Rumble, Tumble, Crumble

Disseminator: Arlene Trotter
Crestview Elementary
2201 N.W. 187th Street
Miami Gardens, Florida 33056

Mail Code: 1161

Phone (305) 624-1495
Fax (305) 628-3198

Principal: Ms. Melissa Mesa

For more information concerning IMPACT II opportunities including Adapter and Disseminator grants,
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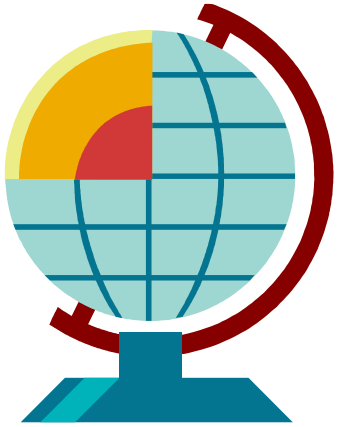
Title: Core of the Matter

Purpose: to observe the layers of the Earth



Materials:
For Each Student

- 1 marble (core)
- 3 slices of modeling clay(2 different colors,
- And a slice of brown for the crust)
- plastic knife
- Wax paper (to take home in)

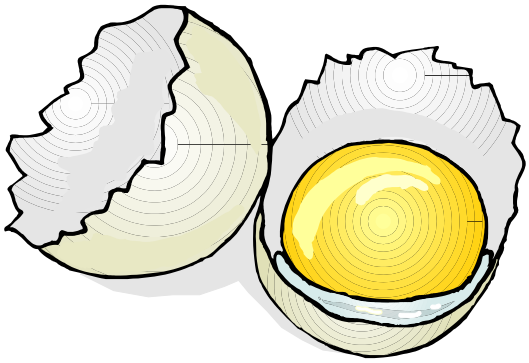
Procedure:
1. Start with marble.
2. Cover with clay.
3. Cover the next layer with another color slice of clay.
4. Cover the last with brown clay
5. Slice a V shape into the ball and observe the layers.

This is how geologists observe- they take a core sample.

What's Happening?
The marble represents the inner core. The next layer is the outer core, followed by the mantle. The top layer is the crust, which we walk on. When you slice it open, all the layers can be observed.

Background Information:
Planet Earth is made of different layers, one on top of the other. The outer layer is called the crust, and it is made of rock. In some places, the crust is only three miles deep. Below the crust is the mantle. It is hard on the top and soft farther in. The very center is called the core. The outer core is molten iron, and the inner core is solid iron. If you could dig to the center of Earth, the temperature would get hotter and hotter the deeper you went. The problem is that even the toughest tools would melt just eight miles in.

You can also model the three layers of the Earth using a hard boiled egg. The shell is the outer crust, the white is the mantle and the yellow yolk is the core. Slice it easily with dental floss.

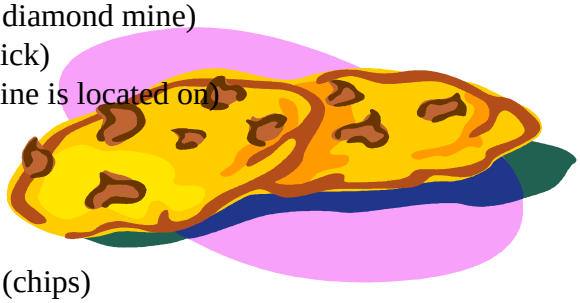


Title: Mining Resources- Digging for Diamonds!

Purpose: To understand that some resources are mined and that the "mining" may affect the land around it.

Materials:

- One paper plate per student
- One chocolate chip cookie per student (this is the diamond mine)
- One toothpick per student (this is the geologist's pick)
- Paper plates or paper towels (this is the land the mine is located on)
- One cup of water per table
- Eyedroppers



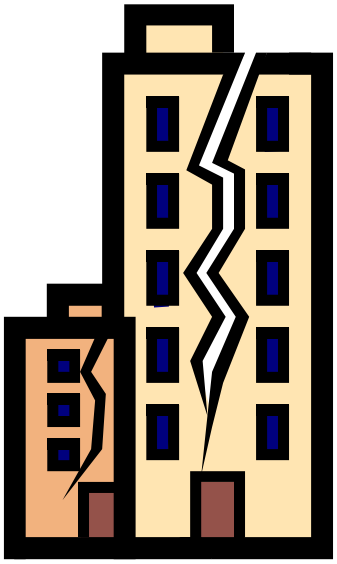
Procedure:

1. Observe your mine. Do you see all the diamonds? (chips)
2. Using one hand and your toothpick, extract the "diamonds" from the mine and place them on the side.
3. If the task is difficult, add a few drops of water to the mine.
4. Observe what happens to the mine after this task.

