

Exercise:

Watching Waveforms!

- **30 minutes**
- **Ages 7+**
- **Entire class (students can complete worksheet in pairs)**

Summary:

Having a seismograph in the classroom is an excellent opportunity to demonstrate physics and Earth science concepts to students in a hands-on and interactive activity. In this activity, they will explore how acoustic energy waves are recorded by seismographs, how they lose energy over distance (attenuation), and why different actions cause different waveforms.

Pre-class Preparation:

- Print the student worksheet (you can also decide to have the students copy the worksheet in a notebook)
- Raspberry Shakes must be connected to an external display to show data. Ensure that there is a functioning system (a separate computer, most likely) in place for the Raspberry Shake to stream live, real-time data for your classroom to view during this activity. You can find tips and instructions for that [here](#)
- Clear a space in the front of the class on the floor for the sensor. It is important that the students can see what they are jumping at!

Procedure:

Students will explore and experience what seismographs are and how they work by interacting with one in real time. Different jumping tests will be performed by changing variables like distance, duration, and mass. The students will practice being scientists by making observations and inferences.

Step 1 — Introduction and planning:

To start the class, briefly introduce the students to the concept of a seismograph! A seismograph records ground movement (shaking) and it is used by scientists to detect and record earthquakes. Here you can introduce them to the live waveform graph that is on the monitor. Be careful not to give the students too much of an explanation — they will get a hands-on understanding soon!

Then, tell the students that they are doing an experiment to see how the seismograph records data, and responds to different movement happening around it.

Plan the process with the students:

- The class decides together who will be the “jumper”.
- Instruct the students on how to fill out the “Observation Sheet”. They fill out the first column with their predictions, second with their written observations, and the third column is a space to sketch the waveform they saw. There is a space provided on the worksheet for students to sketch the waveform. See the image below, for an example of how it can be filled out.
- Encourage students to make qualitative observations like “one, tall spike” or “many, little waves”

**Raspberry Shake Exercise:
Observation Sheet**


	Predictions.	Observations	Sketch of waveform
Test A	biggest	One big spike, then little squiggles	
Test B			
Test C			
Test D			
Test E			

Figure: Observation Sheet, “Test A” row completed as example

Step 2 — Making predictions:

Hand out the worksheet, or instruct the students to copy the chart into their notebooks. Give students 5 scenarios. Write them on the board.

- Test A: One person jumps once, very close to sensor
- Test B: One person jumps once, 10 feet away
- Test C: One person stomps their feet for 5 seconds, 5 feet away
- Test D: Everyone jumps once, all at the same time
- Test E: Everyone stomps their feet as hard as they can for 5 seconds

Which will make the biggest change in the graph? The biggest “squiggle”? Rate them 1 - 5, higher numbers being more change. Fill out the first column on the worksheet.

Step 3 — Jump and Shake!

Complete the first test, Test A. Once the “jumper” jumps, it may take a few seconds for the data to register on the monitor. Remember — take notes of the

observations and try to sketch the form of the graph in the space provided. Then, allow some time for the graph to reset after each test to proceed, and then repeat this process for tests B through E.

Step 4 — Reflect and share

Start a conversation with the students:

- What did we learn?
- What conclusions can we make?
- Was anything surprising?
- How does this activity relate to the real world?