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Geology

Domain Geology: The Earth and Its Changes

Grade 4

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I. Grade Level Domain Map

Core Knowledge Content		State Standards	
Science		Science	
IV. Geology: The Earth and Its Changes A. THE EARTH'S LAYERS <ul style="list-style-type: none"> Crust, mantle, core (outer core and inner core) Movement of crustal plates Earthquakes <ul style="list-style-type: none"> Faults, San Andreas fault Measuring intensity: seismograph and Richter scale Tsunamis Volcanoes <ul style="list-style-type: none"> Magma Lava and lava flow Active, dormant, or extinct Famous volcanoes: Vesuvius, Krakatoa, Mount St. Helens Hot springs and geysers: Old Faithful (in Yellowstone National Park) Theories of how the continents and oceans were formed: Pangaea and continental drift B. HOW MOUNTAINS ARE FORMED <ul style="list-style-type: none"> Volcanic mountains, folded mountains, fault-block mountains, dome-shaped mountains Undersea mountain peaks and trenches (Mariana Trench) 		Standard 3 The Physical Setting <i>Earth and the Processes That Shape It</i> 4.3.5 Describe how waves, wind, water, and glacial ice shape and reshape Earth's land surface by the erosion of rock and soil in some areas and depositing them in other areas.	
Core Knowledge		Language Arts	
Core Knowledge		CCSS ELA	
I. Writing, Grammar, and Usage A. WRITING AND RESEARCH <ul style="list-style-type: none"> Organize material in paragraphs and understand how to use a topic sentence How to develop a paragraph with examples and details that each new paragraph is indented 		English Language Arts Reading Standards for Informational Text: Literary Nonfiction and Historical, Scientific, and Technical Texts Key Ideas and Details 4.RI.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. Writing Standards Text Types and Purposes W4.2 Write informative/explanatory texts to	



	<p>examine a topic and convey ideas and information clearly.</p> <p>a. Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.</p> <p>b. Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.</p> <p>d. Use precise language and domain-specific vocabulary to inform about or explain the topic.</p> <p>e. Provide a concluding statement or section related to the information or explanation presented.</p>
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Prior Knowledge	What Students Will Learn In Future Grades
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<p>Students in Core Knowledge schools should be familiar with Grade 1 –</p> <p>Earth</p> <ul style="list-style-type: none"> • Geographical features of Earth’s surface, including the shape of Earth and the horizon • Oceans and continents • North and South Poles and Equator • What’s inside Earth, including the layers of Earth, volcanoes and geysers, and rocks and minerals <p>Kindergarten through Grade 3 –</p> <ul style="list-style-type: none"> • What rivers, lakes, and mountains are and how they are represented on maps and globes 	<p>In Grade 6, students will review and extend their learning about geology when they learn about plate tectonics.</p>
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Cross-Curricular Links

	<p>Mathematics</p> <p>I. Numbers and Number Sense</p> <ul style="list-style-type: none"> • Order and compare number to 999,999,999 using the signs <, >, and =.
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Domain Vocabulary

<ul style="list-style-type: none"> • magna • plate tectonics • Richter scale • seismograph • tectonic • tectonic plates • tsunami • volcano 	<ul style="list-style-type: none"> • bedrock • crust • core • geothermal energy • mantel • dome • extinct volcano • fault- block mountain • folded mountain • mountain 	<ul style="list-style-type: none"> • convection current • dormant • earthquake • fault • geyser • hot spring • igneous rock • lava
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II. Domain Instructional Overview
Summary

During this unit, students will explore the surface of the Earth through many hands-on, engaging activities. The unit begins by delving into the four layers that make up our earth. It continues by encouraging students to investigate the different landforms on our earth and how they are formed. Questions and activities of high cognitive rigor are used to motivate children while exploring the different landforms. English Language Arts activities are included in all lessons with a read-aloud that asks students to make inferences and support these inferences with details from the text. Students are asked in some lessons to create paragraphs with topic sentences, supporting details, and concluding sentences. By infusing the reading and writing skills with the geology content, the students will complete the unit with a deep understanding of what makes up our earth.

The Big Idea

Earth is composed of layers that, through heat and pressure, cause movements that result in geological features above and below the surface.

Content Objectives

Lessons	Measurable Core Knowledge Objectives
1, 9	Students will identify and describe the layers that make up the earth.
2	Students will identify characteristics of earthquakes.
3, 9	Students will describe what happens underneath the Earth to cause volcanoes.
4, 5, 6, 7, 8, 9	Students will identify different types of mountains, how they are formed, and their features.
8, 9	Students will compare and contrast volcanic mountains.

Language Art Objectives

Lessons	Measureable ELA Objectives
2, 3, 5, 9	The students will write a paragraph that includes a topic sentence, supporting details, and a concluding sentence.
4, 8, 9	The students will create a Venn diagram that compares and contrasts two concepts.
2, 3, 5, 9	Students will indent each new written paragraph.
2, 3, 5, 9	Students will demonstrate command of the conventions of Standard English capitalization, punctuation, capitalization, and spelling when writing.
1, 2, 3, 4, 5, 6, 7, 8	The students will make one inference after reading a text and support the inference with two details.

Domain Lessons
Lesson 1: The Earth's Layers

Lesson 1: Read-Aloud: *What are the Layers of the Earth?* By Tega Jessa

This lesson uses hands on activities to introduce students to the layers that make up our earth.

Lesson 2: Moving Plates!

Lesson 2: Read-Aloud: *Earthquakes* By Trudi Strain Trueit

This lesson facilitates learning of the characteristics of earthquakes with a video and a read aloud.

Lesson 3: Volcanoes

Lesson 3: Read-Aloud: *Why do Volcanoes Blow Their Tops?* By Melvin and Gilda Berger

In this lesson, the students will discover the causes of volcanic eruptions.

Lesson 4: Volcanic Mountains

Lesson 4: Read-Aloud: *Mountains* By Terry Jennings

This lesson is an introduction to volcanoes and the difference between volcanoes and mountains.

Lesson 5: Fold Mountains

Lesson 5: Read-Aloud: *Mountains* By Terry Jennings

Through a demonstration, students will discover how fold mountains came to be.

Lesson 6: Dome Mountains

Lesson 6: Read-Aloud: *Dome Mountains* By Fraser Cain

This lesson asks students to demonstrate how a dome mountain is formed and then analyze that demonstration.

Lesson 7: Fault-Block Mountains

Lesson 7: Read-Aloud: *Mountains* By Terry Jennings

This lesson gives examples of fault-block mountains and discusses their features.

Lesson 8: Underwater Mountains

Lesson 8: Read-Aloud: *Mountains* By Terry Jennings

This lesson identifies different underwater mountains and trenches.

Lesson 9: Show What You Know

Lesson 9: Read-Aloud: *N/A*

This lesson concludes the unit by asking students to show what they have learned in the unit. They will take a written assessment.

Additional Resources

For Teachers

- *1001 Facts About Rocks and Minerals*, Sue Fuller & Chris Maynard (ISBN 0789490439)
- *Earth Shock: Hurricanes, Volcanoes, Earthquakes, Tornadoes, and Other Forces of Nature*, Andrew Robinson (ISBN 0500283044)
- Website for maps: www.nationalgeographic.com
- *This Dynamic Earth: The Story of Plate Tectonics*, <http://pubs.usgs.gov/publications/text/dynamic.html>
- Website for photos and images of Mt. St. Helens: www.fs.fed.us/gpnf/mshnvm/digital-gallery/index.html
- *What Your Fourth Grader Needs to Know*, Edited by E.D. Hirsch Jr. (ISBN 0385411189)
- *Grade 4 Teacher Handbook, Core Knowledge*, Edited by E.D. Hirsch Jr. & Souzanne A. Wright, (ISBN 1890517763)

For Children

- *Mountains*, Kimberly M. Hutmacher (ISBN 9781429650045)
- *Mountains*, Jen Green (ISBN 9781448832811)
- *Mountains*, Sallie Hewitt (ISBN 9781607531272)



- *Massive Mountains*, Terry Jennings (ISBN 9781599203706)
- *Mountains*, Seymour Simon (ISBN 9780688110406)
- *Earthquakes and Volcanoes*, Lin Sutherland (ISBN 0794402658)
- *Volcano: The Eruption and Healing of Mount St. Helens*, Patricia Lauber (ISBN 0395732573)
- *Volcanoes*, Seymour Simon (ISBN 0688074111)

The Big Idea

The Earth is composed of layers that, through heat and pressure, cause movements that result in geological features above and below the surface.

Prior Knowledge
Previously Learned Content

Students in Core Knowledge schools should be familiar with Grade 1 –

Earth

- What's inside Earth, including the layers of Earth, volcanoes and geysers, and rocks and minerals

Prerequisite Skills

Language Arts: Grade 2

III. Reading

E. Reading Comprehension – Nonfiction and Informational Text

- Answer questions about the details of a nonfiction text, indicating which part of the text provided the information needed to answer specific questions.
- With assistance, categorize and organize facts and information for a given topic.

