

On Level



SCIENCE • GRADE 4

Science Content Standards

Earth Sciences: 5.A

Earth Sciences: 5.B

Earth Sciences: 5.C

Our Changing Earth

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INSIDE
FOR:

California's
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•
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Student Book

•
Reproducible
English-language
Arts Activities

Our Changing Earth

California's Content Standards Met

GRADE 4 SCIENCE

- EARTH SCIENCES: 5**—Waves, wind, water, and ice shape and reshape Earth's land surface. As a basis for understanding this concept:
- Students know how some changes in the earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.
 - Students know natural processes, including freezing and thawing and the growth of roots cause rocks to break down into smaller pieces.
 - Students know moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

GRADE 4 ENGLISH LANGUAGE ARTS

1.0 WORD ANALYSIS, FLUENCY, AND SYSTEMATIC VOCABULARY DEVELOPMENT

Vocabulary and Concept Development 1.3—Use knowledge of root words to determine the meaning of unknown words within a passage.

2.0 READING COMPREHENSION

Structural Features of Informational Materials 2.1—Identify structural patterns found in informational text (e.g., compare and contrast, cause and effect, sequential or chronological order, proposition and support) to strengthen comprehension.

Comprehension and Analysis of Grade-Level-Appropriate Text 2.2—Use appropriate strategies when reading for different purposes (e.g., full comprehension, location of information, personal enjoyment).

Comprehension and Analysis of Grade-Level-Appropriate Text 2.3—Make and confirm predictions about text by using prior knowledge and ideas presented in the text itself, including illustrations, titles, topic sentences, important words, and foreshadowing clues.

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Science Content Standards

Earth Sciences: 5.A

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Student Book

Our Changing Earth

Print pages 5 – 18 of this PDF for the student book.

How to Make the Student Book

- The student book is contained on pages 5–18 of this PDF. It begins on the next page.
- To make one student book, or a two-sided master copy that can be photocopied, you will print on both sides of seven sheets of 8.5" x 11" paper.
- Do a test printout of one book first to familiarize yourself with the procedure.
- Follow these instructions carefully.

First—Select the Paper

Since you will be printing on both sides of the sheets of paper, select a good quality white paper. We recommend using at least a 22lb sheet.

Second—Check Printer Settings

Be sure you have the correct page setup settings for your computer and printer. You will print these pages in landscape format.

Third—Print EVEN Pages

Open the PDF of the book you want to print. Select print from your file menu. In your printer's dialogue box enter pages 5–18 to print. Then select EVEN pages only. It is important to print only the EVEN pages first. Click "Print" to print the even pages. (**Important note:** The first page that prints will be blank. DO NOT discard this page. It will be needed to print the cover in the next step.)

Forth—Print ODD Pages

When the even pages have printed, flip the stack of pages over to print the odd pages. Place the stack back in your printer. Select print from the file menu again. In your printer's dialogue box, select ODD pages. Click "Print" to print the odd the pages.

Fifth—Fold the Book

You now have a complete book. Check to be sure the pages are in the correct order with the book's cover as the top page. Then fold the stack of paper in half.

Sixth—Staple the Book

Use an extended-length stapler to staple the pages together. Place three staples in the spine of the book.

Please note that printers vary in how they output pages. Do a test printing with one book and adjust the procedure as necessary.

If you want to make a one-sided master copy, print ALL pages 5–18 at once. Then select "one-sided to two-sided" on the copy machine.

Our Changing Earth

California's Content Standards Met

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GRADE 4 SCIENCE

EARTH SCIENCES: 5—Waves, wind, water, and ice shape and reshape Earth's land surface. As a basis for understanding this concept:

- a. Students know how some changes in the earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.
- b. Students know natural processes, including freezing and thawing and the growth of roots cause rocks to break down into smaller pieces.
- c. Students know moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

