

**National Curriculum Objectives:***(Statutory Requirements)*

- a) Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.
- b) Describe in simple terms how fossils are formed when things that have lived are trapped within rock.
- c) Recognise that soils are made from rocks and organic matter.

**Experimental and investigative work focuses on:**

<b>Planning an investigation:</b>	<b>Obtaining and evaluating evidence:</b>
<ol style="list-style-type: none"> <li>1. Asking relevant questions and using different types of scientific enquiries to answer them.</li> <li>2. Setting up simple practical enquiries, comparative and fair tests.</li> </ol>	<ol style="list-style-type: none"> <li>3. Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment.</li> <li>4. Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions.</li> <li>5. Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables.</li> <li>6. Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.</li> <li>7. Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.</li> <li>8. Identifying differences, similarities or changes related to simple scientific ideas and processes.</li> <li>9. Using straightforward scientific evidence to answer questions or to support their findings.</li> </ol>

**Most children will:**

- **Understand** that there are different types of rocks and that these have different textures.
- **Describe** the characteristics of rocks.
- **Understand** that rocks change over time and that the wind and water can erode rocks.
- **Understand** that fossils are made when living things get trapped within rock and begin to explain how fossils are made.

**Some will progress less and will:**

- **Describe** the appearance of rocks.
- **Understand** that rocks change over time.
- **Know** that fossils are very old and are made when living things get trapped within rock.

**Others will progress further and will also:**

- **Predict** the permeability of rocks.
- **Understand** that some rocks erode more easily than others.

**Key vocabulary:**

**Previously taught:** condensation, plants, leaves, animals, rough, smooth, hard, soft, shiny, alive, not alive, dead

**New:** grains, crystals, fossils, rocks, slate, marble, chalk, granite, soils, clay, stone, pebble, absorbent, sieve, separate.

Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
1	<p>To be able to describe and compare different types of rock.</p> <p>Assessment: a</p>	<p>Set up Rock samples on each table. Each rock should be numbered e.g. sandstone (3).</p> <p>Explain to the children that this half term in science, they will be geologists.</p> <p><b>Q. What is a geologist?</b> Explain that geologists are scientists who study what the earth is made from. We will be particularly concentrating on rocks.</p> <p><b>Q. What is a rock?</b> Explain to the children that rocks are made of minerals. To help them understand, ask them to imagine a cake. The cake is made of flour, butter, sugar and eggs. The cake is like a rock and the flour, butter, sugar and eggs are the minerals. Rocks are made of minerals- minerals are not made of rocks.</p>	<p><b>Q. Are all rocks the same?</b> On the IWB show images of different rocks and also man-made substances which are like rock e.g. brick and cement. Which of these are rocks? Which are not rocks? What are they? How do you know? Ensure that children understand that rocks are natural and the other things are man-made. They may share some characteristics of rocks but they are not rocks.</p> <p><b>Q. Which words would you use to describe rocks?</b> Ask children to discuss as a table and record on sugar paper. Feedback as a class don't change their suggestions. Model looking at a rock and using the children's vocabulary write a description on the sample worksheet next to the rock number.</p> <p><b>Activity 1:</b> (mixed ability groups) children to have a selection of rocks on tables. Children to handle rocks, discuss them and record descriptions on the worksheet. Allow children to complete the activity and then discuss their suggestions for each sample. Explain that it helps to use specific vocabulary so that everyone understands what we mean. Discuss useful vocabulary for describing the characteristics of rocks with the children. Example of some useful vocabulary to describe texture and appearance: smooth, rough, grainy, glassy, sandy, crumbly, crystalline, permeable.</p> <p>Show the children the flipchart page with the magnifying glass questions on. Then model using the magnifying glass questions (on resource sheet) to help you think about the characteristics of the rock, and model using some of the key vocabulary when answering. Use hand lens to look closely at the rock. Model recording this more refined description of the rock in the last column of the worksheet.</p> <p><b>Activity 2 (in mixed ability groups)</b> Children return to their samples with hand lenses and magnifying glass questions for support. Children to look closely and describe the rocks using questions to help them think about various characteristics. Teacher to ensure they are using the new vocabulary accurately.</p> <p><b>Exceeding:</b> To look in detail at the rocks and try to record descriptions of different characteristics – e.g. texture and appearance. If they understand permeability, could be encouraged to predict whether they think it will be permeable or not – linking to future session.</p> <p><b>Emerging:</b> With support of additional adult, and vocabulary, should be able to describe the appearance of the rock, and perhaps the texture.</p> <p><b>Plenary</b> Mini plenaries within session to discuss each rock and the children's answers to the magnifying glass questions.</p>	<p>How do these rocks compare to each other?</p> <p>Which do you think would be the strongest? Why?</p> <p>What do you think each would be used for?</p>	<p>Rock samples (some permeable and some impermeable ).</p> <p>Rock identification worksheet.</p> <p>Hand lenses, magnifying glass questions,</p>
Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
	To explore	Review learning from previous	<b>Q: What do you think happens to the fragments of rock?</b>	Show	Containers