Lesson Objectives
Content Objectives

Students will identify the layers that make up the Earth.

Students will describe each of layers of the Earth.

Language Art Objectives

Students will make one inference after reading a text and support the inference with two details.

Cross-curricular Connections
Sayings and Phrases (optional)
Core Vocabulary
Tier 2 Words

layer (noun)	A thickness of material that lies over or under something else Example: There are four layers that make up our earth.
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Tier 3 Words

Crust (noun)	The outer portion of the Earth Example: The crust is made of many plates that “float” above the mantle.
Mantle (noun)	The layer of Earth found between the crust and the core Example: The mantle lies below the crust.

Core (noun)	Earth's innermost layer, which is composed mainly of iron and nickel and is separated into different zones, the outer core and the inner core Example: Many scientists believe that the mantle transfers heat from the core to the surface
Bedrock (noun)	A solid rock mass that is unweathered, i.e., undisturbed by environmental conditions on Earth's surface Example: <i>Bedrock</i> is the native consolidated rock underlying the surface of our planet.

Read-Aloud

What are the Layers of the Earth? By Tega Jessa (<http://www.universetoday.com/74034/what-are-the-layers-of-the-earth/>)

Materials

Apple
 Knife (for teacher)
 Sheet of white construction paper (one per student)
 Blue 9" circle (one per student)
 Brown 8 ½ " circle (one per student)
 Yellow 5 ¼ " circle (one per student)
 Black 3" circle (one per student)
 Core Knowledge Instructional Master 60A
 Glue

Procedure and Activities

1. Activate prior knowledge by asking students what they know about the Earth we live on. Collect answers on chart paper that can be displayed during the unit.
2. Introduce the layers of the earth using an apple.
3. Cut the apple in half across the core.
4. Explain that the skin represents the crust, the heart represents the mantle, the seed coat represents the outer core, and the seed represents the inner core. (Please note this is meant to teach students the order of the layers, not to represent the approximate depth of each layer).
5. Explain to students that they are going to listen to *What are the Layers of the Earth?* In order to gain an understanding for what makes up each layer. As you read, ask students questions about the text content and pause as you come across vocabulary words (listed above). Use the context of the sentence and a brief discussion to teach each word's meaning.
6. At the conclusion of the read aloud, ask the students comprehension questions (see below) that enable them to demonstrate their understanding and use the new vocabulary.
7. After reading, ask students to write down one inference in their science notebooks, along with two details that support that inference.
8. Choose one student to share his/her inference with the class. Once it is shared, have the student call on a classmate to remember a detail from the read-aloud that supports that inference. Repeat this process.
9. Using construction paper, create the layers of the earth.
10. Take one large white piece of construction paper and as you place the following pieces of paper on the white piece of paper, share what it represents and label it's depth.
11. First, place a blue 9" circle labeled 6-40 miles on the white construction paper.

12. Tell students, "This represents the crust. The crust is made of many plates, which 'float' above the mantle. The crust is thicker and lighter at the continents and thinner and denser at the ocean floor."
13. Next, place a brown 8 1/2 " circle labeled 1,800 miles on top of the blue construction paper.
14. Tell students, "This represents the mantle. The mantle lies below the crust. It is a thick layer of solid rock. Many scientists believe that the mantle transfers heat from the core to the surface."
15. Next, place a yellow 5 1/4 " circle labeled 1,375 miles on top of the brown construction paper.
16. Tell students, "This is the outer core. The outer core is made of melted iron and nickel. It is much denser than the rock layers above it. The temperature of the outer core can range from 4000 to 9000 F."
17. Lastly, place a black 3" diameter circle labeled 1,750 miles over the yellow circle.
18. Tell students, "This is the inner core. The inner core is made of solid iron and nickel. These materials sank to the center of the earth while it was still in a molten form."
19. After labeling 1,750 miles, direct students to look at the apple again. When looking at their paper diagrams of the layers of the Earth with the depths listed, ask students if they see any discrepancies with their apple. Discuss with students that models (the apple) do not always appear exactly as the object they are supposed to be. For example, ask students what the thickest layer of the apple was. When they say the "heart" which represents the mantle, ask if this makes sense now that they know the depth of the mantle. Ask students to identify any other discrepancies with this model.
20. Pass out Core Knowledge instructional master 60A and have students work individually to complete. Students will label and answer questions about the layers of the Earth.

Comprehension Questions

1. What are the names of all four layers of the earth? (crust, mantle, outer core, inner core)
2. In miles, how thick is each layer? (Crust is 6 – 40 miles, mantle is 1800 miles, outer core is 1,375 miles, inner core is 1750 miles)
3. Compare and contrast the inner core and the outer core. (They are both made of iron and nickel, but the outer core is melted and the inner core is solid.)
4. Why do you think the crust is thicker and lighter at the continents and thinner and denser at the ocean floor? What inference could scientists make knowing this information? (Accept any answers that are supported with information from the text.)
5. Can you think of any other models that we use that are not proportioned exactly right (like the apple and the earth's layers)? What are they? Describe them. (Answer will vary but may include the following: maps, globes, toy cars, etc).

Extension (optional)

To reinforce the concept of scale, pass out graph or grid paper and have students color individual boxes that create a star design. Make this star 20 boxes tall and 20 boxes wide. After students complete this star, let them know that they are going to make another star. This star is going to be half of its original size. Since we know we want it exactly half its size, we need to create a scale. Let students know that for our new star, every single square we color in is actually going to represent two squares from our original star. Once students complete the smaller star, ask them what they notice. They should be able to share that their smaller star is half the size of the bigger star. Inform students that this is what we are doing with our layers of the earth model. We are taking something that is really, really big and scaling it down or making it smaller.

Scaffolding and Support

- Activating prior knowledge and connecting students' experience and current level of understanding to content.
- Modeling the activity with a different material before asking students to complete it.
- Encouraging students to draw inferences from the text with supporting details.
- Modeling the thought process through “think-alouds” to demonstrate how to identify the details in the text.
- Asking questions (e.g. descriptions, predicting/planning, explanations, connections) while reading to encourage critical thinking of concepts.
- Using concrete models demonstrate lesson concepts.

Assessment and Evaluation

Ongoing Assessment

Students' understanding is evaluated through their responses/questions during discussions, word work, and extension activities. Students should show understanding of content when making inferences and supporting each inference with details from the text. During discussions, students are asked questions to demonstrate what they learned as well as how they can apply the new vocabulary and content knowledge. Such questions include: *What are the three layers of the Earth? Does earth's crust move or stand still?* Student responses will indicate their understanding of the layers of the earth and what they are made up of. Their ability to elaborate responses as well as utilize domain vocabulary will clearly exhibit their knowledge of the earth's layers.

Summative Evaluation

Formally evaluate the “Earth's Layers” worksheet(Core Knowledge Instructional Master 60A)
**Please note that SIAL and SIMA were not discussed in the lesson and can be offered as extra credit points when evaluating.

Bibliography

Core Knowledge Instructional Master 60A (from *Grade 4 Teacher Handbook, Core Knowledge*, Edited by E.D. Hirsch Jr. & Souzanne A. Wright, (ISBN 1890517763)

The Big Idea

The Earth is composed of layers that, through heat and pressure, cause movements that result in geological features above and below the surface.

Prior Knowledge

Previously Learned Content

Students in Core Knowledge schools should be familiar with Grade 1 – Earth

What’s inside Earth, including the layers of Earth, volcanoes and geysers, and rocks and minerals

Prerequisite Skills

Language Arts: Grade 2

IV. Reading

E. Reading Comprehension – Nonfiction and Informational Text

- Answer questions about the details of a nonfiction text, indicating which part of the text provided the information needed to answer specific questions.
- With assistance, categorize and organize facts and information for a given topic.

Language Arts: Grade Three

I. Reading and Writing

B. WRITING

- Organize material in paragraphs and understand:
 - how to use a topic sentence
 - how to develop a paragraph with examples and details
 - that each new paragraph is indented

C. SPELLING, GRAMMAR, AND USAGE

- Spell most words correctly or with a highly probable spelling, and use a dictionary to check and correct spellings about which he or she is uncertain.
- Use capital letters correctly.

Lesson Objectives

Content Objectives

The students will identify characteristics of earthquakes.

Language Art Objectives

The students will make one inference after reading a text and support the inference with two details.

The students will write a paragraph with a topic sentence, details, and a concluding sentence.

Students will demonstrate command of the conventions of Standard English capitalization, punctuation, capitalization, and spelling when writing.

Students will indent each new written paragraph.

