

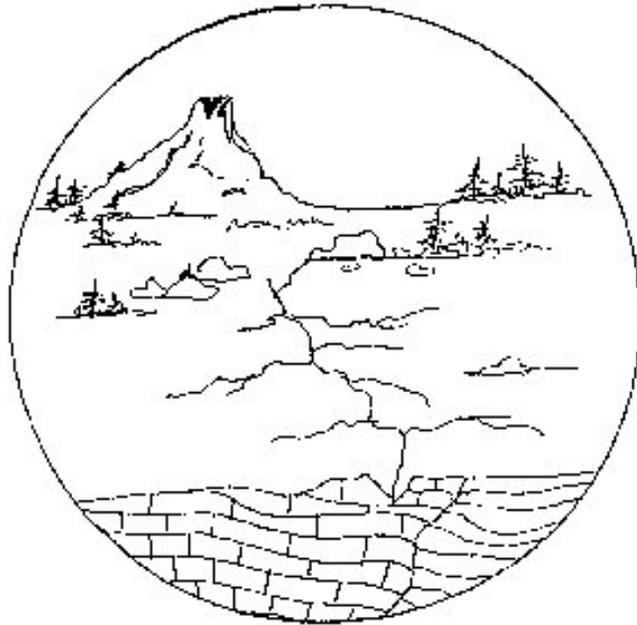


Plate Tectonic Cycle

Earth's Moving Force

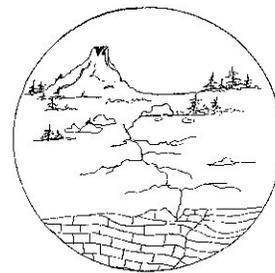


FIFTH GRADE HAZARDS



1 WEEK
LESSON PLANS AND
ACTIVITIES

PLATE TECTONIC CYCLE OVERVIEW OF FIFTH GRADE



VOLCANOES

WEEK 1.

PRE: *Exploring the rocks produced by volcanoes.*

LAB: *Comparing igneous rocks.*

POST: *Critiquing books on volcanoes for their scientific content.*

EARTHQUAKES

WEEK 2.

PRE: *Analyzing the types of waves produced by earthquakes.*

LAB: *Interpreting seismograms with associated damages.*

POST: *Analyzing earthquakes around the world.*

PLATE TECTONICS

WEEK 3.

PRE: *Investigating the patterns produced by volcanoes and earthquakes.*

LAB: *Testing models of crustal movement.*

POST: *Defining plate boundaries.*

HAZARDS

WEEK 4.

PRE: *Comparing volcanic and earthquake hazards.*

LAB: *Determining what type of viscous mixtures can cause the most damage.*

POST: *Exploring earthquakes that are associated with volcanoes.*

PLATE TECTONIC CYCLE - HAZARDS (5)

PRE LAB

Students learn how mudflows form.

OBJECTIVES:

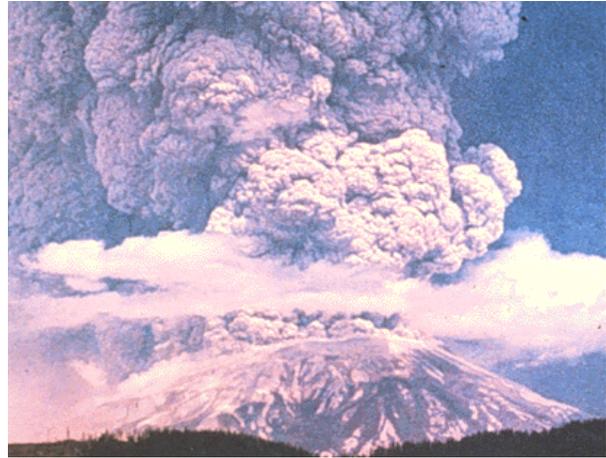
1. Comparing volcanic and earthquake hazards.
2. Exploring why some volcanoes are more dangerous than others.

VOCABULARY:

ash
lava
mudslide
viscous
volcanic hazard

MATERIALS:

Volcano Slideshow



The 1980 eruption of Mt. St. Helens, which triggered many mudflows.

BACKGROUND:

Earthquakes and volcanoes cause damage not only to humans and their structures, but to the environment and wildlife. Earthquakes can cause damage by shaking, tsunami's, and landslides. Volcanoes can cause damage by ash flows, release of gases, mudflows, lava flows, and landslides.