Draw Conclusions:

1. Were there any "diamonds" buried deep in the mine?
2. If you continued to mine every last one, would there be any left? How does this relate to other materials that are mined?
3. When the chips were mined from the cookie, the cookie was torn up. If the land were
4. mined in the same way, would the land be torn up?
5. Are diamonds a renewable or non-renewable resource?

Title: Shake the Earth



Purpose: To observe the effects of an earthquake.

Materials:
For each group

- Rectangular pan filled with gelatin (premade jello)
- Plastic wrap
- 20 assorted croutons

Procedure:
1. Cover pan with plastic wrap
2. Use croutons to make buildings on the gelatin
3. Move the pan up and down and from side to side

What's happening?
Students are observing the shaking of the land (gelatin) which results in damage to the buildings as well as cracks in the earth's surface. This movement is similar to the movement in Earth's surface caused by earthquakes.

Extension:
Students can repeat his activity using straws or toothpicks to stabilize the buildings. Observe another earthquake. Discuss the designs and materials that best prevented damage to the buildings.

Title: Where's the Epicenter?

Purpose: To see if there is more damage to buildings located closest to the epicenter of an earthquake.

Materials:
For each group

- One shoebox covered with dark paper
- 3 different colored cups of popcorn kernels
- 3 spoons
- 3 stopwatches
- 1 ruler

Procedure:

1. Place the box upside down on the floor
2. Place one teaspoon of each colored popcorn at each end of the box
3. Place the third color popcorn in the center of the box
4. Label the location E (epicenter at front of box)
5. Label the next A and B (or name of a city)
6. Tap the side of the box nearest the epicenter with a ruler.
7. Observe and record what happens to the different popcorns
8. Measure how far away each color was moved with the ruler

Explain Your Results:

1. Why do you think the popcorn at different locations moved different distances?
2. How would knowing where earthquakes might occur help you decide where to put a building?
3. Would you want to live in area where an earthquake may occur?

What's happening?

The tapping on the box modeled what happens during an earthquake (the energy from underground is released).More kernels moved when they were closest to the epicenter.

Background Information:

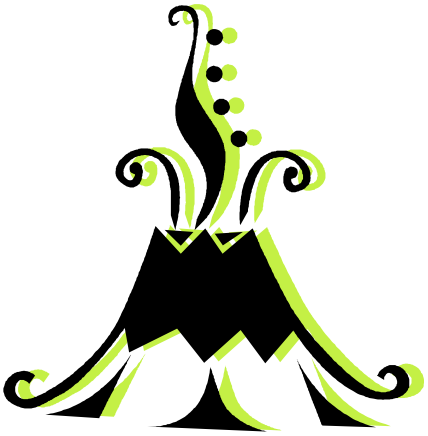
Earthquakes are caused by Earth's surface shaking and rolling. The place where an earthquake begins is its focus. It may be miles underground. Seismic waves or shock waves, spread out from the focus. The epicenter of the quake is the point on Earth's surface directly above the surface. This is the point where the earthquake is felt most strongly. The strength of an earthquake is called its magnitude.

Scientists who study earthquakes are called seismologists. They use two scales to measure earthquakes. The Richter scale is the most well known. It measures the amount, or magnitude of energy released by an earthquake. The scale is named after its creator, Charles F. Richter, an American scientist. The modified Mercalli scale measures the amount of shaking and damage caused by an earthquake. It is based on the effects of a tremor on buildings and people. This scale was created by the Italian scientist Giuseppe Mercalli. It is recorded using Roman Numerals from one to twelve, with twelve representing total destruction.

By studying this information, seismologists can recognize patterns that may suggest that a gig tremor is on the way. However, even with modern technology, scientists cannot accurately predict if and when an earthquake will occur.

Title: Model Volcano

Purpose: to observe what happens during a volcano



Materials:
(For each group)

- Small plastic tray or sheet of wax paper
- Graduated cylinder
- 2 small paper cups (4oz. works well)
- 20 ml. vinegar (add a drop of red food coloring)
- I tablespoon baking soda
- Handful of potting soil

Procedure:

1. Put baking soda in small cup. Place cup on plastic tray.
2. Spread potting soil all around the cup and push up.
   (So it looks like a little mountain)
3. Pour the vinegar into the cup and observe.

What's happening?

The vinegar and baking soda form a chemical reaction. But look at the land (dirt) around the cup. Volcanic eruptions make new land. This is how the Hawaiian Islands were formed. The lava cools and hardens and spreads out.

