

CONNECT TO LITERACY

Discuss the Text

NGSS.4-ESS2.B, NGSS.4-ESS3.B, CCSS.ELA-Literacy.RI.4.2

Have students focus on these questions about the text:

- **Compare** *Compare the Mercalli and Richter scales.* (The Richter scale goes from 3 to 8 and measures the intensity of an earthquake using scientific instruments. The Mercalli scale goes from 1 to 12 and measures how people feel and react to the earthquake, as well as how destructive it is.)
- **Create** *Imagine that you were creating a model of tectonic plate movement. What objects might you use to represent this?* (Students might use pudding for Earth’s mantle and crackers or cardboard for Earth’s plates.)
- **Apply Concepts** *Based on what you learned about continental drift, what do you think Earth’s surface will look like in 10,000 years?* (Answers will vary but students should indicate that the continents will have moved.)

Provide Prompts for Response

Offer prompts that allow students to explore the text:

- Locate and label on a map the several locations mentioned in the text.
- Compare the effects of an underwater earthquake and an earthquake that happens on land.
- Tell which ideas were new to you. What questions do you still have about earthquakes?
- Review the book. Give it a rating between one and four stars and explain why it earned that rating.

Connect with Writing:
Informational/Explanatory Text

CCSS.ELA-Literacy.W.4.2a, W.4.2b, W.4.2d

Introduce the Text Type and Assignment Say: *There are many types of informational/explanatory text. Science textbooks are informative/explanatory. Many newspaper articles are informational text. They tell who, what, where, why, and how. Today, we’ll write a newspaper article a real event. Choose an event from the text to write about.*

Review Features Review the features of an informational article and be sure to display these features for students’ reference:

- structure that explains who, what, where, when, and how
- the most important information first
- an eye-catching headline
- text features, such as headings and graphics

Model the Writing Model the writing process as you begin an article about the 1812 earthquake discussed on p. 17: *I’ll write my article on the 1812 earthquake that occurred in New Madrid. Watch as I begin my model with the most important information:*

.....
Yesterday, February 7, 1812, a magnitude 8.0 earthquake struck the town of New Madrid. Residents say they heard a horrible rumbling sound, which they quickly realized was an earthquake.
.....

Since the articles in a newspaper are about things that are happening or happened recently, I imagined I was a reporter in 1812. Notice how I gave the most important information in the first sentence. In this case, I explained what occurred, where it occurred, and when it occurred. Model one more paragraph of the text, showing how you can continue using the text and illustrations on the page to add to the article.

Support Writers Display your model as students begin writing. Remind them that their writing should include facts, concrete details, and content-specific vocabulary. Give students a chance to research their topic if desired. Support them as they create headlines and visuals to add to their articles.

Revise and Edit Show students how to revise and edit for specific points, such as:

- Clear, understandable writing
- Sentence variety
- Vivid verbs and enticing adjectives
- Factual information

Share and Reflect Allow time for students to share their work with an authentic audience. Then ask questions to guide self-reflection:

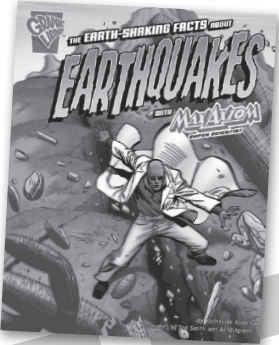
- What was the purpose of your article?
- What features did you include in your writing?
- What facts did you include? How did you organize them?
- What would make your article even stronger?

Connecting Literacy and Content

The Earth-Shaking Facts about Earthquakes with Max Axiom, Super Scientist

Level U
Earth Science

Content: Earthquakes—causes and effects, structure of Earth, tectonic plate motion, types of faults, measuring and mapping, safety



Objectives

- Students will:
- explain how Earth’s structure is related to earthquakes.
 - interpret a text feature: map.
 - determine the causes and effects of earthquakes.
 - do a close reading to answer questions about content.
 - define and use academic vocabulary related to earthquakes.
 - use Greek roots to understand science words.
 - read grade-level prose with expression.
 - write a newspaper article about a real earthquake.

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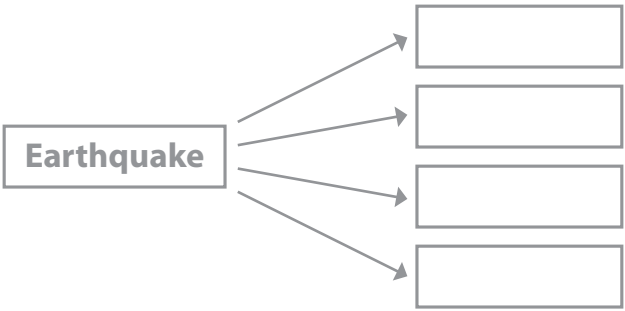
Build Content Background

Engage Students

Say: *What happens when an earthquake occurs? Watch as I start a list of effects, things that happen as a result of earthquakes.* Write *shaking* on a list on chart paper. *What other effects do earthquakes have?* Have students turn and talk with partners and then capture relevant ideas on the list, such as *windows break, ground moves,* and so on.

