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Contact: info@ukrigs.org.uk

Recommended preparation prior to field work:

At an early stage, a preparatory visit is essential, not only to familiarise yourself with the Earth science aspects but also the wildlife potential of the area. Check the graveyard to locate suitable headstones for the rock identity and weathering exercises. Familiarise yourself with the Teaching Trail on-site.

If the fieldwork includes activities involving Ryton Pools Country Park staff, teachers should follow the guidance given by them. Such a visit may include a programme of work at the Centre classroom and fieldwork in the Country Park and Ryton Wood Nature Reserve, guided by the Education Ranger. Details will need to be arranged prior to the visit. There are toilets and a café next to the RPCP Centre.

It is assumed that, prior to this visit, schools will have already undertaken class-based activities related to rocks and possibly soils. The following packs, published by ESTA, were written to support the QCA Guidance, Unit 3D **Rocks & Soils**. These, and the additional activities listed, will give teachers and pupils a useful vocabulary and introduce Earth science concepts in a practical way. Many can then be put into context by investigating the ancient world largely hidden in the rocks beneath our feet. "**Working with Rocks**" provides useful background on the rock cycle and explains the terms igneous, sedimentary and metamorphic rocks. In both packs porosity and permeability are clearly defined. The UK Geology Wall Map, published by the Ordnance Survey would be useful additional reference material. Teachers may wish to introduce soils as part of the field visit, collecting samples for later investigation.

'**Working with Rocks'** includes the following activities:

1. Sequencing - Story of a marble gravestone [literacy].
2. Sorting rocks - using different criteria, incl texture, colour.
3. Rock identification - using key terms as clues, introducing names of common rocks.
4. Testing rocks - testing for porosity, permeability and "hardness". Making wells.
5. Weathering - how to weather your own rock by freeze/thaw.
6. Use of rocks - devising a town trail & showing the use of building materials.

'Working with Soil' includes the following activities:
Science/Geography:
1. Looking at soil - see, feel, smell, content & properties.
2. Separating soils - by sieving dry.
3. Separating soils - by settling in water.
4. Porosity - water held in pore spaces.
5. Permeability - rate of water draining through.
6. Soil erosion - with or without vegetation cover?

There are also four Literacy and five Numeracy activities based on a storybook about a family of worms! Work on maps includes scale and compass points.

Additional activities:

1. To model layering in sedimentary rocks by settling in water – a demonstration.
Collect samples of different coloured sand, silt, and a few broken shells. Mix each sample with water in a beaker. Half fill a transparent tank or plastic jar with water. Ask the children to predict what will happen when material is tipped in. Carefully pour one beaker at a time into the larger container. Observe the settling of the sediment. Do not disturb. Pour in another beaker and observe. Repeat, using shells and the remaining samples. Note that clay in any of the samples will remain in suspension, make the water cloudy and take ages to settle. The sediment will be layered. Ask the children which is the oldest layer (the one on the bottom). Which is the youngest layer? (the one at the top).

Geologists call this 'the law of superposition' and it helps them to work out the order of a sequence of events as shown by the rocks.

2. To model rounding of pebbles during transport.
Use a tin or plastic tub [with lid]. Weigh ten sugar cubes or chunks of confectionery pineapple. Record in table. Describe & record the shape – with corners and edges.
Place in tin or tub, with lid!
Ask children to predict what will happen when they are shaken. Shake for one minute [timed], carefully remove the "cubes" with tongs [why tongs?], weigh, record in table for later graph. Ask children to describe the shape and size and explain what is happening – corners and edges are being knocked off as a result of contact with other cubes and the sides of the container. Carefully look inside the container for powdered material [try not to blow or inhale!].
Repeat at one minute intervals. Record for later graph [block or line].
How long does it take to make them well-rounded [without corners or edges]?
You could weigh the amount of powder knocked off, but this is difficult [why?] Better to calculate the amount of powder knocked off by subtracting final weight from starting weight.
What would eventually happen if you continued? End up with just powder!
This is done dry. Problem of using soluble sugar etc in water! Is it a fair test?

Relate to erosion/abrasion of pebbles during transport - getting smaller and rounder, with fragments knocked off to form sand and mud. This happens especially in rivers, on the seashore [you can hear it], also in deserts to small pieces and less so in glaciers.
Harder pebbles of vein quartz and quartzite last longer than weaker rocks [see trail notes]. How could this be modelled? Use sugar cubes and pineapple chunks mixed together!!