<p>2</p>	<p>how and why rocks change over time.</p> <p>Assessment: 1, 2, 3, 6</p>	<p>session and ensure children remember that there are different types of rock, and that these types have different physical properties. Show the children a large rock.</p> <p><b>Q: Do you think this rock will change today? This week? This year? By the time you are a grandma or grandad?</b></p> <p>Discuss the children's answers.</p> <p>Explain that even though it looks like rocks don't change to us, actually, over hundreds and thousands of years, rocks do change.</p> <p><b>Q: Can you think how a rock might change? What could happen to it?</b> (Allow children to discuss with partners – then discuss as a class). Compile a class list of ways a rock could be made to change.</p> <p>Show weathering and erosion clip from this website: <a href="http://www.learner.org/interactives/rockcycle/change3.html">www.learner.org/interactives/rockcycle/change3.html</a></p> <p>Explain that through weathering – wind and water – the rock is eroded, and fragments break off.</p> <p>This could also be demonstrated to the children by putting post-its on a child, and using a hair-dryer or fan to blow them off – so the post-its represent rock fragments, and the fan is the</p>	<p>Show compacting and cementing clip from the same website.</p> <p>Explain to the children that weathering is part of the life-cycle of rocks. Ensure they understand that they are not living things – but they should still see the 'circle of life' aspect to it.</p> <p>Show children photos of graveyards/ rocks of different ages.</p> <p><b>Q: How have these rocks changed over time? Why do you think they have changed?</b></p> <p>Exceeding: could also be introduced to the idea that temperature and pressure (being squashed) can also change rocks</p> <p>Take children outside and ask them to collect 10 rocks for their groups (if not enough outside provide them with these).</p> <p><b>Q: How could we investigate the weathering of these rocks?</b></p> <p><b>Activity</b> (On mixed ability tables)</p> <p>Children to put their 10 rocks into a container with a water-tight lid. Fill the container with water and put lid on tightly.</p> <p>Take it in turns to shake the container whilst counting up to 100.</p> <p>When they have finished, they should sieve the contents of the container into a second container – so the rocks will be in the sieve, and the water will be in another container.</p> <p>They should discuss (and record if desired) any changes they notice to the rocks, and to the water.</p> <p><b>Emerging:</b> Supported in mixed ability groups. Will be able to describe the changes and with adult support could understand the causes for those changes.</p> <p><b>Exceeding:</b> Potential extension work on caves which are also caused by erosion. <a href="http://www.goodearthgraphics.com/virtcave/">www.goodearthgraphics.com/virtcave/</a> This website has photographs from various caves, with some explanation of how they were made.</p>	<p>photographs of landscapes with weathered rocks e.g. Paracas in Peru, caves, old gravestones. Ask children to discuss how they have changed over time.</p>	<p>with water tight lids, rocks, sieves, other containers, photos of weathered rocks.</p>
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3	To investigate whether rocks let water through them (permeability).	<p>wind.</p> <p>Remind children of their investigation in the previous session – that wind and water can erode rocks. Explain that today, they will be investigating rocks and water in a bit more detail. You will have two clear containers of water, like the children will. Model putting one permeable rock (e.g. sandstone) and one impermeable rock (e.g. granite) each into the containers of water, and look closely at the bubbles which form. If possible, showing this on the whiteboard so everyone can see clearly would be ideal. Try to describe both the bubbles, and where they come from on both samples.</p>	<p><b>Activity 1</b> (Mixed Ability groups) Children to investigate the rock samples and describe the bubbles, and where they come from.</p> <p><b>Mini Plenary</b> – Discuss what the children have found, and why they think this is. Why do you think some rocks have more bubbles than others? What do you think this means? Explain to the children that some rocks have holes between the grains, and this lets air or water into them. When you put these rocks into the water, the air is less dense than the water, so it rises up as a bubble. This is called a permeable rock. Other rocks do not have spaces between the grains, so their bubbles might be air that was in a crack on the surface. These are impermeable rocks.</p> <p><b>Activity 2</b> (Mixed ability groups) Children to sort from most bubbly to least bubbly. If desired, children could record their descriptions next to each sample, or the final ranking.</p> <p><b>Emerging:</b> Supported in mixed ability groups. <b>Exceeding:</b> They could time how long the bubbling continues and record their findings in a graph.</p> <p>Discuss the uses of permeable and impermeable rocks.</p>	When might you need to use a rock which was impermeable. (e.g. slate for roof tiles).	Clear containers, rocks from session 1 (some permeable and some impermeable)
Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
4	To recognise that there is rock under all surfaces.	<p>Sit chn in group and ask them to close their eyes and imagine they are sitting on the grass in school field/park/garden. Write the word grass at the top of the flip chart. Ask <i>What is underneath the grass?</i> Write '<u>topsoil</u>' (<i>rich and dark with rotting vegetation</i>) below 'grass'. Ask <i>What is below the topsoil?</i> Write '<u>clay</u>' or '<u>subsoil</u>' (<i>tightly packed, different colour</i>). Continue down with '<u>rocky soil</u>' (<i>rocks breaking down into soil</i>) then</p>	<p>Can chn describe anywhere they have seen rocks on the surface of the Earth – perhaps cliffs or rock pools at the seaside or a local rocky outcrop? Rocks that are broken into smaller &amp; smaller pieces eventually form sand. Soil is also made of tiny pieces of different rocks plus remains of plants &amp; animals, air &amp; water. <i>The crust is the thin outer layer of cold hard rock that covers the world (10km-90km thick). The mantle (extremely hot rock that often flows like treacle) is 3,000 km thick. The core, which is made of metal, is hotter than the mantle.</i> So the material that planet Earth is made of is rock, wherever you stand on earth there is rock beneath you and no other known planet in our solar system is like this. Explain that when the crust is very thin sometimes the liquid rock (magma) escapes and this is a volcano (more about this in the next session!). Show a picture (<i>session resources</i>). Show chn a scotch egg (or a hard-boiled egg – shell is the crust) and ask them to imagine that it is planet Earth. Carefully cut it in half and show chn the cross-section.</p>	Do children understand how soil is made? Establish children's understanding of vocabulary relating to session, e.g. crust, mantle, outer core and inner core, magma.	Scotch egg or hard boiled egg