Use a Graphic Organizer

Remind students that an effect may have more than one cause, and causes may have more than one effect. Draw a rectangle on the board and write the word *Earthquake* in it. Draw arrows extending from this box to several boxes drawn to the right of the center box. Explain: *We can use a graphic organizer to show that a cause can have several effects. We named some of these effects in our discussion.* Write the effects from the Engage discussion in the boxes. Say: *As we read, we can fill in more effects.* Point to the area to the left of the Earthquake box. Say: *What could we write over here?* Guide students to understand that they will be learning about the causes of earthquakes.



Introduce the Content

Preview Earthquakes

Give each student a copy of the text and explain: *This book is about earthquakes. We already listed some of the effects of earthquakes. Take a look at the cover. How can you describe what is happening in the picture?* (An earthquake is causing the ground to shake and split apart. Cacti and rocks are falling.) Have students click through the book, paying attention to the illustrations. *What else do you think we will learn about earthquakes?* Allow a few moments for students to turn and talk to share their predictions.

Preview Academic Vocabulary

CCSS.ELA-Literacy.RI.4.4

Go to the Glossary. Say: *A glossary gives definitions for important words in a text. Notice that there is only one definition listed for each term. How is that different from a dictionary?* (A dictionary has many definitions for some words.) Direct attention to the words *crust, fault,* and *plate.* Say: *These words have meanings that don’t have anything to do with earthquakes.* Have students give examples. Say: *As you read, pay attention to how these words are used to talk about earthquakes.*

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Discuss Text Features

CCSS.ELA-Literacy.RI.4.5

Say: *Text features add to our understanding of the words on the page. The author of this text uses maps to help us understand why and where earthquakes occur.* Examine the map on p. 7. Point out that the yellow lines show tectonic plate boundaries. Have students work in pairs to examine another map. (See maps on pp. 10 and 24.) What features do the maps have in common? How are they different?

Focus on the Content

NGSS.4-ESS2.B, NGSS.4-ESS3.B

As you focus on the text, ask questions that require students to use varying depths of knowledge. Model how to determine the answer to a question before you pose additional questions. (A model is shown for the second question.)

- **List** (p. 6) *List the layers of Earth, and give a short description of each one.* (Crust—thin and brittle; Mantle—hot, flexible rock; Outer core—hot, liquid iron; Inner Core—hard iron and nickel)
- **Identify Cause/Effect** (pp. 8–9) *Identify three effects of tectonic plate movement.* (breaks in Earth’s crust that lead to earthquakes; formation of continents from one “huge chunk of land”; formation of mountains)

Model *This question is asking me to describe the effects of tectonic plate movement. As I begin to read page 8, I notice that the text says “big changes for the earth.” I think that the rest of the panels on pages 8 and 9 will explain some of those changes caused by plate movement.*

Collaborate *Partners, read together. Read to find out what the next panel focuses on. What does this panel explain about how tectonic plate movement changes Earth?*

Provide independent practice Have students look at the two panels on p. 9 to identify two more changes caused by tectonic plate motion.

Summarize *We’ve found three effects of tectonic plate motion. We know that this motion sometimes causes earthquakes, that it caused separate continents to form from one large chunk of rock, and that mountains and mountain ranges are also caused by plate movement.*

- **Interpret** (pp. 10–11) *How does the text classify the San Andreas Fault? Use the diagrams on p. 10 to find out what kind of motion occurs at the San Andreas Fault.* (The text classifies the San Andreas Fault as a strike-slip fault. According to the diagrams, this means that at the San Andreas Fault, two blocks of earth move past each other horizontally.)
- **Classify** (pp. 12–13) *Make a graphic organizer to show how seismic waves are classified.* (Organizers should show that seismic waves are divided into two types: body waves and surface waves. Body waves are further divided into P-waves and S-waves.)
- **Draw Conclusions** (pp. 16–17) *According to the text, only one person died in the 1812 earthquake in New Madrid. Why is this? Draw a conclusion about factors that determine how deadly an earthquake will be?* (The text tells us that few people lived in New Madrid. The size or strength of the earthquake and the number of people living where it hits are both factors that determine how deadly it is.)
- **Assess** (p. 23) *How important is it for scientists to research earthquakes? What are the benefits of this research?* (Accept reasonable responses. Students should support their answers with evidence from the text and background knowledge. They may note that it is important to study earthquakes because it helps us learn about our planet and because it helps us prepare for earthquakes, which can save lives.)

