



Lesson Title: Vibrant Volcanoes

Grade level: 2 – 4

Topic/Subject Matter: Earth Science

Time Allotment: 1-2 class periods

Overview This lesson will introduce elementary students to the fiery and explosive nature of volcanoes, using segments from the NATURE film, “Kilauea: Mountain of Fire.” Students will get to know different features of volcanoes and volcanic activity: what volcanoes are like, where they are found, how and why they erupt, and what happens after an eruption. Students will begin by learning key terms about the earth’s structure and plate tectonics, and followed by a hands-on demonstration of plate tectonics. Students will then view video clips to provide an overview of volcanic activity and the effects on the surrounding landscape. As a culminating activity, students will explore the locations of volcanoes around the world.

Media Resources

Video Clips

1) Volcanic Views

Describes many aspects of volcanic activity.

2) Lava Landscapes

How volcanic activity affects the surrounding land.

3a) Steamy Seas 1

What happens when lava flows meet the ocean.

3b) Steamy Seas 2

What happens when lava flows meet the ocean.

Web sites

[National Geographic Decade Volcanoes](http://ngm.nationalgeographic.com/2008/01/volcano-culture/decade-volcano-map-interactive)

(<http://ngm.nationalgeographic.com/2008/01/volcano-culture/decade-volcano-map-interactive>)

This map highlights sixteen volcanoes that have been designated as Decade Volcanoes, due to both their potential activity and proximity to populated areas. There are photos of each volcano on the map, as well as information and statistics about its activity.

[WorldAtlas Ring of Fire](http://www.worldatlas.com/aatlas/infopage/ringfire.htm) (<http://www.worldatlas.com/aatlas/infopage/ringfire.htm>)

This map shows the series of volcanoes circling the Pacific Ocean that are known as the “Ring of Fire.” More than half of the world’s active volcanoes are in this region, which coincides with the edges of tectonic plates.

Learn more at www.pbs.org/nature



[Volcano Cross-Section](http://www.kidcyber.com.au/IMAGES/volcanoXjup1.jpg) (<http://www.kidcyber.com.au/IMAGES/volcanoXjup1.jpg>)

This image shows the basic components of a volcano.

Standards:

National Science Education Standards, Grades K - 4

http://www.nap.edu/openbook.php?record_id=4962

Content Standard B:

PROPERTIES OF OBJECTS AND MATERIALS

Materials can exist in different states-solid, liquid, and gas. Some common materials, such as water, can be changed from one state to another by heating or cooling.

LIGHT, HEAT, ELECTRICITY, AND MAGNETISM

Heat can be produced in many ways, such as burning, rubbing, or mixing one substance with another. Heat can move from one object to another by conduction.

Content Standard D

PROPERTIES OF EARTH MATERIALS

Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials, as sources of fuel, or for growing the plants we use as food. Earth materials provide many of the resources that humans use.

CHANGES IN THE EARTH AND SKY

The surface of the earth changes. Some changes are due to slow processes, such as erosion and weathering, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.

Content Standard F

CHANGES IN ENVIRONMENTS

Environments are the space, conditions, and factors that affect an individual's and a population's ability to survive and their quality of life.

Changes in environments can be natural or influenced by humans. Some changes are good, some are bad, and some are neither good nor bad. Pollution is a change in the environment that can influence the health, survival, or activities of organisms, including humans.

Some environmental changes occur slowly, and others occur rapidly. Students should understand the different consequences of changing environments in small increments over long periods as compared with changing environments in large increments over short periods.

Materials

For each student:

Volcanic Vocabulary Student Organizer

Lava Landscapes Student Organizer

For each group of 3-4 students:

Medium-cooked egg (boiled for 5 - 8 minutes, depending on the size of the egg)

Paper towels

For the class:

Volcanic Vocabulary Terms and Definitions Answer Key

Learn more at www.pbs.org/nature



Lava Landscapes Student Organizer Answer Key
World Map
Computer with internet access
Chart paper, chalkboard, or whiteboard
Raw egg (optional)
Push pins or small sticky notes

Objectives

Students will be able to:

Recognize key characteristics of volcanoes and volcanic eruptions

Define vocabulary terms relating to volcanoes and volcanic activity

Understand how volcanic eruptions change the Earth's surface

Identify locations of volcanoes around the world

Prep for Teachers

Prior to teaching this lesson, you will need to:

Preview all of the video segments and Web sites used in the lesson.

