

Science: Earth Science, where does clay come from?



GRADE / AGE

All ages

TEACHING GOALS/OBJECTIVES

To show students where clay comes from, how it's formed, and the different stages of clay. An optional hands-on activity of fossil records is included.

TECHNIQUES / SKILLS

If making "fossil records", slab making.

MATERIALS

For *What is clay*:

Clay

Bone-dry clay

Glass of water

For "fossil records" cast/mold:

Clay

Stamps or other items that can create impressions in the clay

Patterns for the shape of the tile or plate

Plastic knives for cutting the clay

Skewers for tracing the pattern

BACKGROUND

Pass out the "What is Clay" hand out and read it a loud with students or use the Powerpoint presentation.

Explain where clay comes from:

The earth's crust is made up of largely igneous rock, which, as nature breaks it down, becomes clay. It has been being formed for millions of years, since the time of the glaciers. The main ingredients in clay are alumina, silica and water.

In its natural state clay can be easily molded and manipulated by the hand. This quality is called *plasticity*, and it is what makes clay so delightful to use. A second defining characteristic of clay is that when heated to at least 1200F, it becomes hard, or *matures*. Earthenware clay matures at 1200F-1800F; stoneware and porcelain at temperatures up to 2400F. Firing clay to its maturing temperature makes it *vitreous*--impermeable to water--and gives it permanence. Pieces of pottery made thousands of years ago have been found in archeological digs around the world. It provides a wonderful record of human history.

Naturally-occurring clay exists in many areas of the world, including right here in Pennsylvania. With curiosity and ingenuity one can find out where nature has deposited it for our use. Look for it in lakes, ponds or at the seashore. Find it where road construction crews and builders have cleared away the topsoil. You might also visit your local historical association to see if a pottery or brickyard was ever in operation in your area

LESSON DESCRIPTION

Bring an example of clay in all of its stages to show students that clay can be found naturally wet or dry and show how clay changes state—or becomes *vitreous* (impermeable to water) once fired in a kiln.

Pass out a small piece of wet clay to all students, to show them the *plasticity* of wet clay. For fun challenge them to make something from their small ball of clay—like the world's smallest cup.

Next allow the students to handle and see some examples of completely dry or *greenware* clay. Ask students what they think will happen when you drop the *greenware* in water. Show them by dissolving the clay in water.

Explain how firing work in a kiln changes the clay and show students examples of *bisqueware* (fired once) and *glazeware*.

Below is a script/lesson plan that can be used for this lesson:

Experiment: Clay Changes State but remains a Solid.

When matter is in a solid state, it holds its shape. The molecules of the matter are very close together, and they barely move. The atoms that make up the molecules of a solid are in motion, because all atoms are moving all the time. Even though the tiny atom particles are in motion, the molecules are not free to go anywhere they want. The solid stays in one position. You can hold a solid in your hand.

Many solids do not have much, if any, flexibility. That means they can't be easily bent or molded into a new shape. For example, a rock cannot change its shape unless it breaks. Some solids, like clay, can be molded and changed. But some kind of force must be applied to change the shape.

Ask: What is matter?

Define: Matter is anything that takes up space.

Ask: What are the 3 types of matter?

Answer: Solids, Liquids, and Gases

Today we will be learning more about solids and how the solid clay undergoes physical changes.

Is clay a solid, liquid or gas?

At the table you will have an example of clay in three different conditions but in all conditions clay is still a solid. We will also be changing clay from a solid to a liquid. Clay can only be changed from a solid to a liquid before it has encountered an extreme change in temperature (being fired in the kiln).

Example one: Wet unfired clay.

Even though clay bends easily it is a solid.

We will give you a bag of clay in its moist state. This is the state we work with clay in. Even though we can bend and mold the clay in this state it is still a solid material—not a liquid or a gas. Have students break off a small piece of clay and roll it into a ball to see how flexible it is.

Example two: Dry unfired clay or “greenware”

These examples are all clay that have been dried out but have not yet been fired. Dry clay is very brittle and you can break it more easily than you can bend it. Clay at this state can be easily changed back into its moist state.

To demonstrate this have students drop the greenware tile into a container of water. Clay can turn back into a workable condition or it can be turned into a liquid that resembles mud, potters call this mud “slip” and we use it in the creation of clay sculptures.

Example three: Fired clay or “bisqueware”

These examples have been fired and cannot change their shape unless you hit them with considerable force. To demonstrate have students drop the fired clay into another container of water. Now the clay does not dissolve and it can no longer be turned back into a liquid by adding water.

OPTIONAL HANDS-ON ACTIVITY

What is the fossil record? Fossil cast and mold plates or tiles

BACKGROUND

This is a simple two-part lesson that can be completed on a paint day.

What is a fossil?

Fossils are preserved remains or traces of animals, plants and other things from the remote past.

One way we learn about animals that are extinct is by studying the fossil record (the history of life as documented by fossils). There are four main types of fossils:

- **mold fossils** (a fossilized impression made in the substrate - a negative image of the organism)
- **cast fossils** (formed when a mold is filled in)
- **trace fossils** = ichnofossils (fossilized nests, gastroliths, burrows, footprints, etc.)
- **true form fossils** (fossils of the actual animal or animal part).

Today we are going to create our own tile or plate that demonstrates cast and mold fossils.

STEP BY STEP

- Give each student a piece of clay about the size of an orange (could also be square etc.)
- Have students flatten the clay and then throw it into a flatter slab. The slab should remain thick.
- If the project is to be a plate, have students cut their slabs into circles, if the project is a tile students (or you) may choose the shape
- Have students press objects in the clay to create a cast of the object.
- This part of the project is complete. Once this work is bisqued use it as a press mold to create the mold fossil tile/plate. Works can be painted after this next step is complete.

TROUBLE SHOOTING

This class is dense with information and it will be difficult to retain the attention of all of our students. In classes where attention spans are shorter move quickly to the hands-on components of the lesson.

NOTES

In well-behaved classrooms the first "*What is Clay?*" activity can take the entire class.

CATEGORIES

Science, earth science.