

Tsunami: Teacher's Guide

Grade Level: 6-8

Curriculum Focus: Earth Science

Lesson Duration: Two class periods

Program Description

- **The End Of Dinosaurs**—Learn the theories of how the dinosaurs became extinct on Earth.
 - **Earth's Changing Landscape**—Explore the history of Earth's many types of terrain.
 - **Great Quakes**—See how poor structural planning of buildings in Kobe, Japan, contributed to the damage caused by an earthquake.
 - **Tsunami!**—Discover how tsunamis form and how people can protect against them.
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Onscreen Questions

- How is the Earth constantly changing?
 - What are the evidences of this change?
 - What natural disasters help change the shape of the Earth?
 - How are people protecting themselves from natural disasters?
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Lesson Plan

Student Objectives

- Discover the causes of tsunamis in oceans and fjords.
- Learn that tsunamis in oceans and fjords can create great surges that cause much destruction.
- Learn why ocean tsunamis and fjord tsunamis behave differently.

Materials

- *Our Changing Earth* video and VCR, or DVD and DVD player

For each group:

- Two plastic containers with the same lengths but different widths; one should be significantly narrower.
- Water
- Small rock, ball of clay, or other object to drop in the containers

- Ruler or tape measure

Procedures

1. Review what students know about tsunamis. Discuss the causes of a tsunami: undersea earthquakes or landslides, volcanic eruptions, or the impact of a large meteorite in the sea.
2. Tell students that a tsunami can also occur in a fjord, a narrow ocean inlet surrounded by cliffs. Portions of icebergs breaking, or calving, into the water can cause a fjord tsunami.
3. Tell students they will perform an experiment to discover how calving icebergs can create different wave patterns in the ocean and in a fjord. Before the experiment, students should write a hypothesis about how wave patterns might differ in the two environments.
4. Divide the class into groups and distribute materials to each group. Ask students how they can use these materials to test their hypotheses. Remind them that water depth should not be a factor in their experiments; they should consider the widths of water in an open ocean and in a fjord. (The wider plastic container represents the ocean, the narrow container represents a fjord, and the small object represents the calving iceberg.)
5. Have students fill each container with water, using the ruler to make sure that the depth is the same in both containers.
6. Next, students will drop an object from the same height into each container and observe the resulting wave patterns. Have students record their results.
7. Hold a class discussion about the experiment. Ask students how they know that the difference in wave pattern was not due to differences in water depth. Have students hypothesize in which environment a calving iceberg might cause a greater ocean surge.
8. Have each student draw a diagram showing the results of the experiment. A brief paragraph should describe each diagram.
9. Hold a discussion to compare the effects of fjord tsunamis as a result of a calving iceberg and ocean tsunamis that are the result of an underwater earthquake.

Discussion Questions

1. Why do tsunamis occur more frequently in the Pacific Ocean than in the Atlantic or Indian Oceans?
2. Describe how tsunamis affect people who do not live on a coastline.
3. Do you think it is possible to make architectural changes that can protect a beachfront home from a tsunami?

Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- 3 points: Students' created carefully executed diagrams that clearly showed the experiment's results; wrote clear, accurate, and error-free descriptive paragraphs.
- 2 points: Students created diagrams that somewhat clearly showed the experiment's results; wrote satisfactory descriptive paragraphs that included some errors.



- 1 point: Students created unclear diagrams; wrote vague descriptive paragraphs that included numerous errors.

Vocabulary

crest

Definition: The top of a wave

Context: The crest of a wave may rise only a foot or two above normal.

fjord

Definition: A narrow sea inlet between cliffs or steep slopes

Context: The falling ice creates a wave that spreads rapidly across the fjord.

surge

Definition: A large wave or billow

Context: The water builds and then breaks into a huge surge that rushes ashore.

trough

Definition: The lowest point between waves

Context: For every wave peak is a trough. If the trough appears first, the sea recedes before a wave arrives on land.

tsunami

Definition: A series of catastrophic ocean waves generated by undersea earthquakes or landslides, volcanic eruptions, or the impact of a large meteorite in the sea.

Context: The word "tsunami" comes from the Japanese term for great harbor wave.

Academic Standards

The National Academy of Sciences provides guidelines for teaching science and a coherent vision of what it means to be scientifically literate for students in grades K–12. To view the standards, visit this Web site: <http://books.nap.edu/html/nse/html/overview.html#content>.

This teacher's guide addresses the following national standards:

- Earth and Space Science: Structure of the earth system
- Physical Science: Motions and forces; Transfer of energy
- Science in Personal and Social Perspectives: Natural hazards; Risks and benefits

Mid-continent Research for Education and Learning (McREL)

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit

<http://www.mcrel.org/compendium/browse.asp>.

This teacher's guide addresses the following national standards:

Science: Physical Science: Understands the sources and properties of energy.

Science—Earth Science: Understands Earth's composition and structure.



Geography—Physical Systems: Knows the physical processes that shape patterns on Earth's surface.

Academic Standards

The National Council for the Social Studies (NCSS) has developed national standards to provide guidelines for teaching social studies in the early grades, middle grades, and high school. To view the standards online, go to <http://www.socialstudies.org/standards/strands/>.

This teacher's guide addresses the following thematic standards:

- People, Places, and Environments
 - Individuals, Groups, and Institutions
 - Power, Authority, and Governance
 - Science, Technology, and Society
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Support Materials

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the Discoveryschool.com Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>
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