Working with Fossils

HMDT music STEM SISTERS
ENSURING A MUSICAL FUTURE
EDUCATION ZONE

Learning Objectives:

- To recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago;
- To identify how animals are adapted to suit their environment in different ways;
- To identify scientific evidence that has been used to support or refute ideas or arguments;
- To recognise that our understanding of prehistoric animals is based on the evidence we have to date and may change if new evidence is found.

Science Skills:

- Closely observe and compare the skeletons of modern vertebrates;
- Make observations of a fossil skeleton;
- Make a model of a trace fossil.

Resources for each team:

- A copy of the dinosaur skeleton worksheet per group or per child if you prefer
- Paper
- Scissors
- Glue
- Powerpoint "Working with Fossils"
- Modelling clay/plasticine/playdough
- Shells of various shapes
- Plaster of Paris
- Mixing bowls and spoons
- Tray/board
- Hand lenses

WHAT YOU SHOULD KNOW BEFORE YOU START

When Mary Anning and her brother Joseph uncovered the fossilised ichthyosaur skeleton from the cliffs at Lyme Regis, they had no idea what this animal was. It was the first entire skeleton of such a creature to be found. The only way to work out what kind of animal it came from was to compare it with the skeletons of living creatures. In the early 1800s, it was thought that the ichthyosaur could be related to crocodiles or fish.

Until more fossil skeletons of these animals were discovered and compared to one another, it was hard to tell what shape they would have been in life as some fossils were bent or squashed. When multiple skeletons were found, each with a bend in the tail at the same point, scientists realised that this bend was not damage – it was there to support a tail fin much like a shark's tail.

There are two types of fossil:

Body Fossils
These are formed when the body of a dinosaur is buried and becomes encased in mud or sediment. The soft tissue rots away but the skeleton is trapped within the sediment. The sediment is compressed by weight of new layers of sediment above and it becomes rock. Water passing through this rock slowly dissolves away the bone and leaves behind minerals which take the place of the skeleton and form a fossil made of rock.

Trace Fossils
Sometimes an imprint of an animal is left behind – a footprint or the shape of a shell pressed into mud. It was never part of the animal but can give clues about the animal. Footprints can tell us something about the weight of the animal which made them, the number of legs they used to walk upon and the shape of the foot. But, of course, they may not even be found near a fossil of the animal which made them.

Mary Anning and Trace Fossils
Mary Anning often found coprolites on the beach at Lyme Regis. She was one of the first to suggest that the strange fossil shapes could be fossilised faeces. She found several of these in the same area as the fossil skeletons and when broken open they often contained things like fish scales. She told William Buckland about her theories and he even referenced her in the paper he wrote about the nature of coprolites - a rare bit of recognition in an age when women were largely overlooked.

WARM UP – Observation Skills

Display the Powerpoint "Working with Fossils" *Slide 1* of various vertebrate skeletons. In small groups, the children must work out which animal the skeleton belongs to. Once, they have committed their answers to paper, gather lots of suggestions, both correct and incorrect and ask why the group decided upon their answer.

Ask:

- What evidence did you use?

The children will be keen to know 'if they got it right'. Before you reveal the right answers, make the point that Mary Anning wouldn't have had live specimens to compare her fossilised skeletons to. She wouldn't necessarily know if she had found something entirely new.

Then, reveal the pictures of the living animals on *Slide 2* of the PowerPoint.
Make the point that the skeletons of living creatures are positioned correctly. We can see how a live frog sits and moves so we can assemble the skeleton in a lifelike pose.

Ask:

- Imagine if that skeleton had been crushed flat and maybe even folded in half so that some of the bones appear to be at the front when they belong at the back. Would it have been so easy to work out what the animal looked like from a skeleton like that?

- Do you think palaeontologists know for sure that they have got the reconstructions of skeletons correct?

- Where else might they get clues?

(Trace fossils such as footprints can show how many legs they used for walking and their stride length. Comparison with living creatures with similar skeletons can give clues about how they might have stood.)