GRADE 4 ENGLISH LANGUAGE ARTS

1.0 WORD ANALYSIS, FLUENCY, AND SYSTEMATIC VOCABULARY DEVELOPMENT

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SCIENCE • GRADE 4

Science Content Standards

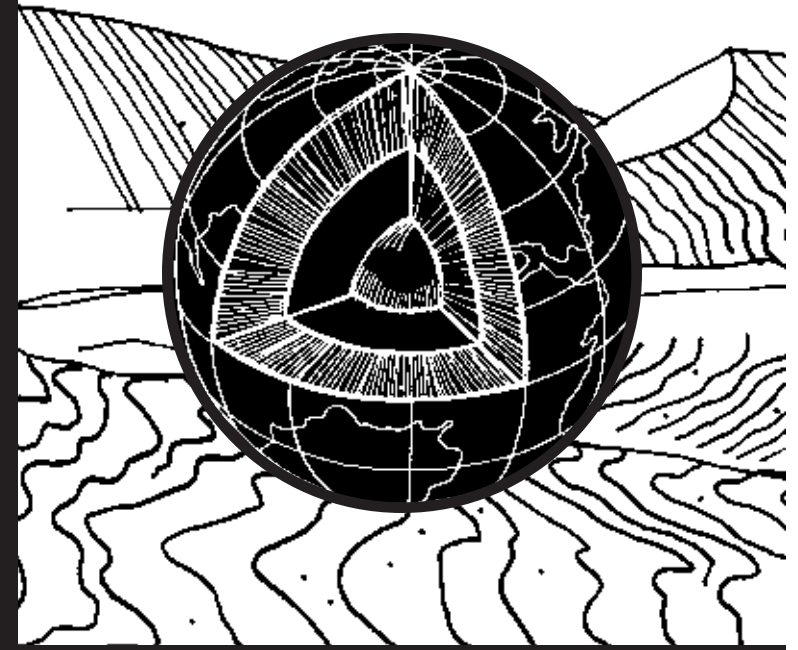
Earth Sciences: 5.A

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Our Changing Earth

by Caitlin Scott





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INTRODUCTION

Earth Is Changing

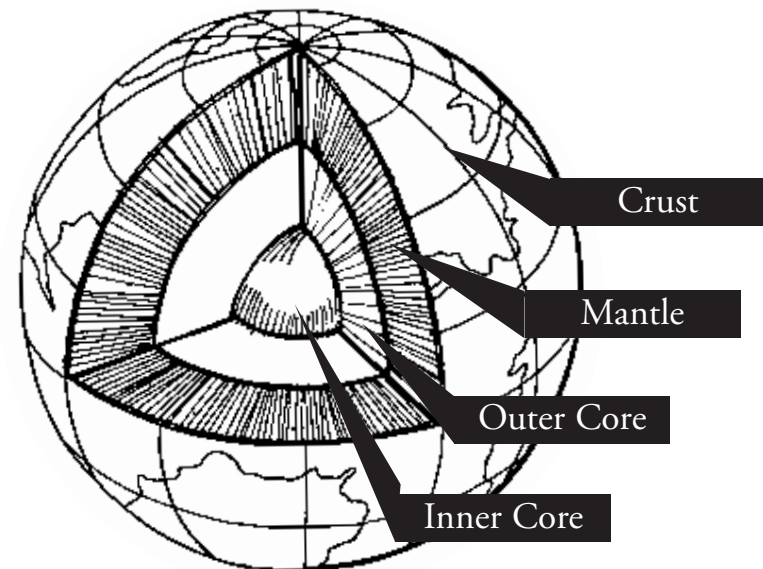
The surface of Earth is always changing. Most of these changes happen slowly. On sandy beaches everywhere on Earth, the wind is blowing sand into large piles called sand dunes. All the rivers of Earth are slowly washing dirt and small rocks downstream to the ocean. These slow changes are gentle.

But Earth is changing rapidly, too. These fast changes are very dramatic. They can kill plants and animals. Sometimes, they even bring down buildings and put people in danger. Fast Earth-changing events include such things as earthquakes, volcanoes, and landslides.

CHAPTER 1

Causes of Slow Changes

Earth is made of four different layers. Most of the slow changes to Earth take place on the crust which is thinner and more **brittle**. There are several **natural** processes that cause these slow changes.



brittle: easily broken
natural: not made by man

Wind

Have you ever seen a dust storm? The wind might blow dust across a road or field. This is a type of **erosion**. The wind is carrying the dirt away. On a beach, the wind can move sand for several miles. On top of a mountain, wind slowly wears away the rock.

Water

Like wind, water can also erode soil and rocks and then carry them away. Most of the time water causes erosion very slowly.

For example, rain on a rocky cliff can erode the rock away over thousands of years. Or, a river can slowly carve out the land. This creates twists and turns in the river. Sometimes these twists break off and create small ponds or lakes beside the river.

