potteriesmuseum.org.uk

British Ceramics Biennial

Clay Museum
Produced in the Potteries

Teachers Notes

Minimum workshop time: 1hour 30mins, can be extended to a whole day.

The workshop information is in sections which can be adapted or omitted to suit the amount of time you have in your session, or the student age group.

See activities 1,2 & 3 for materials and equipment needed.
A worksheet is available for students to fill in answers to key questions.

Slide 1&2: Title page and learning objectives

Slide 3: The Potteries Geology

Stoke-on-Trent is one of the most famous places for pottery production in the world. The geological make up of Stoke-on-Trent is one of the major contributing factors to this.

- Ask the students to think about what raw materials were needed to make the pottery i.e., clay and what was needed to fire the kilns; coal.

http://mapapps.bgs.ac.uk/geologyofbritain/home.html?&_ga=2.119967752.1690716620.1605713089-168167890.1594408879 – The link to the maps is here as well as on the PPT.

- The definitions for **superficial and bedrock geology** are important as the maps are split in to these two categories. On the website there is a slider on the **right-hand** side, which overlays a **geographical** map on the **geological** one.

- Start with the geographical map and get the students to identify and zoom in on the Stoke-on-Tent area.

- There are buttons on the **left-hand** side which shows either the **bedrock or superficial deposits**. Switch between the two geology types and encourage the students to look at the different types of deposits in the area. If you **click on the coloured deposits** an identification box will pop up.

On the **bedrock map** you can see **large coal seams** – indicated in the grey shades running the length of Stoke-on-Trent.

Much of the **bedrock** is made up of **coal**. This **sedimentary** bedrock was formed approximately **308 to 315 million years ago** in the **Carboniferous period**. The coal was formed from layers of dense tropical forests which would have compacted together to form coal over millions for years.

On the **superficial map** you can see **seams of clay** in yellow, running the length of the city, in particular, along the river. Note that the River Trent also runs the length of the city.

The clay was formed up to **2 million years ago** in the **Quaternary period**, deposited along the river beds which would have been much larger than the river that runs through the city now. This makes up much of the **superficial** (top layer) layer of the ground.

This means that the area had a large supply of coal and clay to make pottery.

Slide 4: The Potteries – Transportation

Raw materials, like clay and coal, were moved from the pits and mines to the factories. Materials were also brought in from outside of the city as well, including flint, lead, and salt.

Red clay or terracotta is the clay found locally in Stoke-on-Trent. This was used for bricks (this is why many houses in the area are made of red bricks).

White clays which were predominantly used for tableware were transported into the city from places like Dorset, Devon and Cornwall.

Once the pottery was fired it needed to be transported out of Stoke-on-Trent.

- What types of transport would have been used in the 1700's? Click to reveal 2 images.

They would have had horse and carts and canal barges. Trains did not come to the UK until 1825.

Slide 5: The Potteries – Transportation

By 1777 the Trent and Mersey Canal was complete. Josiah Wedgwood played a major role in the building of the canal system.

- Where does the water come from for the canals?

The river which runs right thought the city, would have been temporarily redirected to fill the canals. They would have also used clay to line the canals and prevent the water from leaking out.

- The canals saved the pottery manufacturers thousands of pounds in breakages. Why?

The roads in the 1700s would have been nothing more than dirt tracks, sometimes covered with a layer of stone or gravel. They would have had lots of pot holes (so maybe not that different to now!), meaning a lot of pottery would be broken along the way. Breakages were common and meant that refunds or replacements needed to be sent.

In the 19th century, the railway lines became an important transportation means for the potteries industry.

Comparisons between current transport methods and past can be made here. We now have smoother roads and lorries, so we no longer rely on the canal barges, as lorries are much faster. As well as the importance of rail infrastructure.

Slide 6: The oldest pots in Stoke-on-Trent

The pottery industry in Stoke-on-Trent became really popular in the 1700s, especially when Josiah Wedgewood set up **his factory in 1759.**

There is archaeological evidence of pottery in Stoke-on-Trent dating back to the Roman period.

Slide 7: Roman pottery finds

A kiln dated AD 43-69 was uncovered in **Trent Vale** during excavations started in 1955. Nearby a potter's workshop and a fort was found. The area is now the **Michelin factory**.

The kiln at Trent Vale was one of the first **Roman** influences in this area. It may not have been operating very long – perhaps while they were moving on to better locations up and down their roads. We know from the last firing that the kiln dome collapsed on top of the pots, so the entire contents of the last firing were uncovered. (There are pieces in the Potteries Museum and Art Gallery, you would need to check if they are currently on display)

Images: 'Face pot' used to store cremated remains. The kiln excavated in 1955.