INTRODUCTION

There are two types of fossil – trace fossil and bone fossils. Show the children this animation from The Natural History Museum Website to see how each type of fossil is formed.

https://www.nhm.ac.uk/discover/how-are-fossils-formed.html

MAIN TASKS – making body fossils and trace fossils

1. **Reconstruct a paper skeleton from pieces.**

In small groups, the children should cut out and manipulate the dinosaur skeleton pieces to reconstruct the whole skeleton in a lifelike pose and then glue them onto a separate sheet. Allow time for discussion and then once they have completed the skeleton, they should compare it with the version from another group to see if they agree or disagree with them. You may want them to complete one of their own as well.

Look at the completed reconstruction of the raptor on *Slide 3* of the PowerPoint. Discuss what the skeleton might tell us about:

- How the animal moved
- What they ate
- If they were predator or prey
- Where they might live

2. **Make a trace fossil.**

Watch this video about how dinosaur footprints are made.

https://www.bbc.co.uk/teach/class-clips-video/science-physics-ks2-ks3-how-dinosaurs-get-made-in-solid-rock/zbm4d6f

Introduce the idea that sometimes a print of an object can be made in the sand or clay and this imprint can be preserved.

Give each child a piece of modelling clay (clay/plasticine/playdough) which is about the size of a satsuma and a selection of shells. Tell them to explore the different imprints they can make by pressing the shell into the top of the dough. Roll the dough back into a ball and press down onto a tray or board so that the base is flattened, and the dough will not roll. Press the shell into the dough to make a clear imprint which creates a dip in the top of the dough. Remove the shell, leaving the imprint.

In small groups, under adult supervision, mix up some plaster of Paris and spoon a little into the imprint to make a permanent cast of your 'trace fossil'. Leave to set and then remove the clay. Make sure you have read the instructions on the packet carefully and take safety precautions – some are suggested below.

Once the plaster has set, peel away the clay. Look closely at the cast you have made.

Ask:

- How much detail can you see with a magnifying glass/handlens?
- Why might you need to make a cast of a trace fossil? (details could become weathered away/ can't remove the fossil/ inaccessible position for close examination)
- What kind of evidence might a trace fossil of a dinosaur footprint give us?

Note that you might never find a fossil of the dinosaur that made those footprints!
Sometimes shells can dissolve leaving a mould and cast behind:

Read this page to find out more:

https://www.nhm.ac.uk/discover/how-are-fossils-formed.html

EXTENSION
Research other types of trace fossil which can be found e.g. coprolites. It was Mary Anning who first suggested what these fossils might actually be.

FINALE:
To end the lesson, watch this video of body fossils being found inside a trace fossil!

https://www.bbc.co.uk/programmes/p00l17zf

Discuss the rare conditions in which fossils are made and the rare conditions which bring those fossils to the surface in a place where they can be discovered. Sediment is often carried to the sea in rivers where it then drops to the bottom, as the water slows down, and it covers whatever is on the sea floor. Fossils of marine animals are, therefore, more common.

Ask:

- How many fossils do you think there are in the sedimentary rock of the Earth's crust?
- Can you think of any reasons why most of them will never be found?

REVIEW
ALL: will know that fossils provide evidence of living things that inhabited the Earth millions of years ago.
MOST: will know the difference between a trace fossil and a body fossil and why dinosaur fossils are rare in comparison to marine fossils.
SOME: Students will be able to explain the variety of evidence that can be gleaned from trace fossils and body fossils and how these help palaeontologists to imagine what the animal might have looked like in life.

Information on websites to link to this activity:

https://www.nhm.ac.uk/discover/how-are-fossils-formed.html

WORKING SAFELY WITH PLASTER OF PARIS

CLEAPSS Guide PS 74 – Using Plaster of Paris in Primary Schools is a good reference for H&S for this activity.

- Pupils should be supervised at all times.
- Brief the students on the Hazards of plaster of Paris. Explain the need to handle the powder with care to minimise the chance of dust and never to mix up large quantities.
- Explain that it can get hotter as it solidifies and so they must not touch the plaster with bare hands.
- Any spillages should cleaned up as soon as possible by the adult.
- Dispose of fragment of separately from normal solid waste.
- Thoroughly wash hands after use.
- Store plaster of Paris in secure packaging/container and in a safe location.
- Keep out of children's reach when in storage and in an unsupervised location.
- Give the pupils the plaster of Paris in very small quantities (a few teaspoons at most) in individual pot so they don't have to transfer the powder themselves.