Flooding can carry soil and rocks away more quickly. This type of erosion can be dangerous.

erosion: the process of slowly wearing away; a type of weathering

Ice

Ice doesn't erode the way water and wind do. You might not think ice could cause erosion, but it can. This type of erosion happens slowly.

Water freezes at 32 degrees Fahrenheit or 0 degrees Celsius. When water freezes, it **expands** rapidly. Have you ever left a soda in the freezer by mistake? If so, you know that the soda can swells up. It looks as if the soda is about to break out of the can.

The same thing happens when water freezes inside the ground. The ice expands and breaks Earth's crust apart. Sometimes ice even breaks rocks apart.

Describe how wind, water, and ice reshape Earth's land surface.

expands: gets bigger

Slow Change Processes

Most of Earth's slow changes are natural. But, some of these changes hurt the plants and animals that live on Earth. It is important to learn about these changes and stop the harmful ones. Two important processes that change the land are erosion and deposition.

Erosion—when wind, water, ice, or human activities wear away parts of the crust.

Deposition—when material worn away by erosion is carried away to form new land.

*Think of all the ways erosion changes Earth.
Brainstorm a list with a friend.*

Erosion

Erosion is the breakdown of rocks and minerals. This breakdown can be caused by physical and chemical processes.

Physical Erosion

Physical erosion is the breakdown of large pieces of earth material into smaller ones through forces such as changes in heat, water movement, ice formation, and pressure.

For example, water can seep into cracks in rocks. When the water freezes, it expands and causes stress, or pressure, in the crack. As the stress increases, the crack widens and breaks the rock or mineral apart.

Plants also can physically erode rocks and minerals. Plant roots grow into crevices and slowly wedge the rock apart as they grow larger.

*Describe how plant growth and
freezing water causes erosion.*

Chemical Erosion

Physical erosion does not change the material that is being broken down.

Chemical erosion does.

Chemical erosion is the process by which earth materials are **decomposed**, dissolved, or loosened by chemical processes which leads to a breakdown of the material. Chemical erosion alters the properties of the weathered material.

For example, when oxygen is added to material with iron, the iron forms rust. The surface of the iron has changed from a solid, hard surface to a loose, crumbly surface. It is no longer iron any more.

Both physical and chemical erosion lead to erosion and the deposition of rocks and minerals.

decompose: to break down into separate, basic parts

Deposition

Erosion occurs when earth material is worn away and moved to another place. But, what happens to all that eroded dirt and rock? It is carried or transported somewhere else and deposited. This process is called deposition. It also changes the earth. Sand on a beach is an example. Wind and waves erode the sand. The sand piles up and forms big sand dunes.



If you look closely at a sand dune, you can often see a pattern on the surface of the dune. This shows how the wind is slowly moving the sand.

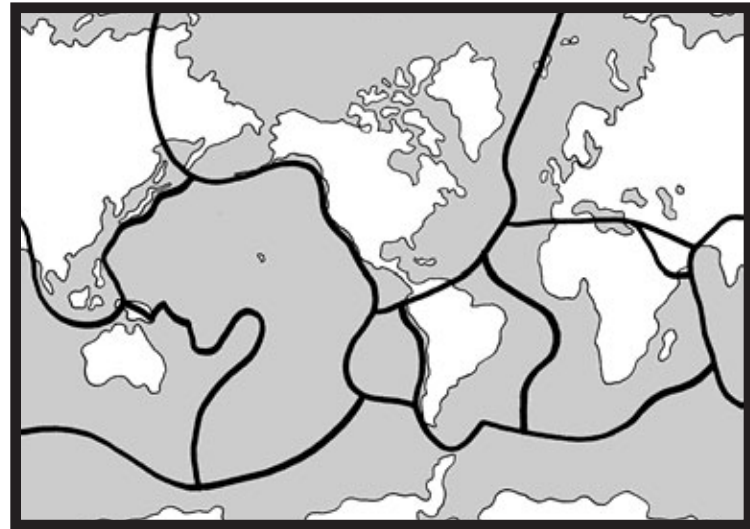
Fast Change Processes

Look at a map of Earth. You might notice that the land could fit together like a puzzle. For example, South America and Africa could fit together side-by-side. That's because they once did.

