuss the structure of a volcano with pupils. Use the *factsheet for teacher* to help you. This image is available on the related *Volcano* PowerPoint. Rather than producing a pre-labelled diagram, it is suggested that the structure is labelled and discussed as a class.

Main Activity

Either draw and label a diagram showing the cross section of a composite volcano.

Or in pairs or small groups make a 3d cross section of a volcano using colour-appropriate plasticine. Annotate the key features using small labels attached to cocktail sticks. This activity will offer peer support for lower ability pupils.

As an extension or homework activity pupils could cut out and glue their own composite volcano. For a make-your-own, cut-out and glue 3d composite volcano go to the Geoblox: <http://www.geoblox.com/colorvolcano2.pdf>

Plenary

What have we learned today?

Give each pupil a post-it note. They should write, or draw, one piece of information they have learned today. Pupils can then stick their post-it note on a wall or whiteboard (perhaps in the shape of a composite volcano). As a class did we remember everything?

Does the UK have Volcanoes?

You may like to pose this question to your pupils. There are no active volcanoes in the UK. However, there is evidence of past volcanic activity. This is detailed in the *factsheet for teachers* and includes: Castle Rock the seat of Edinburgh Castle; The Giant's Causeway in Northern Ireland; Fingal's Cave in Scotland and The Hebrides Terrace Seamount.