

HORN PARK QUARRY

National Nature Reserve
and Fossil Box

Teachers' Pack

Fossils at your Fingertips

Horn Park Quarry National Nature Reserve is an exceptional and unique place for children and young people to learn about fossils and rocks through practical outdoor learning activities. The rock exposures in the small site offer a wide range of learning opportunities all within a very safe environment. Led by an expert guide, students can be Fossil Detectives for the day through learning how to create maps, being part of a Fossil Time Team, and even hunting for their own fossils!



The Jurassic Coast Connection

Horn Park Quarry has a direct link to the Jurassic Coast World Heritage Site. The rocks and fossils exposed in the quarry are also found along the World Heritage Site, but only at the top of the cliffs near Burton Bradstock. Obviously this is not safe or practical unless you are a nesting bird, which is why Horn Park Quarry is so brilliant for visiting educational groups. It's a chance to get close and personal to creatures that died out 165 million years ago.

Let the Fossils do the Talking

We have an amazing collection of fossils from Horn Park Quarry that your students can use as an aid to learning in the classroom. The possibilities of using the fossils for cross curricular learning are limitless from creating a mini-museum to writing creative stories about mysterious creatures of the past. Our fantastic fossil collection costs £10 to hire for a minimum three week period. We think that's pretty good value for 165 million years of earth's history in a box!



Want to Find out More?

To book a visit to Horn Park Quarry or to borrow the fossil handling collection please contact:

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CONTENTS

	Pages
The Jurassic Coast and our VIP Rocks	2
What's the Story with Horn Park Quarry?	2
Rocks and Fossils – Now for the Science Bit	3
It's all about the Fossils	4 - 5
Our Take on Fossil Collecting	6
Marvellous Museums	6
Visiting Horn Park Quarry: Activities	7 - 15
Horn Park Quarry Fossil Box: Activities	16 - 29
Still looking for ideas?	30

KEY WEBSITES

**Jurassic Coast
World Heritage Site**
www.jurassiccoast.org

Natural England – Horn Park Quarry
www.naturalengland.org.uk/ourwork/conservation/designations/nnr/1134258.aspx

Beaminster Museum
www.beaminstermuseum.org

Check out these
websites to find
out more...



The Jurassic Coast and our VIP Rocks

As a World Heritage Site, the Jurassic Coast is part of a large international family managed by UNESCO (United Nations Educational, Scientific and Cultural Organisation). They have a pretty big job helping countries to identify, protect and conserve outstanding natural and cultural heritage for everyone in the world, forever. The Jurassic Coast is home to some of the most spectacular and varied coastal landforms and landscapes (geomorphology) in the world. Across the 95 miles of coast, the sea has shaped the coast into a series of incredible beaches, cliffs and bays that have some incredible and unique landforms. From Durdle Door (a natural coastal arch) to Old Harry Rocks (chalk stacks), the coastline is like a geography textbook come to life (ice cream and sand between your toes is optional though). The rocks underpin the biodiversity in the landscape and influence how the landscape is used so that across the coast there are myriad of stories to explore.

Horn Park Quarry is an important part of our geological story since the rocks exposed at the top of the cliffs near Burton Bradstock, are found at ground-level in the Quarry. Accessible, safe and truly amazing; visiting Horn Park Quarry is like scuba diving at the bottom of a Jurassic sea bed. Well almost, except you're a little less wet.



What's the Story with Horn Park Quarry?

The rocks at Horn Park quarry are a type of limestone called the Inferior Oolite (stop laughing at the back there, that's a real geological term). The rocks were laid down in shallow tropical sea between 175 and 165 million years ago. As the layers of rock were laid down they were jostled by faults and cracks caused by the ongoing break up of Pangea (an ancient supercontinent). Incredibly, these faults can actually be seen today at the quarry. Eventually these layers were buried as rocks continued to form throughout the Jurassic and Cretaceous period. Today these rocks help shape the landscape of West Dorset, forming the flat tops of many of the hills in the area.



The continents during the Jurassic Period

Horn Park Quarry itself was a source of commercially quarried building stone for almost 200 years until it closed in the 1980's. Extraction tended to take place as and when it was needed and was not continuous. Small quarries like Horn Park were once the supply of local building stone.

The honey coloured limestone that came from local quarries was used throughout West Dorset, particularly in Bridport, Symondsburry, Beaminster, Broadwindsor and the surrounding villages. Small quarries are a part of local history and our local rocks help to define a sense of place.

There are buildings in the local area dating from the 12th to the 18th centuries like churches, cottages and farmhouses that are built from the same stone which can be found at Horn Park Quarry. At the time it made sense to source stone for buildings from local quarries, which is why so many Dorset villages are great places for studying local geology. The rocks that were suitable for use as building stone lay above layers that contained abundant fossils. As these fossil rich layers were left behind, fossil collecting became very popular in the Quarry and much of what was exposed and left behind was collected or removed in the 1970s and 80s.

Scientists have known for many years that Horn Park Quarry was an important geological site. It is now a Special Site of Scientific Interest, and a small part of the fossil rich rock exposure was protected and designated a National Nature Reserve – the smallest in the whole country! Horn Park Quarry is managed by Natural England in partnership with the Jurassic Coast Team.



Map of the Jurassic Coast and location of Horn Park Quarry

Rocks and Fossils – Now for the Science Bit

Almost everything we know about the history of planet Earth comes from studying rocks. For instance, we know that during the Jurassic Period, Dorset was covered in a warm tropical sea and that sea levels rose and fell by hundreds of metres over millions of years. The reason for these incredible shifts in climate between then and now is all down to a process called plate tectonics. Basically the crustal plates on the Earth's surface have been moving and shifting for billions of years. That is how 170 million years ago, Dorset was almost on the equator!