Earth is made up of layers. The crust, or the layer we walk on, breaks easily. Below the crust, the mantle is softer and very hot. The crust floats on the mantle in big pieces called plates. Heat inside Earth began pushing the plates apart 300 million years ago.

Most of the time, this happens very slowly, but sometimes two plates moving past each other get stuck together. The pressure builds up. Then, suddenly the plates move. This causes problems.

Earth's Major Plates

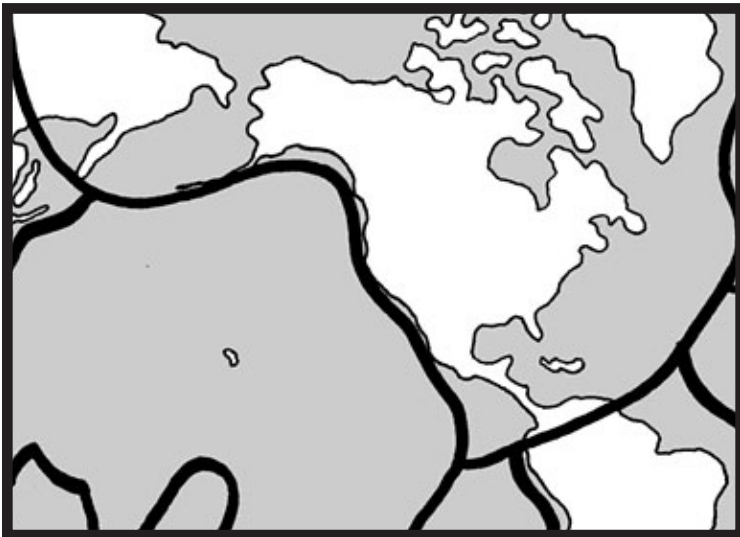


The dark lines on this map show the edges of Earth's major plates. These plates are always moving.

Earthquakes

When two plates move suddenly, they can cause an earthquake on land. The earthquake happens along the line where the plates were stuck together. Sometimes, earthquakes cause gentle shaking that might knock a book off a table. Other times earthquakes bring down whole buildings.

Places where earthquakes happen a lot are called fault lines. On the map you can see a dark line down the west coast of North America. This is a fault line.



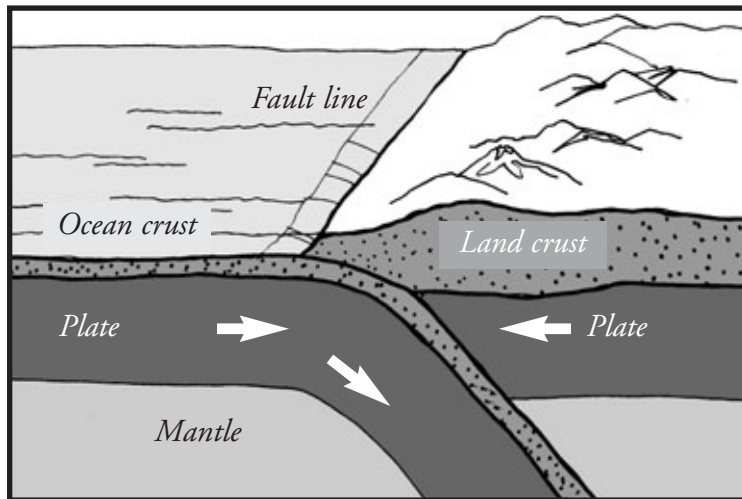
People who live near fault lines should know what to do in an earthquake. They should also make sure the buildings they live and work in can withstand earthquakes. In recent years, scientists have found ways to build buildings that will sway in an earthquake rather than fall down.

How can you protect yourself in an earthquake? The best thing to do is:

- drop to the ground.
- take cover by getting under something heavy like a desk or a doorway.
- hold on and wait for the ground to stop shaking.

Volcanoes

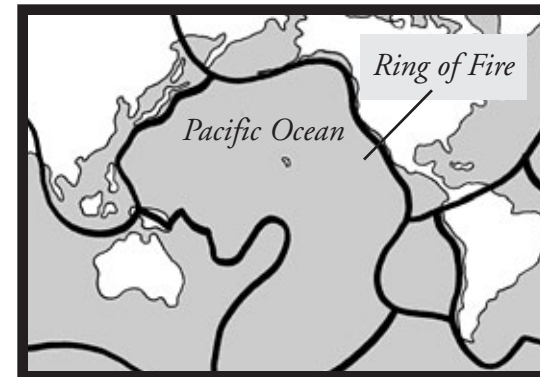
Volcanoes also happen along fault lines and where one plate moves under another. Look at the diagram below. One plate is moving under another. When this happens heat is generated. This heat melts some of the rock. If the melted rock is pushed toward the crust, a volcano forms.