Cross-curricular Connections

Sayings and Phrases (optional)
Core Vocabulary (3-5 words)
Tier 2 Words

Fault (noun)	A fracture in Earth's crust along which the blocks of rock on either side have been pushed together or moved apart; faults are created by pressure on Earth's plates as they move Example: How many fault lines run underneath your city?
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Tier 3 Words

Earthquake (noun)	A movement of the Earth's crust Example: An earthquake can cause a great amount of destruction to a city.
Pangaea (noun)	The name scientists have given to the supercontinent that once contained all of the major continents in the world about 248 million years ago Example: Scientists believe the continent of Pangaea existed many years ago.
Richter Scale (noun)	A numerical scale that measures the magnitude of an earthquake Example: What was the measure of that earthquake on the Richter Scale?
Seismograph (noun)	A machine that detects and records the intensity of ground movements such as earthquakes Example: The needle on the seismograph moved quickly during the earthquake.
Plate tectonics (noun)	The movement and reformation of continents due to the shifting of the ocean's crust and the mantle underneath Example: The earth has many different features due to plate tectonics.

Read-Aloud

Earthquakes By Trudi Strain Trueit (ISBN 0531121976)

Materials

Internet access – Brainpop subscription
 Paragraph rubric – Appendix A

Procedure and Activities

1. Before students enter the classroom set up the BrainPop video on plate tectonics <http://www.brainpop.com/science/earthsystem/platetectonics/> .
2. Once students arrive and settle in their seats tell students, "Today we are going to learn about natural disasters and how they are created. We are going to begin by watching a quick video clip".
3. Pass out the guided notes for the video clip that are attached to the video. (You will need the brainpop subscription to print these notes, but they are not necessary to watch the clip).
4. Allow time for discussion and, if guided notes were given, review the guided notes and the answers to the quiz.

5. Explain to students that they are going to listen to *Earthquakes* in order to learn about the characteristics of earthquakes. Read pgs. 7-15,19-30 from *Earthquakes*. As you read, ask students questions about the text content and pause as you come across vocabulary words (listed above). Use the context of the sentence and a brief discussion to teach each word's meaning.
6. At the conclusion of the read aloud, ask the students comprehension questions (see below) that enable them to demonstrate their understanding and use the new vocabulary.
7. After reading, ask students to write down one inference in their science notebooks, along with two details that support that inference.
8. Choose one student to share his/her inference with the class. Then have the student call on a classmate to remember a detail from the read-aloud that supports that inference. Repeat this process.
9. As a class research information on earthquakes in California. Read the following article aloud: <http://earthquake.usgs.gov/earthquakes/states/california/history.php>
10. As the article is read, have students write down the name of one earthquake they hear about and two details about that earthquake.
11. When finished reading, quickly review what a good paragraph should include: a topic sentence, at least two supporting details, and a concluding sentence. Remind students of the following rules when writing: 1. We need to check for spelling mistakes. 2. We need to check for capital letters at the beginning of sentences. 3. We need to check for appropriate punctuation at the end of each sentence. 4. We need to check for indentation of each paragraph we write.
12. Have students write a short paragraph that shows what they have learned about their earthquake.

Comprehension Questions

1. What is the part of the Earth's crust that is broken into separate sections called? (plates)
2. What theory explains the formation, movement, and subduction of Earth's plates? (plate tectonics)
3. What are the 3 kinds of plate boundaries? (divergent, convergent, and transform boundaries)
4. Do you think home builders should consider fault lines before designing a new neighborhood? State your opinion and support it with facts. (Accept reasonable answers that are supported with facts.)

Extension (optional)

In order to reinforce the identification of characteristics of an earthquake, students may create an earthquake online by selecting the following criteria: ground, prevention, magnitude

<http://dsc.discovery.com/guides/planetearth/earthquake/interactive/interactive.html>

Scaffolding and Support

- Providing guided notes to students who are having difficulties following the lesson or may have difficulty writing at a quick pace.
- Activating prior knowledge and connecting students' experience and current level of understanding to content with the brainpop video and discussion that follows.
- Encouraging students to draw inferences from the text with supporting details.
- Modeling the thought process through "think-alouds" to demonstrate how to identify the details in the text.
- Asking questions (e.g. descriptions, predicting/planning, explanations, connections) while reading to encourage critical thinking of concepts
- Reminding students of expectations of paragraph writing.

Assessment and Evaluation**Ongoing Assessment**

Students' understanding is evaluated through their responses/questions during discussions, word work, and extension activities. Students should show understanding of content when making inferences and supporting each inference with details from the text. During discussions, students are asked questions to demonstrate what they learned as well as how they can apply the new vocabulary and content knowledge. Such questions include: *What are the moving pieces of earth's crust called? What happens at plate margins?* Student responses will indicate their understanding of the layers of what causes earthquakes to happen. Their ability to elaborate responses as well as utilize domain vocabulary will clearly exhibit their knowledge of the causes of earthquakes.

Summative Evaluation

Formally assess written paragraph for structure and science content taught in this lesson using paragraph rubric (Appendix A).

Bibliography

Von Hake, Carl A., April, 1971. *Earthquake History*. Retrieved from:
<http://earthquake.usgs.gov/earthquakes/states/california/history.php>

Brainpop, 2011. *Plate Tectonics*. Retrieved from:
http://www.brainpop.com/science/earthsystem/plate_tectonics/.

The Big Idea

The Earth is composed of layers that, through heat and pressure, cause movements that result in geological features above and below the surface.

Prior Knowledge

Previously Learned Content

First Grade –

B. WHAT'S INSIDE THE EARTH

- Volcanoes and geysers

Prerequisite Skills

Language Arts: Grade 2

II. Reading

E. Reading Comprehension – Nonfiction and Informational Text

- Answer questions about the details of a nonfiction text, indicating which part of the text provided the information needed to answer specific questions.
- With assistance, categorize and organize facts and information for a given topic.

Language Arts: Grade Three

I. Reading and Writing

B. WRITING

- Organize material in paragraphs and understand how to use a topic sentence
how to develop a paragraph with examples and details
that each new paragraph is indented

C. SPELLING, GRAMMAR, AND USAGE

- Spell most words correctly or with a highly probable spelling, and use a dictionary to check and correct spellings about which he or she is uncertain.
- Use capital letters correctly.

Lesson Objectives

Content Objectives

The students will describe what happens underneath the Earth to cause volcanoes.

Language Art Objectives

The students will make one inference after reading a text and support the inference with two details.

The students will write a paragraph with a topic sentence, details, and a concluding sentence.

Students will demonstrate command of the conventions of Standard English capitalization, punctuation, capitalization, and spelling when writing.

Students will indent each new written paragraph.

Cross-curricular Connections

Sayings and Phrases (optional)

Core Vocabulary (3-5 words)

Tier 2 Words

Dormant (adjective)	Temporarily inactive Example: The dormant volcano has not erupted in 2,000 years.
Extinct (adjective)	No longer in existence Example: The extinct volcano will never erupt again.

Tier 3 Words

Volcano (noun)	An opening in the crust of Earth that ejects lava, gases, and ash Example: The volcano erupted, cause mass devastation to its surroundings.
Lava (noun)	Molten rock moved to Earth's surface by a volcano Example: The lava was very hot.
Magma (noun)	Molten rock found under Earth's surface Example: The magma was very hot.

Read-Aloud

Why do Volcanoes Blow Their Tops? By Melvin and Gilda Berger (ISBN 0439148782)

Materials

Internet access – Brainpop subscription
Paragraph rubric – Appendix A

Procedure and Activities

Before students enter the classroom set up the BrainPop video on volcanoes
<http://www.brainpop.com/science/earthsystem/volcanoes/>.

1. In order to activate prior knowledge, ask students to tell you one main idea from yesterday's lesson about earthquakes. Have that student choose a classmate to give one or two details about that fact.
2. To introduce students to volcanoes, watch the Brainpop video. To ensure students' understanding of the video content, have them complete the online quiz at the end of the video and record answers in their notebooks. When all students have finished, review answers and troubleshoot any misconceptions.
3. Open the book *Why Do Volcanoes Blow Their Tops*, by Melvin and Gilda Berger to page 3 and read pgs. 3-15.
4. Explain to students that they are going to listen to *Why do Volcanoes Blow Their Tops?* In order to understand what happens underneath the earth that causes a volcanic eruption. As you read, ask students questions about the text content and pause as you come across vocabulary words (listed above). Use the context of the sentence and a brief discussion to teach each word's meaning.
5. At the conclusion of the read aloud, ask the students comprehension questions (see below) that enable them to demonstrate their understanding and use the new vocabulary.