Download the video clips used in the lesson to your classroom computer, or prepare to watch them using your classroom's Internet connection.

Make copies of the student organizers for each student in the class.

Bookmark the Web sites used in the lesson on each computer in your classroom. Using a social bookmarking tool such as del.icio.us (<http://delicious.com/>) or [diigo](http://www.diigo.com/) (www.diigo.com/) (or an online bookmarking utility such as [portaportal](http://www.portaportal.com/) (<http://www.portaportal.com/>)) will allow you to organize all the links in a central location.

Prepare chart paper or chalkboard/whiteboard by writing the vocabulary terms from the Introductory Activity: Crust, Mantle, Magma, Lava, Plates. Leave enough room to write the definitions as you cover them in the lesson.

Prepare medium-cooked eggs for the Introductory Activity. These eggs should be boiled for approximately 5 - 8 minutes, depending on the size of the eggs, and should be thoroughly cooled before distributing to students.

Introductory Activity:

Open the lesson by asking students what, if anything, they already know about volcanoes. (Answers will vary, may include knowledge about mountains, lava, explosions.)

Explain to students that a volcano is an opening in the earth's surface, which allows liquid rock, ash, and gases to escape from inside the earth. Tell students that when these materials come out of a volcano, often unexpectedly and at high speeds, it is called an eruption.

Learn more at www.pbs.org/nature



Distribute the Volcanic Vocabulary organizer and tell students that you are going to discuss what makes volcanoes erupt. Give students a visual aid by drawing a simple picture of a volcano in the board, or projecting one on the screen. (A simple cross-section of a volcano can be found here:

<http://www.kidcyber.com.au/IMAGES/volcanoXjup1.jpg>.)

As you review the vocabulary terms, point them out on the image of the volcano. Explain that the solid ground that we stand on is called the Earth's crust, and underneath the crust is a layer called the mantle, which is made up of liquid, or molten, rock called magma. Volcanoes erupt when the magma escapes through the crust. Explain that when it is underground the molten rock is called magma, when it is above ground it is called lava. Write the definitions of crust, mantle, magma, and lava on the chart paper or chalkboard/whiteboard, and label them on your volcano image (if they are not labeled already). Ask students to fill in the definitions on their organizer. Answers can be found on the Volcanic Vocabulary Terms and Definitions Answer Key.

How does the magma escape from the crust? Divide the class into groups of 3 or 4 students. Tell students that they are going to create a model of Earth using a boiled egg. Before distributing eggs to the group, demonstrate what they will be doing. Take a medium-boiled egg and roll it gently on a paper towel, so that the shell cracks but does not break off. Distribute 1 egg and paper towels to each group. Ask each group to roll their egg gently on a paper towel to crack the shell. Explain that the broken eggshell is like Earth's crust – it is not one solid piece, instead it is broken up into smaller chunks called plates. Write the definition of plates on the chart paper or chalkboard/whiteboard, and ask students to fill in the definition on their organizer.

Ask each group to GENTLY squeeze their egg. They should see some movement in the pieces of the eggshell. Explain that the Earth's plates are in motion – they float on top of the liquid mantle. Now ask students to squeeze the egg harder. They should notice some material oozing out of the cracks. (For this part of the activity, it's all right if the students make a mess!) Explain that on Earth, sometimes when the plates move magma escapes from between the cracks, and causes a volcanic eruption. Have students clean up and wash their hands if necessary.

Learning Activity 1:

Ask students if they know where Hawaii is located. If they say yes, ask one of them to point it out on a map for the class; if they don't know, point it out for them. (A world map is recommended for this activity rather than a U.S. map, to accurately reflect Hawaii's location.) Tell students that while Hawaii is often thought of as an island paradise, it is also home to some of the most active volcanoes on Earth.