Along fault lines, one plate moves under another. This causes earthquakes. It can also form a volcano.

Volcanoes are very dangerous. The ground shakes when they **erupt**. Hot rocks, **lava**, ash, and mud fly up from the top of the mountain. The trees and buildings for miles around can be knocked down.

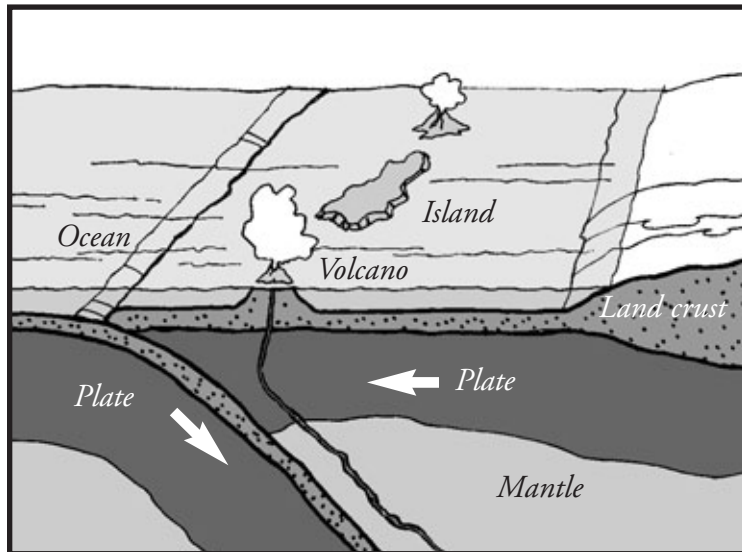
More than half of Earth's volcanoes form a ring around the Pacific Ocean. This is called the "Ring of Fire."



Scientists are pretty good about predicting when a volcano will erupt. People usually have time to get away. If you live near a volcano and hear that it might erupt, listen to the news. Scientists will tell people how far away they need to get.

erupt: to explode with great force
lava: molten rock that flows or bursts from a volcano

Some volcanoes are under the ocean. The volcanoes erupt under water. Then, they break through to the surface. When this happens, islands form. This is how the Hawaiian Islands were formed. The volcanoes on the big island of Hawaii are still active.

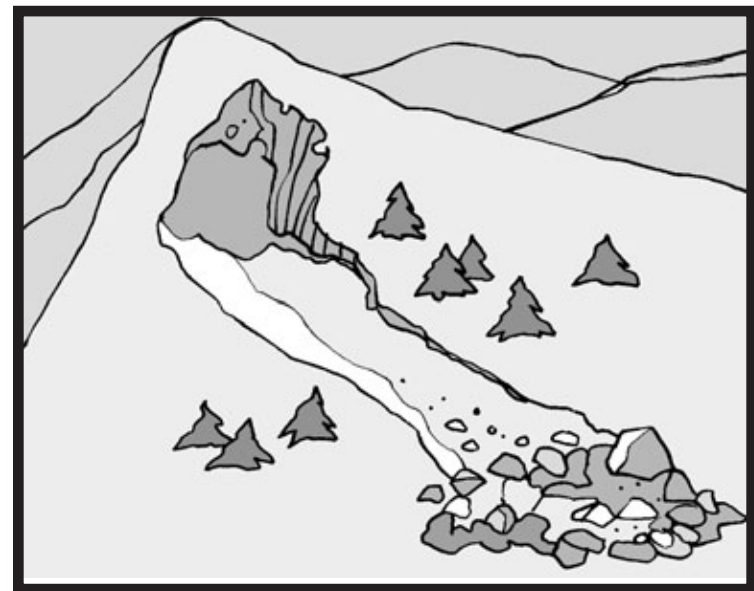


Heat from the two plates rubbing against each other cause rock to melt. The lava is pushed up, forming a volcano. This is how undersea volcanoes form islands.

