Plate Tectonic Cycle

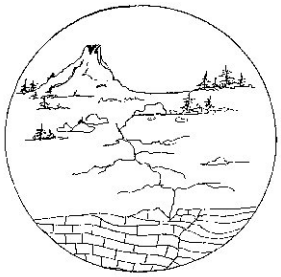
Earth's Moving Force

KINDERGARTEN

VOLCANOES

1 WEEK
LESSON PLANS AND
ACTIVITIES

PLATE TECTONIC CYCLE
OVERVIEW OF KINDERGARTEN



VOLCANOES

WEEK 1.
PRE: *Learning that all mountains are not volcanoes.*
LAB: *Investigating rocks that come from volcanoes.*
POST: *Discovering how volcanoes grow.*

EARTHQUAKES

WEEK 2.
PRE: *Learning that earthquakes cause the Earth to shake.*
LAB: *Discovering that earthquakes cause different types of shaking.*
POST: *Dramatizing different types of earthquake intensities.*

PLATE TECTONICS

WEEK 3.
PRE: *Learning that the crust of the Earth moves.*
LAB: *Analyzing a puzzle of the Earth.*
POST: *Comparing the continents with plate boundaries.*

HAZARDS

WEEK 4.
PRE: *Learning to critically think during an earthquake.*
LAB: *Analyzing the sounds created by earthquakes.*
POST: *Exploring dangers in the classroom.*

PLATE TECTONIC CYCLE - VOLCANOES (K)

PRE LAB

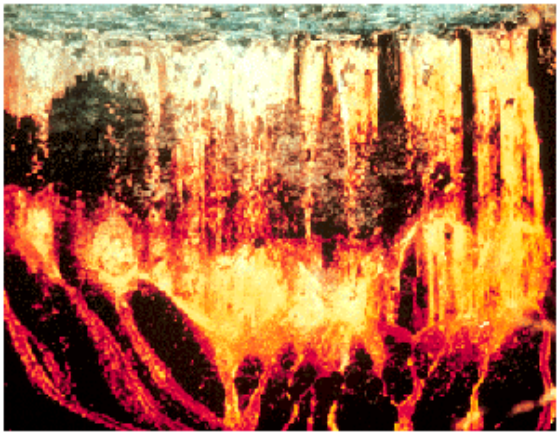
Students dramatize how magma

OBJECTIVES:

1. Learning that not all mountains are volcanoes.
2. Dramatizing how volcanoes erupt.

VOCABULARY:

lava
magma
mountain
rock
volcano



Hawaiian lava flow

MATERIALS:

Samples of volcanic rocks
Minerals and Rocks Display Kit

BACKGROUND:

Children are fascinated with the spectacular volcanic eruptions that occur throughout the world. Volcanoes are very important to interpret the outer portion of the Earth, as well as to the Earth's history. As the new Earth developed 4.5 billions years ago, volcanoes erupted, emitting not only lava, but steam, and other gases. This steam, through eons of time, was one of the major sources of water on this planet. The volcanic rocks (igneous rocks) produced by volcanoes make up much of the Earth's surface.

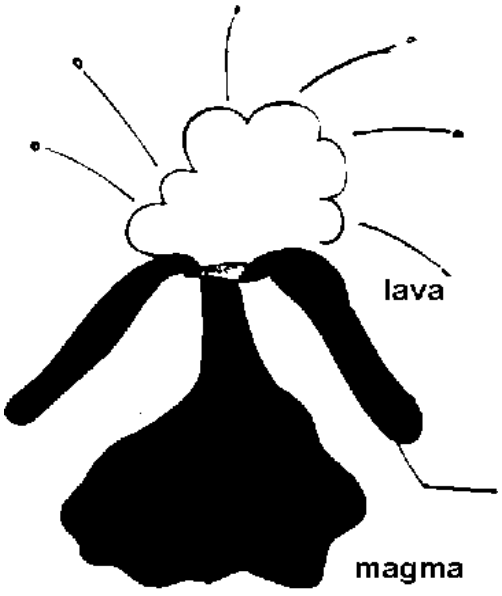
Explaining why volcanoes occur in certain places requires a knowledge of plate tectonics, specifically the three different types of plate boundaries. Essentially, a variety of processes at plate boundaries cause rocks to melt. This molten rock, called magma, moves upward because it is hot and buoyant. It erupts to form volcanoes. Some volcanoes, like the Hawaiian Island chain, are not related to plate tectonics: these volcanoes form over "hotspots", which are sources of magma (molten rock) the have their origin below the plates.