		'bedrock' ( <i>just rock</i> ). Could continue with 'crust, mantle, outer core and inner core' if chn mention any of this vocabulary. Sometimes the rocks do show on the surface of the Earth, or buildings, roads, etc. cover the rocks instead of grass ( <i>session resources</i> ).	<b>Activity 1:</b> Draw a carefully labelled picture of a cross section of the earth Write a paragraph describing the structure of the earth underneath.		
Session	Learning Objectives	Introduction	Main activity	Application and review	Resources
5	<b>To understand what fossils are and how they are formed.</b>  Assessment : b	<b>Q: What are fossils? What kinds of fossils are there?</b> Children are likely to know about dinosaur fossils, but may not be aware that other living things can become fossils too. Discuss the children's answers. Explain to the children that fossils are the preserved remains of plants or animals. Sometimes these are rocks, and sometimes these are whole creatures in amber. Show this YouTube video: <a href="http://www.youtube.com/watch?v=3rkGu0BItKM">www.youtube.com/watch?v=3rkGu0BItKM</a> Pause at key points to discuss. Ensure main teaching points are clear: 1. Fossils are made after a plant or animal gets buried by layers of rock. 2. Over time, the plant or animal remains are washed away, leaving a mould in the shape of the animal behind. 3. Over even more time, this mould gets filled with bits of	Show a picture of the ichthyosaur fossil found by Mary Anning. Tell the children that Anning was born in 1799 and died in 1847. In 1811 (when she was 12), she was hunting for fossils with her brother in Lyme Regis (show on a map) and found a whole ichthyosaur fossil. It was a marine reptile which looked a bit like a dolphin, and its skull was 2m long. Now explain to the children that they will be modelling their own fossils. <b>Activity 1:</b> Making fossils <a href="http://www.homegrownfun.com/how-to-make-homemade-fossils-classroom/">www.homegrownfun.com/how-to-make-homemade-fossils-classroom/</a> Clear instructions are on the website but in brief: Put flattened clay in bottom of cups. Make an impression using a plastic creature. Fill with plaster of Paris (not to be used in schools so use alginate) and mix carefully. Leave to set for 24 hours. Peel off the cup, and the clay, and you are left with a pretend fossil which the children can then paint. <b>Exceeding:</b> Could help design a museum exhibition with the class's specimens making labels explaining how fossils are made and arranging them.  <b>Activity 2:</b> Use information books and the internet to find out more about fossils. Draw a cartoon strip ( <i>session resources</i> – choose 6 or 8 pictures) to show how they are formed.  <b>Activity 3:</b> Put the diagrams ( <i>session resource</i> ) showing how a fossil is formed into the correct order, stick them on a sheet of paper & add labels or captions.	<b>What have the children learned about making fossils? Ensure an understanding that fossils are very old and that they can explain how they are made.</b>	Picture of Ichthyosaur, alginate (safe plaster of paris alternative) little plastic creatures

