

What's Shakin', Dude?

TOPIC: P- & S-wave travel chart

GRADE LEVEL: 9-12

CONTENT OBJECTIVE: Students will create their own P- & S-wave travel chart and develop a better understanding of the relationship between the two wave types, travel times, and travel distances.

TIME REQUIRED: 1 class period (45 min. to an hour)

MATERIALS NEEDED: 1 pylon or stick to place in the ground for each "seismograph station"

1 pylon or stick to represent the epicenter

1 stopwatch for each seismograph station

1 lab packet per student

1 drum/tambourine/set of sticks/ etc. to set pace

1 index card per team to record field data

Graph paper (1/4" square ruled paper)

LESSON PLAN AUTHOR & CONTACT INFO:

Submitted by: Peggy Warren

Kendall Jr. Sr. High School, Kendall, NY 14476

Email: pwarren@kendallcsd.org

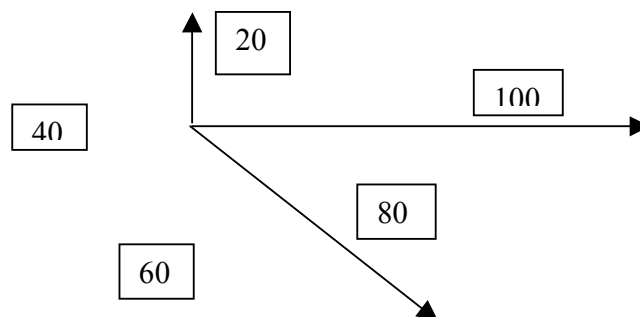
Modified from a lesson created by Alex Mackie, Schoharie Central Schools

SUGGESTIONS FOR RUNNING THE EXERCISE:

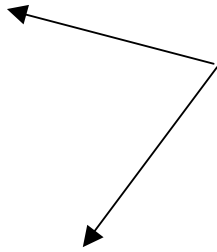
1. Set up stations in advance!
2. Assign the roles to the students before you go outside.
3. Take as few materials outside as possible.
4. Select a site as close to your classroom as possible.
5. Use a horn or whistle to signal the beginning of the exercise.
6. Use a drum or sticks to strike a beat so students are stepping at the same pace.
7. If time allows, run the exercise a second time.
8. Follow up this activity with a worksheet using the P- and S-wave travel time graph.

SET-UP:

Choose an area that will allow you ample room to set up the activity. Place a pylon or stick in position to be the "epicenter" of your earthquake. Place additional pylons radiating away from the epicenter, representing the seismograph stations. Suggested distances: 20', 40', 60', 80', etc. See illustration below.



REVIEW: Prior to having students perform this activity, review P- and S-waves.



Remind students that P-waves are compressional. This motion can be demonstrated by setting a clear pie plate filled with water on the overhead projector and dropping a pebble into the center of the water. Students who are assigned P-wave status must step straightforward.

S-waves are shear waves. Their motion can be demonstrated using a slinky or length of rope traveling side-to-side as they progress forward. Students who are assigned S-wave status must step side-to-side as they progress forward in a straight line.

INSTRUCTION TO STUDENTS:

Each student representing a p- or s-wave must take a step with each beat. Using the stopwatch, record the arrival time at the “seismograph station” of both the p- and the s-wave. Data will be compiled in the classroom. Be sure that you are heading toward the correct station.

When you return to the classroom, instruct students to collect data from classmates to complete the data table. Then students should graph the data on the graph provided.

Sample Index card:

FIELD DATA	
TEAM #	_____
“S”-wave travel time =	_____
“P”-wave travel time =	_____
Travel time difference =	_____

EVALUATION:

NAME _____

P- & S-wave relationships

Complete the data table. Plot P- and S-wave data on the graph.

Sample Data Table (You will probably need to allow space for more teams)

TEAM #	DISTANCE FROM EPICENTER	P-WAVE ARRIVAL TIME (SEC)	S-WAVE ARRIVAL TIME (SEC)	TRAVEL TIME DIFFERENCE (SEC)
1				
2				
3				

After plotting the data on the graph, answer the following questions.

1. The center cone in our exercise served as our earthquake's _____.
2. How many earthquakes occurred during our exercise today? _____
3. What did the timer at each station represent? _____
4. In how many directions do the earthquake waves move from our epicenter?

5. P-waves move _____ than S-waves.
6. We know this because we observed outdoors that P-waves took _____ time to arrive at the seismograph station than the S-waves.
7. As we increase our distance from the epicenter, both the P- and S-waves need _____ time to arrive at their seismographic stations.
8. As the distance from the epicenter to the seismographic station increases, the difference in travel time between the P- and S-wave will _____.
9. Graph a qualitative relationship between epicenter distance and travel time difference between P/S-Waves below. This is a(n) _____ relationship.