Earthquakes may be associated with volcanic hazards, especially as a precursor to an eruption. However, earthquakes can cause disasters without the help of a volcano. Earthquakes generate seismic waves that can release great energy. But if the earthquake occurs in an area that is not populated, it is not a human disaster.

Volcanic damage occurs because of the products generated by an eruption. The type of eruption is important. For instance, a quiet lava eruption gives human enough time to evacuate an area. Violent eruptions that occur with little warning are sometimes difficult to avoid. Many people do not believe that volcanoes can cause much damage, and refuse to move.

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. Kilauea 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 gases. The loose material produced by these eruptions often becomes the raw material for landslides or mudflows.

can cause dangerous explosions as well as gentle lava flows.

PROCEDURE:

1. With the class, review that earthquakes and volcanoes are dangerous. Explain that every year, they cause damage not only to humans, but to the environment and wildlife as well. Earthquakes cause damage to structures that cannot withstand shaking. Volcanoes can cause dangerous explosions as well as gentle lava flows. Explain that this unit will concentrate on volcanic hazards. Remind the students that after an eruption, life will come back in due time.

2. Show the class the slides of the aftermath of the 1980 Mt. St. Helens eruption and other disasters in the Volcano Slideshow. The remaining slides show different types of hazards, ranging from flowing lava to violent eruptions causing great plumes of ash and debris to explode from a volcano.

3. Show the students the image below, or draw it on your board. Make sure that the students understand that water (melted snow) mixes with ash to form mudflows. Ask students if the shape of a volcano determines if the mud moves slowly or fast. The steeper the slopes of a volcano, the faster the mudflow will “ride down” its flanks. In the lab, students will learn that the more viscous (thicker) the material, the faster it will flow.

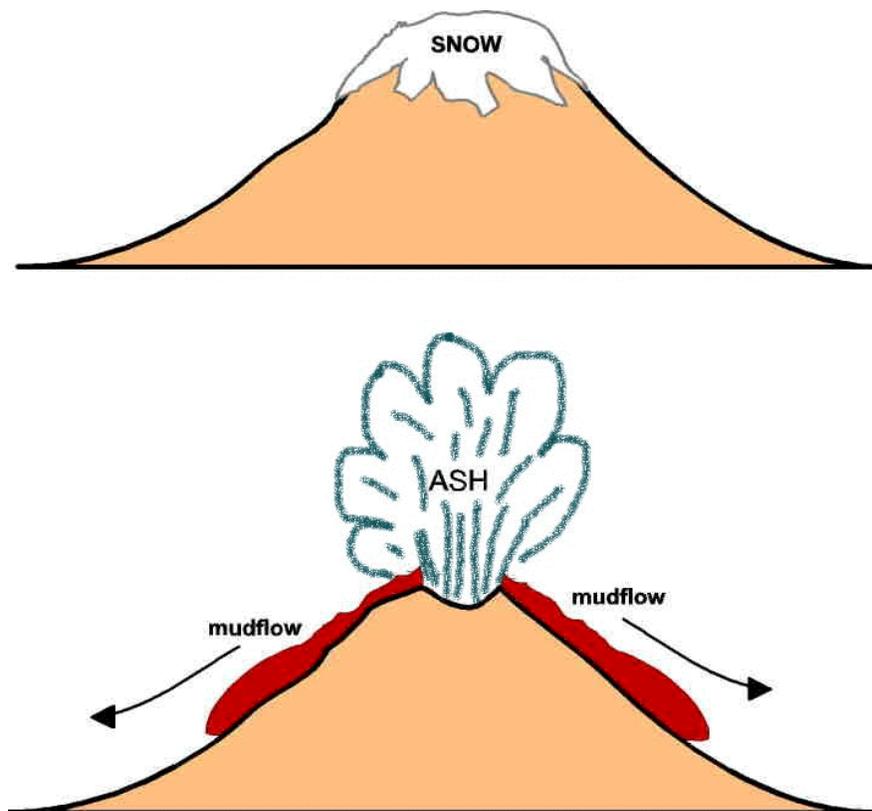


PLATE TECTONIC CYCLE - HAZARDS (5)

LAB

Students simulate volcanic mudflows.

