

# Science Programme of Study

## Rocks

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This unit has been designed for children in Year 3 and meets the requirements of the 2014 Curriculum

### Introduction to the programme

Rocks feature in the Year 3 Programme of Study for Science. Through this unit, children will compare and describe different kinds of rocks. They will also describe how fossils are formed and have a go at making their own fossils. They will recognise that soils are made from rocks and organic matter. There are potential cross-curricular links with geography and art.

It is suggested that the study of this unit could be enhanced by a visit to the DISCOVERIES: Art, Science & Exploration from the University of Cambridge Museums exhibition at Two Temple Place, London between 31 January and 27 April 2014. Should this not be possible, it is suggested that a visit to an alternative museum or gallery could be arranged. However, if no visit is possible, the plans and resources will work well as a stand-alone unit.

It is also suggested that teachers organise a visit to somewhere in the local area where rocks could be investigated – and ideally hunt for fossils. Soil samples are required and it would be best if these were from a variety of locations in the local area.

### Resource requirements

It is very important that children have the opportunity to investigate and explore with real rock specimens. A rock pack is available from [www.ukge.co.uk](http://www.ukge.co.uk) for £29.50 at the time of printing. This includes 11 different types of rock.

Ideally they will also have access to hand lenses so they can look closely at the composition of the rocks.

Additional resources which are required are listed on the planning, but are likely to be in school already.

## Recommended websites

For resources – [www.ukge.co.uk](http://www.ukge.co.uk) (see above)

For subject knowledge – [www.learner.org/interactives/rockcycle/index.html](http://www.learner.org/interactives/rockcycle/index.html)

Other websites are referred to in the planning.

## Lesson Variations

The session plans for this unit are detailed.

Suggestions have been made about how to differentiate activities for children with Special Educational Needs, children with English as an additional language, and children who are gifted and talented.

Each lesson also has a resource list which makes it clear which resources have been included in this pack, and which need to be sourced at school.

# Year 3 Rocks Session 1

Duration 1-1.5 hours Date:

Planned by Matilda Munro for Two Temple Place, 2013

Main teaching	Activities - Differentiation	Plenary
<p><b>LO:</b> To be able to describe and compare different types of rock.  <b>CCL - Geography (can investigate rocks in local area)</b>  <b>Optional preparatory work:</b>            This session could follow a gallery or local area visit (see introduction to scheme).            Setting up – to start, on each table should be a selection of different rocks (3 minimum) with a number stuck on them. Ideally, each number should be the same for each table – i.e. all number 3s are sandstone. One worksheet per child – or can easily be drawn into books to save paper.            Explain to the children that this half term in Science, they will be geologists.  <b>Q: What is a geologist?</b> Explain that geologists are scientists who study what the earth is made from. They will be particularly concentrating on rocks.  <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.  <b>Q: Are all rocks the same?</b>            On the whiteboard, show images of different rocks, and also man-made substances which are like rock (e.g. brick and cement).  <a href="http://www.rocksforkids.com/RFK/Rocks&amp;Minerals.html">http://www.rocksforkids.com/RFK/Rocks&amp;Minerals.html</a> - links to pictures of many rocks.  <b>Q: Which of these are rocks? Which are not rocks? What are they? How do you know?</b> Ensure 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.  <b>Q: What words would you use to describe rocks?</b>            Allow children to use talk partners, and feed back to the rest of the class.            Model looking at a rock, and using children’s vocabulary suggestions to write description next to sample number.</p>	<p><b>Activity 1 (in mixed ability groups): Samples on tables.</b>            Children to have selection of rocks on the tables. In pairs or threes, children to handle the rocks and discuss them. Then record descriptions on worksheet.</p> <p><b>Activity 2 (in mixed ability groups) Hand lenses, magnifying glass questions, samples and vocabulary on tables.</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>HA:</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>SEN:</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>Assessment:</b> The development of children’s understanding should be shown by a comparison between their descriptions for each activity.</p> <p><b>Success criteria:</b>            I understand that there are different types of rock.            I know that rocks have different textures.            I know that rocks vary in appearance.            I can describe and compare different types of rock.</p>	<p>Mini-plenaries in session to discuss each rock, and children’s answers to key questions.</p> <p>Go through the different samples and discuss children’s descriptions.</p> <p><b>Q: How do these rocks compare to each other? Which do you think would be the strongest? Why? What do you think each would be used for?</b></p> <hr/> <p><b>Resources</b></p> <p><b>(Bold = in pack)</b>  <b>Magnifying glasses Resource sheet</b>  <b>Vocabulary sheet</b>  <b>Worksheet</b>            Rock samples (see introduction to pack)            Hand lenses            Images of different types of rock and man-made substances e.g. lego, brick, cement</p>

