

- Why would you want to live near a volcano? Which type would you most likely live near? Justify your answer.
- Discuss why lava may not be the most dangerous aspect of an erupting volcano.
- Explain why a volcanic eruption would be less likely to occur on the eastern coast of the United States than on the western coast.

Follow-up Activities

- Create a model of an erupting volcano with your students. Mixing equal parts of baking soda and vinegar in a bottle creates an eruption. Students can vary the amount of the ingredients to determine differences in the strength of the eruption. (See the "Volcano World" Web page: volcano.und.nodak.edu/vwdocs/volc_models/models.html for variations of volcano models.)
- Have students imagine that they are reporters for a Roman newspaper in Pompeii when Mount Vesuvius erupts. They can record their observations of the destruction in a front page news story. (See the "Volcano World" Web page: volcano.und.nodak.edu/vwdocs/volc_images/img_vesuvius.html for more information about Mount Vesuvius.)
- Conduct a class research project on famous volcanoes. Each student can select and research a famous volcano, including the location, eruption history, effects on the surrounding area and the potential for future eruption. Students can share their information with the class and plot these famous volcanoes on a world map.

Suggested Internet Resources

Periodically, Internet Resources are updated on our Web site at www.libraryvideo.com

- www.cotf.edu/ete/modules/volcanoes/volcano.html

As part of NASA's Learning Technologies Project, this Web page provides a learning module about volcanoes. Information is presented about the analysis of the potential risk of volcanoes, locations of volcanoes and different types of volcanoes and lava. Several activities are provided, including making decisions about living in the shadow of active volcanoes.

- volcano.und.edu/

"Volcano World" is a great source of information about volcanoes. One interesting feature of this site is the "Current Eruptions" page, which provides up-to date details about active volcanoes. This site also presents many volcano images, facts and activities.

- www.usgs.gov/education/learnweb/volcano/

The United States Geological Survey has a Learning Web that contains activities and lesson plans for Earth science topics. The "Volcanoes!" section provides a teacher's guide and activities for learning about volcanoes, in addition to many facts about volcanic eruptions.

Suggested Print Resources

- Green, Jen. *Volcanoes*. Copper Beech Books, Brookfield, CT; 1997.
- Lauber, Patricia. *Volcano: The Eruption and Healing of Mount St. Helens*. Aladdin Books, New York, NY; 1993.
- Moores, Eldridge M. *Volcanoes and Earthquakes*. Time-Life Books, Alexandria, VA; 1995.
- Vogt, Gregory. *Volcanoes*. Watts, Danbury, CT; 1993.

TEACHER'S GUIDE CONSULTANT

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Teacher's Guides Included
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Volcanoes

Grades 5–8

Students in grade 5-8 classrooms possess a wide range of background knowledge. Student response to this video program is sure to be varied, so the teachers at these grades need all the help they can get! This guide has been designed to help the 5-8 science teacher by providing a brief synopsis of the program, previewing and follow-up questions, activities, vocabulary and additional resources.

Before Viewing: Extensive research tells how important it is for the teacher to discover what the students know — or think they know — about a topic, before actually starting a new unit. Therefore, after prompting discussion with the pre-viewing questions, lead your class to create an "Everything We Think We Know About..." list. You may also wish to preview key vocabulary words, and have students raise additional questions they hope will be answered.

After Viewing: Have your students share video excerpts that fascinated or surprised them, then challenge your students to prove or disprove the accuracy of the facts they put on their "Everything We Think We Know About..." list. Discuss what else they learned and use the follow-up questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.



Program Summary

The release of thick smoke, rock particles, scorching lava and poisonous gases can result from the eruption of volcanoes. But how do volcanoes initially form and why do they eventually erupt? The formation and eruption of volcanoes has a lot to do with the layers under the Earth's surface. The inner core at the center of the Earth consists of extremely hot, solid metal under great pressure, while the outer core is made of very hot, liquid metal. The next layer, the mantle, makes up most of the inner Earth and consists of molten rock called magma that is constantly moving. The surface layer above the mantle is called the crust and is composed of solid rock plates that float on the mantle. Cracks in plates are perfect locations for molten magma to rise to the surface in a volcanic eruption. Once the magma erupts from its underground chamber, hot gases escape and molten rock, now called lava, flows out. The lava can escape through the vent of the volcano and out through its crater, or it can seep out of cracks or fissures in the sides of the volcano.

Different types of volcanoes are formed in various ways. Cinder cone volcanoes are formed mostly by volcanic cinders or small pieces of scorched rock blown from the vent. This type of volcano is not very tall (less than 500 meters) and has steep sides with a bowl-shaped crater. A shield volcano is formed of light lava that oozes gently, slowly building up layer upon layer of hard volcanic rock called basalt. The tallest and most explosive volcanoes are called composite volcanoes, which have characteristics of both shield and cinder cone volcanoes. When this type of volcano erupts, materials such as lava, ashes, cinders, rocks and gases explode into the air and layers of lava build up on the surface.

