Classroom Teacher Preparation

Earth Science 15: Seismic Waves

Please use the following to prepare for the next SfS lesson.

Description:

In this lesson, students explore different types of seismic waves produced by an earthquake as recorded on a seismogram. Students first build a simple seismograph to better understand how seismic waves are detected and analyzed. Then they model the two main types of seismic waves and identify them on a seismogram. Longer classes also learn how to use seismic waves to locate the epicenter of an earthquake.

Lesson Objectives – SWBAT ("Students Will Be Able To…"):

6^{th}-8^{th}

- Describe the main differences between the two types of body seismic waves
- Identify different types of seismic waves on a seismogram

Disciplinary Core Idea (DCI):

PS4. Waves and Their Applications in Technologies for Information Transfer

- (6^{th}-8^{th}) *PS4.A: Wave Properties* – A simple wave model has a repeating pattern with a specific wavelength, frequency, and amplitude, and mechanical waves need a medium through which they are transmitted. This model can explain many phenomena including sound and light. Waves can transmit energy.

ESS3. Earth and Human Activity

- (6^{th}-8^{th}) *ESS3.B: Natural Hazards* – Mapping the history of natural hazards in a region and understanding related geological forces.

Science & Engineering Practice (SEP):

Constructing Explanations and Designing Solutions

- (6^{th}-8^{th}) Construct an explanation using models or representations.

Crosscutting Concept (CCC)

Patterns

- (6^{th}-8^{th}) Patterns can be used to identify cause and effect relationships.

Preparation:

Students should already be familiar with the concept of tectonic plates.

Room Set Up for Activities:

Students work in groups of 3-4 to complete two activities. In the first activity, students work on their desks to build and test a seismograph. In the second activity students model seismic waves with a slinky. Each group should stretch the slinky to 4-6 feet. Students will do this activity on their desks/clusters of desks or on the floor if the desks are too small.

Safety:

There are no safety precautions for this lesson

Related Modules:

This lesson may be taught as part of a sequence or group of related modules on **Earth Science**, particularly Earthquakes. Other modules in this sequence include:

Earth Science 7: Intro to Tectonics – Students work in pairs to construct a puzzle model of Pangea. They then analyze a modern-day map of the tectonic plates, model the plate boundaries using putty and tiles, and then return to the opening question about mountain formation. This is lesson is targeted towards 3rd-5th grades, but may be useful as a review.

Earth Science 18: Modeling the Mantle – This lesson gives students hands-on practice with two different viscoelastic materials – Silly Putty & oobleck – that also exhibit the behaviors of both solids and liquids in order to promote understanding of the properties of the Earth's asthenosphere.

Engineering 7: Earthquake Resistant Buildings - This module focuses on model testing of various earthquake-resistant designs. Students will build different block configurations and test them using shake tables to determine which model provides the best protection in a simulated earthquake.

For other module sequences and groups, look here: www.sciencefromscientists.org/sequences

Standards Covered:

Please click the following link to our website to review the standards covered by this lesson, listed by state: http://www.sciencefromscientists.org/standards/

Lessons are matched to both national NGSS and local state standards.

After Our Visit:

Extend this lesson by using a homemade seismograph and a Richter scale to measure the magnitude of bumps experienced during a car ride.

Access this Extension activity by visiting the Classroom Post found on our website at sciencefromscientists.org/cohorts. Use the name of your school/cohort and password to log in.

To help Evaluate, check out our Open Response questions online at sciencefromscientists.org/open-response-questions. They are freely available for all of our lessons for current teachers. Use the password supplied by your instructor to log in.

Additional Resources:

- NOVA: Earthquakes: The Seismograph http://mass.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.seismograph/earthquakes-the-seismograph/
- Seismic Slinky—An analogy for P & S waves (video, 5:16) https://www.youtube.com/watch?v=KZaI4MEWdc4&t=6s
- 4-Station Seismograph Network Records Earthquake (video, 1:30) https://www.youtube.com/watch?v=BzZhspiyg2I
- Earthquake Epicenter Triangulation (video, 3:39) https://www.youtube.com/watch?v=oBS7BKqHRhs