

Overview:

In this lesson, students learn how volcanoes are formed and observe a model volcano eruption.

Targeted Alaska Grade Level Expectations:

Science

- [3-4] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.
- [4] SD2.2 The student demonstrates an understanding of the forces that shape Earth by identifying causes (i.e., earthquakes, tsunamis, volcanoes, landslides, and avalanches) of rapid changes on the surface.

Objectives:

The student will:

- identify layers of Earth;
- distinguish magma from lava;
- explain how volcanoes are formed; and
- illustrate a volcano triggering a tsunami.

Materials:

- Globe
- Chocolate-covered cherries or soft-boiled egg
- Baking Soda ($\frac{1}{2}$ tablespoon)
- Vinegar ($\frac{1}{4}$ cup)
- Red food coloring
- Dish soap ($\frac{1}{2}$ tablespoon clear, yellow or orange)
- Erupting Cross Section Volcano Model by Learning Resources®
- MULTIMEDIA FILES: “Earth’s Layers,” “Magma,” “Where Volcanoes Form,” and “Volcano Tsunami Triggers” on the ATEP Website <http://www.aktsunami.org/multimedia>
- VISUAL AID: “Volcano Box”
- STUDENT WORKSHEET: “Volcanoes and Tsunamis”

Science Basics:

The multimedia files present concepts used to explain the formation of volcanoes and volcanic activity known to produce tsunamis. Volcanoes are vents in Earth’s crust through which lava, gas and ash are forced out.

Earth’s Layers

Earth is made of four layers. The outermost layer is the crust; of all the layers, this is the thinnest. Below the crust is the mantle; this layer is solid, but high temperatures soften it and cause it to change shape. Below the mantle is the outer core, which is so hot it acts like a liquid. Finally, the hot inner core is squeezed into a solid ball by outside pressure.

Magma

Magma is hot, molten rock that forms deep inside Earth's mantle. When magma reaches Earth's surface, it becomes lava.

Where Volcanoes Form

Most volcanoes form over subduction zones and they also form over spreading centers. Some volcanoes form at hotspots where narrow plumes of magma rise to Earth's surface.

Volcano Tsunami Triggers

Volcanic activity, that is known to produce tsunamis, includes earthquakes accompanying eruptions, pyroclastic flows encountering water, submarine explosions, calderas collapsing or volcanic landslides.

Activity Preparation:

1. Place baking soda into the lava tube of the volcano model.
2. Mix the vinegar, food coloring and dish soap.

Activity Procedure:

1. Explain students will learn how volcanoes are made and how they can start tsunamis. Display the VISUAL AID: "Volcano Box." Explain that the Alutiiq people have lived around volcanoes for many years. This image was taken from an Alutiiq box that was discovered in the Kodiak area. It is believed to be about 500 years old.
2. To learn about how volcanoes are made, we first need to learn about Earth. Hold up the globe and ask students what is inside Earth. Record responses on chart paper or on the board.
3. Access multimedia files on the ATEP Website: <http://www.aktsunami.org/multimedia>. Display the MULTIMEDIA FILE: "Earth's Layers" and briefly talk about the layers. Click on the layers to highlight each layer.
4. Distribute one chocolate-covered cherry to each student. Explain that a chocolate-covered cherry has layers like Earth. The chocolate shell represents the crust and the filling represents the mantle. The cherry represents the outer core. If the cherry still had its pit in center, that would represent the solid inner core. What would happen if the chocolate shell covering the cherry cracks? The gooey filling would come out. (NOTE: A soft-boiled egg, cut in half with a serrated knife may be substituted for the chocolate-covered cherry.)
5. Ask students if they know what comes out of a volcano. Students may respond that lava, gas, ash, or smoke come out of a volcano. All of these are correct. Display MULTIMEDIA FILE: "Magma." Explain that magma is hot, molten rock inside Earth. When it is pushed up out of the ground, it becomes lava.
6. Display MULTIMEDIA FILE: "Where Volcanoes Form." Move the mouse over areas to display where volcanoes form. Explain that volcanoes can form on land and under the sea.
7. Display the inside of the volcano model and point out features such as magma and vents. Reconnect the two halves of the volcano and insert the lava tube. Place the volcano in the tray and pour in the vinegar mixture. Watch as the volcano erupts.
8. Explain volcanoes can start a tsunami in many ways. Display MULTIMEDIA FILE: "Volcano Tsunami Triggers." For younger students, the animation of a volcanic landslide alone may be the most appropriate way to demonstrate how a volcano may start a tsunami. For older students, show the animation of the volcanic landslide, then make a list on the board of ways that a volcano may start a tsunami. Include: 1) volcano landslide falling into the sea; 2) undersea eruption; 3) strong earthquake from a volcano moving the sea; and 4) strong eruption reaching the sea.