3. Fossils.
It is unlikely that fossils will be seen on the visit, but children are interested in them and they are a significant part of interpreting Earth science. The definition of a fossil is:

> **"A fossil is the remains or trace of an animal or plant which lived in the distant past and is now found preserved in rocks. A body fossil is the altered remains of an animal or plant itself, eg shell, bone, leaf. A trace fossil is the trace left behind by an animal, eg footprint, burrow".**

Your local museum may have specimens to loan to schools. There are also many reference books available for children.
See also: Teaching Primary Earth Science **Issues 1 – Fossils**; and **22 – Putting Fossils into the National Curriculum.** Making plaster casts of fossils is one activity children enjoy.

4. To model geological time.
There are several ways of demonstrating the immensity of geological time.
The Earth was formed about 4,600 million years ago. Use a paper roll or string to make a time line. At a scale of 1 cm to 1 million years it will be 46 metres long. To fit your classroom, you may need to reduce the scale in the oldest part. The names and dates of the geological periods of the last 570 million years, with significant events, are illustrated in column form on the UK Geology Wall Map, published by the Ordnance Survey. The advantage of a column is that the older are below the younger!

Other comparisons involve using a 24 hour clock or a calendar year.
See also: Teaching Primary Earth Science, **Issue 43 – Geological Time**.

5. Modelling igneous rocks.
This can best be done as part of "Changing materials" – liquids to solids by cooling. Children are likely to have some first-hand knowledge from home, school, holidays, with additional input from TV , including news.
Examples include:

- Water to ice - see the crystals;
- Wax and fat can be melted;
- Chocolate, toffee & sugar-based sweets show solidification on cooling & may show crystallisation. Some are solidified froth or bubbles, like pumice!;
- Industrial melting in furnaces and subsequent cooling – iron & steel making, glass making.

A model volcano can be made by utilising a mixture of baking powder, liquid detergent and red food colouring in the neck of a model volcano and adding vinegar. The eruption produces a red carbon dioxide froth, which trickles down the model!

Magma [molten rock] comes from volcanoes as flows of lava, often full of gas bubbles. It cools rapidly on land or under water as a glass or pumice [glass froth]. Such rapid cooling results in microscopic crystals. Magma cooling slowly at depth beneath mountain chains produces rocks with larger crystals eg granite. Magma cooling nearer the surface forms rock with small-medium crystals, eg dolerite.
Useful illustrations include active volcanoes [Hawaii, Tenerife etc], ancient lava flows [Giant's Causeway etc], granite tors on Dartmoor etc. See also Working With Rocks.
Crystallisation from a watery solution by evaporation is slightly different from cystallising from magma.

6. Modelling contact metamorphism – baking clay.
Hot molten magma loses heat to the surrounding rocks as it cools and crystallises. This baking of rocks is known as contact metamorphism. When clay-rich rocks are baked they re-crystallise and harden. This has happened at Barrow Hill when the dolerite baked the Etruria Marl in Carboniferous times. Limestone re-crystallises to form marble during metamorphism.
If the school has a pottery kiln, this could be a useful time to link with Art.
A sample of clay can be tested before firing, and the children asked to predict the outcome of firing. Fired clay is shrunk, hard, has little water and is only slightly porous. If glazed in a second firing it is no longer porous. This could be linked to the use of bricks and tiles in buildings. In the BBC "Come Outside" series Auntie Mabel and Pip visit a brickworks.
Metamorphism with great pressure turns clay-rich rocks into hard, non-porous slate, which splits at right angles to the pressure.

7. Modelling the Pressure effects of Metamorphism.
The pressures suffered by rocks during metamorphism in plate collisions is immense. The minerals in the rocks accommodate the pressure by re-aligning themselves at right angles to the pressure. This is how muddy rocks become slate. To demonstrate this you need a flat surface, two pieces of wood, about 40 matchsticks [beheaded] or short lengths of drinking straw.
Lay the pieces of wood about 10 cm apart. Scatter the sticks/straws randomly. This represents the unsquashed clay minerals found in mudstone etc.
Ask the children to predict what will happen when the pieces of wood are pushed towards each other.
Gently push the pieces of wood together [as in plate collision], observe how the bits behave. You should end up with the bits aligned in the same direction. This represents the mineral alignment found in slate and how they tend to split easily in one plane.
Ask the children what will happen when the pressure is removed.
They stay in the same alignment, don't rebound, not elastic.
With straws you gan go further and actually crush them. What would happen if you used a vice?
With sandy rocks, the quartz grains tend to be rounded and hard. They do not compress much. Perhaps try to demonstrate this using hard balls.

For Teacher Reference.
The following issues of Teaching Primary Earth Science provide useful background information for a visit to Ryton Pools Country Park:

1- Fossils;	2 - Introducing Rocks;	3 - Soil;
5 - Using Rocks,	9 - Minerals,	10 - Out and About 1,
12 - Out and About 2,	20 - Out and About 3,	24 - Out and About 4,
25 - Out and About 5,	37 - Organising Field Trips.	

