Exercise:

Build your own seismograph!

Photo Credit: Scientific American

- **60+ minutes**
- **Ages 7+**
- **Small groups (3-4 students)**
- **Extra materials required**

Summary:

Help your students understand how the Raspberry Shake (and other seismographs) works by building their own simple seismograph, using everyday school supplies. Then compare and contrast the student's home-made seismograph to the Raspberry Shake!

Preparing for the lesson:

- Ensure that there is a functioning system in place for the Raspberry Shake to display live, real-time data to a monitor that your classroom can view during this activity. You can find tips and instructions for that here
- Download and Follow IRIS's Build your own seismograph activity with your students.
- It is important to have sufficient materials to allow the students to build the seismograph. Materials include boxes, pencils, paper, string, tape, paper/plastic cups, coins...
- To further prepare and understand the project, there are many youtube demonstrations and tutorials that you, as a teacher, can watch ahead of time.

Procedure:

Plan: Students think of ways to build a simple device that will record ground motion. Draw plans out on a piece of paper, and plan the materials needed. Do not give much instructions!

Build: In small groups of 3–4 students, students design and construct a seismograph using common household and craft materials provided. Each group will demonstrate to the class (by shaking their table) how their seismograph records motion

Test and Compare: Test your seismograph! Shake the desk that the seismograph is on, and (if applicable) move the "recording paper" to see movement over time.

At the same time, place the Raspberry Shake seismograph on the desk and watch the graph that results from the shaking. Think about the similarities and differences between the geophone of the Raspberry Shake, and the sensor for your homemade seismograph.

Closing - Reflect and Share

Start a conversation with the students about the activity:

- How could the design be improved?
- What were the biggest differences between the home-made seismograph and Raspberry Shake? Similarities?
- Were there any difficulties building your seismograph?
- Does having build a seismograph help you understand what goes on inside a geophone? Why?

IRIS In Class
www.iris.edu/educate

Build Your Own Seismograph

Bringing Seismology's Grand Challenges to the Undergraduate Classroom

60 min | Intermediate | Student Investigation | Whole Class | Small Group | Materials Required

Exercise provided by Boston College Educational Seismology Project, https://www2.bc.edu/~kafka/SeismoEd/BC_ESP_Home.html

OBJECTIVE

Students will gain a greater appreciation of how a seismograph works, and a better understanding of recordings of ground motion that they see on seismograms.

ACTIVITY

In small groups of 3–4 students, design and construct a seismograph using common household and craft materials provided. Each group will demonstrate to the class (by shaking their table) how their seismograph records motion (and, if possible, the time of the disturbances).

PROCEDURE

Think of a creative and effective way to measure seismic waves generated by an earthquake. Draw a clear diagram of your seismograph, and label all the parts. Then describe how your seismograph works (in no more than one page of text and one page of figures).

A good design would be:

- Made of the common inexpensive materials provided for this exercise
- Capable of determining the relative size of each disturbance it measures
- Capable of measuring vibrations continuously for at least one minute
- Capable of capturing the time when these disturbances occurred
- Capable of measuring vibrations from three different sources: a bang on or shaking of the table holding the seismograph; a person jumping up and down on the floor next to the table on which your seismograph is located; and a ball bounced off of a wall or floor nearby.

Each student should bring to class one or two small, unusual items to add variety to the list of building materials. After your initial design is complete, gather the materials you need and build the seismograph you designed. Be prepared to show the class how your device works.

After each group presents their design, the teacher will give a brief description of the kinds of seismographs that seismologists use, and will explain how seismographs record ground motion.

See this activity as part of one or more learning sequences at: www.iris.edu/hq/inclass/5e

REFLECTION

- How can your seismograph design be improved?
- What elements of your seismograph are similar to seismographs used by seismologists? What elements are different?
- What were some of the challenges you encountered in designing and building your seismograph? How did you try to solve those problems? Did you succeed in solving those problems?
- What are the physical principles underlying the mechanism of how your seismograph measures ground motion?
- Can you think of any other reflection questions that would be appropriate for this exercise? If yes, what is your question, and how would you answer it?

SUGGESTED MATERIALS

- Masking tape (4 rolls)
- Weights or sinkers (6–12)
- Empty paper towel rolls or toilet paper rolls
- Coil springs
- Straws
- Paper
- Paper plates
- Paper cups
- Pipe cleaners
- Marbles
- Pens and pencils
- Bouncy ball for demos
- String or wire
- Scissors (4)
- Miscellaneous items brought to class by the students