6. After reading, ask students to write down one inference in their science notebooks, along with two details that support that inference.
7. Choose one student to share his/her inference with the class. Once it is shared, have the student call on a classmate to remember a detail from the read-aloud that supports that inference. Repeat this process with as many students as you like.
8. As a class, research information on volcanoes: <http://www.woodlands-junior.kent.sch.uk/Homework/mountains/volcanoeruptions.html>. Let students know that all the information necessary is on this particular webpage and they may explore the entire site after they have recorded their information.
9. While researching, have students choose one main idea about the effects of volcanic eruptions on the environment from the content.
10. When finished looking for information, review with students the appropriate format of a paragraph: a topic sentence, supporting details, and a concluding sentence. Remind students of the following rules when writing: 1. We need to check for spelling mistakes. 2. We need to check for capital letters at the beginning of sentences. 3. We need to check for appropriate punctuation at the end of each sentence. 4. We need to check for indentation of each paragraph we write.
11. Direct students to use their main idea to write a short paragraph stating one effect of a volcanic eruption with at least three details supporting this fact. Make sure students complete their paragraphs with a concluding sentence.

Comprehension Questions

1. What makes a volcano erupt? (Eruptions happen when rock from deep underground surges up and explodes onto the surface.)
2. Compare and contrast lava and magma. (They are both molten rock, but lava is above the earth's surface and magma is below the earth's surface.)
3. Do all volcanoes look alike? How do you know? Support your answer with facts. (No, the lava can come out differently making the shape of the volcanoes look different.)
4. What events could happen after a volcano erupts? (Answers may vary but should include the effects on the environment and surrounding habitat.)
5. Are all eruptions violent? Support your answer with facts. (All eruptions are not violent, but accept reasonable justifications for this answer.)

Extension (optional)

Have students create a model volcano out of play dough and determine what type of volcano it is. Write a short description of that specific volcano:

- Name the volcano
- Share at least 2-3 characteristics of your volcano that makes it different from the other types of volcanoes.

Scaffolding and Support

- Activating prior knowledge and connecting students' experience and current level of understanding to content with the brainpop video and discussion that follows.
- Encouraging students to draw inferences from the text with supporting details.
- Modeling the thought process through "think-alouds" to demonstrate how to identify the details in the text.
- Asking questions (e.g. descriptions, predicting/planning, explanations, connections) while reading to encourage critical thinking of concepts
- Reminding students of expectations of paragraph writing.

Assessment and Evaluation**Ongoing Assessment**

Students' understanding is evaluated through their responses/questions during discussions, word work, and extension activities. Students should show understanding of content when making inferences and supporting each inference with details from the text. During discussions, students are asked questions to demonstrate what they learned as well as how they can apply the new vocabulary and content knowledge. Such questions include: *When a volcano erupts, what comes out?* Student responses will indicate their understanding of the layers of how volcanoes occur. Their ability to elaborate responses as well as utilize domain vocabulary will clearly exhibit their knowledge of volcanoes.

Summative Evaluation

Formally assess written paragraph for structure and science content in this lesson using paragraph rubric (Appendix A).

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The Big Idea	
The Earth is composed of layers that, through heat and pressure, cause movements that result in geological features above and below the surface.	
Prior Knowledge	
Previously Learned Content	
Students in Core Knowledge schools should be familiar with Grade 1 –	
Earth	
<ul style="list-style-type: none"> Geographical features of Earth’s surface, including the shape of Earth and the horizon 	
Prerequisite Skills	
Mathematics: Grade 4 I. Numbers and Number Sense <ul style="list-style-type: none"> Order and compare numbers to 999,999,999 using the signs <, >, and =. Language Arts: Grade 2 V. Reading <ul style="list-style-type: none"> E. Reading Comprehension – Nonfiction and Informational Text <ul style="list-style-type: none"> Answer questions about the details of a nonfiction text, indicating which part of the text provided the information needed to answer specific questions. With assistance, categorize and organize facts and information for a given topic. 	
Lesson Objectives	
Content Objectives	
Students will identify different volcanic mountains and their features.	
Language Art Objectives	
The students will make one inference after reading a text and support the inference with two details. The students will create a Venn diagram that compares and contrasts mountains and volcanoes.	
Cross-curricular Connections	
I. Numbers and Number Sense <ul style="list-style-type: none"> Order and compare numbers to 999,999,999 using the signs <, >, and =. 	
Sayings and Phrases (optional)	
N/A	
Core Vocabulary (3-5 words)	
Tier 2 Words	
Range (noun)	A row or line of mountains. Example: Many mountain ranges exist on our earth.

Tier 3 Words	
Lava (noun)	Molten rock moved to Earth’s surface by a volcano Example: The lava was very hot.
Magma (noun)	Molten rock found under Earth’s surface Example: The magma was very hot.
Geothermal energy (noun)	Energy that uses or relates to heat from the interior of the Earth Example: Geothermal energy is thermal energy generated and stored in the Earth.
Volcano (noun)	An opening in the crust of Earth that ejects lava, gases, and ash Example: The volcano erupted, cause mass devastation to its surroundings.
Tectonic plates (noun)	Rigid layers of Earth’s crust, including the continental and oceanic crusts, that drift slowly atop the mantle Example: The tectonic plates are continuously moving.
Read-Aloud	
<i>Mountains</i> By Terry Jennings (ISBN 0382399412)	
Materials	
Internet access	
Procedure and Activities	
<ol style="list-style-type: none"> 1. Before students enter the classroom write the ‘Do Now’ on the board. Write the following questions “What are mountains? How are mountains formed? How many different types of mountains are there?” 2. As students enter the classroom remind them that they have five minutes to complete their ‘Do Now’. 3. Once the five minutes have elapsed call on students to answer the ‘Do Now’ questions and discuss as a class. 4. Tell students, “This week we will be learning all about how mountains are formed”. 5. Ask students, “If you were orbiting in a space shuttle looking back at Earth, do you think the Earth’s surface would look flat and smooth like the skin of an apple?” (Allow for answers. Correct answer: No, it is bumpy and wrinkled. The Earth has mountains, hills, valleys and canyons.) 6. Tell students, “Mountains are found on every continent including Antarctica and the formal definition is a landmass that projects conspicuously above its surroundings and is higher than a hill”. 7. Remind students, “Although we can see some mountains from space, there are also mountains and canyons beneath the Earth’s oceans”. 8. Tell students, “Today we are going to focus on mountains that are formed on land”. 9. Explain to students that they are going to listen to <i>Mountains</i> in order to identify volcanic mountains and their features, and read from page 4 to page 7. As you read, ask students questions about the text content and pause as you come across vocabulary words (listed above). Use the context of the sentence and a brief discussion to teach each word’s meaning. 	

10. At the conclusion of the read aloud, ask the students comprehension questions (see below) that enable them to demonstrate their understanding and use the new vocabulary.
11. After reading, ask students to write down one inference in their science notebooks, along with two details that support that inference.
12. Choose one student to share his/her inference with the class. Once it is shared, have the student call on a classmate to remember a detail from the read-aloud that supports that inference. Repeat this process with as many students as you like.
13. Have students identify the three different ways mountains can be formed.
14. Tell students, “When geologists study mountains, they classify them according to the way they were formed”.
15. Show the students the types of mountains diagram: <http://www.woodlands-junior.kent.sch.uk/Homework/mountains/types.htm>
16. Tell students, “Today we are going to learn about volcanic mountains”.
17. Define volcanic mountains as mountains that are formed from the accumulation of layers of volcanic material.
18. Say, “Examples around the world of volcanic mountains are the Cascade Mountains that extend from British Columbia through western Washington and Oregon to northern California, Mt. St. Helens in Washington State, Mt. Fuji in Japan, and Mt. Kilimanjaro in Kenya, Africa”.
19. Ask students, “Which volcanic mountain do you think has a peak with the highest elevation?”
20. Using a LCD projector/Smartboard research and determine, as a class, the elevation of each mountain range’s highest peak.
 - a. Cascade Mountain Range: Mount Rainier – 14,410 ft
 - b. Mount Saint Helens – 8,364 ft
 - c. Mount Fuji – 12,385 ft
 - d. Mount Kilimanjaro – 19,340 ft
21. After students have recorded the elevation of each mountain range’s highest peak, have them work in mixed ability groups to order the elevations from smallest to largest. Then, have students compare their answers with other groups. Direct students to write a sentence that “proves” which mountain is the highest. (At this point, students should be able to explain which value is the largest by using knowledge of place value).
22. When finished, direct students to create a Venn diagram that shows the difference between mountains and volcanoes. Direct students to have at least three written details and one picture in each part of the circles.

Comprehension Questions

1. What are mountains? (Answers may vary but should include the idea that they are a steep sided mass of rock that stands above the landscape.)
2. How are mountains formed? (By movement in the earth’s crust)
3. How many different types of mountains are there? (Five)
4. What do you think the landscape is like on a mountain? (Accept reasonable responses)
5. Would you choose to build a house on the side of a mountain? Why or why not? Support your answer with details about how different kinds of mountains are formed. (Accept reasonable responses as long as there is enough justification.

