

Lesson 3: The formation of mountains

Lesson Plan

Use the *formation of mountains* PowerPoint presentation in conjunction with the Lesson Plan. The PowerPoint presentation contains photographs, images and maps and follows the sequence of the lesson.

The *factsheet for teachers*, to accompany this lesson, explains some of the key processes in more detail. It also contains a glossary of terms that will help you to explain these processes using the key geographical vocabulary.

Key questions and ideas

- What is the structure of the Earth?
- What is the role of plate tectonics in forming mountains?
- To understand that mountains can be formed in different ways.
- How are fold mountains formed?
- How are fault block mountains formed?
- How are dome mountains formed?
- Can pupils name mountains exemplifying each formation?
- How do mountains change over time?

Subject content areas

- Locational knowledge: 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.
- Place knowledge: Understand geographical similarities and differences through the study of physical geography of a region within North and South America.
- Physical geography: describe and understand key aspects of physical geography, including mountains.
- Geographical skills and fieldwork: Use maps to locate countries and describe features studied.

Downloads

- The formation of mountains (PPT)
- Factsheet for teachers PDF | MSWORD
- The formation of mountains differentiated worksheet PDF | MSWORD
- The formation of mountains differentiated answer sheet PDF | MSWORD
- Examples of pupils' work: mountain formations (PDF)
- Examples of pupils' work: South America plate side (JPEG)
- Examples of pupils' work: South America plate front (JPEG)

Starter

Pupils can play the game 'Just a Minute'.

Choose a confident pupil to begin. Can they speak for one minute without hesitation, repetition or deviation (and using factual information and correct vocabulary) on the topic of either of the first two lessons (Mount Everest and the first ascent or Mapping mountains)?

Time the pupil and see how long they can speak. The class teacher can 'buzz' the pupil out if they um and ah, repeat themselves or are factually incorrect. Alternatively, other pupils can 'buzz' by a show of hands, or other device, as long as they have a good reason.

Does the class have a 'Just a Minute' champion?

Main Teaching

The structure of the Earth

Begin by asking the pupils what they already know about the structure of the Earth. These ideas can be recorded on a whiteboard or large sheet of paper and used or amended later in the lesson.

Show pupils the diagram of the structure of the Earth. Label the diagram as you discuss the structure with the pupils.

The Earth is made from four distinct layers: the inner core, the outer core, the mantle and the crust. Each layer has a different thickness and is composed of different materials which have different characteristics. These are detailed in the accompanying *factsheet for teachers*.

Inner core

The inner core is the centre. It is primarily a solid ball of iron. It has a temperature of 5500°C, which is almost as hot as the outer layer of the sun.

Outer core

The outer core is composed of iron and nickel. Unlike the inner core, the outer core is liquid.

Mantle

This is the thickest part of the Earth. The mantle is viscous and composed of semi-molten rock or magma.

Crust

This is the outer layer of the Earth's surface and it is the thinnest layer. The crust is composed of solid rock and rests on the top layer of the mantle. It is up to 60km thick. In order to help pupils appreciate what a thickness of 60km means, use the ruler function on Google Earth to show pupils the distance from your school and a landmark 60 km away. It is in the crust that mountains are formed.

Then, introduce concept of 'plate tectonics'

Explain that the Earth's surface (the crust) is not one smooth unbroken covering but is made up of different sections called plates. You might want to give pupils the example of a cracked egg shell. Show pupils the world map showing the position of each plate. There are eight plates floating on the mantle. These are:

- Eurasian
- Pacific
- Indo-Australian
- Antarctic
- Nazca
- North American
- South American
- African

Ask pupils to name and locate these on the map. Ask pupils which plates include more than one continent and which do not mark the boundaries of continents. The major plates mainly mark the boundaries of the continents. Which plates are oceanic?

Tell pupils that the Earth's plates are constantly and slowly moving, and then ask how they think this could happen. Show pupils the diagrams of convection currents. Explain that convection currents in the mantle cause the plates to move. Heat rises and falls throughout the molten rocks that compose the mantle. As the magma moves so do the plates above. The Earth's plates are constantly moving. On average this movement is between 1 and 10 cm per year. Give pupils the analogy of bubbling porridge or custard.

So, how are mountains formed?

Occasionally two plates move closer to each other, or converge. This creates intense pressure, causing the plates to buckle in different ways and this process forms a mountain.

There are different ways mountains are formed, depending on their type.

This lesson will concentrate on three types of mountain:

- Fold mountains
- Fault block mountains
- Dome mountains.

Show pupils the diagram of a fold mountain: Formed over millions of years, these are the most common type of mountain. They are formed when two plates move towards each other. This causes the plates to buckle and pushes the crust upwards, forming a mountain.

Give every pupil a piece of A4 paper and ask them to push the two ends towards each other. This will create an upward fold in the paper. This is similar to how a fold mountain is formed. The upward folds are known as anticlines and the downward folds are synclines. These can be labelled on the diagram.

Then show pupils the photograph of the fold mountain rock formation. The image on the picture is of the Zagros Mountains.

The Himalayas are another good example of a range of fold mountains. These were formed 25 million years ago when the Indo-Australian plate pushed against the Eurasian plate.

Explain to the pupils that there are fossilised sea shells and marine deposits within the rocks that make up the summit of Everest. Then ask them how they think they got there?

Other examples of fold mountains include Mount Aconcagua in the Andes, South America; Mont Blanc in the Alps in Europe and the Rocky Mountains in North America. Ask pupils to locate these using an atlas.

Show pupils the diagram of the formation of a fault block mountain: These are formed when two plates move towards each other. Rather than the crust folding under the pressure of the moving plates, it cracks along lines of weakness. These lines are called fault lines. The crust then breaks into blocks along these fault lines.

Reinforce to pupils that in real life fault block mountains do not form in straight lines. Ask pupils how they think a mountain gets its 'mountain shape'. Explain that erosion (the continual wearing away of rock by rain, ice and wind over time) changes the shape of rocks and land.

An example of fault block mountains is the Sierra Nevada mountain range in California. Show pupils the photograph of this mountain range.

Show pupils the diagram of a dome mountain: Dome mountains are the result of a great amount of molten rock (magma) pushing its way up under the Earth's crust. Without actually erupting onto the surface, the magma pushes up the overlying rock strata. At some point the magma cools and forms hardened rock.

The uplifted area created by the rising magma is called a dome because it looks like the top half of a ball.

An example of dome mountains is the Black Hill range in South Dakota. Mount Rushmore is also a dome mountain. Show pupils the photographs of Bear Butte and Mount Rushmore, depicting the faces of the four presidents.

Main Activity

Pupils will draw and annotate diagrams of the three main types of mountain formation (fold, fault block and dome).

Higher ability pupils should be expected to show the stages of formation over time. Higher ability pupils may also be expected to write a short explanation in addition to the annotations on the diagrams.

For pupils requiring support, '*The formation of mountains differentiated worksheet*' can be used. This combines pre-drawn diagrams, sentences and vocabulary lists.

Plenary

Pupils should peer assess their partner's work. Pupils can nominate their partner for praise for the accurate use of geographical vocabulary and detail. Do they have any suggestions for improvement?

Then, show interactive clip of Pangea. Available from the Education at the San Diego Super Computer Website: http://education.sdsc.edu/optiputer/flash/pangea_4.htm
Can pupils use their knowledge of plate tectonics to explain what happened?

After, look at how today's political borders fit with Pangea. This is available from Twitter: <https://twitter.com/amazinmaps/status/478567737833574401>