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Earthquake Waves

Grade Level:

- 4
- 5
- 6
- 7
- 8

Lesson Time:

35 minutes

Objective:

- Students will be able to understand the significance of different seismic waves by recognizing how they move.

Preparation

Before going to the classroom, you will need to:

1. Contact the teacher to find out the length of the class period. Alert the teacher that this investigation requires a long open area for students to line up and will create a modest amount of noise.
2. Find out the technology requirements for the classroom and create either a PowerPoint or overhead transparency of the *Photos of Earthquakes*.
3. Collect any giveaways for the students, such as plate tectonics or earthquake posters.

Materials:

For instructional purposes:

- Stopwatch
- *Photos of Earthquakes* (these could be made in to a PowerPoint or overhead transparency depending on the technology requirements of the classroom)
- Whiteboard or flip chart and markers
- See-through bin filled with water
- Metal weight or coin

- Overhead projector and screen

Purpose

Earthquakes are exciting and dangerous, and many Earth scientists try to determine the risks they pose to people. In fact, earthquakes are one of the most costly natural hazards faced by the Untied States, posing a significant risk to 75 million Americans in 39 States. Earthquakes occur every day. It is important to study earthquakes so that you can learn how to minimize risks to the damaging effects caused by an earthquake. In this investigation, students will learn about the significance of the different waves and how seismographers work.

Safety

This investigation is considered safe to do with students. Be prepared for some horseplay during the human seismic wave experiments.

Investigation Question

How are earthquakes detected?

What to do

1. **(5 minutes)** Prompt a small discussion about earthquakes by starting a demonstration on waves. Put the water-filled bin on the overhead projector and turn the projector on. Ask students to watch what happens when you drop a metal weight into a bin of water. Be sure to accept as many explanations as you can. Questions you might ask the students:
    - What happened to the surface of the water? (*Student responses should reflect how the water rippled like waves when the weight was dropped.*)
    - What did it sound like?(*Student responses will vary.*)
    - If you were on the surface of the water when the weight fell in, what would it feel like? (*Student responses will vary.*)
2. **(2-3 minutes)** share the *Photos of Earthquakes.* Be sure to accept as many explanations as you can and record the responses on a flip chart or board. Some questions you could use are:
    - What would you expect to see, hear, and feel in an earthquake?
    - What caused these earthquakes?
3. **(2-3 minutes)** Explain to the students that earthquakes are the result of a sudden release of energy in the Earth's crust. This energy creates waves similar to the ones created by the metal weight when it hit the water, called **seismic waves**. These waves spread out in all directions from where the **focus**, or place within the Earth's crust where the sudden release of energy first occurred. There are many different types of seismic waves which students will explore through a simulation.
4. **(10-20 minutes)** Start the simulation**.**
    - Ask the students to line up shoulder to shoulder in a line. Have them stand close enough to touch shoulders. (Another option is to have students stand in a circle, so that they will be able to see the waves as they move.)
    - Inform students that you will send a different wave through the line to see how quickly each

type of wave moves.

- Explain to students that you are going to send a “surface wave” down the line. (*Write this wave on the board or flip chart.*) This will be done by pushing down on the shoulder of the first student, who will then bend his/her knees and return to standing. The adjacent student can duck down only when s/he feels his/her neighbor move. (*Have the teacher time how long the wave takes to travel down the line. Have the teacher record the time on the board or flip chart.)*
- Next, explain to students that you will send a shear (S) wave down the line. (*Write this wave on the board or flip chart.*) This will be done by pushing the shoulder of the first student forward or back and have the student return to upright. Again, the next student will lean forward or back only when s/he feels his/her neighbor move. (*Have the teacher time how long the wave takes to travel down the line. Have the teacher record the time on the board or flip chart by the name of the wave.)*
- Finally, explain to students that you will send the compressional (P) wave down the line. (*Write this wave on the board or flip chart.*) This will be done by pushing the shoulder of the first student in the direction of the line, and having the students repeat the movement to the end. (*Have the teacher time how long the wave takes to travel down the line. Have the teacher record the time on the board or flip chart by the name of the wave.)*
- Note that it may take a few trials to get a good sample of each wave. The compressional wave will be fastest and the surface wave will be slowest.

5. **(5 minutes)** Discuss the simulation. Be sure to accept as many explanations as you can. Some questions you might use are:
   - Which seismic wave was the fastest? Why?
   - How do you think scientists study seismic waves?
   - What is the difference between a surface wave, S wave and P wave?
   - Which seismic wave would do the most damage to a community? Why?
6. **(2 minutes)**. Thank students for their time and attention. You can leave giveaways behind for the classroom teacher to distribute.

PhotosofEarthquakes.pdf