STEM Program

Make a Seismograph

Mechanical and Physical Waves

In this activity we will make a simple seismograph! A seismograph is a device that is used to detect earthquakes. It can also be used to tell you how severe (big) and intense the earthquake was. This information can be explained by S waves and P waves.

This project was inspired by Science Buddies “Make Your Own Seismograph”. It can be found here: https://bit.ly/DIYseismograph

Suited to Section

Joey Scouts | Cub Scouts | Scouts | Venturer Scouts | Rover Scouts

Challenge Area

COMMUNITY | PERSONAL GROWTH | OUTDOORS | CREATIVE

Key SPICES Growth

SOCIAL | PHYSICAL | INTELLECTUAL | CHARACTER | EMOTIONAL | SPIRITUAL

Likely Scout Method Elements

COMMUNITY INVOLVEMENT | LEARNING BY DOING | NATURE AND THE OUTDOORS | PATROL SYSTEM

PERSONAL PROGRESSION | PROMISE AND LAW | SYMBOLIC FRAMEWORK | YOUTH LEADING, ADULTS SUPPORTING

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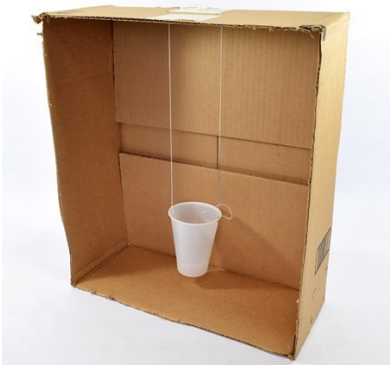
Plan

Materials needed:

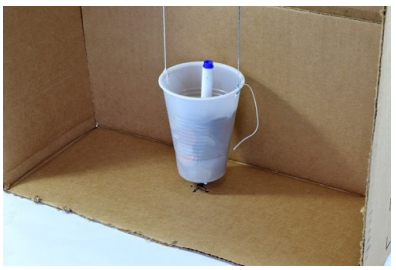
1. Medium sized cardboard box, a shoe box would work
2. Paper or plastic cup
3. String, slightly longer than the length of the box
4. Marker or pen
5. Scissors
6. Receipt paper or other long piece of paper (1 metre by 10cms wide)
7. Tape
8. Coins, marbles, small rocks or other small heavy objects to use as weights
9. A helpful team :)

Do

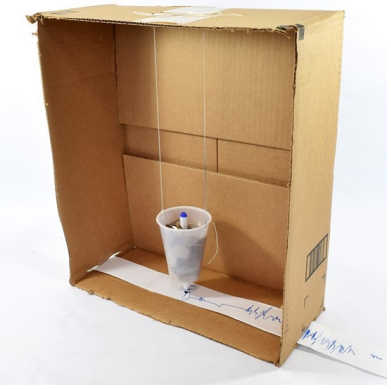
1. Cut the lid or flaps off the cardboard box. Stand the box up on one of the smaller sides
2. Poke two holes opposite each other near the rim of the cup
3. Tie a piece of string to each hole.
4. Poke two holes in the top of the box at the centre, making sure they are the same distance apart as the holes in the cup
5. Push the two pieces of the string through the holes and tie them together on the top of the box, so the cup hangs down inside the box. The bottom of the cup should be about an inch above the bottom of the box



6. Poke a hole in the centre of the bottom of the cup. Remove the cap from the marker, and push the marker through the hole, so its tip just barely touches the bottom of the box.
7. Fill the cup with coins or other small weights, making sure the marker stays vertical.



8. Fold a piece of paper in half lengthwise, then fold it in half lengthwise again. Unfold the paper and cut along the folds to form four equal sized strips. Tape the strips of paper together end to end, to form one long strip. If you have a long printed receipt, you can skip this step.
9. Cut two slits on opposite sides of the opposite sides of the cardboard box, as close as possible to the bottom edge. The slits should be wide enough to pass the paper strip though one side, across the middle of the box, and out the other side with enough paper to pull through.
10. Make sure the marker is centred on the paper strip. You might need to poke different holes in the top of the box and re-hang the cup if necessary.
11. Now you are finally ready to use your seismograph! Stabilise the box with your hands as your helper slowly to pull the paper strip through the box from one side to the other side



12. Now, shake the box back and forth (horizontal to the paper strip, keeping the bottom of the box in contact with the table) as your helper continues to pull the paper strip through, doing their best to pull at a constant speed.
13. Pause your shaking for a few seconds (as your helper continues to pull the paper) then try shaking the box harder
14. Pause for a few more seconds, then shake the box very gently
15. Pull the paper strip all the way out of the box and look at the line

Question Prompts:

1. How does the line on the paper change?
2. Can you tell how hard the box was shaking based on the line? Can you tell when the box was not shaking at all?
3. Does your seismograph work if you shake the box side-to-side or up and down?
4. Can you design a seismograph that can record motion in multiple directions?
5. What happens when you put this on another surface?
6. What if you just hit the surface compared to when you move the box?

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Review

When your helper pulls the paper through the box with no shaking, the marker should just draw a straight line on the paper. When you shake the box, it moves back and forth, and the paper moves along with it. Because of the heavy mass of the cup and the way it is suspended by strings, the cup does not move as much.

This means that the paper moves back and forth under the (mostly) stationary marker, resulting in a squiggly line. The size of these squiggles (their amplitude) corresponds to how hard you shake the box, just like how the line drawn by a real seismograph corresponds to the strength of an earthquake.

Want To Learn More?

- Make Your Own Seismograph | STEM Activity (sciencebuddies.org) https://bit.ly/DIYseismograph
- Make Your Own Seismograph! - Science World: https://bit.ly/ScienceWorldSeismograph
- How a Seismograph Works - YouTube: https://bit.ly/SeismographVideo
- How To Build A Seismograph At Home? - How to build (www.constructorasenqueretaro.com): https://bit.ly/SeismoAtHome
- Locate the epicentre of an earthquake https://bit.ly/LocateEpicenter

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SciScouts Physics of Waves

The SciScouts Physics of Waves is a National Science Week project, undertaken in collaboration with Fizzics Education. These instructions were prepared by Scouts for Scouts. This National Science Week project is supported by the Australian Government.

Scouting has always been strong on STEM skills. Maths to calculate catering quantities and navigate, the science of water purification, the physics of abseiling, and the engineering of pioneering structures – they all have their place. In the current program for our youth members, STEM and Innovation forms one of six Special Interest Areas that enable Scouts to set goals and pursue their own ideas.

SciScouts PHYSICS

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