As the plates have moved around on the earth's surface, global sea level and climate have changed repeatedly, affecting the environments where rocks formed. Over billions of years, the continents on the Earth's surface have broken apart and joined together several times. During the Jurassic Period a massive super-continent called Pangaea, made up of all the land masses on Earth, was breaking up.

The Jurassic Period (200 - 140 million years ago)

Across the world the Jurassic period marks a huge change in climate as Pangaea broke up. In some areas, dense lush jungles evolved and were home to the early dinosaurs. Our bit of the earth's crust started to sink as sea levels began to rise and a vast tropical sea began to form. Swimming about in this Jurassic sea were large numbers of Fish, Ammonites and Belemnites. The largest marine predators were reptiles called Ichthyosaurs, Plesiosaurs and Pliosaurus. Ichthyosaurs had streamlined bodies like dolphins, Plesiosaurs had long thin necks and needle sharp teeth and Pliosaurus were simply the most powerful and scariest predators that have ever existed (even bigger than T-Rex!). The rocks at Horn Park Quarry formed during the middle part of the Jurassic during a time when sea levels were relatively low. The environment at the time would have resembled the Bahamas – a tropical paradise teeming with marine life. We wish we were there too, only without the creatures with sharp teeth.



Duria Antiquior by Henry De La Beche.
Reproduced courtesy of the Department of Geology, National Museum of Wales

It's all about the Fossils

Fossils can tell us about what an environment was like, how an animal lived and even what it had for dinner! Fossils come in many forms; they can be the actual remains of an animal, traces where a creature (or plant) lived or moved or even an imprint of a natural process (like a ripple on a beach). In most cases, the ideal conditions for fossils to form are when an animal or plant dies and their remains are buried very quickly. Horn Park Quarry is world famous for the amazing abundance of fossil ammonites found there. Scientists studying the ammonites have discovered that Horn Park Quarry represents an almost complete record of a part of the Jurassic period and the small disused quarry is now used to correlate rocks of the same age throughout the world.

Ammonites

The beautiful coiled shells of ammonites are probably the most recognisable fossil in the world. Ammonites are extinct and because no soft parts of ammonites are ever found fossilised we don't know exactly what they looked like. We do know they belonged to the same group of animals as octopus, squid and nautilus so they must have been quite similar to these creatures and used their gas-filled shells to float and move up and down in the water. Despite becoming extinct, Ammonites were very successful creatures and their fossils tell us that they lived for millions of years. Ammonites can be found all over the world and they adapted themselves to survive in a wide range of habitats. The result was that there were a great many of them living in the oceans. That's a lot of great aunts and uncles, which would have meant getting lots of socks at Christmas.

Suture lines – these beautiful patterns on ammonite shells show how the sections in the shell are joined together and they are designed to give strength. Similar patterns can be seen along the joins in mammal skulls.



Nautilus – Nautilus are known as 'living fossils' they first appeared around 400 million years ago and have remained almost unchanged ever since. They bear a striking resemblance to ammonites except they did not go extinct like ammonites did 65 million years ago.



The ammonite tourist – An extremely rare ammonite found at Horn Park Quarry shows us something about how the world was changing during the Jurassic Period. This particular ammonite (only one has been found here in 30 years!) is thought to have migrated all the way from the Pacific Ocean through a sea-way that formed as the super continent Pangaea broke up. It would have travelled a very long way from its home to become fossilised in the Horn Park Quarry rocks and this is why it is so rare. We just hope it didn't lose its luggage on the way.

Belemnites

These bullet shaped fossils of belemnites were once known in folklore as 'thunderbolts'. They are actually the hard internal shell of an animal that would have closely resembled a squid. Belemnite fossils are very common in Jurassic aged rocks along the coast, particularly around Charmouth. Here the beaches can be strewn with them after a storm, but at Horn Park Quarry the belemnites are a bit harder to find.



Bivalves

- Fossil sea shells

The seashells that are common on beaches today also appear as fossils in Jurassic rocks. Clams and oysters are the most common, but there are many different varieties, shapes and sizes. The name 'bivalve' comes from the fact that these creatures have two shells that close together protecting the animal inside.



Gastropods

- Fossil sea snails

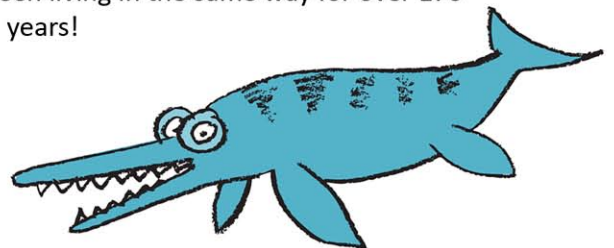
Fossil sea-snails are common in some Jurassic rocks but can be difficult to find at Horn Park Quarry. Some can be very large (about the size of a person's fist) and others can be small (about the same size of a modern winkle).



Worm Casts

Fossil ammonite shells from Horn Park Quarry often have fossilised casts of marine worms attached to them. Worms still make their homes on the shells of other marine creatures today. It is very common to find modern mussel shells with worm casts on. This shows that marine worms have been living in the same way for over 170 million years!

Where are all the Ichthyosaurs?



When the rocks at Horn Park Quarry were being laid down the largest marine predators would have been living in much deeper water. The environmental conditions were also far from ideal for preserving bones and skeletons and so these fossils are extremely rare.