Suggestion:

Take the class outside. Do this investigation on the dirt placing the cups partially underground. This will also show how new land forms around the volcano.

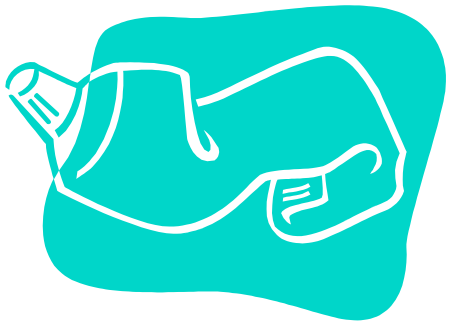
Extension:

Use a tube of toothpaste to further model volcanoes. Hold it up and remove the cap. Squeeze and observe how the pressure forces the toothpaste (magma) up. Next make some tiny pinholes in the tube. Squeeze again. Observe how the toothpaste also comes out of these tiny openings. In addition to the main opening, magma will also ooze through cracks and weak places in the crust and force its way up, emerging as lava.

Videos:

- **Too Hot to Handle** (3-2-1-Contact, Children's Television Network)

- **Volcano !** (National Geographic Society)



Title: Pudding Tectonics

Purpose: to observe how liquefied magma pushes up through the mantle . It then cools and hardens to form additional crust. This rising magma can form mountains and volcanoes.

Materials:
For each Group:

- One large box of chocolate pudding (not instant)
- Milk (as required from the box recipe)
- Insulated cups for each student (or large bowl for team)
- Wooden spoon
- Pan or hot plate to cook pudding
- Old newspapers
- Spoons

Procedure:

1. Mix milk and pudding in large pot and heat until mixture is ready.
2. Spread newspapers over tables.
3. Pour pudding in cups or bowl
4. Allow to cool until crust develops over top of pudding

If a refrigerator is available, place cups there and a more definite crust will form. Ideally this could be prepared before lunch and then taken out later.

5. Gently push down on the crust with a spoon and observe the layer crack
6. Separate some of the pieces.

What's Happening:
The pudding crust represents the Earth's crust. The crust is hard, but the mantle underneath is still liquefied. Pressure from the liquefied magma (pudding) pushes up on the crust and eventually forces a crack in it. The magma pushes up through the crust and very quickly cools and hardens to form additional crust. This rising magma can form mountains and volcanoes and islands in the sea.

Background Information:
Scientists have theorized about rock formations and how the continents came into existence. A German scientist named Alfred Wegner developed a theory based on the fact that all the continents seemed to fit together like a jigsaw puzzle. He believed that the continents were once joined in a single land mass called Pangea. Pangea is a Greek word that means "all lands". Another indication that Pangea did exist is that similar rocks and fossils have been found on continents that are far away from each other. Fossils of similar plants and animals have been found in Africa and South America. Pangea is believed to have broken into pieces and drifted apart creating the seven continents that exist today. During the 1960's scientists developed the theory of plate tectonics in order to explain continental drift. The theory proposes that the entire surface of the Earth is broken up into giant plates. There is a difference of opinion among scientists as to the exact number of plates. However, six large plates along with some smaller

ones have been discovered. The plates are always moving, sliding under, over or bumping into each other. When two plates move away from each other—a gap forms and volcanoes emerge.When two plates scrape along the sides or bump into each other—an earthquakes occurs. When two plates push against each other—mountains form.
(Use two wooden blocks to model these movements)
Most of the actions and consequences of plate tectonics take a long time to observe. This is Earth's history and the study of Geology.

Title: Fly Away Sand

Purpose: to observe how moisture affects beach erosion

Materials:
(For each group)

- 50-60 paper circles (use the paper hole punch)
- Shallow pan or tray
- Cup of water

Procedure:

1. Place all the circles on tray
2. Blow across the circles
3. Observe how easily they move around
4. Dip your fingers in the water and sprinkle drops all across the paper circles. Blow across the circles again
5. Observe how many less circles moved this time

What's Happening:

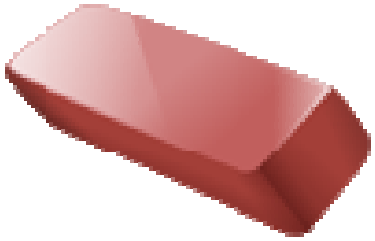
The circles represented the sand on our beaches. Loose, lightweight sand particles easily get blown away during our windstorms and hurricanes. Damp land areas and those covered with vegetation are not as easily eroded by the wind. Wet sand is less likely to be eroded. In Florida, we plant **sea oats** as a way to prevent erosion. Their root system is a far reaching mass of tangled stems and threads that stabilize the sandy dune soil and sand.