Landslides

Most of the time, gravity causes slow changes on Earth's surface. But, gravity also causes sudden changes. These changes are less common and can be dangerous. Landslides are caused, in part, by gravity.

Landslides make mud, dirt, and rocks slide downhill. This can bury buildings. Landslides happen in all 50 states. In the United States, landslides cause about \$2 to \$3 billion worth of damage a year.



Landslides often happen at the same time as other disasters. They can follow an earthquake or flood. They can also follow human actions. Sometimes digging on a hill causes a slide.

Cutting down a lot of trees on a hill can also cause a slide. The tree roots are no longer there to hold the land in place.

How can you stay safe during landslides? The first thing to do is avoid them. People should not build houses or other buildings on steep hills. If these hills could get flooded or have earthquakes, the danger is even greater.

Second, notice if the land is shifting. If trees or fence posts seem to be leaning over, there might be a landslide. If you are in a landslide, try to get away. If you can't get away, get under something heavy like a table.

Finally, after the landslide, you need to be careful. Do not go into the landslide area. The land may still be shifting.

CHAPTER 4

Wangari Maathai

Wangari Maathai was born in Nyeri, Kenya in 1940. She went to school to study biology. She noticed that many, many trees were being cut down, but very few trees were being replanted. Without trees, the land eroded rapidly. The rain and wind carried the good, rich topsoil away. Eventually, people began to have trouble farming.



To help solve these problems, Wangari formed the Green Belt Movement. She got Kenyan women to plant trees.

Through Green Belt, Kenyan women have planted more than 20 million trees and much of the land has been restored. As a result of her work, Wangari won the Nobel Prize in 2004.

Glossary

brittle—easily broken

decompose—to break down into separate, basic parts

expands—gets bigger

erosion—the process of slowly wearing away; a type of weathering

erupt—to explode with great force

lava—molten rock that flows or bursts from a volcano

natural—not made by man

To Find Out More . . .

Want to learn more about how Earth changes?

Try these books

Erosion by Joelle Riley. Lerner Publications, 2006.

Volcanoes and Earthquakes by Andres Llamas Ruiz. Sterling Publishing Company, Inc., 1997.

Access these Web sites

U.S. Environmental Protection Agency
Land Revitalization Office

<http://www.epa.gov/oswer/landrevitalization/lrso.htm>

The Nature Conservancy
<http://www.nature.org/>

FEMA for Kids: Federal Emergency
Management Agency
<http://www.fema.gov/kids/>

Write for more information

The Nature Conservancy
4245 North Fairfax Drive, Suite 100
Arlington, VA 22203-1606

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ENGLISH-LANGUAGE ARTS • GRADE 4

California Content Standards
Vocabulary and Concept Development: 1.3
Structural Features of Informational Materials: 2.1
Comprehension and Analysis of Grade-Level-Appropriate Text: 2.2
Comprehension and Analysis of Grade-Level-Appropriate Text: 2.3

On Level

English-language Arts Activities

Our Changing Earth

Print pages 20–24 of this PDF for the reading activities.

Locate Information

TRY THE SKILL

The table of contents tells the reader what information is in the book and what page number the reader can start reading on to find the information.

Read the beginning of the table of contents from another book about changes on Earth.

Introduction:	
The Parts of Earth	4
Chapter 1:	
Mountain Building	7
Natural Erosion	8
Deposition	12
Chapter 2:	
Dangerous Erosion	18

What page would you begin reading to find information about mountains?

Page 7, because the subheading on page 7 is “Mountain Building.”

What chapter would you read to find information about natural erosion?

Chapter 1, because the subheading “Natural Erosion” is contained in Chapter 1.

Read the beginning of the table of contents again. Answer the questions.

1. What page would you begin reading to find information about what Earth is made of?
Ⓐ Page 4
Ⓑ Page 14
Ⓒ Page 17
2. Which chapter would you read to find information about deposition?
Ⓐ Introduction
Ⓑ Chapter 1
Ⓒ Chapter 2
3. What page would you begin reading to find information on dangerous erosion?
Ⓐ Page 6
Ⓑ Page 9
Ⓒ Page 18
4. Which two chapters would you read to find information on erosion?
Ⓐ Introduction and Chapter 1
Ⓑ Introduction and Chapter 2
Ⓒ Chapter 1 and Chapter 2

Proposition and Supporting Details

TRY THE SKILL

In some paragraphs, the author will begin with a statement or proposition. The sentences that follow will support or further explain the proposition.