Volcanoes produce volcanic rocks such as lava, which is magma that has cooled on the surface of the Earth. If the magma cooled inside the Earth, it forms what is called plutonic rock. Both plutonic and volcanic rocks are types of igneous rocks. Melted rocks that have hardened are considered igneous rocks.

When magma erupts on the Earth's surface, it often builds a volcano, which is basically a pile of cooled volcanic rock. Volcanoes may be hill to mountain size. However,

not all hills and mountains are volcanoes. Some are tectonic features, constructed by mountain building , which often happens at plate boundaries, just like volcanism. Others are erosional features, leftovers from earlier tectonic mountains.

Volcanoes are impressive to young students. In the eyes of a child, the fire and disaster caused by volcanoes are simply "awesome." This Pre Lab capitalizes on your students' curiosity by introducing the science of volcanic eruptions.



PROCEDURE:

1. Discuss and introduce the concept that not all mountains are volcanoes. Show pictures of mountains that are volcanoes and ones that are non volcanic (see pictures on next page). The Internet also has many wonderful pictures. Here are some recommended websites:

www.meto.umd.edu/~jose/VOLCANOES/volcpage.html

This site has good pictures, including a simulated 3-D column of ash erupted out of a volcano.

http://volcano.und.nodak.edu/vwdocs/current_volcs/current.html

Information on currently erupting volcanoes around the world, with links to each site.

http://www.geo.mtu.edu/volcanoes/

University of Michigan volcano sites around the world.

http://vulcan.wr.usgs.gov/home.html

The US Geological Survey Cascades Volcano Observatory. Excellent information on US volcanoes, as well as plate tectonics and geologic hazards.

http://www.norvol.hi.is/

The volcanoes of Iceland and their eruption histories.

If you have volcanic rocks in your area, discuss them with the students. If you do not know if the mountains are a result of an old volcano, consult your local university's geology department, natural history museum, or email us with your exact location at (msn@msnucleus.org).

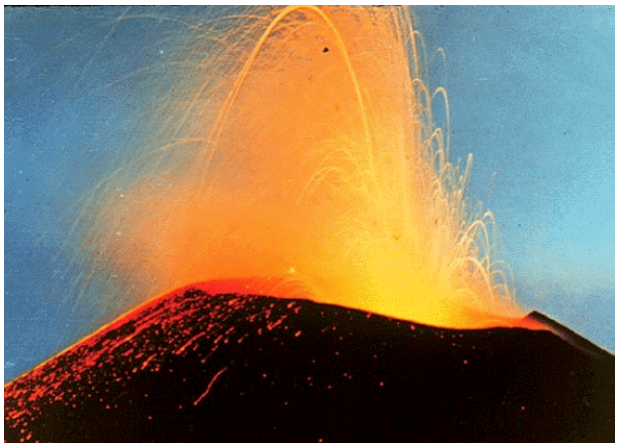
2. Explain to the students that volcanoes produce rocks from cooled down melted lava. The melted rock inside the Earth is called magma and when it erupts on the surface it is called lava. Discuss how lava comes from a volcano. Ask the students about their own experiences with volcanoes.

3. Announce that you are going to have them play a game called "Like a Volcano."

Have the students lie in a prone position on the floor and imagine that they are magma inside the volcano. Have them pop up or "erupt," mimicking the eruption of lava. Remember magma inside the Earth, lava on its surface. Repeat this activity several times, reiterating that magma is in the Earth, and lava is outside the Earth.

4. You may want to have samples of volcanic rocks in your classroom, but do not use the same samples for the hands-on lab. You can usually get large "lava" rocks (basalt or pumice) by going to a local landscaping supply house, or use samples in the Minerals and Rocks Display Kit.