		<p>rock.</p> <p>4. Eventually the fossil is formed and due to weathering and erosion (as covered in previous sessions) the fossils can be found on the surface.</p> <p>Amber fossils are formed when an insect gets trapped in the resin of a plant, which then hardens like glass. You could also explain about trace fossils – these are not the remains of the animal itself, but its activity e.g. footprints. The time scales involved with fossil formation are difficult for anyone to comprehend – but ensure children understand that fossils are usually at least 10,000 years old, with many being millions or even billions.</p>			
Session	Learning Objectives		Main activity	Application and review	Resources
5	<p>To investigate soil</p> <p>Assessment :c,1, 2, 3, 5, 6</p>	<p>For this session, it would be ideal to collect soils from different locations - e.g. different gardens, under a tree, out in the open etc. If involving the children and their parents in soil collections, please ensure they are aware of health and safety considerations. Children must wash their hands thoroughly after this session.</p> <p><b>Q: What is soil?</b> (soil is a mixture of rock and organic matter – e.g. when you throw away an apple core, and it</p>	<p><b>Activity 1</b> (in mixed ability pairs): Children to put some of their soil sample onto kitchen towel and look at it and describe it. They could record their notes. Key questions:</p> <ul style="list-style-type: none"> <li>• What can you see?</li> <li>• Are there things in your sample which are not soil?</li> <li>• What does the soil look like?</li> <li>• What else do you notice about the soil?</li> <li>• Are there different sized pieces?</li> <li>• How does it feel?</li> </ul> <p><b>Activity 2</b></p> <ol style="list-style-type: none"> <li>1. Use the funnel to put soil in your bottle until it is 1/3 full.</li> <li>2. Put the lid on and shake the soil up. What do you notice?</li> <li>3. Take off the lid. Slowly, using the funnel, fill your bottle with cold water but leave some air at the top.</li> <li>4. Put the lid on tightly and shake it until you have counted up to 100. What does it look like now? Do you notice anything?</li> </ol>	<p>Do the children understand that soil is not just mud?</p>	<p>Clear plastic bottles with lids, funnels, soil samples, water, rulers, key questions.</p>

		<p>rots into the ground, it becomes part of the soil. At this stage, they are likely to say that it is brown, mud etc which is fine)</p> <p><b>Q: What happens when soil gets wet?</b> (different soils react in different ways to water – one possible answer is that it becomes ‘mud’ – this could lead onto a discussion about why it is important that soil can hold water)</p> <p><b>Q: How do people use soil?</b>(for growing plants in – this will be discussed in more detail in the video in the plenary)</p> <p><b>Q: What do you like to do with soil?</b></p> <p><b>Q: How do you think soil is made? What is it made of?</b> (see above, and plenary video).</p>	<p>5. Put your bottle on a shelf where it will not be disturbed for a day</p> <p>On day of experiment, end by watching this video about different types of soil, and how it is formed, and why it is different.  <a href="http://www.growingthenextgeneration.com/video-2-the-soil-beneath-your-feet/">http://www.growingthenextgeneration.com/video-2-the-soil-beneath-your-feet/</a></p> <p>Ensure children understand that soils are made from a mixture of rocks and organic matter.</p> <p>The next day.</p> <p>What do you notice inside your bottles?          (the soil should have separated into layers).</p> <p>Explain to the children that the bottom layer is gravel, the middle layer is clay, and the top layer is silt. They may also have some organic matter – twigs etc – floating in the water.</p> <p>Is everyone’s the same?</p> <p>Explain that soil is different in different places.</p> <p>Finally, the children can measure the height of each of their layers using a ruler.</p>		
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