

Earthquakes 6–8

Earthquake Safety



Visit the American Red Cross Web site
at www.redcross.org/disaster/masters

LESSON PLAN 4

Stay Safe in an Earthquake

Preparing for an earthquake before one occurs will minimize risk during and after the quake. Preparations will include reducing hazards; preparing a family disaster kit and an emergency plan; and practicing Drop, Cover and Hold On.

Key Terms and Concepts

aftershock	evacuate	extinguish	implode
Drop, Cover and Hold On	hazard		landslides

Purposes

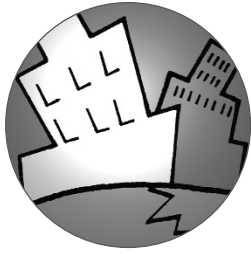
To acquaint the students and their families with actions they can take before an earthquake occurs to minimize harm to people and damage to property

To ensure that students and their families know what actions can be taken during an earthquake to minimize injury

Objectives

The students will—

- Guess the possible effects of an earthquake on structures in their town.
- Review their family disaster supplies kit (from the Background for *Be Disaster Safe*) and consider other items that might be especially useful in the case of an earthquake.
- Review earthquake damage at schools in California to create and implement classroom and school hazard checklists and suggest remediation.
- Write to school administrators identifying hazards and ask for assistance in applying remedies.
- Assess their homes for earthquake hazards and work with family members to make at least two cost-free changes that improve the safety of their homes. (Home Connection)
- Depict the effect of an earthquake on a classroom before and after safety modifications have been made. (Linking Across the Curriculum)
- Use online resources to explore earthquake-resistant construction and build structures utilizing earthquake-resistant designs. (Linking Across the Curriculum)
- Identify methods for reducing injury-causing hazards in school and at home and practice Drop, Cover and Hold On.



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- Practice earthquake evacuation, assessing performance and the evacuation route.
- Use Earthquake Safety (from the Background) and *Earthquake Scenario Cards* to depict steps to take in different situations during an earthquake.
- Plan and practice earthquake safety at home. (Home Connection)
- Set up and evaluate an earthquake drill for the whole school. (Linking Across the Curriculum)
- Create a set of simple brochures or posters to educate the public about earthquake hazards and safety. (Linking Across the Curriculum)
- Use Earthquake Probability Mapping online at the U.S. Geological Survey to assess the earthquake risk in their community or across the country. (Linking Across the Curriculum)

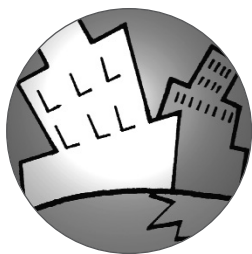
Activities

“School Earthquake Challenge”

“Drop, Cover and Hold On”



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Materials

- *Family Disaster Supplies Kit* from the Background for *Be Disaster Safe*
- “California Schools After a Quake” (photos included on the *Masters of Disaster* CD-ROM)
- LCD projector or printouts of above photos
- Earthquake Safety Checklist, from the Background for *Earthquakes*, 1 copy per group



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“School Earthquake Challenge”

SET UP 15 minutes **CONDUCT** 60 minutes, plus school hazard hunt

Science: Health; Language Arts: Writing



- In this activity students will assess damage to a high school from an earthquake. They must know the definitions of the following terms to accurately determine the kinds of damage or danger. Work with students briefly to define the following terms—

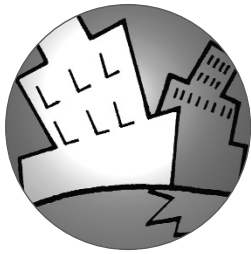
aftershock
debris

Drop, Cover and
Hold On

hazard
infrastructure

- Ask the students to guess the effects of earthquakes on a community and create a class list. Guide the students’ responses to make sure they include the effects listed in the chart below.