Slide 8: What do we use clay for?

- How many things can you think of that are made from clay?

There are lots of uses for clay in the modern world. Clay is used for bricks, plates, mugs, cooking pots, sinks, toilets, tiles, pipes, hip joints, teeth veneers, phone components, face masks, space shuttles – heat resistant tiles, car catalytic converters, racing car brake disk, toothpaste and much more.

Slide 9: What do we use clay for?

ACTIVITY 1: 15mins

Give each pair of students a small amount of each type of clay.

Ask them to explore the properties of the different types of clay. They can squash it, flatten it, roll it, stretch it, pinch it and smooth it. Some will be smooth, some gritty and rough, some will be different colours. They can discuss the similarities and differences in pairs.

Once they have had time to discuss in their pairs. Ask them to discuss which type of clay they would use to make each of these products:

- Bricks
- A mug
- A **stack** of Saggars

For the bricks they should identify the terracotta clay for its colour.

For the mug they should choose a white (grey when unfired) smooth clay.

- Ask the students if they have heard of bone china? This is a very popular material for making crockery, like cups. It is very smooth and when the products were made thinly, then fired, they would become translucent. It was a much more expensive material, so would have been used mainly for high end tea sets and other high end items. It was called bone china because of how the clay was made, using the ground up bones of cattle. The bone element of the clay could be up to 30% of the clay body.

For the Saggars they should choose a clay with some grog (gritty texture). This is because if they choose the smooth clay, the Saggars would have less grip when stacked up in the bottle kilns and would be more likely to collapse.

SUGGESTED BREAKTIME – Time to wash hands and clean up.

Slide 10: If we didn't fire the clay what would happen?

Take a small amount of clay (teacher only) that has been dried overnight and ask the students what would happen if we tried to use the clay without heating it in a kiln.

The clay would break and fall apart, as it is brittle and lacks strength. If the clay is placed in water you can see the clay fall apart and dissipate (it does not dissolve as it is insoluble). When the clay is heated in the kiln the clay particles are joined together making it stronger.

In the 1700s they built bottle kilns to fire the pottery.

Slide 11: The Bottle Oven

Bottle Ovens were used to fire the wares, the clay is called ceramic once it has been fired.

As the name suggests they were shaped like bottles.

There would have been up to 4000 bottle kilns in Stoke-on-Trent. Now there are only 47 left.

Slide 12: How did the bottle ovens work?

The wares would have been fired up to 1250°C.

- Bone china for tableware would have gone up to 1250°C, while earthenware which was popular in Stoke-on-Trent would have fired at a lower temperature (around 1000°C).

On average bottle ovens were fired once a week. A biscuit/bisque firing (the first firing which made the pottery strong enough to decorate and glaze) would take up to seven days. A glaze firing would not take as long as it did not need to reach such a high temperature. Coal-fired bottle ovens were not as energy efficient as the electric kilns we have today, over 90% of the heat generated was wasted, much of it would go up the chimney as smoke. This smoke would come out in plumes up to sixty feet high and then drop down into the surrounding town and buildings, making the air very polluted.

The introduction of gas and electric kilns from the early 20th century onwards and the implementation of the 1956 Clean Air Act in 1963 meant that bottle ovens became obsolete in the 20th century."

ACTIVITY 2: 15mins

Using Bottle Oven Worksheet and labels

See if you can work out what all the parts of the kilns are called and what they do using the descriptions on the labels.

The bottle oven can be printed out on A3, with all the labels on an A4 sheet for them to cut out and place in the appropriate place.

Slide 13: Ceramic faults and wasters

Sometimes things would go wrong in the firing. **Wasters** are ceramic remains which have become damaged or warped during the firing process.

In the image you can see a stack of plates that have collapsed and fused together. And a plate that has cracked and distorted.

Slide 14: Ceramic faults

In the firing process the clay will shrink by around 12%, this is because the last of any moisture evaporates and the clay particles fuse together. These are a couple of the most common things that would go wrong in the firing.

Crazing

It is caused by the glaze (the shiny layer on pottery) being under too much tension, causing it to crack. Pottery shrinks when it is in the kiln. When the glaze shrinks more than the pottery then crazing occurs.

Shivering

Shivering is the opposite of crazing. It is when the glaze is too big for the pottery and has not shrunk as much as the clay causing it to come away from the clay.

Slide 15: What did they do with all the waste?

SAFF RUCK (or Shaff Ruck)

A heap of broken crockery. A rubbish tip containing waste moulds, saggars and faulty ware such as wasters.

Any clay which hadn't been fired could be reused. The fired waste would have been piled into landfill or used as fillers for building foundations.

Slide 16: Saggars

The saggars contained the unfired wares.