Title: Weathered Away

Purpose: to demonstrate how rocks weather and change into soil and sand and then get erode away

Materials:
(For each group)

- Large rectangular eraser
- Writing paper
- Pencil



Procedure: The Eraser is the Rock

1. Write the word “WEATHERING” on your paper
2. Gently rub it with the eraser until it disappears
3. This represents the weathering away of rocks.
Observe all the little pieces of the eraser.
4.Now blow on the pieces. This is erosion by wind. Wind can move the pieces away. If you poured water on the pieces, the water would move the pieces to another area too.

What’s Happening?

The rubbing of the eraser models weathering of rocks. The blowing models erosion. Weathering is the breaking down of rock and erosion is the movement of the pieces. Over time, the rock (the eraser) gets smaller and smaller. If it is not affected by wind or water or gravity, it might stay in that same area. But with lots of wind or water, the rocks can be moved far away from their original place.

Title: Run Off

Purpose: To demonstrate how rain affects topsoil

Materials:
(for each group of four)

- 75 ml. water
- cup of dirt
- 1 teaspoon of red powdered paint
- large plastic spoon
- measuring cup or graduated cylinder
- funnel
- coffee filter paper
- plastic cup

Procedure:

1. Add 1 teaspoon red powdered paint to one cup of dirt (mix)
2. Set funnel in plastic cup
3. Place coffee filter in funnel
4. Pour dirt into filter
5. Add 75 ml. of water to funnel
6. Observe water dripping into cup
7. Pour this water out of cup and add 75 ml. of water to funnel again

Results: The liquid dripping out of the funnel is red

Why:

The red paint represents the nutrients in topsoil that are soluble in water. Nutrients dissolve in rainwater. When the rain is too heavy, the water runs across the land. Excess rains can leave the topsoil lacking in nutrients. During our Florida hurricanes, we often lose valuable good topsoil and precious sand. This is a form of erosion.

Title: Shrinking Rocks

Purpose:
To demonstrate how rocks change through weathering as well as determine the effect water and rock size has on weathering rocks.

Materials : (For each group)

- Small hard candy for each student (use a different color for each glass of water
- Paper
- Pencil
- Graph paper
- 4 Stopwatches for each pair
- Hammer

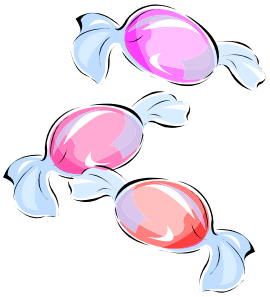
The candies will represent the rocks. We are going to time the number of minutes (or seconds) it takes for the candies to dissolve (weather). Then we will graph the results.

Problem Statement:
Does the size of the rock (candy) effect the time it takes to dissolve (weather)?

Hypothesis: Students write what they predict

Procedure: (2 Class periods)

1. Each student needs a partner to time them (Let two groups work together. Each group will want a chance to have the candy so you may want to repeat this lesson the next day)
2. Student #1 whole candy
3. Student #2 cut candy into two pieces
4. Student #3 hit candy hard with hammer
5. Student #4 smash candy with hammer.



6. When the teacher says: ”Weathering” all students put the candy in their mouth and their partner presses start on the stopwatch. Students will swish the candy around in their mouth and the partner presses stop when the candy is almost completely dissolved. You do not want the “rock” totally gone.

7. Record how long it took for each to dissolve. Did the size of the rock have an effect on the time it took to dissolve?

8. Record your data and use graph paper to graph your results. If you have three groups, you can record the results as a class on the board and you will have three trials.

9. You can now repeat this experiment adding water to your mouth and see if that changes the results. Does more water have an effect on weathering?

What's Happening?

You just demonstrated mechanical weathering-the breaking of rocks by the forces of wind, water, waves and ice. In other words, it is the physical hitting of one object against another. During a storm, for example, water enters the many holes in the rock. When this water freezes, it expands. The expansion of the water results in the holes or cracks getting wider. Water is the most common mechanical weathering agent. Factors affecting the rate of weathering include particle size and water speed.

Look at the Grand Canyon and see how the Colorado River flowing through has made canyons and valleys throughout!

