



EDIBLE EARTH LAYERS



BENCHMARKS and TASKS

SC.D.1.2.4 The student knows that the surface of the Earth is in a continuous state of change as waves, weather, and shifts of the land constantly change and produce many new features.

SC.D.1.2.5 The student knows that some changes in the Earth's surface are due to slow processes and some changes are due to rapid processes.

- The student investigates how waves, wind, water, and ice shape and reshape the earth's surface by eroding rock and soil in some areas and depositing them in other areas to form new features.
- The student experiences how some changes in the earth's surface are due to slow processes, such as erosion and weathering; and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.

KEY QUESTION

What forces can cause changes in the earth's surface?

BACKGROUND INFORMATION

Predicting the age of rocks is not always simple. The Law of Superposition states that if rock layers are not disturbed, the oldest layers are on the bottom and the youngest layers are on the top, but rock layers can be disturbed by a variety of **forces**. If forces push the rock layers toward each other, the mound is called an anticline. If the rock layers are pushed apart and the crust sags, a syncline is formed. Mountains and valleys are the results of these movements.

The outer layer of the earth is called the crust; it is the part of the earth we live on. The crust is very thin. From the top of mountains to the floor of oceans, the crust is no more than 70 kilometers (about 45 miles) thick. The crust is made up of three main layers: topsoil, subsoil, and bedrock.

Sometimes the earth's crust suddenly moves up, down, or sideways along a crack or fault.

Earthquakes occur along faults – cracks in the earth's crust. The earth's crust is broken up into giant plates of rock and some smaller ones. Sometimes as they move, the plates scrape together and the edges may lock. Pressure builds up until the rocks break apart and shift as they move to a new position. This sudden movement, caused by the release of **energy**, creates vibrations (waves) that may be felt as an earthquake.

The waves created by this sudden release of energy can make the rocks vibrate up and down and back and forth and send the waves out in all directions from the center. Earthquakes usually begin with slight tremors (shaking movements), rapidly increase to one or more violent shocks, and are followed by less severe aftershocks. Most earthquakes are too small to be felt, but others are so strong they can cause major damage to homes and businesses.

MATERIALS

Per group

- | | |
|---|-----------------|
| 1 slice of white bread | 1 plastic knife |
| 1 slice of light wheat bread | paper towels |
| 1 slice of rye or dark wheat bread | 1 paper plate |
| 2 Tbsp. of jelly in a small cup | |
| 2 Tbsp. of crunchy peanut butter in a small cup | |

Teacher

The Sun, the Wind, and the Rain, Lisa Westberg Peters
After the Earthquake, William McCay, Benchmark Education Co.

Per student

science journal

TEACHING TIPS

1. Measure the jelly and peanut butter and place the different breads for each group on a paper plate prior to the lesson.
2. Have students wash their hands prior to the activity. (Students should wear surgical gloves for hygiene, if you want them to eat the sandwiches afterwards.)

ENGAGE

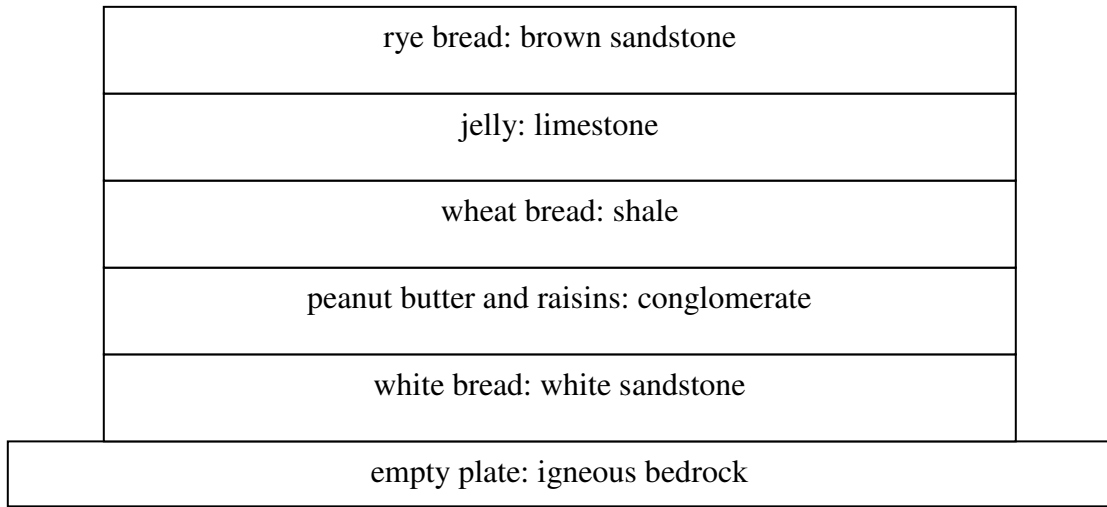
1. Have students hold their hands up with their palms together. Tell them to press their hands together firmly – as hard as they can! (This is how the earth’s plates push against one another.)
2. While they are still pushing firmly, instruct them to try to slide one hand up along the other hand. Discuss: *Was this hard to do? Did you feel the sudden movement?* (When a giant earth plate breaks free from another one, this sudden release of pressure causes an earthquake.)