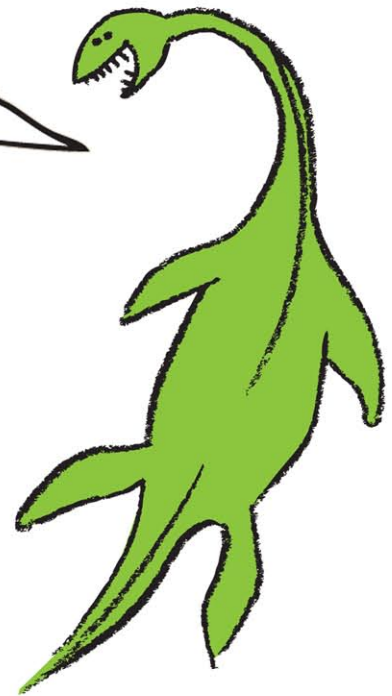
Our Take on Fossil Collecting...

Why are people allowed to collect fossils freely on the coast at Charmouth but Horn Park Quarry has a big fence around it? Well, there are good reasons for this. The cliffs at Charmouth are composed of soft clays and limestones which are rich in fossils. When the waves attack the cliffs, they erode quickly and any fossils that are released are lost to the sea. However, they can be saved if they are collected by people like you and me. We know that there are thousands of fossils still left in the cliffs at Charmouth, so the likelihood of all of the fossils being collected and taken away is very small. Horn Park Quarry is a very different site where there are only a small amount of fossil rich exposures left after many years of quarrying. If these fossils were collected, not only would the remaining exposures be lost but a very important resource to science would be lost.

Why not visit Charmouth and Horn Park Quarry to compare the two sites?

To appreciate the differences between the two sites, this can be a great discussion to have as a class, either on a fieldtrip to Horn Park or in the classroom. Questions to pose could include:

- Should people be allowed to collect fossils or should they only be for scientists?
- How would you protect fossils along the coast where the thing that exposes them – erosion – also destroys them?
- What are the differences between fossil collecting at Horn Park Quarry and at Charmouth? What are the reasons for the differences?



Marvellous Museums



Museums near Horn Park Quarry offer additional resources for schools visiting the area.

Beaminster Museum

You'll find a dedicated display about Horn Park Quarry here as well as staff able to lead visits to the quarry and run activities with your class. The museum also covers local history from prehistoric flint tools to the invention of the Henry Hoover!

Bridport Museum

Bridport Museum contains a collection of high quality fossils from the Jurassic Coast. A visit to their Jurassic Coast Gallery, with their broader collection of local fossils, will complement a visit to Horn Park Quarry.

VISITING HORN PARK QUARRY

Horn Park Quarry is a small, disused quarry near Beaminster in West Dorset. It is situated at the back of a small industrial park and is not open to the public. Visits must be arranged through Beaminster Museum.

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Site Description

- A fantastic exposure of limestone rocks that formed in a tropical sea 170 million years ago during the Jurassic Period.
- Rock layers show evidence of how they were formed and what processes were operating in the ancient environment including faults, different rock layers and an exposed ancient seabed.
- A low rubble pile has been created specifically to allow visiting groups to search for fossils. It is safe, and groups will be able to take a small amount of fossil away with them.
- An exposure of fossils still in the bedrock has been created to fully show the quality of the geology of Horn Park Quarry. This exposure is protected by a wooden cover that can be removed to allow access.

Facilities

- Ample adjacent parking for one coach or 2 -3 minibuses
- There are no toilets on site
- The site is in a relatively sheltered landscape but is fully exposed to the elements. There are no undercover areas.
- Beaminster museum is only 1.5 miles away and is able to act as a base during a trip to the quarry. A toilet stop can be made either at the museum or in Beaminster town before or after visiting the site.

Suggested equipment for a visit to Horn Park Quarry...

- Fossil hammer and several sets of goggles (group leader only)
- Clip boards, plain paper, gridded paper, graph paper, map of site
- Pens, pencils, erasers
- Camera, video/flipcam, hand lenses
- String, scissors, tape measures, metre rules, 30cm rulers
- Newspaper, cotton wool, plastic bags (for any specimens collected)

You don't need all of these, choose what works best for your group.



HORN PARK QUARRY: FIELD VISIT	
ACTIVITY 1: MAPPING THE QUARRY	TIMING: 20 - 40 MINUTES
AIM	Using an aerial photograph, students must create a map of the quarry detailing the main features of the site.
PREPARATION	You will need sufficient copies of aerial photographs to distribute to the students. Ensure that you have measuring tapes, ranging poles and compass clinometers to take accurate measurements of features.
ACTIVITY	OUTCOMES
Using the aerial map of the quarry provided, ask the students to draw and label the main features of the site.	Students can relate aerial image to location and identify the extent of the different features or zones.
Next ask the students to add written descriptions of the main features. Features to look out for include the rock face, back slope, the surface of the quarry floor, the faults and the fossil bed exposure.	Height, aspect, features of each main area of the site are described, including reference to layers, fossils, cracks etc.
Use measurements to create a more detailed map by including a scale and information such as heights, depths, slopes/ angles, layers and aspect (use compass).	Students select and use suitable means to add useful measurements to descriptions of the site (students could use long tape measures or "paces" and later convert these into metres). Scale bar could be added to map. Students could calculate total area of the site.
KEY WORDS	
Observe, Describe: Quarry face, fossil exposure, bedding plane, fault, crack, layers. Measure and Record: Scale. Slope. Aspect.	
EXTENSION TASKS	
<ol style="list-style-type: none"> 1. Make detailed sketches of main features or one of the main features 2. Take photographs while on site 3. Ask students to describe the main features of the site verbally using video or audio recordings. 	

HORN PARK QUARRY: FIELD VISIT

ACTIVITY 2: DEVELOPING GEOLOGICAL IDEAS

TIMING: 20 - 40 MINUTES

AIM	With a guide, study the flat floor of the quarry, the rock layers at the rear of quarry and the back slope. Students discuss and formulate theories to try to explain these features.
PREPARATION	You will need to have divided your students into small groups and if necessary, ensure they have copies of the "Learning Grid".

