

- Share historical myths about earthquakes with your students, including the Japanese myth about the giant fish that caused earthquakes. See www.ceri.memphis.edu/public/myths.shtml as one source for these myths. After discussing these myths, encourage students to create their own myth about the cause of earthquakes. These myths could be illustrated and bound into a class book of earthquake myths.
- Visit the University of Edinburgh's earthquake locator web site at www.geo.ed.ac.uk/quakexe/quakes. Using a world map, help students plot the locations of any earthquake activity for the past month. Encourage students to search for patterns. Where are the majority of earthquakes taking place? This activity could become part of an ongoing project where students could plot weekly seismic activity on a classroom bulletin board or world map.
- Have students visit the Red Cross's safety site at www.redcross.org/disaster/safety/earth.html and read about important earthquake survival tips. Students can then design their own earthquake safety poster, demonstrating their understanding of earthquake preparedness.

Suggested Internet Resources

Periodically, Internet Resources are updated on our web site at www.LibraryVideo.com

- pasadena.wr.usgs.gov/ABC/
This ABC book for children entitled "A Child's View of Earthquake Facts and Feelings" is presented by a seismologist from the United States Geological Survey. This online book provides kids' definitions and illustrations of key earthquake terms. A parent and teacher guide offers a greater depth of information about these concepts.
- www.thetech.org/exhibits_events/online/quakes/
This web site sponsored by The Tech Museum of Innovation offers an online exhibit about earthquakes presented in a slide show format. Details are provided about seismographs, faults and plates. Helpful graphics and images are featured on this site.
- pasadena.wr.usgs.gov/eqhaz/4kids/4teachers.html
This web page is part of the "Earthquakes for Kids & Grownups" site sponsored by the United States Geological Survey. The "Stuff for Teachers" page offers earthquake Web resources for teachers that are arranged by topic and by grade level.
- www.fema.gov/kids/quake.htm
The Federal Emergency Management Agency for Kids web site is a helpful resource for students learning about earthquakes. This colorful site defines earthquakes, gives important safety tips and even provides disaster-related math activities.

Suggested Print Resources

- Enderle, Judith Ross and Stephanie Gordon Tessler. *Francis, The Earthquake Dog*. Chronicle Books, San Francisco, CA; 1996.
- Rogers, Daniel. *Earthquakes*. Raintree Publishers, Inc., Austin, TX; 1999.
- Souza, Dorothy M. *Powerful Waves*. Carolrhoda Books, Minneapolis, MN; 1992
- Walker, Sally M. *Earthquakes*. Carolrhoda Books, Minneapolis, MN; 1996.

TEACHER'S GUIDE

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5/04

K7056



All About Earthquakes

Grades K-4

This guide is a supplement, designed for educators to use when presenting this program in an instructional setting.

Before Viewing: Research in learning suggests that it is important for the teacher to discover what the students know — or think they know — about a topic, at the start of a new unit, so that their accurate conceptions can be validated and reinforced, and their misconceptions identified and corrected. Therefore, after reviewing the pre-viewing discussion questions provided for your class, create an "Everything We Know About..." list. Preview key vocabulary words and have students raise additional questions they hope will be answered by this program. Most importantly, students should be told that as "science detectives" they must listen closely, so that after viewing the program, they will be able to tell whether or not the facts/beliefs they put on their list were scientifically accurate.

After Viewing: After a brief discussion about the program, challenge your "science detectives" to prove or disprove the accuracy of the facts they put on their "Everything 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

An earthquake is the shaking of the Earth's surface caused by rocks moving underground. These events are unpredictable and can cause damage to buildings, bridges, railways and pipelines. To help us learn about earthquakes, we must first learn about the layers of the Earth. At the center of the Earth is an extremely hot, solid ball called the core. Surrounding the core is a deep layer of melted rock that moves called the mantle. The thin, rocky, surface layer on which we all live is called the crust. The crust is broken into huge jigsaw puzzle-like pieces called plates that float on the liquid mantle. As they float, they slowly move against each other, creating tremendous pressure. The pressure builds until there is a sudden shift in the Earth's crust, and this shaking is called an earthquake. Earthquakes usually happen along the edges of plates and along fault lines, which are weak areas in the Earth's surface that stretch out from the edges of plates. In an earthquake, the ground moves, releasing energy that travels out from one spot, like the ripples in a pond. If the earthquake happens on the ocean floor, the seismic energy can cause the ocean water to rise up in a huge, dangerous wave called a tsunami.