Volcanoes and Mountains



Mt. Etna - an erupting volcano in Italy

Mt. Lassen - a volcano in California

The Grand Teton Mountains in Wyoming are not volcanoes.

This mountain in Utah is not volcanic.

PLATE TECTONIC CYCLE - VOLCANOES (K)

LAB

Students sort rocks from volcanoes.

OBJECTIVES:

1. Exploring that volcanoes produce rocks.
2. Investigating rocks that come from volcanoes.

VOCABULARY:

basalt
lava
magma
obsidian
pumice

MATERIALS:

Plate Tectonics - Volcanoes (K)
Hand lens or Swift GH microscope

BACKGROUND:

After it erupts ,a volcano leaves evidence of its activity. These clues are the rocks that were created from molten rock, or magma, erupted by the volcano. These rocks are all igneous rocks. If they are associated with the volcano, they are called *volcanic rocks.* Volcanic rocks are a subset of igneous rocks. If the magma cooled and hardened inside the earth, they are called *plutonic rocks.*

Rocks from volcanoes can be very different. They can be light in color and weight, or they can be dark and heavy. Students have to learn to become familiar with volcanic rocks by examining them. This is generally true of all rocks. The more a child sees and feels rocks, the more that child can associate a name with its characteristics.

Scientist name volcanic rocks in ways that describe their composition, how they erupted, and how long it took them to cool. Students will learn some of these names and their meanings in later grades.

PROCEDURE:

1. Volcanoes are "hills or mountains" made of once melted rock that have cooled and hardened. However, all hills and mountains are not volcanoes. Ask students to

develop a description of the environment where volcanoes form (i.e., hot and fiery places). If possible, show students pictures of volcanoes to help them develop descriptive terms.

2. In your module, there are bags containing small pieces of rock and other materials, including basalt (black rock), pumice (gray, light rock), obsidian (shiny black rock), diatomite (white rock), sea cookies (star on a white disc), a sea urchin spine (long, narrow), and pieces of Styrofoam. Divide your class into working groups. Give each group a bag and a hand lens or reflecting light microscope. Instruct the students to separate the items they think are derived from volcanoes. Have them examine their specimens with magnifying lenses. If you wish, you can make you own module with your own rocks and items.

3. As a class, discuss each item. State whether or not it comes from a volcano. Be sure to discuss how the students arrived at their answers. They may say that volcanic rocks will look like "rocks" - hard, not easy to break and usually dull looking. The volcanic rocks in your module are basalt, pumice, and obsidian. The sea cookie, sea urchin spine, and Styrofoam are not from a volcano, nor are they even rocks.

Diatomite is the only item that may give students a problem. It is a rock, but it is not volcanic. A hint that you can use to explain this is that diatomite breaks apart very easily, and most volcanic rocks do not. (Remember these are simplifications). Students will learn more complex criteria in the upper grades.

Students love to observe the sea cookie in more detail. If you wish, have them examine it in detail to reinforce their observational skills. They can describe the 5 part symmetry on the top of the sea cookie. Instruct them to look underneath the sea cookie. They will see two holes. One hole is the mouth and the other is the anus or “poop” hole. Ask students if they know which way the sea cookie moves, mouth first or anus first? The answer is mouth first because the sea cookie doesn’t want to eat their own poop!

4. Emphasize with the students that rocks from volcanoes were once melted and there are many types of volcanic rocks. Remind them that they are just beginning to learn about rocks. Exposure to samples of volcanic rocks will help students distinguish and learn more in later grades.

PLATE TECTONIC CYCLE - VOLCANOES (K)

POST LAB

Students observe how lava flows from a volcano.

