Plate Tectonic Cycle

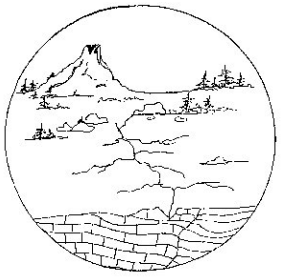
Earth's Moving Force

THIRD GRADE

HAZARDS

1 WEEK
LESSON PLANS AND
ACTIVITIES

PLATE TECTONIC CYCLE
OVERVIEW OF THIRD GRADE



VOLCANOES

WEEK 1.
PRE: *Explaining why there are many types of volcanic rocks.*
LAB: *Comparing rocks from different volcanoes.*
POST: *Learning that volcanoes produce different types of rocks.*

EARTHQUAKES

WEEK 2.
PRE: *Discovering that earthquakes produce energy.*
LAB: Observ*ing different energy experiments.*
POST: *Learning that pressure inside the Earth causes earthquakes.*

PLATE TECTONICS

WEEK 3.
PRE: *Dividing the earth into layers.*
LAB: *Discovering how the earth's crust creates plates.*
POST: *Explaining how plates have moved through time.*

HAZARDS

WEEK 4.
PRE: *Discussing different volcanic hazards.*
LAB: *Exploring different types of volcanoes during an eruption.*
POST: *Learning about historical eruptions.*

PLATE TECTONIC CYCLE - HAZARDS (3)

PRE LAB

Students speculate about the effects of volcanic hazards.

OBJECTIVES:

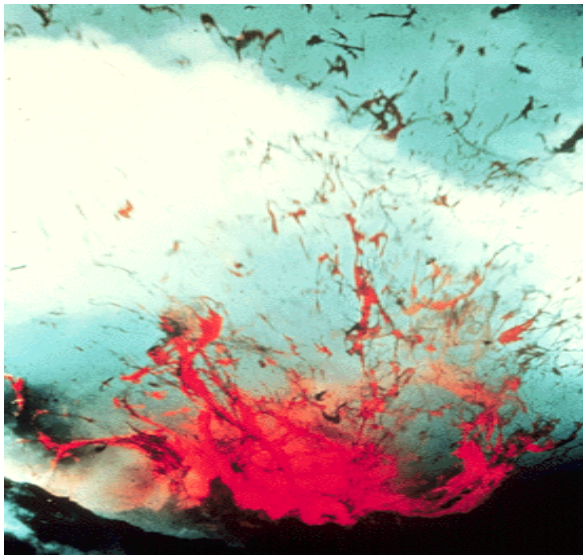
1. Exploring the many hazards associated with volcanoes.
2. Discussing the hazards associated with volcanoes.

VOCABULARY:

ash fall
earthquake
erupt
hazard
lava flow
mudslide
volcanic bombs

MATERIALS:

none


An eruption in Hawaii

BACKGROUND:

Volcanoes are a conduit of molten rock below the surface of the Earth. When pressure builds up, eruptions occur. Gases and rock shoot up through the opening; lava flows downward along the sides of the mountain. Eruptions can cause lateral blasts, lava flows, hot ash flows, mudslides, avalanches, falling ash and floods. Volcanic eruptions have been known to knock down entire forests in one large, burst of hot air. An erupting volcano can trigger tsunamis, flashfloods, earthquakes, mudflows and rockfalls.

Many hazards are associated with volcanic eruptions. These include lava, gases, hot ash flows, mudslides, landslides, and earthquakes. When lava (melted rock) erupts, a thick, hot, viscous liquid flows downhill. It is very hot, so it burns or melts almost everything that is in its path. Gases, such as CO_2 (carbon dioxide), CO (carbon monoxide) and SO_2 (sulphur dioxide) are also emitted by volcanoes. They may fill valleys with a thick blanket of toxic gas, which may kill much of the life in the area.

Landslides are downhill movement of loose material on the side of a volcano. Landslides on volcanoes result when unstable rocks are shaken loose during eruptions, or when ash mixes with water and snow, making a thick slurry that flows down the sides of the volcano. Earthquakes occur as magma moves upward inside the volcano, and as energy is explosively released during an eruption. The earthquakes associated with volcanoes are usually relatively small; they generally cause little damage by themselves.

Some volcanoes are explosive and kill people and other animal life with little warning. Three recent examples are Mt. Pinatubo in the Phillippines, Mt. St. Helens in western Washington, and Nevado del Ruiz in Columbia. Some volcanoes, however, like Kilauea in Hawaii or Mt. Etna in Italy, usually erupt quietly, spewing out lava flows.