ACTIVITY	OUTCOMES	KEY IDEAS
<p>In groups, ask the students discuss the following questions:</p> <ul style="list-style-type: none"> • Why is the quarry floor so flat? • Why are there layers in the rock face at the rear of the quarry? • Why is some of the quarry back sloping and covered in soil? • Why are there cracks and gouges in the quarry floor? • What is the difference between these two? <p>Ensure that the students record their observations, conclusions and evidence.</p>	<p>Students develop questioning skills, thinking and discussion skills (with limited support) which can then be used to interview an "expert" (group leader) to confirm, modify or extend student's understanding.</p> <p>Students can already be trained in independent thinking and learning or this can be an introduction into the power of formulating and asking questions. Using a learning grid (printed either A4 or A3) can really help structure thinking.</p>	<p>Quarrying removes large quantities of rock from the ground. It is essential for providing rocks and ores. This has environmental implications and land use issues.</p> <p>Natural features and man-made features can look similar (faults/cracks or scrapes made by vehicles).</p> <p>Rock varies in hardness, texture and properties (hard vs. soft etc).</p> <p>Fossils can be revealed whenever fossil bearing rocks are uncovered.</p> <p>Exposed rocks can weather and overlying soil can wash down and cover exposed rocks.</p>

KEY WORDS	Observe, Describe, Discuss, Compare, Conclude and Explain: Quarry face, fossil exposure, bedding plane, fault, crack, layers.
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EXTENSION TASKS	Using a 'Learning Grid', groups of students can formulate their own questions to help structure their investigations on-site or research after a site visit.
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ACTIVITY 2: LEARNING GRID *Sample questions (students could be given some worked examples and then encouraged to develop their own questions)*

What do we know already?	What do we want to find out more about?	How can we find out more?	Done ✓
There are different layers of rock at Horn Park Quarry	How thick are the layers? How many are there? What differences are there between layers?	Measure and count the rock layers during our site visit. Observe colour/ texture and hardness of rocks.	
Horn Park used to be a working quarry	Is there anything at the quarry to show how stone was dug?	When we are examining the rocks on site we should look for markings left behind by quarrying	

HORN PARK QUARRY: FIELD VISIT

ACTIVITY 3: FOSSIL TIME TEAM!

TIMING: 20 - 90 MINUTES

AIM

Students play fossil detectives and map out the fossil rich beds that are part of the National Nature Reserve.

PREPARATION

The Guide will need to unlock the protective cover and you will need adults to lift it away to gain access to the site.

ACTIVITY

KEY IDEAS

Students gather around the protected fossil bed exposure. Safety / care of fossils are discussed and the purpose of the cover.

Students are given an introduction to the fossil exposure and key features and issues. How scientists can study and record detailed finds.

Why are fossil special? Why do exposures need protection? Why keep fossils in their original layout and location? What happens to collected fossils?

Working in a small group students help to divide the fossil exposure into squares with string and a tape measure using the wooden frame as a base.

Students work in teams and share or divide roles. Students develop data collection, recording and presentation skills.

Even in the age of digital cameras, observing first hand and especially drawing key features is an essential part of properly studying paleontological (and archaeological) features.

Each student makes a 'field sketch' of one square of the fossil bed as carefully as possible on a blank sheet of squared paper focussing on scale, size and exact positioning of key fossils, imprints, cracks and features.

Students observe, draw and record key visual information, measurements and features, annotating with additional observations.

Scientists work in teams to study, observe and record information.

In the classroom each group's drawings can be put together with others to make giant maps of the fossil exposure.

Drawings can later be assembled into a large display, and compared to a large photograph (available as a digital copy or poster sized print).

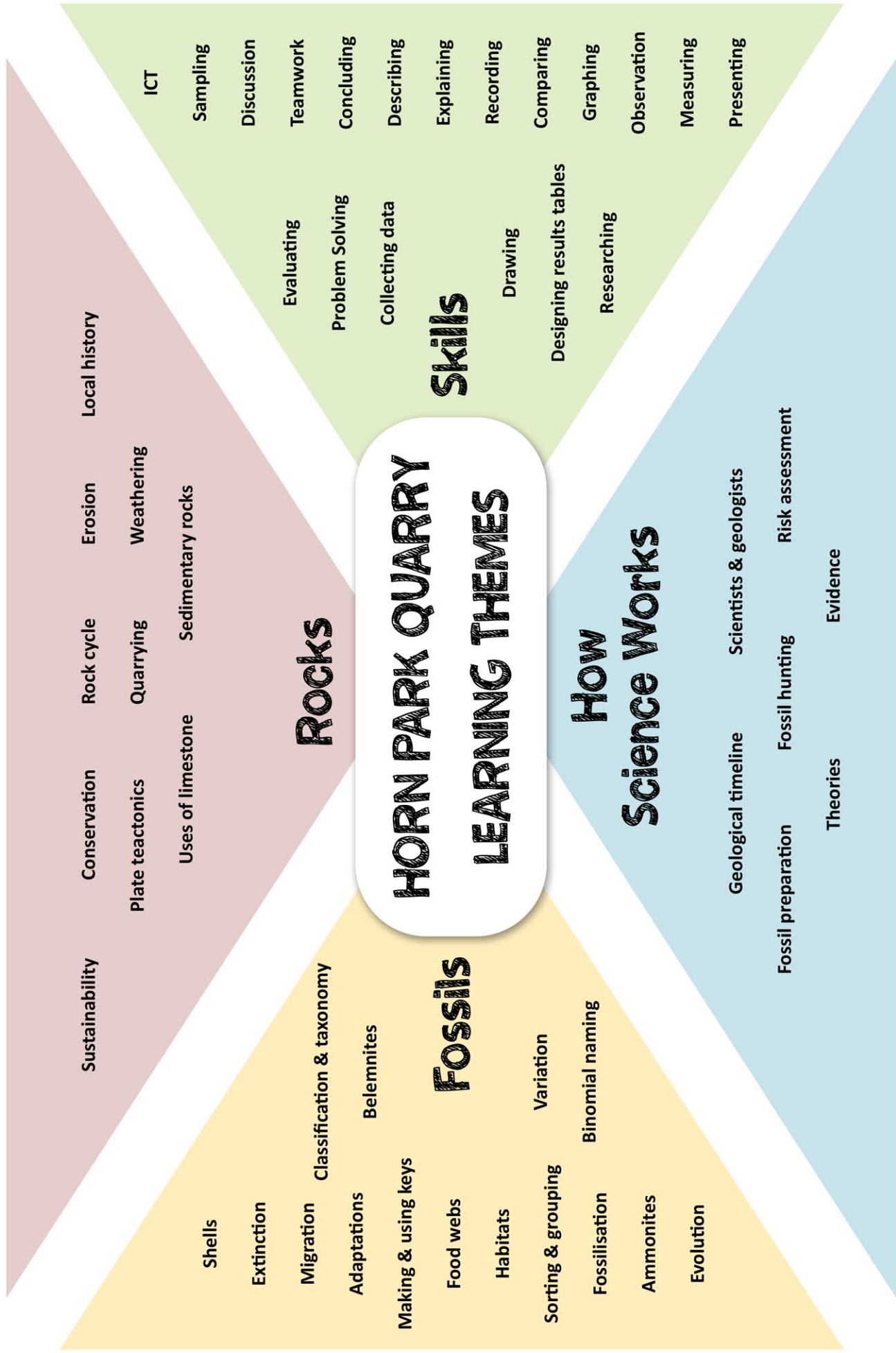
The resulting charts and graphs can be used to summarise key information about the number and size of ammonites or to compare information taken from different zones of the exposure.