Inside the classroom and hallways Overtaken bookcases, furniture and appliances Falling objects from shelves and walls Falling glass from broken windows Collapsing walls Falling pieces of ceiling and light fixtures	Outside the school building Falling brick from walls and chimneys Falling roof shingles or tiles Falling glass from broken windows
Other damage within the school building Power outages Fires from broken gas lines, damaged electrical wires Flooding from broken water pipes Toxic fumes from spilled chemicals	People and their actions People could be injured or trapped Cases of shock are possible The curious will tour damaged areas, impeding the work of rescuers Many might need shelter, food and water Some will donate money and goods to help others
Around the community Fallen power lines and power outages Damage to bridges, highways and railroad tracks Flooding from dam failures, damage to reservoirs and water towers Fires from broken gas lines and chemical releases Landslides or avalanches Tsunamis Liquefaction, causing loss of support for buildings and bridges	



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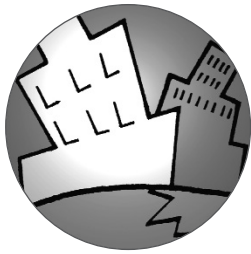
3. Link this discussion to the family disaster supplies kit outlined in the Background for *Be Disaster Safe*. Ask the students to discuss items found in their kits that would respond to the situations described above. For example, the flashlight would offset the lack of electricity. One gallon of water per day per person will compensate for the lack of running water.

What other preparedness items specifically for earthquakes can the students suggest? For example, what about keeping a pair of shoes and a flashlight under or by the bed? How could this be useful in the case of an earthquake at night? (Answer: A leading cause of injury after earthquakes is debris. Getting out of bed and stepping in debris can result in cut feet. Shoes will protect feet, and a flashlight will help in avoiding debris.)

4. Display the photographs of “California Schools After a Quake” with an LCD projector; or distribute printouts to students; or create transparencies for use with an overhead projector. Explain that all these photographs depict earthquakes that occurred when schools were not in session. No one was hurt. Practicing Drop, Cover and Hold On would have prevented injuries had students been in the school buildings. Safe evacuation would have been possible, although the darkened hallways would have been challenging for students to navigate.

As students view the photographs, ask them to point out the hazards they see. (Suspended ceiling tiles and metal brackets were not stable; bookshelves were not bolted down; heavy objects and boxes fell from shelves; etc.) Which of these hazards could have been eliminated? Explain. (Bolt bookcases to wall studs; move heavy or breakable objects from high shelves to low shelves; move filing cabinets away from exits; do not use suspended ceiling tiles; and install emergency lighting in hallways.)

5. As a class, try to name no-cost or inexpensive changes that could have been made to help make this school environment safer.
6. Have the students imagine what would happen if someone picked up their classroom and shook it. What would it look like when the shaking stopped? Tell the students to visually scan the classroom, noting nonstructural safety changes that could be made. List the items they noted on the chalkboard and ask why they considered particular items hazardous.
7. Divide the class into several groups for a school hazard hunt. Distribute the Earthquake Safety Checklist from the Background to each group. Arrange permission for student groups to analyze another classroom or a common room, such as the cafeteria, for items they believe can be modified to increase safety during an earthquake. (Student groups could also check the halls, science labs, custodian’s closet, school grounds, parking lot or gym.) Assign each group specific areas in and around the school.



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Provide time for the students to conduct a hazard hunt throughout the school based on their discussion, the photographs and the Earthquake Safety Checklist.



Wrap-Up

When all the groups have had a chance to visit their assigned area and look for earthquake hazards, they will record and report their findings, using examples, descriptions and illustrations.



As a class, discuss the search to decide whether the major hazards were recognized in each area of the school. Determine which hazards can be corrected and which cannot. Which hazards can students correct? (They can remove stacks of books and boxes from the tops of bookshelves and accomplish similar tasks.) Which hazards can other adults remedy? (They can bolt bookshelves to walls, reinforce lighting, and so forth.)

- What was the safest area in the school? Why?
- What was the most dangerous area in the school? Why?
- What changes or modifications would improve safety in each of the analyzed areas? Explain.

Have the students present their findings from the hazard hunt and possible corrective measures to the school administration through letters or an invitation to a guided tour of possible hazardous areas. Students' letters may request assistance in modifying areas in their school for greater safety.