OBJECTIVES:

1. Discovering how volcanoes grow.
2. Comparing different types of eruptions.

A cooled Hawaiian lava flow

VOCABULARY:

cone
grow
volcano

MATERIALS:

cardboard sheet
paper cone cup
shaving cream or whipped cream in a pressurized can

BACKGROUND:

Volcanoes can help students learn about the formation of the Earth's crust. We have found that some children associate the "blowing" up of a volcano as making it smaller. They have to be coaxed to understand that with each new lava flow the volcano will get larger. Students also need to realize that the shape of a volcano will depend on the pre-existing topography on which it erupts. A an eruption in a valley may fill up the valley before it ever builds a volcano. In addition, volcanoes will not be very steep (their slopes are usually less than 45^{o}), because the magma is not thick enough (viscous) to "stand up" very high.

Volcanoes have many styles of erupting. Some are quiet, like the Hawaiian volcanoes, and other are explosive like Mt. St. Helens in Washington State. The violent eruptions usually are highly charged with gases, which cause magma to explode as they shoot out of the volcano. This is similar to the results of shaking a can of carbonated soda and opening it: don't try this inside!.

Volcanoes are hill- to mountain-sized. They are built by accumulation of their own eruptive products including lava (a flow of magma), and fragments of magma (bombs and ash). There are usually one or "vents" on the volcano that connect the reservoirs of molten rock inside the Earth (magma chambers) with the surface.

Volcanoes have a variety of shapes. Cone and dome shapes are most common, but volcanoes can also be flat. Small children need to see how these different shapes are created. Observing the development of shapes created by nature will help students to

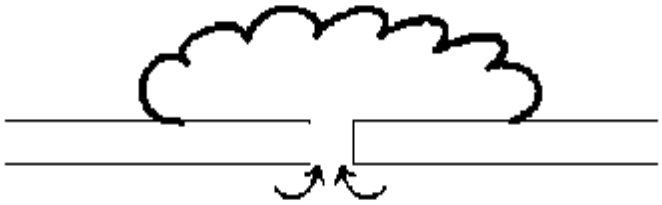
understand the growth of volcanoes.

In this activity the students observe the shapes formed by “eruptions” of whipped cream or shaving cream. The main concept is that the “cream in the can” represents the magma coming from inside a volcano. When it reaches the surface of the Earth, it is called lava. Lava comes out of the earth at different speeds, and forms mountain-like shapes.

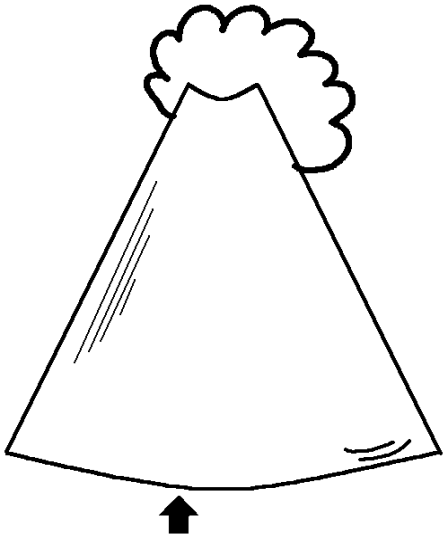
We suggest you practice making volcanoes before you show the class. Controlling the pressure of the can is tricky.

PROCEDURE:

1. Cut a small hole in the sheet of cardboard, and a hole in the top of the paper cone. Squirt the shaving cream or whipped cream through the holes, as shown in figure 1 and 2, to create a “volcano”. Vary the pressure and duration to make different sized volcanoes. In Figure 1, you are having the students observe that a new volcano will build a dome or cone-like structure. In Figure 2 you are emphasizing that a cone-shaped volcano will continue to erupt a dome-shaped lava flow.



1. Eruption through cardboard sheet.



2. Cone shaped eruption.

Instruct students to guess the final shape the “volcano” will make.

Discuss whether the shaving cream or whipped cream is thicker or thinner than real lava. It is actually both thinner and thicker: some magmas are very fluid, like flowing concrete, while others are very sticky, like cold honey.

2. After you have demonstrated the two "eruptions", ask the students if they believe the cream (representing lava) is "growing" or "getting larger". Explain that volcanic "growth" is different from "people" growth. Ask the students why the shape isn't turning

into a ball or going straight into the air. Basically, the lava is liquid and wants to flow. It flows (because of gravity) to a "comfortable" position, which in our world tends to be in the shape of a low lying cone.