

Chocolate Geology

Learning about the landscape with the help of chocolate!

What you will learn through this activity

There are three geological parts to the world: crust, mantle and core.

Mountains are formed by movement in the earth's crust.

There are three main types of rock: **sedimentary, igneous and metamorphic**

What you need:

These are suggested materials and props to use:

- A selection of chocolate including, if possible, Mars Bars, Lion Bars, Crunchies, Curly Wurlies (cut into small pieces and kept cold if possible) and Crème Eggs – don't eat them all at once! (Remember to make sure no one has allergies to the ingredients in the chocolate bars)
- A globe– or try Google Earth as a virtual resource:
➤ <https://earth.google.com/web/>
- Cross section diagram of Earth – you can find one here
➤ <https://www.natgeokids.com/uk/discover/geography/physical-geography/structure-of-the-earth/>
- A small zip-lock or freezer bag
- Rock samples if you can find any in your garden or local walk. If not, use pictures of sandstone, slate, granite, pumice, gneiss, quartzite: ➤ <https://geology.com/rocks/>

How to set it up:

- Lay out the rock samples in the centre of a large table or on the ground or have the images ready to look at on a smart phone, tablet or computer.
- Have the different chocolate bars and zip lock bags ready to give out throughout the session - don't give them out at the start, they may get consumed!
- Before you get started put the Crème Egg in the fridge (we'll come back to this later!)



Part 1

Ready to begin? Here's how to do this activity

We are going to look at how the landscape around Loch Lomond was formed – using chocolate...

This is Chocolate Geology!

WHAT IS GEOLOGY?

It is the study of the origins of the earth, its history and what it is made of. The earth looks like a solid mass of rock. But is it? Using a globe or Google earth, have a look at the earth in some detail.

Using the cross section diagram, look at the composition of our planet and talk about the interesting facts of each layer:

The Inner Core is the solid centre of the planet and is the hottest part of the Earth. What is this made of and how hot is it?

The Outer core is the liquid layer surrounding the inner core. What is the liquid?

The Mantle is the widest section of the Earth and is made up of semi-molten rock called magma. In the upper parts of the mantle the rock is hard, but lower down the rock is soft and beginning to melt

The Crust is the surface of the earth; the layer that we live and walk on. It is up to 22 miles thick and is mainly made up of 3 categories/groups of rocks.

But what are rocks? Rocks are nearly always mixtures of **minerals**, which are like the ingredients in a cake. Different quantities of ingredients mixed in different ways will give you different cakes. And so with rocks – because they are formed in different ways their recipes will vary quite a lot.

Going back to our globe– is the crust solid? It seems solid when we walk on it (other than water!)

The answer is no, it's not. It is actually broken into several enormous pieces called tectonic plates, which are constantly moving over the mantle.

This short video animation explains what's going on:

👉 <https://spaceplace.nasa.gov/tectonics-snap/en/>

What happens when these plates collide? When tectonic plates collide they can cause earthquakes, tsunamis and volcanoes – and they also cause huge mountain ranges to be formed, like the mountains you can find in Loch Lomond & The Trossachs National Park.

Part 2

The Landscape of Loch Lomond (Mars Bars)

We're going to use the Mars Bars to show how the beautiful landscape of Loch Lomond was formed over 400 million years ago.



We use them to show tectonic plate movement and how mountains like Ben Lomond were made when two different plates crumpled together to form Scotland.

Hand out the Mars Bars.

Break the Mars Bar in half so that the caramel is all that joins the two pieces. Looking at the structure of the chocolate bar, you can see the squishy inside layer is like the earth's inner core, the gooey caramel is like the magma and the thick chocolate is the crust.

When you push the pieces back together you are recreating the crumpling upwards of the earth's surface. The cracked thick chocolate should crush together and form a peak or ridge. You've just made a chocolate mountain.

From now on, every time you eat a Mars Bar you'll think of Loch Lomond!

Part 3

Rocks

We are now going to look at the three main groups of rocks that make up the earth's crust – **Sedimentary**, **Metamorphic** and **Igneous**.

SEDIMENTARY (LION BARS OR WAFER BISCUITS)

Hand out the Lion bars or a wafer biscuit if you have them.

Sedimentary rocks are made up from fragments of rocks and the remains of animals and plants. Rain, wind and ice wear away and erode tiny pieces of exposed surfaces like mountains. These fragments are called sediment. Rain washes the sediment into rivers and streams where they tumble and knock into each other. This grinds them down to form sand and mud which is eventually washed into the sea.

On the sea bed the sediment builds up in layers along with the remains of sea creatures and the layers are packed down by the weight of the layers on top.