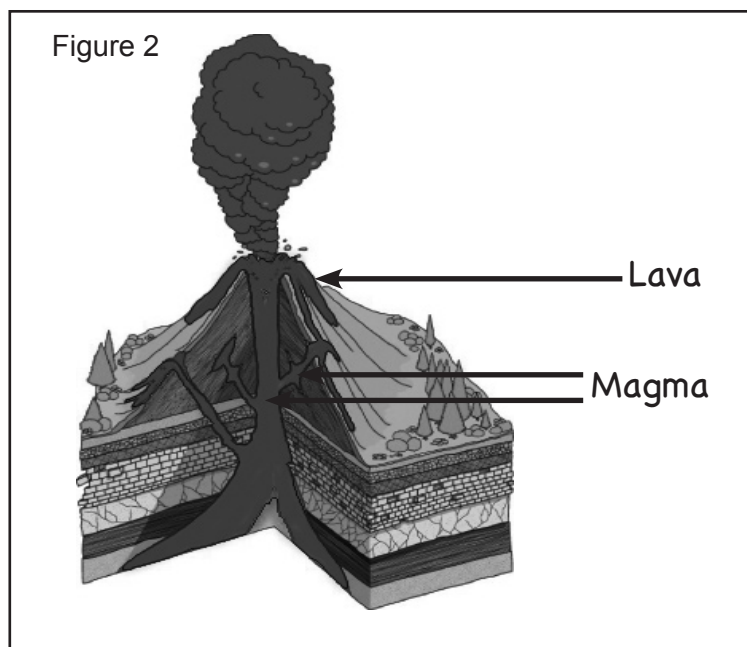
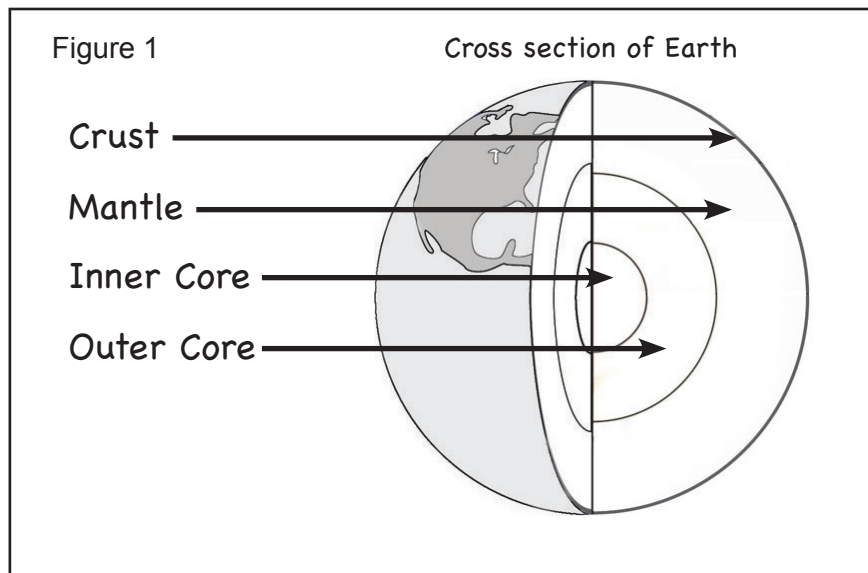
Critical Thinking:

Activity Response Method: For older students, ask students to write a paragraph describing their response to an activity or teacher-led demonstration. For younger students, ask students to think of a response to share. They can begin their response with “I was surprised to learn...” or “I learned that...” or “I wonder if...”

9. Distribute STUDENT WORKSHEET: “Volcanoes and Tsunamis!” for students to complete.

Answers:

1. See Figure 1, below.
2. See Figure 2, below.
3. Student illustrations should show one of the following actions: 1) a volcano landslide falling into the sea; 2) an undersea eruption; 3) a strong earthquake from a volcano affecting the sea; or 4) a strong eruption reaching the sea.



Name: _____

Student Worksheet

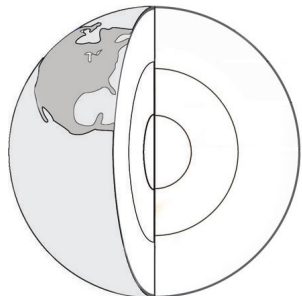
Volcanoes and Tsunamis

1. In the box at right, draw a line from the word to the correct part of the picture.



Cross section of Earth

Crust
Mantle
Inner Core
Outer Core



2. Draw a line from the words below to the correct parts of the volcano picture.

Lava

Magma

3. In the box below, draw a picture of a volcano creating a tsunami.