Extension (optional)

Scaffolding and Support

- Activating prior knowledge and connecting students' experience and current level of understanding to content by having students answer review comprehension questions prior to beginning the lesson.
- Encouraging students to draw inferences from the text with supporting details.
- Modeling the thought process through "think-alouds" to demonstrate how to identify the details in the text.
- Asking questions (e.g. descriptions, predicting/planning, explanations, connections) while reading to encourage critical thinking of concepts.
- Using heterogeneous grouping while using math skills.

Assessment and Evaluation**Ongoing Assessment**

Students' understanding is evaluated through their responses/questions during discussions, word work, and extension activities. Students should show understanding of content when making inferences and supporting each inference with details from the text. During discussions, students are asked questions to demonstrate what they learned as well as how they can apply the new vocabulary and content knowledge. Such questions include: *How many volcanoes can you name?* Student responses will indicate their understanding of volcanoes. Their ability to elaborate responses as well as utilize domain vocabulary will clearly exhibit their knowledge of volcanoes.

Summative Evaluation

Formally assess Venn diagrams for three accurate similarities and differences between mountains and volcanoes.

Bibliography

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The Big Idea

The Earth is composed of layers that, through heat and pressure, cause movements that result in geological features above and below the surface.

Prior Knowledge

Previously Learned Content

Students in Core Knowledge schools should be familiar with Grade 1 –

Earth

- Geographical features of Earth’s surface, including the shape of Earth and the horizon

Prerequisite Skills

Language Arts: Grade 2

II. Reading

E. Reading Comprehension – Nonfiction and Informational Text

- Answer questions about the details of a nonfiction text, indicating which part of the text provided the information needed to answer specific questions.
- With assistance, categorize and organize facts and information for a given topic.

Language Arts: Grade Three

I. Reading and Writing

B. WRITING

- Organize material in paragraphs and understand how to use a topic sentence
how to develop a paragraph with examples and details
that each new paragraph is indented

C. SPELLING, GRAMMAR, AND USAGE

- Spell most words correctly or with a highly probable spelling, and use a dictionary to check and correct spellings about which he or she is uncertain.
- Use capital letters correctly.

Lesson Objectives

Content Objectives

The students will identify different fold mountains and their features.

Language Art Objectives

The students will make one inference after reading a text and support the inference with two details.

The students will write a paragraph with a topic sentence, details, and a concluding sentence.

Students will demonstrate command of the conventions of Standard English capitalization, punctuation, capitalization, and spelling when writing.

Students will indent each new written paragraph.

Cross-curricular Connections

Sayings and Phrases (optional)
Core Vocabulary
Tier 3 Words

Geological (adjective)	Having to do with the structure of the earth Example: Geological maps show types and ages of rocks.
Folded mountain (noun phrase)	A mountain formed where plates move into each other, causing layers of rock to move up and warp or fold Example: When plates collide, a folded mountain is formed.
Seismic (adjective)	Having to do with earthquakes or movements of the earth Example: Seismic maps show movements of the earth surface.

Read-Aloud

Mountains By Terry Jennings (ISBN 0382399412)

Materials

Aluminum foil
Paragraph rubric (Appendix A)

Procedure and Activities

1. Before students enter the classroom write the 'Do Now' on the board. Write the following questions: How are volcanic mountains formed? What is the name of the tallest volcanic mountain? How tall is the tallest volcanic mountain? Besides volcanic mountains, what are the names of the two additional ways mountains can be formed?
2. As students enter the classroom remind them that they have five minutes to complete their 'Do Now'. Struggling students may choose a partner to answer the questions together.
3. Call on students to answer the 'Do Now' questions and discuss as a class.
4. Explain to students that they are going to listen to an excerpt from *Mountains* in order to identify different types of fold mountains and their features, read from page 8 to page 9. As you read, ask students questions about the text content and pause as you come across vocabulary words (listed above). Use the context of the sentence and a brief discussion to teach each word's meaning.
5. At the conclusion of the read aloud, ask the students comprehension questions (see below) that enable them to demonstrate their understanding and use the new vocabulary.
6. After reading, ask students to write down one inference in their science notebooks, along with two details that support that inference. Choose one student to share his/her inference with the class. Once it is shared, have the student call on a classmate to remember a detail from the read-aloud that supports that inference. Repeat this process with as many students as you like.
7. Tell students, "Today we are going to focus on Fold Mountains".
8. Tell students, "The definition of fold mountains is mountains formed by the compression that occurs when plates collide, which crumples or buckles rock and causes it to move up and warp or fold".
9. Tell students, "When two plates carrying layers of the Earth's crust and mantle are pushed and squeezed together Fold Mountains can be formed".
10. Lay a long piece of aluminum foil across some desks and identify it as the Earth's crust.
11. Have two students come forward and stand at each end of the foil.

12. Identify the students as the forces behind crustal plates.
13. Have them place their hands palms down on the corners of the foil and then push very slowly toward each other. The foil will crumple up in folds and mounds.
14. Ask students, “What happened to the surface of the Earth?” (Allow for discussion. Correct answer: It was pushed up in bumps or mountains.)
15. Remind students that mountains formed this way are called Fold Mountains.
16. Ask students, “Why do you think mountains formed this way are called Fold Mountains?” (Allow for discussion. Correct answer - because the Earth's crust is folded or bent)
17. Tell students, “Another way to picture Fold Mountains is to imagine what happens when you push together the ends of a rug or a dish towel. The more you push the ends together, the more it wrinkles and crumples into folds”.
18. Tell students, “Examples around the world of Fold Mountains are the Himalayas in India, Rocky Mountains in Colorado, Appalachians in the U.S., the Andes in South America, and the Alps in Europe”.
19. Tell students, “The tallest mountains on land, the Himalayas, are Fold Mountains”.
20. Tell students “the Himalayas are also the newest fold mountains. About 45 million years ago, the Indo-Australian plate and the Eurasian plate slammed into each other. The ocean floor between the two landmasses was pushed up into mountains. They are still being pushed up today. The Himalayas are pushed up two inches higher every year”.
21. Ask students, “If the Himalayas have the highest peak of Fold Mountains, which fold mountain has the second highest peak?”
22. Using a LCD projector/Smartboard research and determine, as a class, the elevation of each mountain range’s highest peak. Use the Internet to find images and details (suggestions are listed in Bibliography) such as:
 - a. The highest peak on the Himalayas is Mount Everest at 29,029 ft
 - b. Rocky Mountains in Colorado – 14,433 ft
 - c. Appalachians in the U.S. – 6,684 Andes in South America – 6.959 ft
 - d. Alps in Europe – 15,732 ft
23. Show the students pictures of some of these fold mountains.
24. As you are showing students the pictures, have them record in their notebooks at least three details about each picture.
25. When finished, have students choose one of the mountain ranges the class just researched. Have students write a short paragraph describing the mountain range of their choice. Remind students that a good paragraph focuses on word choice/variety and excellent supporting details. This paragraph must include the height of the highest peak in the mountain range. Remind students of the following rules when writing: 1. We need to check for spelling mistakes. 2. We need to check for capital letters at the beginning of sentences. 3. We need to check for appropriate punctuation at the end of each sentence. 4. We need to check for indentation of each paragraph we write.
26. As students finish with their paragraphs, allow them to trade with a partner and draw their partner’s mountain range based on the paragraph.

Comprehension Questions

1. Why do you think fold mountains have that name? (The earth’s crust is folded or bent to form them.)
2. Give some examples of fold mountains from around the world. (Himalayas, Rocky Mountains, Appalachians, Andes, Alps)
3. What is the tallest fold mountain? (Himalayas)
4. Using what you know about the Himalayas, why might the information published in a book in 1990 be inaccurate? (Answers should reference the fact that the mountains increase their height by two inches every year.)

Extension (optional)**Scaffolding and Support**

- Grouping students who may need support with answering the ‘do now’ or comprehension questions with others who can help facilitate an environment of teamwork.
- Activating prior knowledge and connecting students’ experience and current level of understanding to content by having students answer review questions prior to beginning the lesson.
- Encouraging students to draw inferences from the text with supporting details.
- Modeling the thought process through “think-alouds” to demonstrate how to identify the details in the text.
- Asking questions (e.g. descriptions, predicting/planning, explanations, connections) while reading to encourage critical thinking of concepts
- Reminding students of expectations of paragraph writing.
- Using concrete models to enable students to visualize content.

Assessment and Evaluation**Ongoing Assessment**

Students’ understanding is evaluated through their responses/questions during discussions, word work, and extension activities. Students should show understanding of content when making inferences and supporting each inference with details from the text. During discussions, students are asked questions to demonstrate what they learned as well as how they can apply the new vocabulary and content knowledge. Such questions include: *Why do you think fold mountains have that name. Give some examples of fold mountains from around the world. What is the tallest fold mountain?* Student responses will indicate their understanding of the layers of what causes earthquakes to happen. Their ability to elaborate responses as well as utilize domain vocabulary will clearly exhibit their knowledge the causes of earthquakes.