The energy waves caused by the earthquake are called seismic waves. The spot on the Earth's surface just above the deep spot within the Earth where the earthquake actually happened is called the epicenter. Seismic waves are measured by a tool called a seismograph. Earthquakes are measured according to their strength, on a one to ten scale called the Richter scale.

Particularly in earthquake zones, which are places along the edges of plates and along fault lines, earthquake-resistant buildings are common, and fire and emergency services are usually prepared to react quickly to help people. The problem is that some buildings fall apart during earthquakes, and debris from their collapse can hurt people. To find out how buildings can be made to withstand the shock of an earthquake, architects and engineers use shaker tables to test buildings against stresses. Earthquakes can cause a lot of damage; however, being prepared can save lives and property.

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 show.

earthquakes — The shaking of the Earth's crust, resulting from stresses that cause the sudden movement of rocks deep underground.

core — The solid center of the Earth made of very hot, solid metal.

mantle — The layer of the Earth surrounding the core that is made of very hot, melted rock.

crust — The outer layer of the Earth that is made of hard rock.

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plates — Large pieces of rock that make up the Earth's surface. These plates float on the mantle.

fissures — Cracks in the Earth's surface caused by rocks being pulled apart.

fault lines — Weak areas in the crust that stretch out from the edges of plates.

tsunamis — Giant waves caused by an earthquake on the ocean floor.

epicenter — The location on the surface of the Earth immediately above where the earthquake starts deep underground.

seismic waves — The energy waves sent out through the Earth from an earthquake.

Richter scale — The scale developed by Dr. Charles Richter in 1935 to measure the relative size of earthquakes. The weakest earthquake is rated a one on the scale; the strongest is a ten.

seismograph — A tool that is used to record the motion of the ground during an earthquake.

earthquake zones — Places at the edges of plates and along fault lines where earthquakes are most likely to take place.

shaker table — A device used by architects and engineers to test the ability of models of buildings to withstand earthquake damage.

Pre-viewing Discussion

Before students generate their list of "Everything We Know About..." 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 earthquakes?
- What causes earthquakes?
- How are earthquakes measured?
- Where are earthquakes most likely to occur?

After the class has completed their "Everything We Know About..." list, and before watching the show, 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

You may wish to ask your class the following questions to assess their comprehension of key points presented in the program.

1. Describe the layers of the Earth.
2. What are plates? Why do many earthquakes happen at the edges of plates?

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3. How can the movement of plates cause mountains to form over time?
4. What are fault lines?
5. What happens when an earthquake occurs under the ocean floor?
6. What is the epicenter of an earthquake?
7. What are seismic waves? How are they measured?
8. Describe how a seismograph works.
9. What is the purpose of the Richter scale?
10. What is an earthquake zone?
11. What is the purpose of a shaker table?
12. Can earthquakes be predicted? Why or why not?

Follow-up Discussion

The most important part of this segment is to examine both the facts and beliefs generated by the class in their "Everything We Know About..." list. Research indicates that students will retain their previous misconceptions — in preference to the new information — until they actively recognize and correct their own errors. Because of this, it is important to lead students to the correct ideas while identifying and correcting any misconceptions from the class list. After reviewing the list, encourage students to share the answers they got to the questions raised, before viewing the program.

Raising a thought-provoking question is a good way to assess the overall depth of student understanding. A couple of suggestions are listed below:

- Do you think it is possible to prevent earthquakes from happening? Explain your thinking.
- If you lived in an earthquake zone, what would you and your family need to know to prepare for an earthquake?

Follow-up Activities

- Use a 9" by 12" pan of gelatin to act as a model for the shaking of the Earth's surface during an earthquake. While holding the pan firmly with one hand, tap it with the other hand. Encourage students to watch the waves traveling through the gelatin, which are similar to seismic waves during an earthquake. Alter the strength of the taps to determine the effect on the gelatin. To extend this activity, students can cover the pan with plastic wrap and place various items on the gelatin to determine the "earthquake's" effect on these items.

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