OBJECTIVES:

1. Determining what type of viscous mixture causes the most damage.
2. Comparing different types of lava flows.

VOCABULARY:

viscous
volcanic hazard

MATERIALS:

worksheet
flour
corn meal or sand
water
measuring beaker
dish
cup or dome shaped object
spoons
styrofoam or plastic tray



An eruption in Mexico

BACKGROUND:

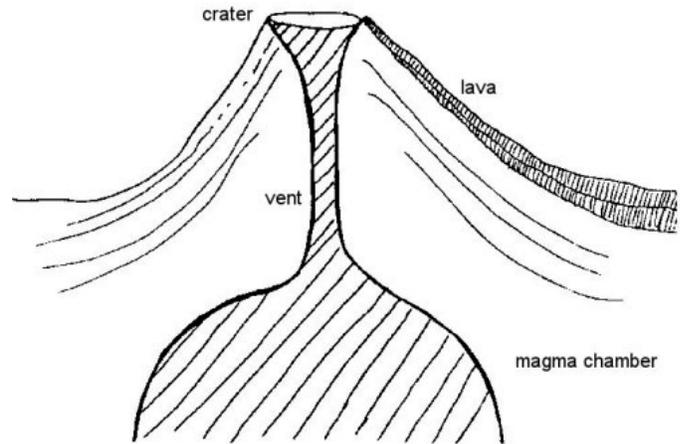
Volcanic eruptions are hazardous in several ways, as discussed in the Pre Lab. This lab emphasizes the effects of mudflows. Mudflows are generated on the sides of volcanoes during and after eruptions. Mudflows are a type of fluid landslide. They are composed of a mixture of water (often melted snow or glacial ice), mud, rock, and other debris. Mudflows vary in viscosity, which is a measurement of thickness or stickiness. Highly viscous mudflows travel slowly, and may stop before causing much damage. More viscous mudflows, which are often about as thick as wet concrete, can flow rapidly and travel long distances. They are dangerous, capable of covering people and animals and destroying structures. Mudflow deposits often fill up stream channels, which causes flooding later on.

Volcanoes have several basic components. Underneath the volcano is a reservoir of magma (molten rock), called a magma chamber. The magma chamber is connected to the surface of the Earth by a vent. The magma moves upward through the vent because it is less dense than the surrounding rock. It breaks through the surface of the Earth at the volcano's crater, and may flow down its side as a flow of lava, or an eruption of ash.

PROCEDURE:

In this lab the students simulate mudflows by making mixtures of flour, sand or cornmeal, and water. They will try to determine what type of viscous mixture would cause the most damage.

1. Review and discuss the parts of a volcano. You may wish to show the class the presentation image on the next page. Review the hazards that volcanoes can cause, as discussed in the Pre Lab. Discuss how population centers can influence the amount of damage that is caused by a volcano. Do not forget to include in your discussion the damage caused to wildlife, vegetation, and the environment.



2. Carefully demonstrate the lab procedures. You may want to show the students examples of high and low viscosity mixtures. Pour a few spoonfuls of the mixtures over a dome shaped object, such as an overturned cup. We recommend putting the cup in a plastic tray, to minimize the mess. Emphasize that in their experiments, the students should keep track of the amount of materials that they are mixing. This might be difficult for them, because they are usually given exact amounts to mix. Explain that they have to learn to experiment.

3. You may want to give them some hints as they are doing the different trials. For example, they should think about the quantities for each trial before they begin. This will help them improve the mixtures, rather than just mixing random amounts every time. This concept may also be new to them.

4. Go over cleaning procedures. This can be a real fun lab, but it can be very messy!

5. In general, the more water in the mixture, the faster it will move. Also, the less “ash” (i.e., flour in the mixture) the faster it will flow.

PLATE TECTONIC CYCLE - HAZARDS (5) LAB

PROBLEM: How dangerous are mudslides?

PREDICTION: _____

Some volcanic eruptions can cause massive landslides of mud, rock, debris, and water and debris that cascade down the slope of a volcano. In this lab, you will experiment with different mixtures. See if you can find a formula that simulates real mudflows. Instead of mud, you will use flour; instead of rocks you will use corn meal or sand.

MATERIALS: corn meal or sand, water, measuring beakers, cups or other dome shaped objects, dishes, spoons, plastic trays

PROCEDURE: In this experiment you, are trying to create a fast-flowing, dangerous mudflow. You will perform four trials. For each trial, make a different formula of flour sand/cornmeal, and water. Measure the ingredients carefully; you will need to compare them to the rest of your class. After you make each mixture, pour a spoonful of it on top of your cup or dome, which is analogous to a volcano. Describe how the material flows down the side of the “volcano”. Record your measurements and observations in the diagrams below.

MIXTURES	TRIAL 1	TRIAL 2	TRIAL 3	TRIAL 4
ash (flour)				
rock (sand)				
water				

RESULTS	COMMENTS
TRIAL 1	
TRIAL 2	
TRIAL 3	
TRIAL 4	

CONCLUSION: Which mixture will cause the most damage. Why?

