Hands-on Activity

Make a Seismometer: Activity for Measuring Movement

Time

1 Class Period

Key Questions

The Earth moves. Why?
What scientific equipment is used to warn us of the beginnings, or size of an earthquake?
What do earthquakes have to do with volcanoes?

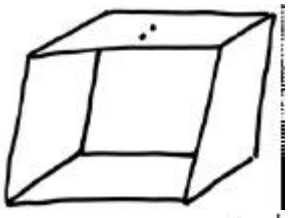
Materials and Preparation

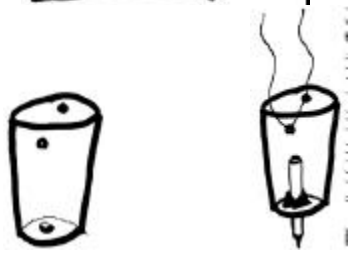
- Small, stiff cardboard box (approximately (8"X10" 12" (deep))
- plastic cup (5" to 6" tall with thin sides)
- black or red felt tip marker
- 20" of string
- small rocks, marbles, or metal objects (bolts, screws, etc.)
- clay
- white paper (81/2" x 11")
- scissors
- 6 wooden tongue depressors or Popsicle sticks
- 12" x ¼" ruler, wooden dowel, or metal rod.
- ½" masking tape

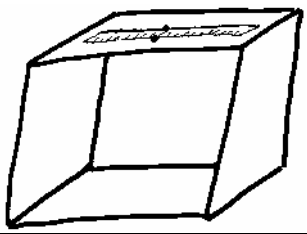
Background

Seismometers are delicate scientific tools used to detect tremors from earthquakes. Seismometers are the forward sentinels in those locations where earthquakes and volcanoes are active. When a volcano comes to life, scientists will place many seismometers in remote areas all around the volcano in order to monitor its activity. An increase in tremors is one sign that a volcano is closer to erupting. The readings from many seismometers become the first line of safety for the people living near a volcano. Because of the dangers involved, most seismometers are designed to transmit by radio or satellite their data to a central spot where scientists can interpret it. With enough data and the proper calculations, scientists can warn people in time of possible danger. This project will give you an idea of how a seismometer works.

Part One – Assembly

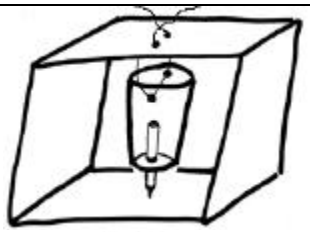






PROCEDURE

1. Take a box. Cut off the flaps. Turn the box on its side so the open side faces you. The side of the box that is on top is now the top of your Seismometer.
2. With scissors, poke two holes one inch apart in the top of the box. The holes should be towards the edge of the box closest to you.
3. Poke one hole in the center of the bottom of the plastic cup for the marker.
4. Cut two holes opposite each other along the rim of the cup.
5. Put half of the marker through the hole in the center of the bottom of the cup. The writing end should be sticking out of the bottom of the cup.
6. Put some clay around the marker where it goes through the hole so that the marker will stay in place.
7. Place the dowel or metal rod across the top of the box and under the string and tape it in place. This will stiffen the box in preparation for the next step.



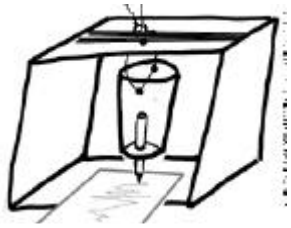
8 With the string, suspend the cup from the holes in the box so that the tip of the pen touches the bottom of the box.

9 Fill the cup 3/4 of the way with the marbles or rocks. Use the tongue depressors to put beneath the knot on the top of the box to adjust the height of the marker so that it just touches the bottom of the box. (If the top of the box sags, you may have to tape some sticks, in the form of a triangle, in place from the corners of the box to the center of the top.)

Part Two- Try It Out

PROCEDURE

1 Cut a strip of paper that's as deep as the box and approximately 4 ¼" inches wide.



2 Put the paper on the bottom of the box with one end of the paper under the marker. Using the Popsicle sticks, readjust the height of the marker if necessary by putting the sticks under the string on top of the box. This keeps you from having to untie and tie the knot. The rocks, etc., may stretch the string.

3 Have someone gently, and with short, brisk irregular movements, shake the box right and left while you slowly pull the paper towards you.

4 As the shaking of the box increases, what happens to the lines on the paper? Try pounding on the table and see what kind of lines it makes. How sensitive is your seismometer? Does it record footsteps? Try making some changes to it so that it can detect really small movements in the air such as when you sing or talk softly.

5 Mark a new strip of paper with lines 1" apart. Can you pull the paper through so that 1" of paper passes under the pen every 10 seconds? Practice this with several strips of paper.

CLOSURE QUESTIONS

Record the answers to these questions, and other observations that you wish to make regarding this hands-on experience, in your *ERT Member Log*.

1. What does the line drawn on the paper tell you about the vibrations of the box?
2. From what you have read about tremors in your studies, is time a factor in using a seismometer?
3. How sensitive is the device you created?
4. How are earthquakes related to volcanoes?

Note: Adapted from the seismometer experiments on the PBS Kids Website/ Zoom: http://pbskids.org/zoom/sci/seismometer.html