

KS3

Earthquakes

TEACHING PACK

- Explore plate tectonics
- Apply research and design
- Build an earthquake-proof house

Lesson plan: exploring earthquakes

About this project-based lesson

This project-based learning unit is designed to teach and reinforce the concepts in a KS3 geography unit on earthquakes and can be used in conjunction with existing curriculum materials.

The project is divided into 5 Milestones; each Milestone includes a self-contained student project activity. Done in sequence, the Milestones connect to enable students to complete a final assessment activity in Milestone 5.

The minimum suggested duration for completing this project is 4 lessons. However, it is completely flexible and can be lengthened or shortened as necessary, based on available lesson time and interest level.

How to use this teaching guide

Each Milestone for this project-based learning unit includes detailed activities presented in step-by-step order, with teaching notes, instructional guidance, and page references to resources and materials included in the Teacher Pack and Student Pack.

Lesson activities are organized for you as follows:

- **Prepare (Starter activity)**
Use these short opening activities at the beginning of class.
- **Present (Teacher explanation/modelling)**
Use this portion of the lesson to deliver new subject material and project information, and to model any instructions or activity required for Produce or Participate elements.
- **Produce (Student project work)**
Use this portion of the lesson to allow students to work independently or in small groups on activities and other project elements.
- **Participate (Student/group share)**
Use this portion of the lesson to allow students to share out any project, research, or presentation materials.
- **Practice (Homework/assessment/independent)**
Use this optional portion of the lesson, if desired, to give students homework activities.



Designing Earthquake-Proof Houses

Overview, Objectives, Inquiry Questions and Planning

Things to consider for milestone #3

- Your students will need cardboard boxes, playing cards, and other materials for the “Practice” activity and to build their model houses. You can find a complete list of materials on page 3 of the Teacher Pack.

Learning objectives for milestone #3

At the conclusion of this milestone, pupils will be able to:

- Conduct experiments to determine how building materials and locations
- impact a building’s damage-level during an earthquake.
- Explain how scientists are designing earthquake-proof buildings.
- Apply what they learned in the experiments and video to design their own earthquake-proof houses.

Extensions and enhancements for milestone #3

- Could you have your students play the “[Stop Disasters](#)” game to learn about how to prepare a city for an earthquake? They will construct buildings, like hospitals, and build strong structures to try to keep the earthquake from causing too much damage. Have the students select “Earthquake” on the first screen.

Student inquiry questions for milestone #3

- What building materials and locations are the best to help a building survive an earthquake?
- How are scientists designing earthquake-proof buildings?
- How can you design your own earthquake-proof house?

Assessment for milestone #3

- Formative Assessment for Individual Activity: Check each student’s “Earthquake-Proof House Planner” handout on page 12 of the Student Pack.
- Formative Assessment for Group Activity: Talk with each student about their design plans and the materials they will use to make their models.

- Summative Assessment: Have the students complete the “Earthquakes Quick Quiz” on page 6 of the Teacher Pack. Use the “Earthquakes Quick Quiz Answers” on page 7 of the Teacher Pack to correct the quizzes prior to starting Milestone #4.
- Summative Assessment: Have the students complete the response printable on page 14 of the Student Pack for the Inquiry Question, “What building materials and locations are the best to help a building survive an earthquake?”

Pupil pack

- Page 10
- Page 11
- Page 12
- Page 13
- Page 14

Teacher Pack

- Page 6
- Page 7

Project activities for milestone #3: Designing Earthquake-Proof Houses**Prepare (Starter)**

Give the students the “Earthquake!” handout on page 10 of the Student Pack. Read about the San Francisco earthquake together. Have the students work with a partner to try the experiments and see the effects of an earthquake.

Present (Explanation/modelling)

Tell the students that the “Prepare” activity showed them how different types of buildings and different types of land affect the damage done by an earthquake. Explain that in this milestone they will build a house for themselves that will stand up well to earthquakes. Give them “The Future of Earthquake-Proof Buildings” handout on page 11 of the Student Pack. Show them the video “[The Future of Earthquake-Proof Buildings](#)”. Have them take notes about three different ways architects are keeping buildings safe from earthquakes.