EXPLORE and EXPLAIN

1. Distribute plates containing the materials. Inform students that they will be building a model of the earth’s crust.
2. Explain that the empty plate represents igneous bedrock. Imagine a river flowing over the bedrock and white sand from rocks eroded by the river is being carried along in the water. The sand is deposited on the river bottom. As time passes, the sand becomes cemented together, forming a layer of white sandstone. Have students place a slice of white bread on the plate to represent the sandstone. Ask, *What position is it in?* (Discuss that it is flat, or horizontal. Rock layers are laid down horizontally, but most rock layers have moved or disturbed by various forces.)
3. Instruct students to spread the peanut butter on the bread. Explain that a flood caused tons of mud (peanut butter) and rocks of various sizes (chunky nuts and raisins) to pour into the area and cover the sandstone. This represents a sedimentary rock layer called a conglomerate.
4. Have students place the wheat bread on the peanut butter. Explain that a gentle river flowed through the area carrying a load of fine clay particles called silt. As the river slowed down,

the silt was dropped to the bottom, forming another layer. In time, the silt will become a type of sedimentary rock called shale.

5. Tell students to spread jelly on the bread. The earth is warming and glaciers are melting. The ocean rises and covers the area. The salt water brings millions of little marine organisms. Their shells line the ocean floor, forming a new layer. In time, the ocean will recede, leaving a layer of limestone.
6. Finally, have students place the rye bread on top. During a time of drought, winds pick up eroded bits of rocks until a layer of brown sand covers the area and becomes brown sandstone.
7. Draw and label the different layers on the board as students draw a side view of the sandwich and label it.



8. With both hands, have students hold the sandwich with the oldest rock layer (white bread) on the bottom. Have them gently push upward on the oldest layer or the bottom of the sandwich. The bulge simulates mountain formation caused by pressure beneath rock layers pushing up and bending the rocks.
9. While still holding the sandwich with both hands, students should push down on the youngest rock layer (rye bread) on the top of the sandwich. This depression simulates valleys formed because of surface pressure.
10. Have students quickly squeeze the sides of the sandwich together. When the sandwich is crushed quickly, breaks in the bread occur. These breaks represent faults. Cut the sandwiches in half (NOT DIAGONALLY) across the break. This cut represents a fault in the earth's crust.
11. Holding both halves, have students rub the two halves back and forth against each other, one side up and the other side down to show a vertical fault. In part, it is this up and down movement that causes earthquakes.
12. With both halves of the sandwich resting side by side on the plate, have students model a lateral fault by sliding one side of the sandwich past the other.
13. Ask students to move one half of the sandwich so that it rests on top of the other side. Sometimes one plate of the earth's crust overrides the edge of another plate, causing a reverse fault.

EXPLAIN

What do the layers of the sandwich represent? (rock layers that might be found in an area)

Which layer is the oldest? How do you know? (bottom layer – white bread; it was put on first)

What is the youngest layer? How do you know? (the top layer – the rye or dark bread; it was the last layer added)

How are mountains and valleys formed? (pressure beneath rock layers pushing up and bending the rocks to create mountains or surface pressure pushing down to create valleys)

What is a fault? (a crack in the earth's crust)

What causes earthquakes? (The earth's crust suddenly moves up, down, or sideways along a crack or fault.)

EXTEND/APPLY

1. Read *The Sun, the Wind and the Rain* by Lisa Westberg Peters.
2. Have students punch a hole in the sandwich through the middle of the top layer. If they press gently on the top with both hands on either side of the hole, the jelly comes up and out making a good volcano simulation.
3. Locate areas on a map or globe that are prone to earthquake activity.
 - Ask students if they have ever experienced an earthquake. Allow those who have to share their experiences.
 - Share the book *After the Earthquake* by William McCay.

ASSESSMENT

Students should respond to this question in their journals:

What forces can cause changes in the earth's surface?