Summative Evaluation

Formally assess written paragraph for structure and science content in this lesson using paragraph rubric (Appendix A).

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The Big Idea

The Earth is composed of layers that, through heat and pressure, cause movements that result in geological features above and below the surface.

Prior Knowledge
Previously Learned Content

Students in Core Knowledge schools should be familiar with Grade 1 – Earth

- What’s inside Earth, including the layers of Earth, volcanoes and geysers, and rocks and minerals

Prerequisite Skills

Language Arts: Grade 2

II. Reading

E. Reading Comprehension – Nonfiction and Informational Text

- Answer questions about the details of a nonfiction text, indicating which part of the text provided the information needed to answer specific questions.
- With assistance, categorize and organize facts and information for a given topic.

Lesson Objectives
Content Objectives

Student will identify different dome-shaped mountains and how they are formed.

Language Art Objectives

Students will make one inference after reading a text and support the inference with two details.

Cross-curricular Connections
Sayings and Phrases (optional)
Core Vocabulary
Tier 2 Words

Granite (noun)	A very hard igneous rock Example: Granite is a very hard material.
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Tier 3 Words

Dome mountain (noun)	A type of folded mountain; the fold is shaped like an upside-down bowl with the layers dipping away from the center in all directions Example: Dome mountains are formed by magma pushing up from beneath the surface.
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Read-Aloud

Dome Mountains By Fraser Cain (<http://www.universetoday.com/29827/dome-mountains/>)

Materials

Internet access
Balloon
Cloth
Small hand pump
Index card (one per pair of students)
Cut, dried grass (a small bag)
Tube of toothpaste (one per pair of students)
Demonstration Quiz – Appendix B

Procedure and Activities

Before students enter the classroom write the ‘Do Now’ on the board. Write the following questions: How are Fold Mountains formed? What is the name of the tallest fold mountain? How tall is the tallest fold mountain? Do you think there can be different types of Fold Mountains? Explain your answer.

1. As students enter the classroom remind them that they have five minutes to complete their ‘Do Now’.
2. Call on students to answer the ‘Do Now’ questions and discuss as a class.
3. Tell students, “Today we will learn more about a specific type of Fold Mountain. These mountains are formed by magma pushing up from beneath the surface. These mountains are called Dome Mountains”.
4. Using a LCD projector/Smartboard pull up the article ***Dome Mountains*** by Fraser Cain on April 23, 2009 <http://www.universetoday.com/29827/dome-mountains/>.
5. Explain to students that they are going to listen to ***Dome Mountains*** in order to learn about how dome shaped mountains are formed. As you read, ask students questions about the text content and pause as you come across vocabulary words (listed above). Use the context of the sentence and a brief discussion to teach each word’s meaning.
6. At the conclusion of the read aloud, ask the students comprehension questions (see below) that enable them to demonstrate their understanding and use the new vocabulary.
After reading, ask students to write down one inference in their science notebooks, along with two details that support that inference.
7. Choose one student to share his/her inference with the class. Once it is shared, have the student call on a classmate to remember a detail from the read-aloud that supports that inference. Repeat this process with as many students as you like.
8. Tell students, “Dome mountains are a type of folded mountain, where the dome is shaped like an upside-down bowl with the layers dipping away from the center in all directions”.
9. Tell students, “Unlike a volcanic eruption, the magma does not flow or shoot out a vent as lava. Instead, the magma builds up under the Earth’s crust and pushes it up like air pushing on the inside of a balloon, making it inflates. The magma has so much pressure behind it that it pushes up a bulge or a dome in the Earth’s crust and makes a mountain”.
10. Tell students, “Over millions of years the magma beneath a dome mountain hardens into a solid core”.
11. Place a balloon under a piece of cloth.
12. Attach the opening of the balloon to a small hand pump.
13. Demonstrate the formation of a dome mountain by slowly pumping air into the balloon.
14. Ask students, “What is the air in the balloon taking the place of in the real formation of a dome mountain?” (Allow for discussion. Correct answer: magma).

15. Tell students, “Some examples of folded mountains are the Black Hills in South Dakota and the Adirondacks in New York”.
16. Using a LCD projector/Smartboard research and determine, as a class, the elevation of each mountain range’s highest peak and take notes.
 - a. Black Hills – 7,244 ft
 - b. Adirondacks – 5,344 ft
17. To have students demonstrate the formation of a dome mountain, have them punch a small, pencil-size hole in an index card. Cover the surface of the card with finely-cut dried grass to represent rock layers and the surface of the earth. Have one student hold the index card while the other student places a tube of toothpaste under the hole and slowly squeezes until the grass is pushed up into a small dome over the squeezed toothpaste.
18. Have students complete the “Demonstration Quiz” (Appendix B) as a summative assessment.

Comprehension Questions

1. Describe how dome mountains are formed. (magma pushes up from beneath the surface of the earth.)
2. Name two dome mountains and name their locations. (Black Hills are located in South Dakota and the Adirondacks in New York)
3. Do you think there can be different types of dome mountains? Explain your answer. (Accept reasonable answers)
4. How are fold mountains and dome mountains similar? Support your answer with at least two facts. (A dome mountain is a type of fold mountain.)

Extension (optional)

Draw a fold mountain and a dome mountain

- Label the pictures
- Identify at least 2 similarities and 2 differences between the two mountains.

Scaffolding and Support

- Activating prior knowledge and connecting students’ experience and current level of understanding to content with review comprehension questions prior to beginning the lesson.
- Encouraging students to draw inferences from the text with supporting details.
- Modeling the thought process through “think-alouds” to demonstrate how to identify the details in the text.
- Asking questions (e.g. descriptions, predicting/planning, explanations, connections) while reading to encourage critical thinking of concepts
- Modeling the activity with different materials before students complete it.
- Using concrete models to encourage students’ understanding of content.

Assessment and Evaluation

Ongoing Assessment

Students’ understanding is evaluated through their responses/questions during discussions, word work, and extension activities. Students should show understanding of content when making inferences and supporting each inference with details from the text. During discussions, students are asked questions to demonstrate what they learned as well as how they can apply the new vocabulary and content knowledge. Such questions include: *Describe how dome mountains are formed. Name two dome mountains and name their locations.* Student responses will indicate their understanding of how dome mountains are formed. Their ability to elaborate responses as well as utilize domain vocabulary will clearly exhibit their knowledge of dome mountains.

Summative Evaluation

Formally evaluate “Demonstration Quiz” (Appendix B) for correct answers ensuring students can make appropriate connections to the demonstration and describe how a dome mountain is formed.

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The Big Idea

The Earth is composed of layers that, through heat and pressure, cause movements that result in geological features above and below the surface.

Prior Knowledge
Previously Learned Content

Students in Core Knowledge schools should be familiar with Grade 1 –

Earth

- What's inside Earth, including the layers of Earth, volcanoes and geysers, and rocks and minerals

Prerequisite Skills

Language Arts: Grade 2

III. Reading

E. Reading Comprehension – Nonfiction and Informational Text

- Answer questions about the details of a nonfiction text, indicating which part of the text provided the information needed to answer specific questions.
- With assistance, categorize and organize facts and information for a given topic.

Lesson Objectives
Content Objectives

Students will identify different fault-block mountains and their features.

Language Art Objectives

Students will make one inference after reading a text and support the inference with two details.

Cross-curricular Connections
Sayings and Phrases (optional)

N/A

Core Vocabulary
Tier 2 Words

Fault (noun)	A fracture in Earth's crust along which the blocks of rock on either side have been pushed together or moved apart; faults are created by pressure on Earth's plates as they move Example: How many fault lines run underneath your city?
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Tier 3 Words

Earthquake (noun)	A movement of the Earth's crust Example: An earthquake can cause a great amount of destruction to a city.
Fault-block mountain (noun)	A mountain formed when Earth's crust is pulled apart, resulting in blocks of crust dropping down or being tilted Example: Fault-block mountains are formed when natural fault movement displaces large masses, or blocks, of rocks to uplift and break them.

Read-Aloud

Mountains By Terry Jennings (ISBN 0382399412)

Materials

5 cardboard boxes
Exit slip (Appendix C)

Procedure and Activities

Before students enter the classroom write the ‘Do Now’ on the board. Write the following questions “How are dome mountains formed? What are the names of at least two dome mountains? What are the names of all three types of mountains? How are the two types of mountains we have already learned about formed?”