HORN PARK QUARRY: FIELD VISIT		
ACTIVITY 3: FOSSIL TIME TEAM! (Continued)		TIMING: 20 - 90 MINUTES
SUMMARY	Students play fossil detectives and map out the fossil rich beds that are part of the National Nature Reserve.	
PREPARATION	The Guide will need to unlock the protective cover and you will need adults to lift it away to gain access to the site.	
ACTIVITY	OUTCOMES	KEY IDEAS
<p>Working in a small group; students can collect measurements of the numbers and size of fossils within the frame.</p> <p>Students may have to design suitable tables for sensible recording of key details (or could be provided with one see below)</p> <p>Students can decide whether to take these measurements by dividing the surface into a grid, or by separating the different rock layers.</p> <p>Students can identify the largest and smallest fossil, how many fossils in total there are and which fossil is most common.</p>	<p>Students develop data collection, recording and presentation skills.</p> <p>Later on charts and graphs can be draw to summarise key information about the number and size of ammonites or to compare information taken from different zones of the exposure.</p> <p>Data needs to be effectively recorded and presented to allow others to interpret the information easily.</p>	<p>Scale, precise layout / orientation and depth are all important pieces of information that may be useful when interpreting finds.</p> <p>Data needs to be effectively recorded and presented to allow others to interpret the information easily.</p>
KEY WORDS		
Observe, record, present: Fossil exposure, bedding planes, in-situ, weathering, data, draw, chart, graph, table.		
EXTENSION TASKS		
<ol style="list-style-type: none"> 1. The assembled field sketches can be compared to a large colour poster (or digital image) of the fossil exposure. Discuss and evaluate similarities/ differences and any errors or omissions. Highlight need for careful observation and recording. 2. Create charts and graphs using the measurement data of the fossils within the exposure. Compare the data sets and discuss if there are any patterns and if any conclusions can be drawn about the distribution of the fossils e.g. which part of the exposure has the most fossils and why? 3. Students could be asked to estimate the number of fossils that could be lying (buried) over the whole area of the reserve site. 		

ACTIVITY 3: AMMONITE RECORDING SHEET

Sector (of the exposure)	Number of ammonites	Ammonite diameter (cm)						Mean diameter (cm)

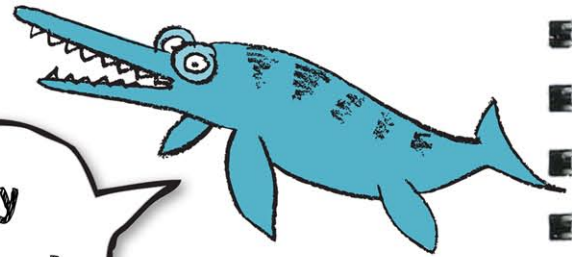
HORN PARK QUARRY: FIELD VISIT	
ACTIVITY 4: FOSSIL COLLECTING	TIMING: 20 - 60 MINUTES
AIM	Students search the spoil heaps and ask questions and hear stories about fossils and preparation.
PREPARATION	You will need a Guide to open up the protected fossil area and other adults to carry away the covers.
ACTIVITY	OUTCOMES
Event leader gathers a small group of students together for talk about the different fossils. Discuss safety issues and protection status of the NNR. Who protects sites and why. Safety issues discussed. Event leader explains what to look for.	Students should be able to identify key hazards of fossil hunting (quarries or coastal cliffs). Prioritise into the top 5 hazards. Students suggest suitable precautions to minimise risk to themselves and others. Students are made aware of National Nature Reserves (NNR) for fossils and wildlife and reasons why protection is needed.
Students look through rock pile to find real fossils. Discussion / drawings / images used to show what the creatures were like when alive. Students vote for best fossil to take back to the classroom (the guide will explain why only one fossil can be taken).	Coastal cliffs are unstable and can fall at any time. DO NOT GO NEAR! Fossils are best found amongst stones on the shore, or here in the "spoil heap". Smashing rocks is dangerous and normally damages or destroys fossils. Experienced experts may be able to help clean up some fossils using hammers and other tools. Goggles must be worn. Each animal was adapted to survive in a marine environment. Each is related to modern creatures nautilus, squid, modern bivalve shells) and share many features, while other features are very different. Some are now extinct. Soft parts normally rot, shells are buried and turned to stone.
KEY WORDS	
	Land slide, rock fall, safety goggles, National Nature Reserve (NNR), adaptations, decomposition / decay/ rotting, fossilization.
EXTENSION TASKS	
	Students could draw or take photographs of fossils they are going to leave behind or could measure / collect size data.