Tell students that they are going to watch a video clip about a volcano in Hawaii. FRAME the clip by explaining that the Kilauea volcano has been erupting ever since 1983, and it is an attraction for both tourists and scientists studying its activity. Give students a FOCUS by asking them to look and listen for three characteristics of volcanoes – how they look, sound, act, etc. PLAY the "Volcanic Views" clip. FOLLOW UP by asking students to share their answers with the class. (Answers may include: smoky, loud, tall, hot, produce a lot of lava, etc.)

Review the new vocabulary terms from the clip. As in the introductory activity, write them on chart paper or the chalkboard/whiteboard as you define them, and ask students to fill in the definitions on their organizers.



Vent: the opening through which volcanic material comes out

Crater: a large hole formed by an explosion or collapse of a volcanic vent

Lava Lake: pool of molten lava contained inside a vent or crater

Explain that the volcanoes on Hawaii are different than many of the volcanoes around the world, since they do not occur at the cracks, or boundaries, between the plates.

Hawaii's volcanic activity is due to a hotspot. Explain that hotspots occur when magma pushes through the middle of a plate, not in the cracks between plates, as if a hole was poked through the shell of an uncooked egg and liquid oozed out. (Demonstrate on an uncooked egg for the class, if desired.) Write hotspot on a piece of chart paper or the chalkboard/whiteboard, along with its definition, and ask students to fill in the definition on their organizers.

Learning Activity 2:

Ask your students if they think that volcanoes can change the way the Earth looks. (Yes.) Based on what they already know about volcanoes, what might cause the changes? (Lava, ash, explosions.) Explain that when the hot lava stops flowing and cools, it can create rocks or new land that looks very different from the original landscape, and that volcanic activity is responsible for shaping much of how the earth looks today.

Tell students that they are going to see a video demonstrating how lava has affected the land in Hawaii. FRAME the clip by telling students that the lava flows from Kilauea and other volcanoes have been making changes to Hawaii's landscape for thousands of years. Distribute the Lava Landscapes Organizer to each student. Ask one of your students to read the first question on the organizer aloud: "Is lava a force of destruction or creation?" Provide a FOCUS for watching the clip by asking your students to consider this question as they watch the clip. PLAY the "Lava Landscapes" clip. FOLLOW UP by asking for student responses to the focus question. (Answer: lava is both destructive and creative.) Go through questions 2 – 4 on the Lava Landscapes organizer and answering them as a class. Replay the clip if necessary.

Ask students what, if anything, can stop the flow of lava? (Answers may vary.) Tell students that in Hawaii, the flow of lava can be stopped by the ocean.

FRAME the next clip by telling students that even though lava is cooled by the ocean, there is still some activity once the lava makes contact with the water. Give students a FOCUS by asking them to think about what lava does once it meets the water that it does not do on land. Play the "Steamy Seas" Clip. FOLLOW UP by asking students for their responses. (Cause explosions, create steam.) Go through the remaining questions on the Lava Landscapes organizer and answer them as a class. Replay the clip if necessary.

Culminating Activity:

Remind students that even though they only saw videos of a volcano in Hawaii, there are more volcanoes in Hawaii and all over the world. Ask students if they know of any other places in the world where there are volcanoes, and to indicate where those volcanoes are on a world map with either pushpins or small sticky notes. (Accept all answers.)

Project the [Decade Volcano Map](http://ngm.nationalgeographic.com/2008/01/volcano-culture/decade-volcano-map-interactive) (<http://ngm.nationalgeographic.com/2008/01/volcano-culture/decade-volcano-map-interactive>) on a screen for the class. Explain to your



students that these volcanoes have been chosen for study because of their activity, and the fact that they are close to populated areas. By being designated as Decade Volcanoes, scientists and the public can work together to be prepared for a potential eruption.