Participate (pupil/group share, group activity)

Give the students the “Earthquake-Proof House Planner” on page 12 of the Student Pack. Show them all the supplies they will have available to create a model of their house. Have them use what they learned in the experiments and in the video to answer the questions. Then, give them the “Earthquake- Proof House Design” handout on page 13 of the Student Pack to sketch their house and label the materials they will use for each part. Tell them they will build the model of their house in Milestone 4.

Formative Assessment: Talk with each student about their design plans and the materials they will use to make their models.

Practice (Homework/independent work/extensions)

Give each student the writing response template on page 14 of the Student Pack and ask them to write an answer to the inquiry question

for this Milestone: “What building materials and locations are the best to help a building survive an earthquake?”

Assessment

Formative Assessment for Individual Activity: Check each student’s “Earthquake-Proof House Planner” handout on page 12 of the Student Pack.

Formative Assessment for Group Activity: Talk with each student about their design plans and the materials they will use to make their models.

Summative Assessment: Have the students complete the “Earthquakes Quick Quiz” on page 6 of the Teacher Pack. Use the “Earthquakes Quick Quiz Answers” on page 7 of the Teacher Pack to correct the quizzes prior to starting Milestone #4.

Teachit sample

Name:

Date:

Earthquake!

On Tuesday 17 October 1989 an earthquake hit the Californian city of San Francisco. The cause of the earthquake was the San Andreas Fault which suddenly jerked, releasing built up pressure that sent shock waves heading towards the city. The earthquake occurred at exactly 5.04 pm. The earthquake lasted for only 15 seconds and measured 6.9 on the Richter Scale. During that time it caused a lot of damage to the city but the effects could have been much worse. San Francisco is part of a wealthy city so the rescue services are well equipped and trained to deal with such disasters, they saved many lives.



To learn more about some kinds of earthquakes, try the experiments below.

Materials:

Cardboard box, metal pan, uncooked beans or rice, deck of cards, dominoes, building blocks.

Procedure:

1. Begin with the cardboard box. Turn it upside down. Build two small houses of cards, one near the edge of the box and another further away.
2. Tap your fingers gently eight to ten times on the box in front of the closest house. Watch the movement of both houses. You should see that the house closest to the tapping receives the most damage, although the walls of both houses will shift position. The different effects are caused by waves of energy sent by the tapping (earthquake). The vibrating energy weakens as it travels.
3. Repeat the experiment, this time with two houses of dominoes. Watch the results.
4. Repeat it once more, this time with block houses. Again, watch the results. The three kinds of structures will show the ability of structures to withstand earthquakes.
5. If desired, the three different housing materials can be built on different surfaces and the experiment repeated. This will show how the various surfaces alter the effects of the quake's energy waves. After the cardboard box, try an overturned metal pan. Next, invert the pan and fill it with dry rice or beans, and then build the structures on them. What happens in each scenario?

Name:

Date:

The Future of Earthquake-Proof Buildings

Directions: Watch the video and take notes about 3 different ways architects are keeping buildings safe from earthquakes. You will need your notes for the next part of the project.

Damage-Prevention
Method 1

Damage-Prevention
Method 2

Damage-Prevention
Method 3

Name:

Date:

Earthquake-Proof House Planner

Directions: Imagine you live in the place where the earthquake you researched occurred. Create a house that wouldn't be destroyed during the earthquake. Answer these questions to plan your earthquake-proof house.

1. What materials would you use to build your earthquake-safe house? What supplies will you use to represent those materials in your model?

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2. Where would you build your house? What type of ground would it be on? Why? Use what you learned in the experiment to support your answer.

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3. What special earthquake-proof features would your house have? Use an idea from the video to keep your house safe during the earthquake. How will you represent this in your model?

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Name:

Date:

Earthquake-Proof House Design

Directions: Use this page to sketch a picture of your earthquake-proof house. Label it with the names of the materials you will use to make each part.



Name:

Date:

Milestone #3 Inquiry Question

Directions: Use what you learned in this milestone to answer the question.

What building materials and locations are the best to help a building survive an earthquake?

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Teachit sample