Suggested Activities
Processes that Shape the Earth:
Earth's Structure and Plate Tectonics

From *Harcourt Science* Teacher' Ed.

Source (Grade Level)	Title	Pages	Concept
Harcourt Science (4)	The Layers of the Earth	C4-5	Earth's Structure
Harcourt Science (5)	Journey to the Center of the Earth	C12-13	Earth's Structure
Harcourt Science (5)	Movement of the Continents	C20-21	Plate Tectonics
Harcourt Science (4)	Earthquakes	C10-11	Earthquakes
Harcourt Science (4)	Volcanoes	C16-17	Volcanoes

Science IDEAS Activities (following this page in the binder)

Title	Concept
Ancient Earth	Plate Tectonics
Crust Pressure	Plate Tectonics
Faulting Builds Mountians	Plate Tectonics
Earthquakes	Earthquakes
See a Wave	Earthquakes

Please refer to the *Suggested Websites* page in Tab 2 of this binder for activities and demonstrations found online.

Pressure on the Earth's Crust

Question: Where do the forces come from that bend, break, and move the Earth's crust?

Prior knowledge questions to ask your students:
What are the layers of the Earth? Which layer is on top?

Materials:
Cardboard, glass bottle, scissors, water

Directions/Procedures:
1. Cut a circle (slightly larger than the top of the bottle) from the cardboard.
2. Put the bottle in the freezer for ½ hour.
3. Remove the bottle from the freezer and set it on a table.
4. Dunk the cardboard circle in the water and then cover the bottle opening with the circle.
5. Quickly rub your hands together for about 15-20 seconds.
6. Place you hands around the bottle. Record your observations.

Journaling Suggestions
What happened to the cardboard, and why? How is the cardboard like the plates in the Earth's crust?

What Happened?
As your hands warmed the cold air inside the bottle, the air expanded and rose, much like the warm material in the mantle expands and rises. When pressure from the rising mantle builds inside the Earth, it pushes on all sides and will move parts that have weak spots to release the pressure, much like the air moved the cardboard. Volcanoes result from weak spots or plate edges that get pushed upward.

NSF/IERI Science IDEAS #0228353

Faulting Builds Mountains

Question: How Does Faulting Change The Land?

Prior knowledge questions to ask your students:
What are mountains? What is faulting? Why do faults move up, down, or sideways?

Materials:
Modeling Clay (red, yellow, blue), 5 similar seashells, sturdy wooden ruler, 2 small cardboard arrows, plastic knife

Directions/Procedures:
1. Work with a partner.
2. Stack your modeling clay in flat layers.
3. Press seashells into one layer.
4. Slice your clay at an angle.
5. Move one chunk of clay higher than the other.
6. Use arrows to show which way the rocks moved.
7. Demonstrate how you formed your mountain.

What Happened?
Force from the mantle can push up the crust, breaking it and exposing lower layers. In the activity, the higher chunk of mountain showed some lower layers exposed above other top layers. Faulting changes the land by exposing lower layers of crust and making mountains. Cliffs are examples of faulted mountains.

Journaling Suggestions:
What forces cause faults to rise above the surface? How do faults help geologists learn about the Earth's past?

Ancient Earth

Question: How Were The Continents Aligned Before They Separated?

Materials:
3 copies of a world map, scissors, 3 sheets of construction paper, glue, globe or world map

Directions/Procedures:

1. Cut out the continents from one copy of the world map.
2. Arrange the continents into one large "supercontinent" on a sheet of construction paper. As you would with a jigsaw puzzle, arrange them so their edges fit together as closely as possible.
3. Label the pieces with the names of their present continents, and glue them onto the paper.
4. Use a globe or world map to locate the following mountains: Cascades, Andes, Atlas, Himalayas, Alps. Then draw these mountains on the supercontinent.
5. Use your textbook to locate volcanoes and places where earthquakes have occurred. Put a "V" in places where you know there are volcanoes, such as the Cascades. Put an "E" in places where you know that earthquakes have occurred, such as western North America.
6. Repeat steps 1-5 with second copy of the world map, but before gluing the continents to the construction paper, separate them by about 2.5 cm.
7. Glue the third world map copy onto a sheet of construction paper. Then place the three versions of the world map in order from the oldest to the youngest.

Journaling Suggestions: Describe what evidence students confirmed in this activity, that suggests that all of the continents were once joined together.

What happened:
Pressure from inside the Earth causes crustal movements, moving continents over long periods of time. All of the continents used to be joined together, and these slow movements separated the continents.

See A Wave

Question: How does a seismograph record motion?

Materials:

Masking tape, graph paper, 8½x11 piece of cardboard, rubber band, marker, plastic ruler

Procedure:

1. Tape the paper to the cardboard.
2. Use the rubber band to attach the marker to the ruler so that the marker tip extends beyond the end of the ruler by about one inch.
3. Lay the ruler on a table so that it extends about halfway over the edge. Tape the ruler securely in place.
4. Hold the paper in front of the marker so that the marker's tip touches the paper on the left side.
5. Have a partner pull down on the ruler and let it go. Move the paper from left to right, and try to get a wave form on your paper. *It may take a couple of tries.*
6. Now move the ruler so that it extends way beyond the table, and repeat. Try to get at least two different, good wave forms.

What Happened?

The farther away from the table, the more the ruler moved, and the longer the lines made on the paper. During an earthquake, the greater the movement from each earthquake wave, the longer the lines are on the seismograph. A seismograph shows how large the earthquake waves are.

Journaling Suggestions

In this activity, you moved the "seismograph" yourself. Explain how a seismograph would be moved during a real earthquake.

Earthquakes

Question: How Can We Show What Makes The Earth's Crust Quake?

Prior knowledge questions to ask your students:
What is an earthquake? What causes the crust to move?

Materials:
3x5 inch self- stick note, small plastic cup, and water

Directions/Procedures:
1. Stick the self-stick note to a table. Make sure that 1 inch of the short side is hanging over the edge of the table. Make sure the self-stick note is firmly stuck in place.
2. Fill the cup ¼ full with water.
3. Place the cup on the center part of the self-stick note that is on the table.
4. Carefully and firmly pull the self-stick note straight out from under the cup.

What Happened?:
The sticky part of the note stopped you from easily pulling it all the way out, and when it released you were pulling with enough force to move the note quickly, thus causing the water to vibrate. The sticky part of the note acted as two plates sticking together and then moving past each other causing the Earth's crust to vibrate. The glass sticking to the sticky note showed how two plates sticking together and then moving past each other would make the Earth's crust quake.

Journaling Suggestions:
What makes plates stick together until there is enough force to move them? How would earthquakes be different if plates did not stick together?