Lesson 3

ROCK FORMATION

Learning intentions

1. Understand that rocks may be classified based on how they have been formed.
2. Be able to explain the origin of rocks as the product of igneous, sedimentary or metamorphic processes.
3. Understand that the rock cycle is the slow continuous process of rocks changing from one form to another (rocks being recycled).

Resources

- One set of rocks for every group to include samples of granite, basalt, sandstone, slate, shale and limestone
- Video clips and slideshows as described in the main text
- Photo of mammals (PE 3.1)
- Rock cycle diagram (PE 3.2)
- Sedimentary rock recipe worksheet (PE 3.3)

Introduction

Remind pupils that in our first lesson we tried to group rocks according to their observed characteristics. Point out that scientists seek to sort and group things based on what they have in common and how they are different from each other (similarities and differences) and that the word scientists use when they do this is **classifying**. Ask the pupils to think for example of the animal kingdom. Can pupils name some of the groups that scientists use to classify animals based on their similarities/differences, for example mammals, birds, fish, reptiles, amphibians. Spend a few minutes thinking about what these different groupings have in common, e.g. mammals are warm-blooded, give birth to live young and feed their young on milk. Show pictures of two very different looking mammals (PE 3.1) and point out that even though they look very different they are grouped together because of similar characteristics.

Now hold up a sample of basalt and another of granite and explain that geologists when classifying rocks would put these two rocks in the same group even though they look very different from each other. Ask the pupils for ideas as to why this might be. Remind them that there must be something that these rocks have in common if they are classified as being in the same group. Hopefully someone will remember from previous lessons that both basalt and granite are very hard, impermeable rocks with grains that are tightly interlocked. Explain that the reason that basalt and granite have these characteristics is to do with the way that these rocks have been formed. Point out that when geologists classify rocks they can do it based on how they are formed and that it is now known that rocks are formed in one of three different ways. Today we are going to learn how to classify rocks based on how they have been formed.

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Development

Teachers, please make sure you have read the background notes for this lesson.

Igneous Rocks

Explain that igneous rocks (Igneous is derived from the Latin word ignis meaning 'of fire , fiery') are the most common of all rocks. (About 95% of the rocks that make up the crust of the planet are igneous rocks) At this point it is useful to watch two short videos:

- The first found at http://www.makemegenius.com/science-videos/grade_3/Igneous-Rocks-for-kids explains how igneous rocks are formed from molten material and how differences in the rate of cooling result in the formation of the two rock types basalt and granite. Please note that this video goes on to explain sedimentary and metamorphic rocks but can be paused if you don't want to watch it all at once. It lasts almost 7 minutes in total.
- The second is a slightly more academic video clip found at http://www.videojug.com/film/geology-igneous-rocks which again explains how basalt and granite are formed.
- A very useful slideshow accompanied by music can be found at http://studyjams.scholastic.com/studyjams/jams/science/rocks-minerals-landforms/igneous-rocks.htm. This slide show introduces the terms intrusive (rocks that cool slowly under the earth's surface resulting in the formation of rocks with large crystals e.g. granite) and extrusive (rocks formed by lava cooling relatively quickly on the earth's surface, resulting in a rock in which the crystals are often too small to see without a microscope e.g. basalt) The site also has a song for the children to learn (perhaps save to the very end of the lesson as it includes all three ways rocks are formed) and a quiz for them to test their understanding of igneous rock formation.

Sedimentary Rocks

Point out that although all rocks might start out as igneous rocks, due to earth processes such as weathering and erosion, rocks are broken down into smaller and smaller pieces. Often these small rock particles end up being suspended in water and find their way to the bottom of lakes, rivers and the ocean. Slowly the layer of sediment on the bottom of the ocean grows deeper and deeper. The weight of the sediment and the water itself can become immense, pushing down on lower layers of sediment with such force that the sediments become compacted to form a new type of rock called sedimentary rock (sometimes known as second hand/recycled rock)

- Show children the second part of the video from makemegenius.com and/or the sedimentary rock slide show from the study jams website.

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- Also show the video found at www.bbc.co.uk/learningzone/clips/the...sedimentary-rock/10621.html which is more detailed explaining how fossils may be found in sedimentary rocks and giving sandstone, limestone and conglomerate as examples of sedimentary rocks.

Metamorphic Rocks

Explain that metamorphic rocks are the third type of rock we will look at. These rocks are basically formed when other rocks are changed (transformed) because of great heat or pressure. For example metamorphic rocks may form when rocks get heated up because they are close to molten magma under the ground. The rocks do not melt, but the minerals they contain are changed by heat to form a new metamorphic rock. Great pressure can also cause rocks to change from one form to another, for example slate is formed when shale (in the video this is referred to as mudstone) is exposed to high pressure deep beneath the earth's surface.

- Show children the third part of the video from makemegenius.com and/or the metamorphic rock slide show from the study jams website.
- Also show the video found at www.bbc.co.uk/learningzone/clips/the...sedimentary-rock/10622.html which explains the link between limestone and marble and mudstone (shale) and slate.

Plenary

Set a selection of rocks on each table (to include basalt, granite, sandstone, limestone, shale, slate and if possible marble) and ask the children to see if they can remember what they have learned, by trying to group the rocks according to how they have formed. Point out that on earth the slow continuous process of rocks changing from one type to another is called the **rock cycle**. Earth processes change rocks from one type to another through geological time (millions of years). Perhaps spend time studying the rock cycle diagram included with this lesson (PE 3.2), making sure that children realise that any type of rock may be changed during the rock cycle into any other type of rock. A useful video can be found at http://studyjams.scholastic.com/studyjams/jams/science/rocks-minerals-landforms/rock-cycle.htm. Then test the pupils understanding by completing the rock cycle test.

Extension activity

- Try unjumbling the recipe for sedimentary rocks (PE 3.3) by cutting out the strips and rearranging them in the correct order to explain how these rocks are formed.