Home Connection

Ask the students to use the Earthquake Safety Checklist with their families to assess their homes for earthquake safety.

Review the findings with the class. Encourage the students to make at least two cost-free changes in their homes, such as moving items away from places where people sleep or sit.



Linking Across the Curriculum

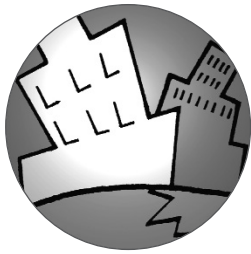
Language Arts: Writing

Assign students to write a short description of an imaginary earthquake that strikes while they are in one of the analyzed areas from the lesson. Their descriptions will specifically mention dangerous events caused by hazards they identified earlier.

They will follow up by writing another short description of the same imaginary earthquake striking the same area. However, this time, the classroom has been modified and the hazards eliminated or reduced. Now what will happen as a response to the quake's shaking?



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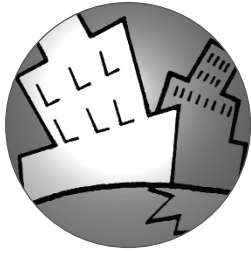
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Science: Earth Science; Physical Science

This activity requires both LEGO® and K'NEX building materials; please refer to the Web site below for further details.



Have your students visit Shakes and Quakes: K–12 Outreach Program at http://www.nd.edu/~eeriund/teacher_manual.pdf to explore the concepts behind earthquake-resistant construction and to try their hand at building a variety of earthquake-resistant structures. Help them gather the materials and follow the directions to explore the effect of earthquakes on several building materials and designs.



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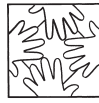
LESSON PLAN 4 Stay Safe in an Earthquake

Materials

- Chalkboard and chalk or chart papers and markers
- Earthquake Safety Checklist (from the Background), 1 copy per student
- *Earthquake Scenario Cards*, 1 copy per team
- School evacuation plan
- Stopwatch



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“Drop, Cover and Hold On”

SET UP 10 minutes CONDUCT 45 minutes

Science: Health; Civics: Community Safety; Language Arts: Writing

TEACHING NOTE Obtain your school’s earthquake evacuation plan from the appropriate administrators. Before presenting this lesson, review your school’s emergency plans and identify the location where the students must meet during an earthquake evacuation.

1. Tell the students that, instead of a fire drill, they will stage an earthquake or drop drill. Emphasize the seriousness of this exercise: like a fire drill, it could save their lives. Explain that when they hear the signal—Drop, Cover and Hold On—every student is to follow this procedure:
 - **Drop** to the floor and get under a table or desk.
 - **Cover** yourself by positioning as much of your body as possible under the table or desk. Protect your eyes by leaning your face against an arm.
 - **Hold On** to a leg of the table or desk. (Your head must be about halfway between the floor and the top of the table or desk.)

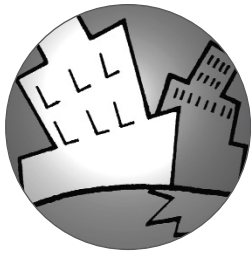
Reinforce the list of actions by writing one word for each action on the board as you explain it. Ask the students to repeat the phrase “Drop, Cover and Hold On.”

TEACHING NOTE The point of Drop, Cover and Hold On is to take cover immediately in the closest safe place. (For example, under a desk at school; under a sturdy table at home; against an interior wall in an office building. If you are in bed, stay there and protect your head with a pillow.)

2. Have one student demonstrate the Drop, Cover and Hold On procedure for the class. Ask the class to evaluate the student’s performance, naming something that was done well and something that could be improved. Have the class practice the drill together.

TEACHING NOTE You can model Drop, Cover and Hold On during every drill.

3. When you are satisfied with the performance of the students, tell them that at some point during the day an imaginary earthquake will strike. Let them know that you will signal the event by saying “Earthquake!” and that you expect them to react with the Drop, Cover and Hold On sequence. Tell them you will evaluate them on how quickly, how quietly and how effectively they take cover.



