

Earthquake-Proof Roads

Students describe how roads/freeways are designed to withstand earthquakes. For grades 6-12.

INTRODUCTION

Culminating Activity:

You are a civil engineer working in the East Bay region of California. Many of the streets around town are in poor condition due to the City being on the Hayward Fault. The City has offered your civil engineering company a large amount of money if you can come up with road designs that can withstand earthquakes. Your task is to create a PowerPoint presentation that offers various road design plans that will be able to withstand earthquakes and present this to the City Council.

Objectives (Students Will Be Able To...)

- Students describe how roads/freeways are designed to withstand earthquakes.

ACTIVITIES IN THIS LESSON

Earthquakes

Lecture

Activity

The lesson begins with the teacher asking the students about general information about earthquakes (e.g., Have you ever felt an earthquake? If not, have you ever seen pictures of damages from earthquakes?)

As a rehearsal cognitive strategy, the teacher goes over the definition of p-waves and s-waves and has the students write them down. The teacher plays the [video](#) P & S Waves for students to add to their general knowledge of such waves.

Checking for Understanding & Engagement

- What is an s-wave?
- What is a p-wave?
- What is the biggest difference between an s-wave and a p-wave?
- How are s-waves and p-waves similar?

- How do earthquakes damage roads?
- What kind of damage do roads exhibit as a result of earthquakes?
- What is the relationship between faults and earthquakes?
- Describe how s-waves and p-waves differ in their impact on buildings

Earthquakes and Roads

Group Work

Activity

Students gather into small groups. The teacher asks the students in each group how they think faults and the location of the epicenter can cause and affect earthquakes. The teacher will give out a “Think-Pair-Share” template for students to fill out and record their ideas.

The teacher then elaborates how the strongest earthquake damages typically occur at the epicenter. The teacher then asks the students to discuss their initial ideas about how road designs can be improved and/or changed to withstand earthquake damage. Many students do not know the answer to this question, which is why the teacher allows students to research the topic for their collaborative project (the teacher does not give the answers to the students for this reason).

Checking for Understanding & Engagement

- Do you think it is important to build more earthquake-resistant roads closer to the fault lines and/or epicenter?
- What do you think would be the impact of constructing all new roads to be earthquake resistant?
- Explain how having roads that are not suited to withstand earthquakes can be dangerous.

PowerPoint Creation

Group Work

Activity

Students research roads, earthquakes, and road designs that can withstand earthquakes. The teacher gives out a template with a Frayer Model design for students to learn how to spell, pronounce, and learn the meaning of *tensile*, *epicenter*, and *modulus*.

The teacher describes the reasons why creating a PowerPoint presentation is a necessary and helpful skill to have. Students can format the presentation however they want, but the teacher teaches them how to create a professional and proper presentation. This link (<https://bit.ly/2DUZWfv>) is used for

students who need additional help for creating a presentation.

Creating and deciding on appropriate transitions between slides and how to tastefully format slides for presentation is taught to the students using think-aloud pedagogy.

The teacher discusses the reason civil engineers need to be educated about earthquake-resistant roads for their career, and how such roads can save lives, too.

The teacher then uses the think-aloud pedagogy to teach students how to elaborate on a slide bullet point; students will not be reading word-for-word from a PowerPoint presentation, thus limiting the amount of words on each slide.

Checking for Understanding & Engagement

- Do these issues matter as much in towns that are not as prone to earthquakes? Explain.
- What do you think would be the impact of constructing all new roads to be earthquake resistant?
- Provide an example of one action you could take to improve standard roads?

SUMMATIVE ASSESSMENT

Assessment Types: Demonstrations, Presentation

Students will present their PowerPoint presentations to the class to learn from each other. The teacher will provide positive feedback to each group in front of everyone and provide suggestions about how they can improve on a scoresheet.

Lesson Times

Earthquakes: 15 minutes

Earthquakes and Roads: 15 minutes

PowerPoint Development: 20 minutes

Presentation: 30 minutes

Industries / Subjects / Grades

Grade Levels

- 6, 7, 8, 9, 10, 11, 12

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