

3: Earthquakes and volcanoes

Syllabus ref.	Learning objectives	Suggested teaching activities
2.1 Earthquakes and volcanoes	Describe the main types and features of volcanoes and earthquakes	<p>Learners define word 'volcano' (see: www.s-cool.co.uk/gcse/geography/tectonics/revise-it/volcanoes). Describe the difference between 'active', 'dormant' and 'extinct' volcanoes – research examples of each using the internet. (I)</p> <p>Learners define 'composite volcano' and add to key word glossary. Learners work in small groups to reproduce a fully annotated diagram of a composite volcano – they are shown a diagram to work from for a short period of time and then work as a team to draw the diagram from memory with as much information as they can remember.</p> <p>Follow up by asking learners to annotate a diagram of a composite volcano and write a description of the key features. Learners describe features of a composite volcano from a photograph – produce a sketch and label.</p> <p>Extension activity: Learners construct a model of a composite volcano. (I)</p> <p>Introduce the key word 'shield volcano' and add to key word glossary. Provide a photograph of a shield volcano – learners produce a labelled sketch and describe how the shield volcano is different from the composite volcano. Explain the key reasons for this. Learners can research examples of shield and composite volcanoes and their locations. (I)</p> <p>Introduce the term 'earthquake' and add to key word glossary (see: www.s-cool.co.uk/gcse/geography/tectonics/revise-it/earthquakes). Learners produce a simple diagram with labels to show the key features – 'focus' and 'epicentre'. Define 'intensity' and other appropriate key words. Update glossary with new key words. (I)</p> <p>Provide a copy of the Richter scale and an earthquake trace from a seismograph – learners work in pairs to place cards describing earthquake events at appropriate points on the earthquake trace according to the Richter scale – learners explain and justify their decisions.</p> <p>Learners independently research the Mercalli Scale and describe the difference between the two scales. Learners can independently research examples of earthquakes at different intensities and their location.</p> <p>Further information on natural hazards can be found here: www.bbc.co.uk/schools/gcsebitesize/geography/natural_hazards/</p> <p>Further information on volcanoes and earthquakes can be found at the following links: www.revisionworld.com/gcse-revision/geography/tectonic-activity/earthquakes www.revisionworld.com/gcse-revision/geography/tectonic-activity/volcanoes</p>

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	Describe and explain the distribution of earthquakes and volcanoes.	<p>Provide learners with a map of volcanoes and earthquakes – they can mark some of the volcanoes and earthquakes that they have previously researched onto the map using an atlas. (I)</p> <p>Learners describe the distribution of volcanoes and earthquake zones – what do they notice about the distribution of the two? Learners can use atlases to provide appropriate place references. (I)</p> <p>Introduce a structure of the earth diagram – learners label each layer (I) and complete a card sorting activity to match names to descriptions of each layer.</p> <p>Explain the two types of crust, the differences between them and how the crust is broken into plates. Introduce a map of plate boundaries. Define ‘tectonic activity’, ‘plate’ and ‘plate boundary’ and add to key word glossary. Learners label the map to show the names of plates and add arrows to show the direction of movement. (I)</p> <p>Discuss rate of movement and how plates move – link to convection currents. Ask learners to discuss and note down what they notice about the plate boundaries and volcano and earthquake zones. Can they suggest any reasons for their observations?</p> <p>Learners identify examples of places where plates are moving together, moving apart and moving side to side. Record in a table. Build on this information to introduce different types of plate boundaries – constructive/divergent, destructive/convergent and conservative plate boundaries. Show animations for each type of plate boundary – learners annotate a diagram of each and write an explanation of what happens at each type of boundary. (I)</p> <p>The following links will be useful here: Tectonic plates: www.bbc.co.uk/schools/gcsebitesize/geography/natural_hazards/tectonic_plates_rev1.shtml and www.s-cool.co.uk/gcse/geography/tectonics/revise-it/tectonic-plates</p> <p>Animated guide to volcanoes: http://news.bbc.co.uk/1/hi/sci/tech/7533964.stm</p> <p>Earthquakes: www.revisionworld.com/gcse-revision/geography/tectonic-activity/earthquakes</p> <p>Natural hazards: www.bbc.co.uk/schools/gcsebitesize/geography/video/natural_hazards/</p> <p>Observation animations of processes that occur along plate boundaries: www.classzone.com/books/earth_science/terc/content/visualizations/es0804/es0804page01.cfm?chapter_no=visualization</p>
	Describe the causes of earthquakes and	Recap learning from previous section – causes of earthquakes and volcanoes at the different types of plate boundary – learners show as a table to consolidate. Introduce volcanoes at hot spots and give a couple of examples. (I)