PROCEDURE:

1. Using the list of volcanic hazards below, ask the students to predict the effect each hazard would have on a person or a home. The hazards and some of their destructive capabilities are listed below.

a. **HOT LAVA** - temperatures can melt steel, burn wood structures
b. **VIOLENT ERUPTIONS** - produce ash, which may bury surrounding areas up to many miles away.
c. **VIOLENT ERUPTIONS** - produce ash and mudslides, which destroy life and property around the volcano.
d. **GASES** - can cause suffocation
e. **EARTHQUAKES** - may trigger landslides
f. **LANDSLIDES** - bury and destroy homes, carry people away.

2. In most cases the students should answer that the people or homes will be severely damaged or destroyed if they are too close to the volcano.

(*NOTE--FOR THE HAZARDS- LAB, STUDENTS NEED TO BRING IN THEIR MODELS OF MT. LASSEN FROM THE VOLCANOES UNIT BACK INTO THE CLASSROOM).

PLATE TECTONIC CYCLE - HAZARDS (3)

LAB

Students evaluate the hazards of different volcanoes.

OBJECTIVES:

1. Exploring different volcanic eruptions.
2. Experimenting with ash eruptions.

VOCABULARY:

dormant
eruption
extinct

MATERIALS:

Volcanoes Slideshow
models of Mt. Lassen
sand
model homes
trees
model of people
worksheet

The 1980 eruption of Mt. St. Helens, Washington.

BACKGROUND:

Many hazards are associated with volcanic eruptions. In this lab, students will consider the following dangers:

Volcanic ash = small particles of the magma that are blown out of the volcano. They are carried away by the wind, along with volcanic gases. They land on the Earth's surface, creating layers that may be several feet in thickness. This may cause buildings to collapse.

Volcanic gases = gases emitted by a volcano either alone or along with ash or lava. Volcanic gases consist chiefly of water vapor, carbon dioxide, carbon monoxide, and various compounds of sulfur, chlorine, and other elements. None of these are breathable!

Ash flows = streams of hot ash and rock fragments that are mixed with hot air and other gasses. Together these form a fluid which rapidly flows down the side of a volcano.

Lava flow = a "river" of lava that moves downhill and can crush, burn, and bury structures

Mud flow = a mass of water-saturated rock debris that moves downslope as a fluid. Previously deposited ash often makes up part of a mudflow.

Landslide = a downhill flow of rock debris on the side of a volcano

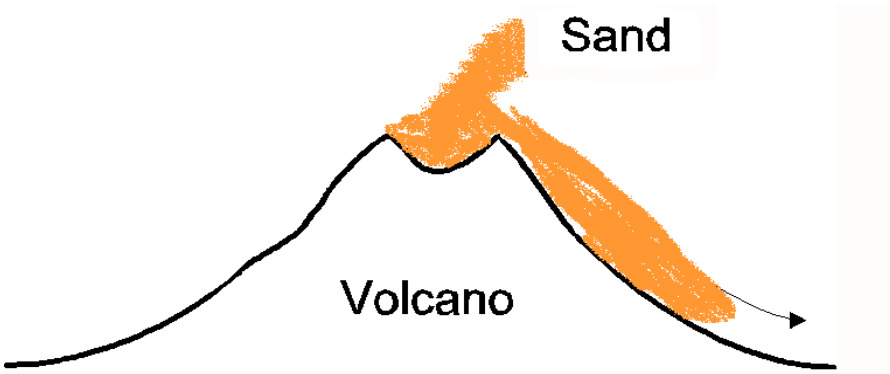
Volcanoes erupt differently, depending on the composition and thickness of the erupting lava, the amount of gas in the parent magma, and force of the eruption. Volcanoes that erupt lava that is low in silica and gases tend to be “quiet,” mostly pouring out streams of fairly fluid lava. Kilaeua volcano in Hawaii is a good example. Volcanoes that erupt silica-rich magmas, and that have a lot of gas, tend to be explosive. This produces tremendous clouds of volcanic ash, ash flows, and gasses. The loose material produced by these eruptions often becomes the raw material for landslides or mudflows.

Mt. St. Helens, Mt. Etna, and Kilauea are active volcanoes. Mt. Vesuvius and Mt. Lassen are sleeping (dormant) volcanoes; they erupted at some point in the past (1912 for Mt. Lassen, 1944 for Mt. Vesuvius). They were dangerous in the past, and will probably erupt and be dangerous again in the future.

PROCEDURE:

1.Show the students the slides from the volcanoes set. Use these slides to illustrate the kinds of damage that volcanoes can produce. Emphasize that lava flows, ash flows, mud flows, etc. can all occur. As you look at the slides, ask your students what damage was caused by the eruptions, or what might happen in future eruptions. Tell students to record the "dangers" they see on their lab sheets.

2. In the second part of the lab, students create their own volcanic disaster and record what happens. They will need the volcano that they made for PLATE TECTONICS - VOLCANOES (3) LAB. Have the students make a village near the volcano. Instruct them to use sand to represent an ash flow. Tell them to gently pour sand until the "cone" becomes unstable and flows down the side of the model, as shown below. Ask the students to keep track of the amount of sand they use. They should realize that it takes a lot of "lava" or "ash" to create a flow. Make sure the students also note students that there is a "critical point" at which the sand begins to slide and then moves very quickly. We suggest that you do this activity either in a tub or on newspaper that can capture the sand in order to reuse it.