HORN PARK QUARRY FOSSIL BOX



**Real, museum quality
fossils in your classroom!**



We have created a high quality set of real fossils from Horn Park Quarry that can be used as a handling collection in your classroom. The collection includes:

- Over 30 different fossils suitable for handling
- Five larger, more spectacular fossils that can be used to show specific features and also to create a classroom 'mini-museum' display
- Teachers Information on all the fossils included in the boxes



To hire this resource please contact:

Sue Morse (Learning & Development Co-ordinator) Beaminster Museum
Tel: 01308 488795 Email: sueholderness@aol.com

HORN PARK QUARRY: FOSSIL BOX

ACTIVITY 1: DESCRIBE A FOSSIL

TIMING: 15 - 30 MINUTES

AIM

Students explore the fossils and make scientific observations and write accurate descriptions of their features

PREPARATION

You will need to lay out the fossils on a large table for the students to look at.

ACTIVITY

Spread the fossils out on a large table.
 Divide the class into pairs. Each pair then chooses a fossil to describe in turn. When they have completed their description they can return the fossil to the main table and choose another one. They need to make descriptions of at least 5 – 8 fossils.
 Their description should include all the key features of their fossil. If possible ask the students to draw the fossil using accurate measurements of length, width etc.

OUTCOMES

Students carefully observe then describe in detail their fossil. This should include descriptive language relating to size, shape, colour, features, patterns, ridges, textures, hardness and even smell.

KEY IDEAS

Observing and recording detail is essential for scientists.

KEY WORDS

Observe, Describe: Ammonite, belemnite, bivalve, ridges, spiral.

EXTENSION TASKS

Students read their description to someone else who then has to identify it from the rest of the specimens. This activity will test out how accurate the description is!

HORN PARK QUARRY: FOSSIL BOX	
ACTIVITY 2: FOSSIL TOP TRUMPS	TIMING: 15 - 30 MINUTES
AIM	Students make simple cards that outline the key features of a fossil so they can be compared against each other.
PREPARATION	You will need to print out the sample cards and ensure students have scales, rulers, callipers and a colour chart.
ACTIVITY	OUTCOMES
<p>Students summarise key attributes and features of their fossil (along with an image) onto a card format.</p> <p>For a more cross curricular approach, students could design their own Top Trump Jurassic Coast cards.</p>	<p>Students carefully observe then describe in detail their fossil. Suggested categories:</p> <ul style="list-style-type: none"> • Image (sketch or photo), • Name ("made up" or scientific name). • Diameter • Depth/ thickness • Mass • Colour <p>Written description of key features</p>
KEY WORDS	
Observe, Describe, Compare: Diameter, measurement.	
EXTENSION TASKS	
These cards could be used in other activities including 3, 4 and 5.	

Activity 2: Top Trump Cards

Name:
Image:

Diameter (cm):
Depth (cm):
Mass (or weight) (g):
Colour:
Description:

Name:
Image:

Diameter (cm):
Depth (cm):
Mass (or weight) (g):
Colour:
Description:

Name:
Image:

Diameter (cm):
Depth (cm):
Mass (or weight) (g):
Colour:
Description:

HORN PARK QUARRY: FOSSIL BOX	
ACTIVITY 3: COLLECTING SIZE DATA	
AIM	Students measure the fossils to create a data table that can be used for further analysis
PREPARATION	You will need to provide students with rulers or small measuring tapes
ACTIVITY	OUTCOMES
Students design a suitable table (or use provided one) to survey the fossils from the fossil box.	Students observe draw and record key visual information, measurements and features, annotating with additional observations.
Information from the cards (activity 2) could be shared instead of students re-measuring each fossil themselves.	Students work in teams and share or divide roles.
Measurements are taken and recorded.	Students develop data collection, recording and presentation skills.
Students could produce pie charts, histograms or bar charts to present data on types of fossils and/ or sizes.	Charts and graphs can be drawn to summarise key information about the number and size of fossils.
Identify the largest and smallest fossil, how many fossils in total there are and which fossil is most common.	Data needs to be effectively recorded and presented to allow others to interpret the information easily.
KEY WORDS	
Observe, Record, Present, Table, Describe, Compare: Data, draw, chart, graph, table, bar chart, histogram, pie chart.	
EXTENSION TASKS	
Students could select best charts/ graphs for display on posters in the classroom.	

TIMING: 15 - 60 MINUTES

Activity 3: Specimen data table

Fossil type	Maximum length (cm)						Mean maximum length (cm)

HORN PARK QUARRY: FOSSIL BOX	
ACTIVITY 4: SORTING AND GROUPING FOSSILS	TIMING: 15 - 60 MINUTES
AIM	Students develop rules for sorting fossils into key categories
PREPARATION	It would be helpful to have completed the Fossil Top Trumps activity first
ACTIVITY	OUTCOMES
<p>Students use fossil specimens (or their cards from activity 2).</p> <p>In groups they discuss the specimens, comparing similarities and differences between the fossils.</p> <p>The groups then share ideas with each other and agree on best way to group the fossils.</p> <p>Record the rules that have been suggested and the main features used to identify a fossil as belonging to a given group.</p>	<p>Students will be able to sort fossils into groups based on anatomical features.</p> <p>Summarise rules identifying characteristics they used.</p> <p>Comparing and sorting based on common features and differences. This is how all life on Earth is categorised.</p> <p>Scientists still use this method when they discover new species (e.g. in rainforests or in deep sea “black smoker” vent systems)</p>
KEY WORDS	
Compare, Group	
EXTENSION TASKS	
	Students could be given a new fossil (one kept back from the collection or even brought in to show by one of the students) or images of others from other sites. They can then decide what to do; whether to integrate it into their existing groups or perhaps redefine their criteria.