Volcanoes can be active, dormant or extinct. Active volcanoes erupt periodically, exhibiting rising plumes of smoke and causing tremors. A volcano that is inactive for a period of time is classified as a dormant volcano. If a volcano has been dormant for over 1,000 years, it is called extinct. Volcanologists, the scientists who study volcanoes, have found ways to predict eruptions by using laser beams and tiltmeters to monitor sudden changes in the shape of a volcanic mountain. These scientists also monitor the temperature of nearby soil and streams, which heats up prior to an eruption. They also observe escaping gases, smoke, tremors and rockslides, which are other warning signs of a volcanic eruption.

Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the video.

volcano — An opening in the Earth's crust through which lava, gases and other materials from the mantle reach the surface.

inner core — The solid center of the Earth made of extremely hot metal under great pressure.

outer core — The layer of the Earth surrounding the inner core made of very hot, liquid metal.

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mantle — The largest layer of the Earth located directly under the crust, composed of very hot, dense, flowing rock.

magma — The molten rock found beneath the Earth's surface in the mantle.

convection current — The process by which heat is transferred through the rising of hot liquid and the sinking of cool liquid.

crust — The outer layer of the Earth, consisting of rock plates floating on the mantle.

plates — Moving, irregularly shaped rock pieces that make up the thin, solid crust of the Earth's surface. These plates float on the mantle.

lava — Magma that flows from an erupting volcano and is found on the Earth's surface.

magma chamber — An underground reservoir of magma.

vent — Also called a central pipe, the opening in a volcano through which lava and other volcanic materials erupt.

crater — The funnel-shaped depression at the top of a volcano.

fissures — Cracks in the sides of a volcano through which magma can escape to the surface.

cinder cone volcano — A low, cone-shaped volcano made mostly from small erupting cinders or pieces of scorched rock.

shield volcano — A gently sloped volcano created by layers of mildly flowing, light lava.

basalt — Hard volcanic rock.

composite volcano — The tallest and most explosive type of volcano made from alternating layers of both rock particles and lava.

pyroclastic material — (pyroclastic: Greek for "broken by fire") Anything thrown from an erupting volcano such as lava, ashes, cinders, rocks and gases.

active volcano — A volcano that erupts regularly or shows evidence of being active.

Ring of Fire — The area around the Pacific Ocean where most of the Earth's active volcanoes exist.

dormant volcano — A volcano that has erupted during modern times but not recently. Dormant volcanoes are expected to erupt in the future.

extinct volcano — A volcano that has not erupted for 1,000 years and is not expected to erupt again.

volcanologist — A scientist who studies volcanoes.

tiltmeter — A tool used to monitor the changing external shape of a volcanic mountain and to predict an eruption.

Pre-viewing Discussion

Before students generate their list of "Everything We Think We Know About..." for this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

- What are volcanoes and how are they formed?
- Do all volcanoes erupt? Justify your answer.
- What changes do you think a volcanic eruption could cause in the surrounding area?

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After the class has completed their "Everything We Think We Know About..." list, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

Focus Questions

1. Describe the layers of the Earth (inner core, outer core, mantle and crust) and discuss their similarities and differences.
2. Why does the Earth's inner core remain solid when its temperature is hot enough to melt metal?
3. What is the relationship between the mantle and the crust?
4. Why is the movement of plates so important to the location of volcanoes?
5. What causes volcanoes to erupt?
6. What are the differences between magma and lava?
7. Describe the different components of a volcano and discuss how they are related (magma, magma chamber, central pipe, crater, fissure and lava).
8. Identify and compare the different types of magma.
9. Describe several types of volcanoes (cinder cone, shield and composite).
10. How are cinder cone, shield and composite volcanoes similar and different?
11. Why are cinder cone volcanoes usually no more than 500 meters high?
12. Why is a composite volcano considered to be the most dangerous of the three types?
13. What are pyroclastic materials? Are they dangerous?
14. What are the three states of volcanic activity? How are they defined?
15. Is it possible for an extinct volcano to erupt again? Explain your answer.
16. What is the Ring of Fire? Why is it so significant?
17. Why do people live near volcanoes despite the obvious dangers?
18. What warning signs do volcanologists search for when trying to predict a volcanic eruption?
19. What tools do volcanologists use in their study of volcanoes?

Follow-up Discussion

Research indicates that students will retain their previous misconceptions about a topic, in preference to new information, until they actively recognize and correct their own errors. Therefore, it is important to have your students re-examine the facts/beliefs they put on their "Everything We Think We Know About..." list. It might also be helpful to review the list by marking each entry with a "+" or "-" to show which facts were correct and which were incorrect.

Thought-provoking discussions provide a good way to assess the overall depth of student understanding. The following are some suggested discussion topics.

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