# Year 3 Rocks Session 1 Continued

Duration 1-1.5 hours    Date:

Planned by Matilda Munro for Two Temple Place, 2013

## Main teaching continued

At this stage, do not particularly comment on, or improve the children's suggestions for descriptive words and phrases.

Children go to tables for **Activity 1**.

Allow children to complete the activity, and then discuss their suggestions for each sample. Highlight areas of agreement – e.g. everyone described their sample five as white – or any areas of disagreement.

Explain that as with any topic, sometimes it helps to use particular, specific words 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 (more on vocabulary sheet)

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.

### Activity 2

Put hand lenses, vocabulary sheets and magnifying glass questions on the tables. Children should then return to the samples, with their magnifying glass questions and compare and describe the rocks using the correct vocabulary.

**ICT:** Showing images on interactive whiteboard.

**Ethnic Minority Achievement/English as an additional language learning strategies:** modeling, visual scaffolding, mixed ability grouping

**Every Child Matters:** Enjoy and Achieve

# Year 3 Rocks Session 2

Duration 1-1.5 hours Date:

Planned by Matilda Munro for Two Temple Place, 2013

Main teaching	Activities - Differentiation	Plenary
<p><b>LO:</b> To explore how and why rocks change over time.</p> <p>Review learning from previous 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 grandpa?</b> Discuss the children's answers. 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. Show weathering and erosion clip from this website: <a href="http://www.learner.org/interactives/rockcycle/change3.html">http://www.learner.org/interactives/rockcycle/change3.html</a> Explain that through weathering – wind and water – the rock is eroded, and fragments break off. 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 wind.</p> <p><b>Q: What do you think happens to the fragments of rock?</b> Show compacting and cementing clip from the same website. 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. If possible, take children to see rocks of different ages – for example (where appropriate) to a graveyard – or photographs could be used.</p> <p><b>Q: How have these rocks changed over time? Why do you think they have changed?</b> [If appropriate, some children could also be introduced to the idea that temperature and pressure (being squashed) can also change rocks]</p>	<p><b>Activity</b> (On mixed ability tables) Children to put their 10 rocks into a container with a water-tight lid. Fill the container with water and put lid on tightly. Take it in turns to shake the container whilst counting up to 100. 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. They should discuss (and record if desired) any changes they notice to the rocks, and to the water.</p> <p><b>SEN:</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>G&amp;T:</b> Potential extension work on caves which are also caused by erosion. <a href="http://www.goodearthgraphics.com/virtcave/">http://www.goodearthgraphics.com/virtcave/</a> This website has photographs from various caves, with some explanation of how they were made.</p> <p><b>Success criteria</b> I understand that rocks can change over time. I understand that the wind and water can erode rocks. I know that some rocks erode more easily than others.</p> <p><b>Vocabulary</b> fragment weathering erosion wind rain water sediment</p>	<p>Show photographs of landscapes with weathered rocks e.g. Paracas in Peru caves old gravestones</p> <p>Ask children to discuss how they have changed over time.</p> <hr/> <p><b>Resources</b></p> <p><b>(Bold = in pack)</b> Containers with water tight lids Rocks (children to collect these). Sieves Other containers</p>