HORN PARK QUARRY: FOSSIL BOX

ACTIVITY 5: MAKING AND USING KEYS TIMING: 30 – 60 MINUTES

AIM	Students write hierarchical questions or descriptors to enable efficient sorting / ID of key species from Horn Park Quarry.	
PREPARATION	You will need the Fossil Top Trump cards or a number of fossil specimens.	
ACTIVITY	OUTCOMES	KEY IDEAS
<p>Ensure that the students in groups of 5 or 6 have a number of fossil specimens (or cards from task 2).</p> <p>Ask the students to discuss common features and differences between the fossils, and then write simple questions or descriptors to make a key to identify or sort each fossil.</p> <p>Students could use additional information gained through internet research and could identify to a species level.</p> <p>(this activity further develops skills and ideas from activity 4)</p>	<p>Students decide which features are useful when sorting and grouping fossils. Features such as shape, patterns, ridges, and colour. Some will be more useful than others.</p> <p>Students produce (or use) a working key, following rules systematically.</p>	<p>Keys are useful tools for comparing and sorting specimens, by focussing on clear differences and similarities.</p> <p>Making and using keys.</p>
KEY WORDS		
Compare, Key		
EXTENSION TASKS		
Students review the keys of other groups, suggesting improvements and pointing out useful features.		

HORN PARK QUARRY: FOSSIL BOX	
ACTIVITY 6: JURASSIC SEAS ALIVE	TIMING: 60 - 180 MINUTES
AIM	Students create drawing/ photography/artwork/ animation of living animals in the Jurassic sea.
PREPARATION	Students will need art materials and access to images in the image pack.
ACTIVITY	OUTCOMES
<p>Students can research then draw, paint or use provided images/information to recreate a scene from the Jurassic Sea, complete with the animals swimming around in it.</p> <p>Images could be photographed and then moved then re-photographed or animated (using software such as "1 Can Animate" from Kudlian) or a simple digital camera combined with Windows Moviemaker or similar software.</p>	<p>Students draw/paint/use ICT to make a Jurassic scene showing the habitat as it would have been. This could be for a large scale Jurassic Display.</p> <p>Students are able to explain what conditions were like in the seas where the creatures forming the fossils at Horn Park used to live.</p> <p>Comparisons could be made with modern marine ecosystems such as lagoons, coral reefs and local cold water ecosystems today.</p>
KEY WORDS	
Adaptations, marine habitat, lagoon, tropical.	
EXTENSION TASKS	
Students could be asked to research a creature at home or make a 3D model of a live ammonite or belemnite.	

HORN PARK QUARRY: FOSSIL BOX

ACTIVITY 7: FOSSILIZATION

TIMING: 15- 90 MINUTES

AIM

Students create drawing/photography/artwork/animation of living animals in the Jurassic sea.

PREPARATION

You will need to print out the captions and cartoons for the fossilization game found in the image pack

ACTIVITY

Play the Fossilization game (included in the image pack) with the students. The students have to match each caption with the cartoon and then put the storyboard in the correct order. Ask a member of each group to come up and read their caption in the order of the story.

Alternatively students could research how fossilisation occurs and make their own series of frames or story board to show the fossilisation process.

ICT (software such as "I Can Animate" from Kudlian) or a simple digital camera combined with Windows Moviemaker could be used to create fossilisation animations.

Students could opt to write a series of stages / flow chart instead of visual approach.

OUTCOMES

Students understand the key stages in fossilization and why not all remains are fossilized.

Students make a visual (or text) guide to the formation of fossils.

KEY IDEAS

Each animal was adapted to survive in a marine environment. Each is related to modern creatures nautilus, squid, modern bivalve shells) and share many features, while other features are very different. Some are now extinct.

Soft parts normally rot; shells and other hard parts are buried and turned to stone.

Fossils take a very long time to form.

KEY WORDS

Describe, Explain: Fossilisation, decomposition, decay, rotting.

EXTENSION TASKS

Students evaluate / mark their own storyboards and animations.

HORN PARK QUARRY: FOSSIL BOX		
ACTIVITY 8: RESEARCHING FOSSILS		TIMING: 30 - 60 MINUTES
AIM	Students use independent research to broaden their knowledge and interest in fossils.	
PREPARATION	You will need to ensure students have access to the image pack or internet.	
ACTIVITY	OUTCOMES	KEY IDEAS
<p>Use the internet, book box or library to research:</p> <ul style="list-style-type: none"> • What are fossils? • The Jurassic Coast. • An individual fossil from the fossil box. • The history of early fossil collectors. • The timescale of geology. <p>Students can use a learning grid sheet to help them.</p>	<p>Students produce a document, presentation or report on a theme related to Horn Park Quarry and fossils.</p> <p>Students develop wider understanding of fossils from Dorset or the wider world.</p>	<p>Horn Park Quarry is part of a wider world of fossils and geological features.</p> <p>The Jurassic Coast World Heritage Site is an internationally important natural feature like the Grand Canyon or the Great Barrier Reef.</p>
<p>The nautilus past and present: Students research the key features of the nautilus – a living creature with striking similarities to ammonites.</p> <p>Students compare nautilus with ammonites and try to answer the question: Why did ammonites die out and nautilus not?</p>	<p>Students produce a document, presentation or report, gaining insights into extinction and survival.</p>	<p>Some animals die out while others survive. This can be based on possession of useful adaptations or even chance.</p>
KEY WORDS		
World Heritage Sites, Jurassic Coast, Extinction, Nautilus		
EXTENSION TASKS		
Students evaluate / mark their own storyboards and animations.		

