

EARTHQUAKES AND VOLCANOES:

How does the Earth shake, rattle and roll?

Unit overview

Our earth is dynamic and ever-changing. In this unit children will explore the dynamism of the earth, learning about its structure, look particularly at the causes and distribution of earthquakes and volcanoes and their effects on landscape and people. They will be introduced to the 'Pacific Ring of Fire', the most active region on earth, and consider why people choose to live on the flanks of volcanoes and in earthquake zones when both can be life-threatening. They will learn that volcanoes have existed throughout geological time, and that there are several different types. In the Big Finish, the children will make their own erupting volcano!

Background information

The rigid outermost shell of the Earth (called the 'crust' and 'upper mantle') is broken up into seven or eight major interlocking 'tectonic plates', and numerous smaller plates. An egg with a cracked shell is a useful analogy to share with children. It gives them an idea of the structure of the Earth, and helps them to understand earthquakes and volcanoes. With the cracked shell representing the thin crust and upper mantle, the white represents the hot magma of the semi-molten lower mantle, and the yolk represents the extremely hot core. The tectonic plates move (a few centimetres a year) towards, away from, or sliding past, each other. This results in volcanoes and earthquakes at their boundaries – the cracks in the egg's shell.

Converging plates (plates moving towards each other) are associated with mountain building and/or volcanoes, such as the Himalayas (India meets Asia), Andes (active volcanoes e.g. Cotopaxi) and the Circum-Pacific Ring ('Ring of Fire'). **Subduction** is when one plate is forced underneath another when they meet. At depth, the rocks in the sunken plate melt and lava is forced up through fractures, to erupt as volcanoes.

An example of **diverging plates** is the mid-Atlantic ridge, where the Eurasian plate and the North American plate are moving apart, at about 2.5 cm a year. Magma from the Earth's mantle rises to create new crust in the gap – Iceland sits on this ridge and is very actively volcanic.

The San Andreas Fault, San Francisco, is an example of plates sliding past each other. Tension increases along faults in the Earth's crust as the plates grind together, and which sudden movement – an earthquake – relieves. The 'Ring of Fire', with all three types of plate boundary, is by far the world's most active earthquake and volcanic zone, with several archipelagos of active volcanic islands rising in the Pacific Ocean.

Knowledge, skills and concepts

In this unit, the children will:

- describe and understand the key aspects of volcanoes and earthquakes
- understand that the distribution of earthquakes and volcanoes follows a pattern
- be introduced to plate tectonics.
- learn about the 'Pacific Ring of Fire'.

Cross-curricular links

- **English:** reading an Earthquake short story by an Australian primary pupil (Weeks 1–6); reading Willard Price's story *Volcano Adventure* (Weeks 1–6); learning about Greek and Roman mythology; legend of the Two Mexican Volcanoes, Popocatepetl and Iztaccihuatl (Week 3).
- **Maths:** learning about measurement of temperature and earthquake scales.
- **Science:** learning about change of state – melting and solidification of rock (lava, magma).
- **Art:** looking at paintings e.g. Turner and the Quechuan artists of Tigua, Ecuador; creating own paintings and a (working) model of volcano.
- **Drama:** dramatizing a volcanic eruption with explosive movement and lava flows; performing a volcano safety drill as in Japan.
- **History:** researching famous volcanic eruptions of the past, including Vesuvius (Herculaneum and Pompeii).
- **Music:** for volcanoes, Handel's *Music for the Royal Fireworks*; for earthquakes, children creating drumming music.

The Big Finish

One recipe for an erupting volcano is given but you will find others online. You may choose for all children to use the same recipe or you may prefer to give the children different recipes, making the activity competitive by setting up a fair test to discover which is the 'best' – how will the children define 'best'? What are the characteristics of a 'good' model volcano?

Map work

Maps to locate volcanoes and earthquakes worldwide, plate (tectonic) boundaries involving maps of the world's oceans as well as land, interactive maps and satellite imagery of Ecuador.

Fieldwork

This unit creates a good opportunity to introduce children to the main groups of rocks – sedimentary (e.g. sandstone and limestone), igneous (e.g. granite) and metamorphic (e.g. slate and schist). Discover which of these are present in your local area and visit appropriate localities. Volcanic rocks are a sub-division of igneous. Pumice stone is one light and bubbly form of volcanic lava which you may have in your bathroom. A museum with a good geological display would be worth a visit to see a wider range. However, if you are in an area of former volcanic activity (e.g. the Lake District), with your local geology including volcanic rocks, you may have opportunities for fieldwork.

Independent learning area

Look for examples of volcanic eruptions and earthquakes as they are reported in the news, and collect video clips and newspaper articles about them for the Independent learning area. Record their locations on a world map, looking for distribution patterns.

Research the effects of topical earthquakes and eruptions on the local population (damaged and destroyed roads and buildings, flooding) and wider population (such as disruption to air traffic by volcanic ash clouds) and on landscape. Do an Internet search to see if there are any webcams recording the events.

Find out about the effects of major eruptions including those of Krakatoa in 1883, Pinatubo in 1991 and Vesuvius in 79CE on Pompeii and Herculaneum.

Assessment

All children can:

- describe some features of earthquakes and volcanoes
- know that people live in earthquake zones and close to active volcanoes
- appreciate that earthquakes and volcanoes are often associated
- name some volcanoes and major earthquakes.

Most children can:

- describe the effects of earthquakes and volcanic eruptions
- give some reasons why people choose to live in earthquake zones and close to active volcanoes
- know where the most active earthquake and volcanic areas are
- name examples of volcanic eruptions and major earthquake disasters.

Some children can:

- explain how earthquakes occur and volcanoes erupt
- describe some advantages and disadvantages of living in earthquake zones and close to active volcanoes
- explain about the Pacific 'Ring of Fire' and link it with plate tectonics
- describe some major volcanic eruptions and major earthquake disasters.