Discuss Concepts

Ask:

- *What causes earthquakes?* (Movement of Earth’s tectonic plates causes stress to build up in Earth’s crust, leading to breaks that cause earthquakes.)
- *Why are researchers interested in studying the Ring of Fire?* (The Ring of Fire is a horseshoe-shaped region along the Pacific Ocean where 90 percent of the world’s earthquakes and volcanoes occur. It gives scientists many opportunities to collect data about earthquakes.)
- *How can scientists and engineers work together to help people prepare for earthquakes?* (Answers will vary. Sample response: Scientists can map earthquakes to try and predict the most likely places for an earthquake to occur. Engineers can develop building materials that make buildings more earthquake resistant.)

Apply Concepts Review with students how tectonic plate movement is related to earthquakes. Provide pairs with world maps showing tectonic plate boundaries. Have them use the illustration on p. 22 to locate and trace in red pencil the Ring of Fire on the world map. Have partners discuss how the Ring of Fire is related to the locations of tectonic plates. Have pairs share their conclusions, and guide a class discussion about how tectonic plate motion is related to the Ring of Fire.

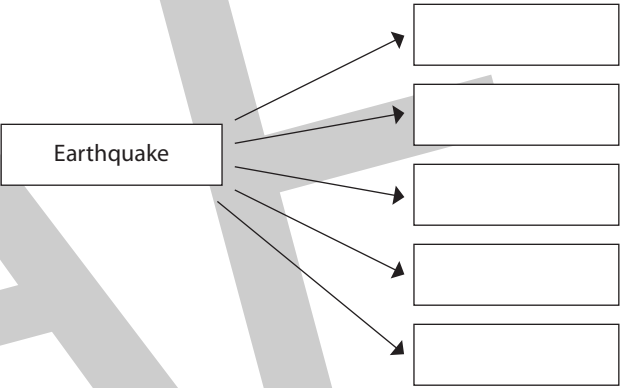
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Determining Cause and Effect

CCSS.ELA-Literacy.RI.4.3, CCSS.ELA-Literacy.RI.4.5

Introduce the Strategy Say: *We’ve been looking at how tectonic plate motion causes earthquakes. Science texts often explain the causes of events in nature. Let’s see if we can find more causes and effects of earthquakes in the text.*

Model Return to the Cause and Effect graphic organizer you began at the beginning of the lesson. Focus on p. 20: *I already know that tectonic plate motion causes earthquakes. So I will write that in the graphic organizer.* Model how to add a box to the graphic organizer with an arrow going to the *Earthquake* box. Say: Now I’ll read to find out what other things can cause earthquakes. Have students name the three causes listed on p. 20, and add them to the graphic organizer.



Guide Practice Have students work in pairs to find additional effects of earthquakes, adding them to the graphic organizer.

Close Reading

CCSS.ELA-Literacy.RI.4.1, CCSS.ELA-Literacy.RI.4.2

Introduce the Strategy Say: *When we are answering a question about the text, sometimes we need to use our own knowledge or as well as what we find in the text. We need to think about the question, do a close reading of the text, then use details from the text and our own knowledge to answer the question.*

Model Model with the **Draw Conclusions** question: *The question asks me explain why only one person died in the 1812 earthquake in New Madrid, even though it was a strong earthquake. Then I need to draw a conclusion about why some earthquakes are deadly and others aren’t. First, I’ll take a close look at the text. I notice that the text says that the town was newly settled and few people lived there. I am marking this with a highlighter. I can use the fact that the earthquake was destructive and that few people lived in the area to point out that both strength of an earthquake and the number of people living in an area are factors that determine how deadly an earthquake is.*

Guide Practice Provide copies of p. 23 along with highlighters. Have students highlight textual evidence to answer the **Assess** question.

Focus on Fluency

CCSS.ELA-Literacy.RF.4.4b

Model Fluent Reading Say: *When I read, I pay attention to cues that help me read with expression. Even a scientific text has cues that show me how to read in ways that are interesting and reflect the meaning of the text.* Read the text in the top frame of pp. 18–19. Pause at the commas and periods. Emphasize the words *massive*, *jolted*, and *ever recorded*. Ask students what they noticed about your reading and identify the cues you used to read with expression.

Guide Practice Choose another passage from the book for students to practice fluent reading. Project the passage and highlight cues and key phrases as students suggest them. Have students pair up and read the passage to each other. Circulate and offer assistance as needed.

Study Words

CCSS.ELA-Literacy.L.4.4b

Introduce the Strategy Say: *Many of the science terms we use are built from Greek words. Understanding these Greek roots helps us better understand the science terms we read.*

Practice the Strategy Focus on the words *epicenter* and *hypocenter* in the text. Write the words on the board or chart paper. Say: *For example, the prefix epi- is related to the Greek word for “above” while the prefix hypo- is related to the Greek word for “under.” This makes sense, since the hypocenter of an earthquake is its location under, or in, the ground while the epicenter is the location on Earth’s surface over the hypocenter.* Have students use resources to find the Greek roots of the words *seismic* and *seismologist*.