Samples of Ryton Pools pebbles, sands and clays should be included in your collection.
See follow-up suggestions.

Ryton Pools Country Park: KS2 Follow-up Work.

Suggested Follow-up work
Much material could go into a folder on the Country Park, being the first part of a wider study, adding later sections on soils, vegetation, wildlife, conservation, recreation and quarrying.

1. Completion of all worksheets [from Teaching Trail notes].
- ***Pupil worksheet 1. - Map of sites in Ryton Pools Country Park.**
- ***Pupil worksheet 2 - Site 1: The "Mystery" stream.**
- ***Pupil worksheet 3 - Site 2: Ryton Pools in the Stone Age [display board].**
- ***Pupil worksheet 4 - Site 2: The view from Paget's Pool.**
- ***Pupil worksheet 5 - Site 3a: The rocks.**
- ***Pupil worksheet 6 - Site 3b: The pebble investigation.**
- ***Pupil worksheet 7 - Site 3b: Counting the pebbles.**
- ***Pupil worksheet 8 - Site 3c: Investigating soil.**
- ***Pupil Summary Worksheets 9 & 10.**

Rock Identification Sheets can be downloaded from Warwickshire website:
http://www.warwickshire.gov.uk/Web/corporate/pages.nsf/WebPrint/A2CEF4DA023AC27E80256A29003D5616?opendocument

2. Classroom display of all aspects of the field visit, including maps, diagrams and photographs. Samples of rock collected from a monumental mason could be displayed, showing a broken, fresh face, suitably labelled. Ask and make a note of where the individual rocks originate. Any sample may be cut [by an adult with a DIY tile cutter] and varnished to bring out the detail, possibly showing layering within the sedimentary rocks, random crystal orientation in the igneous rocks and banding in some metamorphic rocks. Examples include sandstone, limestone, granite, gabbro, marble, slate and dolerite [include a sample collected from Barrow Hill].

The display could include the UK Geology Wall Map. Ryton Pools is in the lemon shading [Triassic] midway between Coventry and Royal Leamington Spa. These rocks underlie the sands and gravels of Ryton Pools. Note the extent of Permian and Triassic rocks up to the Scottish border, containing pebbles eroded from SW England and S. Wales. Rock samples children collect from locally or further afield could be added to the display, with labels and markers linking the sample to the location on the map.

3. Very brief summary of geological events to be used as final summary and in follow-up. This could be given as a list of statements for children to put in order.
1. Deposition of pebble beds and red mudstone in Triassic times, followed by Earth movements and deposition of Jurassic clays and limestones and Cretaceous chalk, sands and clays.
2. Earth movements, uplift, tilting, weathering and erosion of existing rocks for millions of years.
3. Temperate climate, Bytham River cuts across S Midlands to NE. Early Man.
4. Cooling climate, deposition of river gravels and sands.
5. Glacial climate, deposition of till [boulder clay] by glaciers from the north.
6. Later melting and further cooling, with modern drainage of Warwickshire Avon established, flowing to SW cutting through latest deposits.
7. Extraction of sands and gravels for aggregates.
8. Landfill, reclamation, methane extraction and recreation.

4. Make a model of the Country Park – possibly in four parts.
a) **as the original landscape**, covered in trees like Ryton Wood today. [Use "vegetation" purchased from toy/model shops.]
b) **during quarrying for sand and gravel,** use plaster to cement sand to produce the landscape. Show a working quarry with men and machinery etc.
c) **during tipping of domestic waste**, with tipper lorries and compactors [rollers], covering with a liner.
d) **as it is today** with grass, paths and pools. Use "vegetation" purchased from toy/model shops.

5. Research into quarrying and uses of sand and gravel aggregates - in the local area and further afield. Used sand with cement [made from limestone and clay-rich rocks] to make mortar. Gravels may be crushed to size to add to mortar to make concrete used in roads, buildings, paving slabs, kerbstones, roofing tiles etc. Easy to use, transport and pour! Also as lower layers in roads. There are not many hard rocks in the Midlands. Make a collection of small pieces of concrete.

6. Research into the use of transport of aggregates.
Road transport was used for the movement of aggregates from here, especially for major works, like road construction.

7. Research into landfill operations and methane extraction.
The visit to the Martha Methane Exhibition gives a useful insight into the problems and solutions of this important aspect of modern life.

8. Working with Soil.
If not done prior to the visit, it would be appropriate for the Soil topic to follow the visit even if the school isn't following the QCA guidance, Unit 3D –Rocks and Soils. The notes on preparation for the visit give details of ESTA's **Working with Soil** pack. It is anticipated that soil samples will be collected during the visit from a selection of localities and the soil profile in the Centre inspected.