# Year 3 Rocks Session 2 Continued

Duration 1-1.5 hours    Date:

Planned by Matilda Munro for Two Temple Place, 2013

<p>Main teaching continued</p>		
<p>Take children outside and ask them to collect about 10 rocks for their group. If there will not be sufficient rocks in the local area, these will need to be provided.</p> <p><b>Q: How could we investigate the weathering of these rocks?</b> Explain the activity. Children carry out the activity.</p> <p><b>ICT:</b> Showing clips on whiteboard</p> <p><b>Ethnic Minority Achievement/English as an additional language learning strategies:</b> modeling, visual scaffolding, mixed ability grouping</p> <p><b>Every Child Matters:</b> Enjoy and Achieve</p>		

# Year 3 Rocks Session 3

Duration 1 hour. Date:

Planned by Matilda Munro for Two Temple Place, 2013

Main teaching	Activities - Differentiation	Plenary
<p><b>LO:</b> To investigate whether rocks let water through them (permeability). 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. Allow the children to investigate and describe what they have seen (<b>Activity 1</b>).</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>Then encourage the groups to order their rocks from most bubbly to least bubbly. – They are sorting them by permeability.</p> <p><b>Ethnic Minority Achievement/English as an additional language learning strategies:</b> modeling, visual scaffolding, mixed ability grouping <b>Every Child Matters:</b> Enjoy and Achieve</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>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>SEN:</b> Supported in mixed ability groups.</p> <p><b>G&amp;T:</b> They could time how long the bubbling continues and record their findings in a graph.</p> <p><b>Success criteria:</b> I know that some rocks have spaces between their grains, and others do not. Rocks that allow air or water through them are permeable. I can test to see if a rock is permeable or not.</p>	<p>Discuss the uses of permeable and impermeable rocks.</p> <p><b>When might you need to use a rock which was impermeable?</b> (e.g. slate for roof tiles)</p> <p><b>Resources</b></p> <p><b>(Bold = in pack)</b> Clear containers filled with water – 2 per group (clear plastic cups would be fine) Rock specimens from session 1 ensuring you have a mixture of permeable and impermeable rocks</p>

# Year 3 Rocks Session 4

Duration 1 hour. Date:

Planned by Matilda Munro for Two Temple Place, 2013

Main teaching	Activities - Differentiation	Plenary
<p><b>LO:</b> To understand what fossils are and how they are formed.  <b>CCL:</b> Art (by making fossils)  <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=3rkGu0BftKM">http://www.youtube.com/watch?v=3rkGu0BftKM</a>            Pause at key points to discuss. Ensure main teaching points are clear:</p> <ol style="list-style-type: none"> <li>1. Fossils are made after a plant or animal gets buried by layers of rock.</li> <li>2. Over time, the plant or animal remains are washed away, leaving a mould in the shape of the animal behind.</li> <li>3. Over even more time, this mould gets filled with bits of rock.</li> <li>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.</li> </ol> <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 of years old.</p> <p>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...            Continued on right</p>	<p><b>Activity:</b>            Making fossils  <a href="http://www.homegrownfun.com/how-to-make-homemade-fossils-classroom/">http://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 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.</p> <p><b>HA:</b> Could help design a museum exhibition with the class's specimens making labels and arranging them.</p> <p><b>SEN:</b> With support of an adult or partner should be able to access the activity.</p> <p><b>Success criteria:</b>            I know that fossils are very old.            I can explain what fossils are.            I am beginning to explain how fossils are made.</p>	<p>You could re-watch the video to consolidate understanding.</p> <p><b>Q: What have you learned about fossils that you did not know before?</b>  <b>Q: What did you enjoy about making your own fossil?</b>  <b>Q: What did you find tricky?</b></p>
	<p><b>Main teaching continued</b></p> <p>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 (see website under activity).</p> <p><b>ICT:</b> YouTube video and ichthyosaur picture  <b>Ethnic Minority Achievement/English as an additional language learning strategies:</b> modelling, visual scaffolding, mixed ability grouping  <b>Every Child Matters:</b> Enjoy and Achieve</p>	<p><b>Resources</b></p> <p><b>(Bold = in pack)</b>  <b>Picture of Ichthyosaur</b>            Plaster of Paris            Little plastic creatures            Water and container for pouring            Clay            Paper cups            Stirring sticks            Paints</p>