ACTIVITY 8: LEARNING GRID

What do we know already?	What do we want to find out more about?	How can we find out more?	Done ✓
What fossils look like What sizes they are Where they can be found in our local area	How are they formed? Where are they found elsewhere in the world?	Visiting a local Museum Looking on the internet Talking to professional Geologists	

HORN PARK QUARRY: FOSSIL BOX	
ACTIVITY 9: SUTURE LINES	
AIM	Students compare the patterns found in ammonites and the completely un-related bones of mammals.
PREPARATION	You will need to show students images/fossils of suture lines and mammalian skulls from the image pack.
ACTIVITY	OUTCOMES
<p>Students draw ammonite suture lines or use digital photography to record these patterns or trace images from prints.</p> <p>Compare to suture lines as seen on mammalian skulls. Consider possible reasons for similarities in these patterns.</p> <p>Discuss suggestions for possible reasons for such similar patterns.</p>	<p>Students are able to compare patterns of suture lines from different fossils and skulls (or images of them).</p> <p>Students could use the analogy of a jigsaw puzzle to develop explanations for this sort of structure.</p>
	KEY IDEAS
	<p>Interlocking patterns on the joins between chambers (ammonites) or plates (mammalian skulls) create a much stronger joint.</p> <p>Unrelated creatures may evolve to use a common design where it serves a common role (e.g. the patterns in xylem in plants look similar to the pattern of rings in human windpipes and even vacuum cleaner pipes), as this pattern helps to stop the tubes collapsing.</p>
KEY WORDS	
Describe, Explain: Adaptation, convergent evolution, suture.	
EXTENSION TASKS	
Students research other examples where un-related organisms share similar features.	

HORN PARK QUARRY: FOSSIL BOX

ACTIVITY 10: CREATIVE WRITING

TIMING: 30 - 60 MINUTES

AIM

Students write a story to illustrate the amazing (and unlikely) events leading to a fossil being found.

PREPARATION

Read short excerpts to the students from story books about time travel and the ancient past such as *The Lost World* by Arthur Conan Doyle or *Jurassic Park* by Michael Crichton.

ACTIVITY

Starting with the living fossil, students write a story about how it lived, died, was turned to stone and was eventually found by you!

They should refer to the time scale and how lucky they were to find the fossil or see it!

This sort of activity has also worked well for inspiring poetry and even song lyrics.

OUTCOMES

Students use creative story-telling to develop an appreciation of timescales, key events and the element of chance that all play a part in bringing a fossil from the prehistoric past to the present time.

KEY IDEAS

Fossilisation is just part of the story as the rocks formed from sediments on the sea bed were then pushed up to form land, eroded, then uncovered by quarrying before being observed and collected.

Students seem to find the element of chance or luck and the ideas of deep time to be particularly inspiring.

KEY WORDS

Fossilization

EXTENSION TASKS

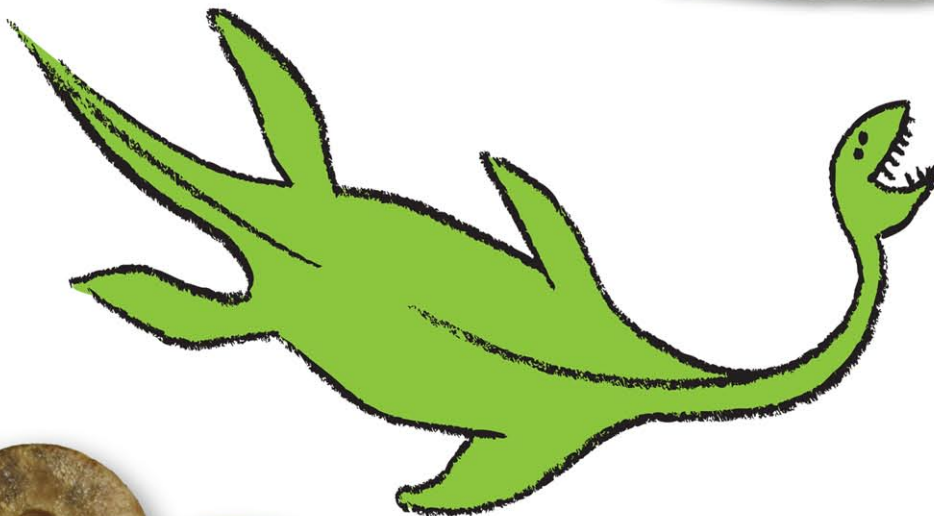
Students read or perform their pieces in small groups, or make presentation displays or posters of their work.

STILL LOOKING FOR IDEAS?

- Make a photographic key/sheet to identify each fossil in the fossil box.
- Make and use a keyword list to define terms (like fossil, extinct).
- Students make a jigsaw puzzle made from photos of the in-situ fossil exposure.
- Make a big poster of about your visit to Horn Park Quarry, fossils your students found there or if you borrowed it, the Horn Park Quarry Fossil Box.
- Give students a word search relating to the site/fossils.
- Take a plaster cast of a fossil or make model ammonites for every member of the class to take home.
- As a class, discuss why ammonites are so abundant in the handling collection. Is it because ammonite fossils are more commonly found in these rocks? Or perhaps it is because ammonites are easier to extract from the rocks and therefore more suitable to handle? Based on their field experiences, what do the students conclude?



If you want more help, don't be afraid to ask. We don't bite!



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