They would have been stacked up in the kiln by **Placers** who balanced the Saggars on their heads.

The Placers would have put rolled up material in their caps to protect their heads and to help balance the Saggars. To enable the kiln to be fired again quickly, the Placers would be sent in to unload the kiln whilst it was still hot.

The kilns used to take 48 hours to cool down, but when the factory owners wanted the wares quickly the Placers would sometimes be sent in after 24 hours. They would have worn several overcoats and wrapped material around their arms to try and protect themselves from the heat. The effects of working in this environment would have reduced their life expectancy. It was also important that the Placers stacked the saggars properly as they would be paid based on how successful the firing was.

The **Saggar makers** were assisted by the **Saggar Makers bottom knocker** and **Frame Filler**.

Slide 17: Saggar making

Watch the video about Saggar making it is 3min 48sec long.

Click on the image for the video

https://www.youtube.com/watch?v=Ll1WOZNsKO4

Here are a few questions for the students to answer after the video:

What did the Saggars do? Protect the wares from the flames and ash
What jobs were there? Saggar maker, bottom knocker and frame filler
How old was the bottom knocker when he started work? 14
How many firings would a Saggar have lasted? 30

Slide 18: Make your own mini Saggar

ACTIVITY 3: 30mins

In pairs the students will need:

- A portion of clay
- Cutting tool – this can be anything, we used plant labels in the video, lollypop sticks would also work
- A pair of guides – This is not essential but helps the students to roll the clay more evenly
- Rolling pin
- A straight edge to help with cutting the clay e.g. ruler

- A cylinder to wrap the Saggar around. This could be a tin, pen pot, gravy granules tub, plastic pipes, custard tin etc.
- A sheet of newspaper
- A board or few sheets of newspaper or some fabric to roll the clay on – Clay will stick to plastic table tops

Watch the video for instructions on how to construct the mini Saggar.

We have made a couple of adaptations:

- Instead of using a Mau' to flatten the clay we will be using the palms of our hands – be careful not to hit the clay too hard with your hand.
- Instead of sawdust, we will be using newspaper to prevent the clay sticking to our cylinder form.

Sand was originally used to stop the clay sticking to the wooden form, but the dust from the sand was bad for the workers lungs, so they switched to sawdust.

Slide 19: Plenary

These answers are not exhaustive, just suggestions.

Tell me a reason why Stoke-on-Trent became so famous for making pottery.

There was lots of clay and coal deposits for making the pottery and firing the kilns. The river provided water to fill the canals.

What is clay used to make?

Clay is used for bricks, plates, mugs, cooking pots, sinks, toilets, tiles, pipes, hip joints, teeth veneers, phone components, face masks, space shuttles – heat resistant tiles, car catalytic converters.

Did you notice anything which people would not be allowed to do today that was normal then?

The Placers were sent into the kilns whilst they were still very hot. They were not given proper protective equipment. The Saggar Makers Bottom Knocker was working at 14.

Tell me a difference between how we made pottery then compared to now.

Bottle kilns were used then, electric or gas kilns are used now. We don't need Saggars as the pottery doesn't need protecting from smoke. Materials and pottery were transported by canal, they are now transported by road.

Curriculum links:

Geography:

Key stage 1: This session focuses on using geographical skills, including first-hand observation, to enhance their locational awareness. It contributes to the following areas of the curriculum.

- Place knowledge – understand geographical similarities and differences through studying the human and physical geography of a small area of the United Kingdom and of a small area of a contrasting non-European country.
- Interpret a range of geographical information, including maps, diagrams, globes, aerial photographs and Geographical Information Systems (GIS).

Key stage 2:

- Human and physical geography – describe and understand key aspects of human geography, including: types of settlement and land use, economic activity including trade links, and the distribution of natural resources including energy, food, mineral and water.

Key stage 3:

- Understand how human and physical processes interact to influence, and change landscapes, environments and the climate; and how human activity relies on effective functioning of natural systems.

History

Key stage 1:

- Changes within living memory. Where appropriate these should be used to reveal aspects of change in national life.

Key stage 2:

- Significant historical events, people and places in their own locality.
- A local history study – a study of an aspect of history or a site dating beyond 1066 that is significant to the locality.
- A study of an aspect or theme in British history that extends pupils' chronological knowledge beyond 1066 (the rise of the pottery industry).

Key stage 3:

- Ideas, political power, industry and empire: Britain 1745 – 1901.
- Britain as the first industrial nation – the impact on society.

Science

Key stage 1:

- Everyday materials – distinguish between an object and the material from which it is made.

- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Key stage 2

- Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda. (Clay to ceramic)

Key stage 3

- Chemistry – Materials – properties of ceramics, polymers and composites (qualitative).