What do we call these remains that are trapped in the layers? – Fossils.

Eventually over millions of years the layers become solid rock.

Break the Lion Bar in half, how many layers can you count in your sedimentary chocolate bar?

Look at your real-life samples if you have them, or pictures on line of sandstone:

👉 <https://geology.com/rocks/sandstone.shtml>



IGNEOUS (CRUNCHIES)

Let's look at the second of our rock groups - Igneous

Show the pumice:

👉 <https://geology.com/rocks/igneous-rocks.shtml>.

What kind of rock is this?

This is igneous rock, that is rock that has been affected by heat or fire.

How might rocks in this group have been formed?

Rocks in this group were formed from volcanoes, lava or magma.

Lava and magma are both molten (liquid) rock. The difference is that lava is molten rock that has come to the surface of the earth's crust and cooled slowly, and magma is still underground. (Remember, magma is the mushy liquid like hot jam inside the Mantle).

Volcanic eruption is caused by the build up of heat and gas which forces the magma up and out through weaknesses in the earth's crust. As it slowly cools, air becomes trapped inside as it begins to harden.

Does rock float? What happens if you put a piece of pumice (lava) into a bowl of water? Why does this particular type of rock float?

Bring on the Crunchies!

Open the Crunchie and break it into 2 pieces. What does it look like on the inside? (Hopefully pumice!)



METAMORPHIC (CURLY WURLY)

Now we'll look at the third main group of rocks. These are called Metamorphic rock.

Metamorphic rocks are sedimentary or igneous rocks which have been changed by heat or pressure.

Think of a caterpillar. What happens to it? In a process called metamorphosis, it changes into a butterfly.

So metamorphic rocks are "changed" rocks – changed by pressure or heat.

Let's have a look at some sedimentary rocks which have been changed into metamorphic rock. If you have any real rock samples we can use slate, gneiss and quartzite. If not, look at them online:

➤ <https://geology.com/rocks/metamorphic-rocks.shtml>

We can find examples of each of these throughout the National Park i.e. Slate quarries at Luss and Sallochy, quartz from Drymen and gneiss from Luss. We have part of a core sample taken when work on the new A82 road was being planned about 20 years ago. In the gneiss you can clearly see the different layers that have been pushed together over millions of years.

The gneiss also shows how different combinations of minerals (or recipes) produce very different looking rocks.

Although they are all different varieties of rock, they all belong to the same group of Metamorphic or "changed" rock.

Enter the Curly Wurlly! (the piece de resistance)

You may think that this is just a Curly Wurlly, but by a very complicated process we're going to make it into sedimentary rock. We will then change our sedimentary rock into metamorphic rock, and we'll do this twice – firstly by using pressure and then by using heat.

Place the Curly Wurlly in the zip lock bag and hit gently off the floor to create sedimentary rock piece (small chunks and dust like chocolate powder), squash between hands for pressure and then sit on the chocolate (make sure it's still in the bag!) for heat for a few minutes. Finally, have a look at the squidgy mass of chocolate in the bag and see how much it has been changed.

You can now eat your metamorphic rock – but remember where it has just been!



Part 4

How the earth is made up (Crème Egg)

Finally, remember that Crème Egg in the fridge?

Take it out and when it's hard carefully cut it in half. Can you remember how the earth is made up? Look at the Crème Egg, the chocolate is the crust, white crème is the mantle, yellow crème is the core.

Well done! You have now learned about geology through the medium of chocolate!



Part 5

Want to learn more?

Why not do a demonstration for your family, friends or teachers by filming your own demonstration?

You can also learn loads more about geology in the National Park on our website at www.lochlomond-trossachs.org/park-authority/how-we-can-help/outdoor-learning/education-resources/geology/

For more activity and learning ideas, visit The Royal Geographical Society website:

www.rgs.org/getattachment/Schools/Teaching-Resources/Geography-at-Home/Geo-Resources-Home-Learning-April-2020_.pdf/?lang=en-GB

You can also check out

www.bbc.co.uk/bitesize/guides/zsg639q/revision/1

This activity supports STEM (Science, Technology, Engineering and Maths) subjects. Examples of some Curriculum for Excellence learning outcomes are:

SCIENCE

- Having explored the substances that make up Earth's surface, I can compare some of their characteristics and uses.

SOCIAL SCIENCES

- I can describe the major characteristic features of Scotland's landscape and explain how these were formed.
- Having investigated processes which form and shape landscapes, I can explain their impact on selected landscapes in Scotland, Europe and beyond.

Enjoy that chocolate, you've earned it!

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