Look at the map together as a class. Ask students the following questions, and click on the volcano that they choose as an answer. View the picture of the chosen volcano and invite student comments. As you review each volcano, ask a student to mark it on the world map with a pushpin or sticky note.

Which volcanoes are on or near the Pacific Ocean? (Avachinsky-Koryaksky, Mt. Unzen, Sakurajima, Taal, Merapi, Ulawun, Mt. Ranier, Colima, Santa Maria, Galeras)

Since there are many volcanoes, choose 2 or 3 to click on and look at.

Which volcano on this map is located in Hawaii? (Mauna Loa)

Which volcanoes are located in Europe?. (Vesuvius, Mt. Etna, Santorini)

Which volcano is located in Africa? (Nyiragongo)

Which volcanoes are located in the United States? (Mt. Rainier, Mauna Loa)

Point out to students that the majority of volcanoes on the map are on or near the coasts of the Pacific Ocean. Project the [WorldAtlas.com Ring of Fire map](http://www.worldatlas.com/aatlas/infopage/ringfire.htm)

(<http://www.worldatlas.com/aatlas/infopage/ringfire.htm>) onto a screen for the whole class. Explain that more than half of the world's active volcanoes are in this "ring" that circles the Pacific Ocean. Explain that this has to do with the boundaries, or spaces, between continental plates. As students should remember from the egg demonstration, when the plates push up against each other or move away from each other, sometimes lava will come up to the surface and through the cracks between plates. Ask students if they can name some of the countries that contain volcanoes in the Ring of Fire.

(Answers can include: U.S., Canada, Indonesia, Japan, Mexico, Philippines, Russia, New Zealand, Chile, Mariana Islands, Tonga.) Ask students to mark these countries with pushpins or sticky notes on the world map.



NAME: _____

DATE: _____

Volcanic Vocabulary Student Organizer

CRUST:
MANTLE:
MAGMA:
LAVA:
PLATES:
VENT:
CRATER:
LAVA LAKE:
HOTSPOT:



NAME: _____

DATE: _____

Volcanic Vocabulary Terms & Definitions

CRUST: the solid top layer of the earth, including the continents and the land under the oceans
MANTLE: the liquid layer of the earth below the crust
MAGMA: hot molten (liquid) rock below the earth's surface
LAVA: hot molten rock that flows from a volcano
PLATES: large chunks of the earth's crust that "float" on top of the mantle
VENT: the opening through which volcanic material comes out
CRATER: a large hole formed by the explosion or collapse of a volcanic vent
LAVA LAKE: a pool of molten lava contained in a vent or crater
HOTSPOT: area in the earth's crust where magma rises and pushes through the surface



NAME: _____

DATE: _____

Lava Landscapes Organizer

1. Is lava a force of destruction or creation? _____

2. The lava changes the Hawaiian landscape to look like:

- a. the forest
- b. the desert
- c. the moon
- d. the ocean

3. What are the conditions like on the barren lava landscape?

4. How do we know that forests used to be where the hardened lava is now?

5. Where does the lava flow stop?

6. What happens when the hot lava meets the cooler ocean water?

7. What does "littoral" mean?

- a. coast
- b. lava
- c. volcano
- d. ocean

8. What weather patterns emerge at the coastline?



NAME: _____

DATE: _____

Lava Landscapes Organizer

1. Is lava a force of destruction or creation? _____ both _____

2. The lava changes the Hawaiian landscape to look like:

- a. the forest
- b. the desert
- c. the moon
- d. the ocean

3. What are the conditions like on the barren lava landscape?

_____ windy, hot _____

4. How do we know that forests used to be where the hardened lava is now?

_____ tree trunks linger, stone molds form around tree trunks _____

5. Where does the lava flow stop?

_____ at the ocean _____

6. What happens when the hot lava meets the cooler ocean water?

_____ steam pressure builds and causes explosions _____

7. What does "littoral" mean?

- a. coast
- b. lava
- c. volcano
- d. ocean

8. What weather patterns emerge at the coastline?

_____ clouds, miniature tornadoes called water spouts _____