Here is a paragraph from *Our Changing Earth*. The graphic organizer shows one proposition, as well as the details that support this proposition.

When two plates move suddenly, they can cause an earthquake on land. The earthquake happens along the line where the plates were stuck together. Sometimes, earthquakes cause gentle shaking that might knock a book off a table. Other times earthquakes bring down entire buildings.

Proposition

Moving plates cause earthquakes.

Supporting Details

- The earthquake happens along the line where the plates were stuck together.
- Sometimes, earthquakes cause gentle shaking that might knock a book off a table.
- Other times earthquakes bring down entire buildings.

Read this paragraph from *Our Changing Earth*.

People who live near fault lines should know what to do in an earthquake. They should also make sure the buildings they live and work in can withstand earthquakes. In recent years, scientists have found ways to build buildings that will sway in an earthquake rather than fall down.

Now complete this graphic.

Proposition

Supporting Details

Roots and Suffixes

TRY THE SKILL

Roots are the main part of a word. They give the meaning of the word. Suffixes are short syllables at the end of roots that change the meaning of the word. Knowing suffixes can help you learn new words.

The suffixes *-tion* and *-sion* have the same sound and change a word in the same way. When you add *-tion* or *-sion* to the end of a root it turns the verb into a noun.

Verb	Meaning
erode	To wear away

Verb+Suffix=Noun	Meaning
erosion	The act of wearing something away

<u>Verb</u>	<u>Noun</u>
erode	<u>erosion</u> _____

When you add *-sion* to *erode* it changes to a noun with a similar meaning.

Notice that when you add *-tion* or *-sion* to the end of a word the spelling of the word changes slightly.

Here are some more words from *Our Changing Earth*. Use what you know about the suffixes *-tion* and *-sion* to match the verbs with their related nouns.

Verb	Meaning
1. deposit	To put something down
2. erode	To wear away
3. move	To travel
4. expand	To get bigger
5. pollute	To soil or dirty something

Verb+Suffix=Noun	Meaning
A. motion	The act of traveling
B. expansion	The act of getting bigger
C. pollution	The act of soiling or dirtying something
D. erosion	The act of wearing something away
E. deposition	The act of putting something down

<u>Verb</u>	<u>Noun</u>
1. deposit	_____
2. erode	_____
3. move	_____
4. expand	_____
5. pollute	_____

Predicting

TRY THE SKILL

You can use facts in informational writing to make predictions. *Our Changing Earth* contains many facts about Earth that would help you predict changes.

Read this passage from *Our Changing Earth*.

Earth is made up of layers. The crust, or the layer we walk on, breaks easily. Below the crust, the mantle is softer and very hot. The crust floats on the mantle in big pieces called plates. Heat inside Earth began pushing the plates apart 300 million years ago.

Most of the time, this happens very slowly, but sometimes two plates moving past each other get stuck together. The pressure builds up. Then, suddenly the plates move. This causes problems.

What is likely to happen next?

There is likely to be an earthquake.

Read the paragraphs. Shade the circle next to the correct answers.

One of the Earth's plates was moving under another. This generated a lot of heat. The heat melted some of the rock. This melted rock was pushed toward the crust. Suddenly, there was a huge disaster.

1. What kind of disaster occurred?

- Ⓐ an earthquake
- Ⓑ a landslide
- Ⓒ a volcano

“Are we going hiking in the mountains this weekend?” Maria asked her mom. All week they had seen steam rising from the mountain. There had been news on the radio about tiny earthquakes. “I’m not sure,” her mother answered. “We need to listen to the news.”

2. How should Maria and her mother decide whether to go hiking?

- Ⓐ They should watch the weather report for rain.
- Ⓑ They should make sure it will be a warm day.
- Ⓒ They should check for volcano warnings.

Answer Key

Locate Information

1. A
2. B
3. C
4. C

Proposition and Supporting Details

Proposition

People can protect themselves in earthquakes.

Supporting Details

- They should know what to do in an earthquake.
- They should also make sure the buildings they live and work in can withstand earthquakes.
- They should live in buildings that sway instead of falling down.

Roots and Suffixes

1. E, deposition
2. D, erosion
3. A, motion
4. B, expansion
5. C, pollution

Predicting

1. C
2. C