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	volcanic eruptions and their effects on people and the environment	Provide photographs of volcanic eruptions and show some video clips or newspaper articles as stimulus material (not case study) – learners work in groups to discuss and mind map the general effects that volcanic eruptions can have on people and the environment. Repeat the activity for earthquakes. Learners then work to classify the different effects – short and long term – and explain the difference between the two. This will be consolidated in more detail through the case study later.
	Demonstrate an understanding that volcanoes present hazards and offer opportunities for people	<p>Effects has been covered in the previous section but can be recapped by a ‘Give me five’ activity (plenary activity where learners ask for five things about a topic – see Appendix: Give me five) – for example, ‘give me five short term effects of a volcanic eruption on people or five long term effects of a volcanic eruption on the environment.’ Learners can draw round their hand and record their ideas on the fingers on their hand. (I)</p> <p>Develop this further by using information from the previous activity to decide the type of volcanic hazard involved – for example, was it as a result of ash, lava, lahars, volcanic bombs, pyroclastic flows, etc. Learners record different volcanic hazards such as lava, ash, pyroclastic flows, mudflows, etc. and a description in a table to include the likely hazards of each for people. (I)</p> <p>‘Think, Pair, Share’ activity (See Appendix: Think, Pair, Share) – learners have one minute to try to think of any benefits of volcanic activity and record on a mind map. Then they work with a partner and are provided with some facts cards as a stimulus to try to add some more ideas to their mind map in a different colour. Finally, share ideas – take feedback from the pairs and discuss. Confirm with a whole class discussion using photographs to illustrate the benefits of volcanic activity in different parts of the world – learners add further detail to their mind maps in a different colour to record ideas and examples. (I)</p> <p>Extension activity: Explain the benefits of living in volcanic regions. Try to encourage learners to develop their answers and include examples to support their ideas. (I)</p>
	Explain what can be done to reduce the impacts of earthquakes and volcanoes	<p>Volcanoes – learners can act as volcano detectives. Provide information (facts/photos/clips) about a particular volcano (choose one that gave lots of warning signs) – learners have to identify the warning signs that the volcano displayed that it was going to erupt and put them in time order – can show as a story board.</p> <p>Use this to introduce the value of prediction and how volcanoes can be predicted along with any equipment that is used – learners complete a card sorting matching activity – for example – magma moves up the volcano and can produce a magma bulge – measured by tiltmeters.</p> <p>Discuss the importance of evacuation and warning systems. Provide photographs and examples of measures taken to reduce the impact of volcanoes – learners record all ideas on a mind map. Can add further ideas and example from independent research. Learners explain why volcanic eruptions do not often cause a large number of deaths. (I)</p>

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		<p>Earthquakes – learners work in pairs to discuss what they would put in an earthquake survival pack – show an example if you have one or research examples from the internet.</p> <p>Learners explain why they have included each item.</p> <p>Learners devise a safety poster or leaflet giving and explaining advice to people about what they should do in the event of an earthquake – can discuss ideas as a whole class first or complete independent research. The class can practise an earthquake drill if this is not a usual routine for your learners. Show photographs of examples of how buildings and structures have been adapted in different parts of the world to withstand earthquakes – learners write up ideas as a short report for a geographical journal – can include labelled sketches and photographs to illustrate.(I)</p> <p>Learners draw scatter graphs to show examples of earthquakes at different intensities in different parts of the world and number of deaths. Discuss what the graphs show. Use this as a stimulus to discuss why there may be more deaths from natural hazards in LEDC and discuss the reasons why – learners write up their ideas. Include volcanic eruptions at this point too. Discuss how confidence in prediction and safety measures mean that people continue to live in hazard zones, and other reasons for this (link to volcanic benefits).</p> <p>Extension activity: Why do many people live in earthquake zones? And what opportunities are offered by volcanic regions? (I)</p> <p>The following links will be useful for this section:</p> <p>Managing tectonic hazards: www.bbc.co.uk/schools/gcsebitesize/geography/natural_hazards/managing_hazards_rev1.shtml</p> <p>New Zealand earthquake: in pictures – Telegraph: http://handygeography.wordpress.com/tag/earthquake/</p>
2.1 Case study	Know a case study of an earthquake and a volcano	<p>Learners should know a case study of:</p> <ul style="list-style-type: none"> • a volcano • an earthquake. <p>For each case study, learners produce a newspaper article to include:</p> <ul style="list-style-type: none"> • a map to show location of the event and description • a fact file – key facts about the event or volcano (e.g. type) – provide place-specific detail • a plate boundary map – ensure plates are identified and named • a plate boundary diagram and explanation • a write-up of the effects on people (short and long term)

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		<ul style="list-style-type: none"> • a write-up of the effects on the environment (short and long term) • any benefits or opportunities (volcano case study) • the immediate response to the event – include relief from other countries • longer term responses to the event including measures taken to reduce the risk in the future. <p>Whilst there is no cut-off date for natural disaster case studies, it is helpful to use recent examples where possible.</p>
Past and specimen papers		
<p>Past/specimen papers and mark schemes are available to download at https://teachers.cie.org.uk (F)</p> <p>2.1 Earthquakes and volcanoes</p> <p>Nov 2013 Paper 12 Q3ai and ii Jun 2013 Paper 13 Q4a Nov 2013 Paper 12 Q3aiii Jun 2013 Paper 13 Q4bi Jun 2013 Paper 11 Q3ai, ii and iii Jun 2013 Paper 13 Q4a Nov 2013 Paper 12 Q3aiii Jun 2013 Paper 11 Q3aiv Nov 2013 Paper 12 Q3b Nov 2013 Paper 13 Q3bi and iii Nov 2013 Paper 12 Q4aiii and iv Jun 2013 Paper 13 Q4bii Jun 2012 Paper 11 Q4aii Jun 2013 Paper 13 Q4c Jun 2013 Paper 11 Q3c Nov 2013 Paper 12 Q3c Jun 2012 Paper 11 Q4c</p>		