1. As students enter the classroom remind them that they have five minutes to complete their ‘Do Now’.
2. Call on students to answer the ‘Do Now’ questions and discuss as a class.
3. Tell students, “Today we will learn about the last type of mountain, a fault-block mountain. Fault-block mountains are formed when natural fault movement displaces large masses, or blocks, of rock to uplift and break them, causing them to drop down or tilt to form elevated ranges and lowered basins”.
4. Explain to students that they are going to listen to *Mountains* in order to learn about different types of fault-block mountains and their features. As you read from pgs 10-11, ask students questions about the text content and pause as you come across vocabulary words (listed above). Use the context of the sentence and a brief discussion to teach each word’s meaning.
5. At the conclusion of the read aloud, ask the students comprehension questions (see below) that enable them to demonstrate their understanding and use the new vocabulary.
6. After reading, ask students to write down one inference in their science notebooks, along with two details that support that inference.
7. Choose one student to share his/her inference with the class. Once it is shared, have the student call on a classmate to remember a detail from the read-aloud that supports that inference. Repeat this process with as many students as you like.
8. Ask students, “What is a fault?” (Allow for answers. Correct answer - a deep crack in the Earth at the boundary of two plates)
9. Tell students, “Sometimes rocks are brittle and will not fold or bend. Instead they crack”.
10. Line up cardboard boxes end-to-end on a desk.
11. Ask students to imagine that the tops of the boxes are the Earth’s surface. Pressure from movement of plates causes the surface to crack into huge blocks at fault lines.
12. Tell students, “A block on one side of a fault might be slowly pushed up (slowly raise the center block). Another might slip down or tilt (demonstrate this with the boxes)”.
13. Tell students, “When a block is pushed up, it is called a *horst*. When it slips down, it is called a *graben*”.
14. Using a LCD projector/Smartboard pull up the following website and show the visual demonstration of how a horst and a graben are formed
<http://dnowlan.ca/VM/science7/planetearth/mountains.htm>
15. Tell students, “A simple way to remember which is which is you have to *hoist* yourself up on a *horst*”.

16. Tell students, “When two pieces of the crust are pushed up and the one between them sinks, that is, when a large graben lies between two horsts, it is called a *rift valley*”. Demonstrate this with the boxes.
17. Tell students, “Some examples of fault-block mountains are the Sierra Nevada’s in California and Nevada, Benbulbin in Ireland. Examples of rift valleys are The Great Rift Valley in East Africa, Death Valley in the U.S., and the Rhine River Valley in Europe.
18. Conclude lesson by having students complete the exit slip. (Appendix C)

Comprehension Questions

1. How are fault-block mountains formed? (Cracks in the earth’s crust force some rocks up and some rocks down.)
2. Give an example of a fault-block mountain. (Teton Range in Wyoming, Harz Mountains in Germany, Sierra Nevada Mountains in North America)
3. Describe how a rift valley is formed. (When two pieces of crust are pushed up and the one between them sinks.)
4. Explain the difference between a horst and graben. (When a block is pushed up, it’s a horst. When it slips down, it’s a graben.)

Extension (optional)

Pass out note cards with the names of mountains that we have covered in this unit. Have students research the mountain that is on their card.

- Determine its highest peak and write that number on the card.
- As a class put the note cards in order from greatest to least.

Scaffolding and Support

- Activating prior knowledge and connecting students’ experience and current level of understanding to content with review comprehension questions prior to beginning lesson.
- Encouraging students to draw inferences from the text with supporting details.
- Modeling the thought process through “think-alouds” to demonstrate how to identify the details in the text.
- Asking questions (e.g. descriptions, predicting/planning, explanations, connections) while reading to encourage critical thinking of concepts
- Using a concrete model and kinesthetic learning to reach all children’s learning styles.

Assessment and Evaluation

Ongoing Assessment

Students’ understanding is evaluated through their responses/questions during discussions, word work, and extension activities. Students should show understanding of content when making inferences and supporting each inference with details from the text. During discussions, students are asked questions to demonstrate what they learned as well as how they can apply the new vocabulary and content knowledge. Such questions include: *How are fault-block mountains formed? Give an example of a fault-block mountain. Describe how a rift valley is formed.* Student responses will indicate their understanding of how fault-block mountains are formed. Their ability to elaborate responses as well as utilize domain vocabulary will clearly exhibit their knowledge of fault-block mountains.

Summative Evaluation

Assess the exit slip (Appendix C) for students' knowledge of fault-block mountains and their features as discussed in the lesson.

Bibliography

Nolan, Diane, April 2002. *Unit 4: Planet Earth*. Retrieved from:
<http://dnowlan.ca/VM/science7/planetearth/mountains.htm>

The Big Idea

The Earth is composed of layers that, through heat and pressure, cause movements that result in geological features above and below the surface.

Prior Knowledge
Previously Learned Content

Students in Core Knowledge schools should be familiar with Grade 1 –

Earth

- What's inside Earth, including the layers of Earth, volcanoes and geysers, and rocks and minerals

Prerequisite Skills

Language Arts: Grade 2

VI. Reading

E. Reading Comprehension – Nonfiction and Informational Text

- Answer questions about the details of a nonfiction text, indicating which part of the text provided the information needed to answer specific questions.
- With assistance, categorize and organize facts and information for a given topic.

Lesson Objectives
Content Objectives

Students will show how volcanic mountains are formed and describe their characteristics.
 Students will compare and contrast volcanic mountains.

Language Art Objectives

The students will make one inference after reading a text and support the inference with two details.
 The students will create a Venn diagram that compares and contrasts two concepts.

Cross-curricular Connections
Sayings and Phrases (optional)

N/A

Core Vocabulary
Tier 2 Words
Tier 3 Words

Volcano (noun)	An opening in the crust of Earth that ejects lava, gases, and ash Example: The volcano erupted, cause mass devastation to its surroundings.
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Read-Aloud

Mountains By Terry Jennings. New Jersey: Silver Burdett Press, 1998. (ISBN 0382399412)

Materials

Internet access

World map

Procedure and Activities

1. Before students enter the classroom write the ‘Do Now’ on the board. Write the following questions “How are Fault-block Mountains formed? Where are fault-block mountains located? What are the names of at least two fault-block mountains?”
2. As students enter the classroom remind them that they have five minutes to complete their ‘Do Now’.
3. Call on students to answer the ‘Do Now’ questions and discuss as a class.
4. Ask students, “Are there underwater mountains that are so tall they reach the surface of the ocean? If yes, what are some examples of these mountains?” (Allow for answers. Correct answers - the island of Surtsey, the Hawaiian Islands, and Iceland)
5. Tell students, “Today we will learn about underwater mountains”.
6. Open the book, *Mountains* by Terry Jennings to page 14 and read from page 14 to page 15.
7. Explain to students that they are going to listen to *Mountains* in order to learn how volcanic mountains are formed. As you read, ask students questions about the text content and pause as you come across vocabulary words (listed above). Use the context of the sentence and a brief discussion to teach each word’s meaning.
8. At the conclusion of the read aloud, ask the students comprehension questions (see below) that enable them to demonstrate their understanding and use the new vocabulary.
9. After reading, ask students to write down one inference in their science notebooks, along with two details that support that inference.
10. Choose one student to share his/her inference with the class. Once it is shared, have the student call on a classmate to remember a detail from the read-aloud that supports that inference. Repeat this process with as many students as you like.
11. Ask students, “How are volcanic mountains formed under the sea? Are they similar or different from how they are formed on land? What is created when an underwater volcano rises above sea level?”
12. Tell students, “Not all underwater mountains rise above sea level to form islands. Those that do not are called seamounts”.
13. Tell students, “Just like the features of land above sea level, the land below sea level has many variables. The majority of the mountains underwater are volcanic mountains. The ocean floor has individual mountains, groups of mountains, as well as long chains or ranges.”
14. Ask students, “If the ocean has mountains it must also have valleys, does anyone know where the deepest valley on the planet can be found?” (Accept all answers.)
15. Tell students, “This valley is much deeper than the Grand Canyon. It is deeper than Mt. Everest is tall. It is nearly 7 miles deep and 600 miles wide”.
16. Tell students, “This deep valley is at a collision plate boundary under the Pacific Ocean and is called the *Mariana Trench*.”
17. Write the word Mariana Trench on the board and locate it on a world map.
18. Have students create a Venn diagram comparing and contrasting a volcanic mountain that is underwater to a volcanic mountain that is above sea level. Each part of the circles should have at least two details and a picture. The details should be specific facts about volcanic mountains that were discussed in the lesson.

Comprehension Questions

1. How are volcanic mountains formed? (When molten rock or magma from deep inside the earth escapes to the surface.)

2. Where are volcanic mountains located? (below and above sea-level)
3. What are the names of at least two volcanic mountains? (Mt. St. Helens and Mt. Kilimanjaro)
4. Imagine that two types of mountain formations exist within one mountain. What two types would be most likely to exist together? Support your answer with at least 3 facts. (Accept all reasonable answers with appropriate justification.)