This exercise helps the students to see that an ash flow will bury everything in its path. They should record their observations by drawing a "before" and "after" picture.

ANSWERS:

Exercise 1:
Mt. St. Helens - lava flows, landslides, ash flows, mudflows, ash, and gasses.
Mt. Vesuvius. - similar to Mt. St. Helens
Mt. Etna - lava flows, gasses
Mt. Lassen - similar to Mt. St. Helens
Kilaeua - lava flows

PLATE TECTONIC CYCLE - HAZARDS (3) LAB

PROBLEM: When is a volcano dangerous?

PREDICTION:_____

EXERCISE I. Look at the following slides and record the dangers that are present.

1. Mt. St. Helens, Washington	
2. Mt. Vesuvius, Italy	
3. Mt. Etna, Italy	
4. Mt. Lassen, California	
5. Kilauea, Hawaii	

EXERCISE II.

Using the model of Mt. Lassen, picture what will happen if it erupts. Draw a picture of what you think the volcano will look like before and after it erupts.

BEFORE	AFTER

CONCLUSIONS: What are the major types of volcanic disasters?

_____

_____

PLATE TECTONIC CYCLE - HAZARDS (3)

POST LAB

Students draw pictures of different types of volcanic eruptions.

OBJECTIVES:

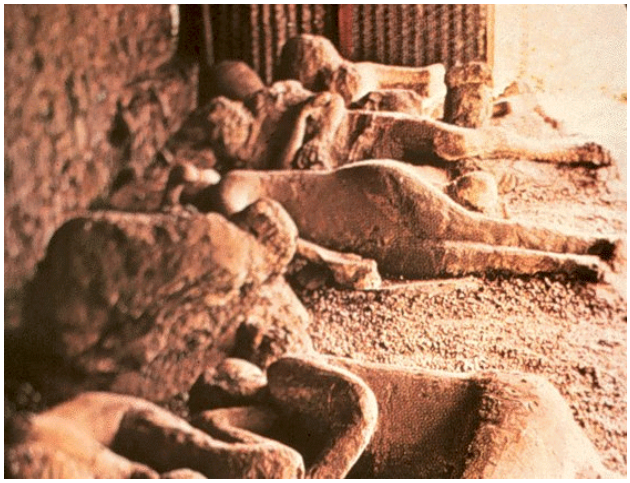
1. Comparing the different types of volcanic hazards.
2. Discovering historical volcanic disasters.

VOCABULARY:

ash
debris
eruption
lava flow
mud flow

MATERIALS:

Internet
reference books



Casts of humans killed by the eruption of Pompeii, Italy, in AD 79.

BACKGROUND:

Volcanic activity has played a predominant role in shaping the surface of the Earth. As described in the lab, not all volcanic activity is the same, some types of eruptions are more harmful than others. Volcanoes like Mt. St. Helens and Nevado del Ruiz (Colombia) erupt much more violently that do Mt. Etna (Italy) and Kilauea (Hawaii) volcanic eruptions. These differences reflect variations in the chemistry and gas content of the erupting lava.

POMPEII, MT. VESUVIUS, ITALY

In 79 AD, Mt. Vesuvius erupted an enormous volume of pumice and ash. This material flowed very quickly down the side of the volcano as hot ash flows. The ash flows covered the Roman city of Pompeii in a few hours. Many people were trapped by the hot ash. Almost the entire population of the city was killed.

CRATER LAKE, OREGON

Crater Lake erupted about 7770 years ago. It was a gigantic eruption of ash flows. So much material erupted that the top of this volcano collapsed. This formed a great hole where the top of the volcano had been. The hole was gradually filled with water from rainfall and melting snow. A new eruption in the middle of the lake formed a tiny cinder cone volcano, now called Wizard Island. No one was hurt in this prehistoric volcanic eruption.

PARICUTIN, MEXICO

A cinder cone grew to a height of more than 1500 feet. It first began in a cornfield in 1943. The volcano grew and erupted a lot of lava, eventually covering more than 10 square miles. It frightened farmers, but enough warning was given for most of the local population to escape without harm.

PROCEDURE:

1. Read the information on Mt. Vesuvius, Crater Lake, and Paricutin. Have the students draw pictures of what they think the volcanoes looked like after the eruptions. You may want the students to do only one volcano, or all three. You may want them to hold their pictures up and have the rest of the class decide which eruption has been illustrated.

2. As a related assignment, students could find their own volcanic eruption in the library or on the Internet, and write a paragraph with a picture about it. Suggested Internet sites are given below.

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/

Michigan Technological University - volcano sites from 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.