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4. Continue with the day's lesson. Distribute the Earthquake Safety Checklist from the Background to *Earthquakes*. Review the recommended actions for different situations and compare them to the simple procedure of Drop, Cover and Hold On.
5. At some point during the lesson, say "Earthquake!" and measure the time the students take to react. Help them evaluate their responses. If either you or the students are not satisfied, announce an aftershock and repeat the drill.
6. When you are satisfied with the students' response, follow with an evacuation exercise. When everyone is gathered outside, take roll. Afterward, ask them to help you evaluate their performance. Ask what was done well and what could have been improved. Encourage them to discuss their feelings about the evacuation.

TEACHING NOTE If possible, coordinate the evacuation drill with another teacher.

7. Ask the students to think about the evacuation route. Can they name some hazards they might have encountered along the evacuation route if an earthquake had occurred? (Possible answers include—fallen lockers or trophy cases, fires, smoke, fumes from laboratory chemicals or broken equipment, and live electrical wires.)
8. Discuss procedures for handling these hazards. Ask the students what they would do if:
 - Their normal evacuation route is blocked by wreckage. (Possible answers could include—take time now to plan and follow an alternate route with the class and make sure that everyone understands it.)
 - An aftershock occurs while they are outside or are in the process of evacuating. (Drop, Cover and Hold On for every earthquake.)



Wrap-Up

Back in the classroom, continue the discussion.

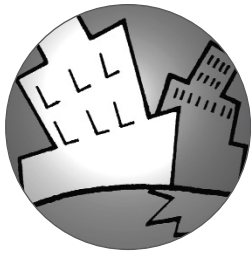


Ask students to suggest things they would do to protect themselves if an earthquake struck while they were in each of the following places.

- You are in the school bus on the way home.
- You are downtown with skyscrapers everywhere.
- You are in the grocery store.
- You are at the beach.
- You are at a movie theater in the middle of a movie.
- You are at the mall hanging out with your friends.



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Have several students demonstrate how they would protect themselves if there were no tables or desks in the classroom. (Possible answers could include, they would drop against an inside wall with hands clasped behind their necks, using their elbows to protect their faces.)

Divide the students into four teams. Distribute copies of *Earthquake Scenario Cards* to each and assign one of the scenarios. The team members' task is to produce a television storyboard for a 30-second or 60-second public service spot. The video must include the steps the public can take to protect themselves if an earthquake strikes in a given situation.

TEACHING NOTE A storyboard is a series of panels that represent the consecutive changes of scene in a video, most often a television commercial.

Encourage the students to share their knowledge with their families. Have the students complete drawings of their homes, with each drawing showing the planned evacuation route, the family meeting place and the safe places to be during an earthquake, both inside and outside. Have them practice the Drop, Cover and Hold On procedure with their families. They can report their experiences at school the next day.

Extension: Encourage the students to take classes in first aid and cardiopulmonary resuscitation from the American Red Cross or to update training they already have. If a number of students are interested, arrange for a Red Cross instructor to visit your class.



Linking Across the Curriculum

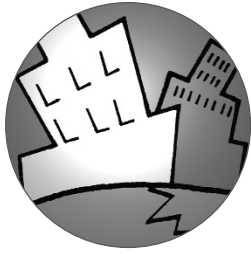
Language Arts: Writing

Invite the class to join you in setting up an earthquake drill for the entire school. Encourage the students to write letters to the school administration, the local chapter of American Red Cross and other local emergency management officials, inviting them to participate and share their knowledge.

As a class assignment, create a set of simple brochures or posters informing the community about hazards to avoid when an earthquake strikes and ways to protect themselves. The students must emphasize the Drop, Cover and Hold On procedure.



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Science: Earth Science; Mathematics: Graphs and Charts; Social Studies: Geography

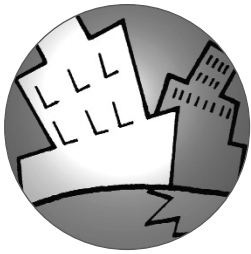
The U.S. Geological Survey has an excellent Web page to help students map the probability of an earthquake anywhere in the United States. Direct the students to Earthquake Probability Mapping at <http://eqint.cr.usgs.gov/eq-men/html/neweqprob-06.html>. They will need to input either their latitude and longitude or their 5-digit zip code. They also must select a time span in years and the magnitude of their future earthquake.