PLATE TECTONIC CYCLE - HAZARDS (5)

POST LAB

Students predict damage during eruptions, based on earthquake patterns.

OBJECTIVES:

1. Exploring the association of earthquakes with volcanoes.
2. Analyzing if earthquakes can predict volcanic eruptions.

VOCABULARY:

earthquakes
eruption
magma

MATERIALS:

worksheet



A lava flow in Hawaii

BACKGROUND:

Volcanic eruptions cause earthquakes in three main ways. First, the ascent of magma inside the Earth beneath a volcano triggers earthquakes. This upward movement causes the magma chamber to expand. This puts stress on the rocks around it, causing earthquakes. Second, earthquakes occur for similar reasons as magma moves upwards through the vent of the volcano. Finally, the explosions associated with violent eruptions can cause earthquakes. The patterns that these earthquakes produce are extremely useful to vulcanologists (scientists who study volcanoes). They use them to try and predict the timing of an eruption. For example, they can track the ascent of magma in the volcano by watching patterns in the depth of the earthquakes.

Earthquakes are one of many tools used to predict eruptions. Some volcanoes swell or bulge before they erupt, as their magma chambers and vents fill with new magma. Others release differing quantities of gases. Finally, scientists also study the history of volcanoes. The past behavior of a volcano is often a good predictor of what it will do in the future.

Volcano prediction is an inexact science. Many unmeasurable variables effect exactly when eruptions take place. The main goal of scientists is to make their predictions as accurate as possible, so that governments can order evacuations or take other appropriate measures.

PROCEDURE:

In this exercise, students focus on the patterns of earthquakes that occur before an

eruption.

1. Explain why earthquakes occur before and during volcanic eruptions.

2. Point out to the students that other things besides the disruption of people's lives are effected by an eruption. Animal life, the atmosphere, and plant life are all damaged during volcanic events.

ANSWERS:

1. How can scientists predict that this volcano may erupt?

Earthquakes will occur as the magma rises and displaces the surrounding rock.

2. Color RED the homes that are effected by the eruption of the volcano.

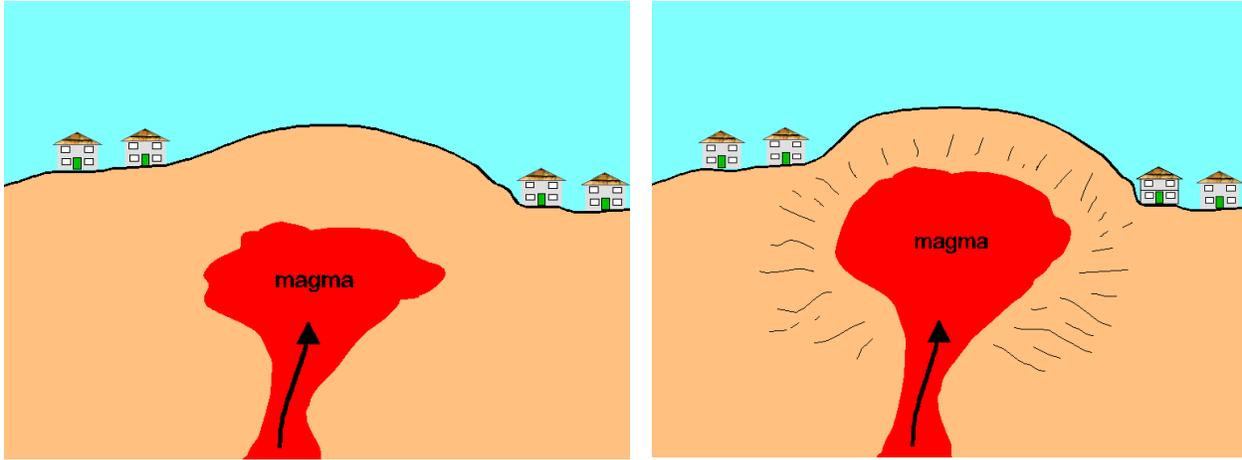
Students should color the two homes on the eastern part of the volcano. However, if the students reason that ash will affect the two homes on the western portion, that can also be a justified answer.

3. What else might be affected by this eruption?

Wildlife, lakes, nearby homes through earthquakes.

PLATE TECTONIC CYCLE - HAZARDS (5)

POST LAB



1. How can scientists predict that this volcano may erupt?

2. Color in RED the homes that are affected by the eruption of this volcano.

3. What else might be affected by this eruption?