EROSION SHAPES THE LAND

Weathering is the process by which the earth is changed due to conditions in the environment. There are four main agents of erosion. They are wind, water, gravity, and glaciers. Water is the most powerful agent of erosion. Erosion is a type of weathering that helps to shape our land. Many canyons began their lives as simple gullies. A **gully** is a ditch or channel cut in the earth by flowing waters, especially heavy rain. Water in streams traveled over these flat lands and carried away the earth materials. A **canyon** is a deep valley with steep walls on both sides. A canyon is also formed by running water. A **delta** is an area of land shaped like a triangle formed by deposits of sand and mud at the mouth of a river. The earth is always changing. Erosion is the wearing down of the earth by natural forces such as wind, water, and ice. Erosion happens slowly over many years so sometimes it is hard to see. Over thousands of years. mountains and hills have been worn down and rivers have been widened. Water plays a very powerful part in erosion. Each year a quarter of the rainfall runs into oceans and streams carrying with it parts of the earth. Wind erosion carries off soil and small rocks and moves them from place to place. Strong winds can even uproot small plants. Snow collects on mountaintops and. as its weight builds up, it becomes compressed into ice. The ice moves slowly downhill and glaciers are formed. Glaciers carry rocks that are frozen in the ice a great distance before dropping them. Glaciers cause erosion when the ice melts.

Draw the sand in the box before and after you changed it b y the wind and rain erosion.

In this activity, you will be simulating erosion by wind and rain.

Safety Tip: Be sure to protect your eyes from flying sand.

MATERIALS: one plastic box half filled with sand, a paper cup with a hole covered with tape on the bottom, 4 straws, a container of water, sand colored with food coloring (optional), small rock

PROCEDURE:

1. Create Erosion by wind: Spread some colored sand if available on top of the sand in the box. Be careful not to get too close or you might get sand in your eyes. Wear safety goggles if available.
2. Hold the box at an angle and gently blow through the straw and watch what happens to the sand in the box.
3. Smooth out the sand and place a rock on one side of the box. Prop the box at an angle with the rock on the top end of the box. Gently blow in the sand on both sides'of the rock. Watch what happens to the rock.
4. Remove the rock from the box and smooth out the sand.
5. Fill the empty cup with water. Hold the box at an angle. .Carefully remove the tape from the cup and let the water drip out in one place at the top of the box. Observe the water and how it changes the surface of the sand. This is similar to what happens when it rains.

Box of sand before the simulation	Box of sand after the wind test	Box of sand after the rain test

Math Connection:
During a bad flood, 12 inches of rain fell on Monday, 11 inches fell on Tuesday, and 9 inches fell on Wednesday. How much rain fell in all?

_____
_____
_____

The sandbox at the park had 86 pounds of sand. During a heavy windstorm, 28 pounds flew away. How much sand was left in the sandbox?

_____
_____
_____

List the four agents of erosion? Put a star next to the most powerful agent.
1.
2.
3.
4.

Tell three things you learned today that you did not already know.

_____
_____
_____
_____

Critical and Creative Thinking

Students could brainstorm some of these ideas or they could be changed into writing prompts.

What would life be like if:

- You lived near an active volcano…
- You lived on one of Earth's moving plates where an earthquake could occur…
- The Earth's temperature rose and the magma couldn't cool and harden (like in Hawaii)….
- All the topsoil washed away during a rainstorm…
- All the beaches lost their sand…
- The glaciers starting melting quickly…

Resources for Strand D:
Processes That Change the Earth

Suggested books:
How Mountains are Made
By: Kathleen Weidner Zoehfeld
(This book describes plate tectonic theory and how forces of nature sculpt our world)

The Magic School Bus Inside the Earth
By: Joanna Cole
(On a special field trip the class explores different kinds of rock formations)

Volcanoes
By: Judith Greenberg and Helen Carey

Mount St. Helens: A Sleeping Volcano Awakes
By: Marion Place

Our Restless Earth
By: Roy Gallant

The Restless Earth
By: Melvin Berger (Newbridge Educational Publishing)

Videos:
Volcano! National Geographic Society, 1989 VHS 59 min.
Magic School Bus Inside the Earth (551 COL)
Weathering and Erosion: National Geographic Society, 1983

Television Series Programs On ITFS DCPS Channels
Also available on video: Children's Television Network

3-2-1- Contact: Fossils: Remains to be Seen
3-2-1- Contact: Earth is Changing
3-2-1- Contact: Volcanoes: Too Hot To Handle

Bibliography

1. Berger, Gilda, The Restless Earth: New York, Newbridge Educational Publishing ,1995.

2. Cooney, Timothy, and Cummins, Jim Dr. Scott Foresman Science-See Learning in a Whole New Light: Glenview, Illinois, Scott Foresman, 2007.

3. Van Cleave, Janice, Earth Science for Every Kid: New York, NewYork, John Wiley& Sons Inc., 1991.