# Year 3 Rocks Session 5

Duration 1-1.5 hours Date:

Planned by Matilda Munro for Two Temple Place, 2013

Main teaching	Activities - Differentiation	Plenary
<p><b>LO:</b> To investigate soil</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 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). Allow children to discuss – but the answers will be covered in the plenary.</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. Use key questions for guidance.</p> <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> <li>5. Put your bottle on a shelf where it will not be disturbed for a day.</li> </ol> <p><b>HA:</b> They could investigate how different types of soil absorb different amounts of water.</p> <p><b>SEN:</b> Will be able to take part in the experiment.</p> <p><b>Success criteria:</b> I know that soil is not just mud. I know that soil is made of different things and different sizes. I can investigate different soils and compare them.</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/just-for-kids-videos-soil-beneath-your-feet.html">http://www.growingthenextgeneration.com/just-for-kids-videos-soil-beneath-your-feet.html</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? 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>
<p><b>Activity 1</b> at tables. Discuss the children’s responses to the key questions. Explain and model Activity 2.</p> <p><b>Activity 2</b> at tables. (The results of this activity, discussed in the plenary, will need to occur at least 24 hours after the activity).</p> <p><b>ICT:</b> Showing images of children’s work on interactive whiteboard</p> <p><b>Ethnic Minority Achievement/English as an additional language learning strategies:</b> modeling, visual scaffolding, mixed ability grouping</p> <p><b>Every Child Matters:</b> Enjoy and Achieve</p>		<p><b>Resources</b></p> <p><b>(Bold = in pack)</b></p> <ul style="list-style-type: none"> <li>• Clear plastic bottles with lids.</li> <li>• Funnels.</li> <li>• Soil samples from various locations.</li> <li>• Water</li> <li>• Ruler (for next day)</li> </ul> <p><b>Key Questions</b></p> <p><b>Activity 2 instructions</b></p>

## Magnifying Glasses Resource Sheet

Teachers, please copy enough for one magnifying glass per two or three children. Ideally, they need to be cut out, laminated, and stuck together with a paper-fastener so children have questions to think about as they walk around the school.







**Are there  
any shapes or  
patterns on  
your rock?**

**What does  
your rock feel  
like?**





Is your rock  
lighter or  
heavier than  
other rocks  
of a similar  
size?

Can you see  
crystals in  
your rock?



# Vocabulary

**texture**

**smooth**

**rough**

**grainy**

**glassy**

**sandy**

**crumbly**

**crystalline**

**permeable**

**fossil**

**jagged**

**dull**

**shiny**

**sparkly**

**one colour**

**multi-coloured**

**speckled**

**streaked**

**stripy**



# Worksheet

Sample number	Activity 1 description	Activity 2 description
1		
2		
3		
4		
5		

## Instructions

1. Use the funnel to put soil in your bottle until it is 1/3 full.
2. Put the lid on and shake the soil up. What do you notice?
3. Take off the lid. Slowly, using the funnel, fill your bottle with cold water but leave some air at the top.
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?
5. Put your bottle on a shelf where it will not be disturbed for a day.

After a day:

What do you notice?

What has happened to your soil?

**Questions**

**What can you see?**

**Are there things in your sample which are not soil?**

**What does the soil look like?**

**What else do you notice about your soil?**

**Are there different**

**sized pieces?**

**How does it feel?**