The Web page will generate a map that is color-coded for the probability of an earthquake. Continue changing the time frame or the magnitude to determine the most likely earthquake scenarios for different areas.

TEACHING NOTE Remind the students that, even though earthquake risk in their area may be relatively low, the chances of their traveling or moving to more susceptible areas during their lifetimes is great. Everyone must learn to be prepared.



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Earthquake Scenario Cards

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Name _____

Directions: You are the producer of a public service spot for television to help educate the public on the steps to take for earthquake safety. Select one of the scenarios below. Then, create a storyboard to illustrate the scenes of the spot with an accompanying script. Your storyboard will include—

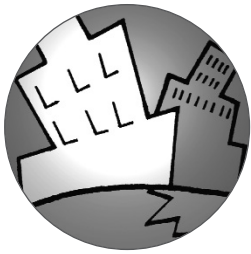
- Descriptions and/or illustrations of each scene of the video (at least three).
- The script for the off-camera announcer and/or the on-camera actor or interviewees for each scene.

Scenario 1 Outside the school building

The final bell just rang. You and your friends are walking toward the softball field to check out the game that's going on. It's the final game of the season and many people are in the stands. As you walk through the trees to the open field, the ground suddenly starts to shake and roll.

- How would you react in this scenario to minimize harm to yourself? (Be specific. Where would you go? What would you do?)
- What potential dangers do you need to be aware of as the earthquake is happening?
- What is the first thing you would do after the ground stops shaking?
- What dangers do you need to be aware of in this scenario after the ground stops shaking?
- Would you re-enter the school for any reason in this scenario? Why or why not?





Earthquake Scenario Cards

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Scenario 2 On the freeway

It's your friend's birthday. He's having people over tonight for a party, and your aunt is driving you downtown to buy him a present. You are just about to cross the overpass to exit the freeway when you feel the ground start to move and shake.

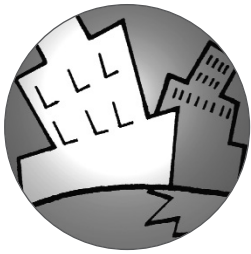
- How would you react in this scenario to minimize harm to yourself? (Be specific. Where would you go? What would you do?)
- What potential dangers do you need to be aware of as the earthquake is happening?
- What is the first thing you would do after the ground stops shaking?
- What dangers do you need to be aware of in this scenario after the ground stops shaking?
- You have your cell phone. Should you report the earthquake to authorities? Under what circumstances would you call the authorities? Should you call your family? Why or why not?

Scenario 3 In class

You're in science lab. Your teacher is reviewing the test he just gave back to the class. You turn to a friend to see what answer she gave to number 7, when all of a sudden you hear a deafening roar and feel the floor start to move.

- How would you react in this scenario to minimize harm to yourself? (Be specific. Where would you go? What would you do?)
- What potential dangers do you need to be aware of as the earthquake is happening?
- What is the first thing you would do after the ground stops shaking?
- What dangers do you need to be aware of in this scenario after the ground stops shaking?
- How would you find out important information from officials in this scenario if there were no electricity?





Earthquake Scenario Cards

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Scenario 4 In a skyscraper

You and your friend are in your mom's office waiting for her to finish work. When she's done, she's going to take you to the movies. You and your friend are looking at the view out of the 32nd-story windows, trying to see if you can find your school. Suddenly, the floor starts to move and things on desks start to topple over.

- How would you react in this scenario to minimize harm to yourself? (Be specific. Where would you go? What would you do?)
- What potential dangers do you need to be aware of as the earthquake is happening?
- What is the first thing you would do after the ground stops shaking?
- What dangers do you need to be aware of in this scenario after the ground stops shaking?
- How would you leave the building when evacuating? (Would you take the elevator or the stairs?) Why?