Extension (optional)

Encourage students to write a short essay that explains the similarities and differences of underwater volcanic mountains and volcanic mountains above sea level using the information from their Venn diagram. Allow time for extra research to be completed if necessary. When finished, have students present their essays as speeches for a younger grade-level that may be studying similar content.

Scaffolding and Support

- Activating prior knowledge and connecting students' experience and current level of understanding to content with review comprehension questions prior to beginning the lesson.
- Encouraging students to draw inferences from the text with supporting details.
- Modeling the thought process through "think-alouds" to demonstrate how to identify the details in the text.
- Asking questions (e.g. descriptions, predicting/planning, explanations, connections) while reading to encourage critical thinking of concepts
- Reminding students of expectations of paragraph writing.

Assessment and Evaluation

Ongoing Assessment

Students' understanding is evaluated through their responses/questions during discussions, word work, and extension activities. Students should show understanding of content when making inferences and supporting each inference with details from the text. During discussions, students are asked questions to demonstrate what they learned as well as how they can apply the new vocabulary and content knowledge. Such questions include: *How are volcanic mountains formed? Where are volcanic mountains located?*

What are the names of at least two volcanic mountains? Student responses will indicate their understanding of how volcanic mountains are formed. Their ability to elaborate responses as well as utilize domain vocabulary will clearly exhibit their knowledge of volcanic mountains.

Summative Evaluation

Formally assess that Venn diagrams have two facts from the lesson about volcanic mountains and one picture in each part of the circle.

Bibliography

"Mariana Trench." *Ilike2learn Menu*. N.p., n.d. Web. 30 Sept. 2011. Retrieved from: <http://www.ilike2learn.com/ilike2learn/seamaps/Mariana%20Trench.html>

The Big Idea

The Earth is composed of layers that, through heat and pressure, cause movements that result in geological features above and below the surface.

Prior Knowledge

Previously Learned Content

Students in Core Knowledge schools should be familiar with Grade 1 –

Earth

- Geographical features of Earth’s surface, including the shape of Earth and the horizon

Prerequisite Skills

Language Arts: Grade Three

I. Reading and Writing

B. WRITING

- Organize material in paragraphs and understand how to use a topic sentence
- how to develop a paragraph with examples and details that each new paragraph is indented

C. SPELLING, GRAMMAR, AND USAGE

- Spell most words correctly or with a highly probable spelling, and use a dictionary to check and correct spellings about which he or she is uncertain.
- Use capital letters correctly.

Lesson Objectives

Content Objectives

Students will identify and describe the layers that make up the earth.
Students will describe what happens underneath the Earth to cause volcanoes.
Students will identify different types of mountains, how they are formed, and their features.
Students will compare and contrast volcanic mountains.

Language Art Objectives

The students will write a paragraph that includes a topic sentence, supporting details, and a concluding sentence.

The students will create a Venn diagram that compares and contrasts two concepts.

Students will demonstrate command of the conventions of Standard English capitalization, punctuation, capitalization, and spelling when writing.

Students will indent each new written paragraph.

Cross-curricular Connections

Sayings and Phrases (optional)

Core Vocabulary (3-5 words)
Tier 2 and 3 Words
All vocabulary taught up to this point
Read-Aloud
n/a
Materials
Paragraph rubric (Appendix A) Geology assessment (Appendix D)
Procedure and Activities
<ol style="list-style-type: none"> 1. Hand students the Geology summative assessment. (Appendix D) 2. After all students have completed the written assessment, allow time on computers to answer any questions the students may still have about mountains and how they are formed.
Comprehension Questions
n/a
Extension (optional)
Scaffolding and Support
n/a
Assessment and Evaluation
Ongoing Assessment
n/a
Summative Evaluation
Unit test will act as the summative assessment.
Bibliography
n/a

Appendix A
 Lessons 2, 3, 5, & 9

Writing Rubric

1	2	3	4
<ul style="list-style-type: none"> No topic sentence or concluding sentence. Did not indent paragraph. 	<ul style="list-style-type: none"> No topic sentence or concluding sentence. Indented paragraph. 	<ul style="list-style-type: none"> Has topic/concluding sentence, but not both. Indented paragraph. 	<ul style="list-style-type: none"> Has a topic and concluding sentence. Indented paragraph.
<ul style="list-style-type: none"> Very few supporting sentences. Few details. 	<ul style="list-style-type: none"> Few/some supporting sentences. Details repeated. 	<ul style="list-style-type: none"> Better details. Some supporting sentences. 	<ul style="list-style-type: none"> Strong details. Strong supporting sentences.
<ul style="list-style-type: none"> Incomplete and/or incorrect sentences. 	<ul style="list-style-type: none"> Many sentence mistakes. Same kind of sentences. Repeated sentences. 	<ul style="list-style-type: none"> Some grammatical mistakes in sentences. 	<ul style="list-style-type: none"> Complete and grammatically correct sentences.
<ul style="list-style-type: none"> Not enough information; information unclear Examples/details inaccurate, confusing, or omitted No clear connection to prompt 	<ul style="list-style-type: none"> Information sometimes repeated or wanders from prompt, task, or topic Examples and explanations are incomplete; need further clarification Accurate response, but topic not developed 	<ul style="list-style-type: none"> All information relates to prompt, task, or topic Examples and explanations help reader clearly understand the topic Clearly addresses the prompt, task, or topic 	<ul style="list-style-type: none"> Quality and quantity of information educates the reader Highly interesting examples, evidence, and explanations bring topic to life Fully develops prompt, task, or topic
<ul style="list-style-type: none"> Many spelling mistakes. Many mistakes with capital letters. Many mistakes with punctuation. 	<ul style="list-style-type: none"> Some spelling mistakes. Some mistakes with capital letters. Some mistakes with punctuation. 	<ul style="list-style-type: none"> Few mistakes in spelling. Few mistakes with capital letters. Few mistakes with punctuation. 	<ul style="list-style-type: none"> No spelling mistakes. No mistakes with capital letters. No mistakes with punctuation.

Appendix B
Lesson 6

Demonstration Quiz

Score: ___/5

Name _____

Based on the demonstration that you just completed showing how dome mountains are formed, answer the following questions in complete sentences.

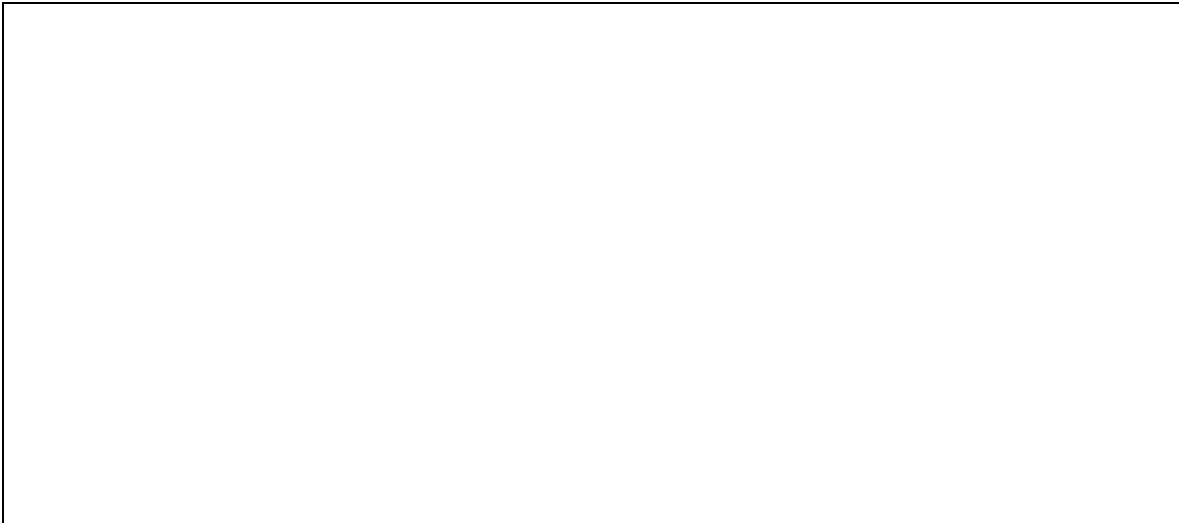
1. What does the toothpaste represent?

2. What could happen inside the earth that would create the same effect?

3. What does the grass represent?

4. How is this landform different from a volcano?

5. Draw a picture showing how a dome mountain forms.



Appendix C
 Lesson 7

Exit Slip
Fault-block mountains

When a block is pushed up, it is called a _____.
 When a block slips, it is called a _____.
 The area between a graben and two horsts is called a _____.
 Complete the following chart:

What I learned	Main idea	Supporting details

Exit Slip
Fault-block mountains

When a block is pushed up, it is called a _____.
 When a block slips, it is called a _____.
 The area between a graben and two horsts is called a _____.
 Complete the following chart:

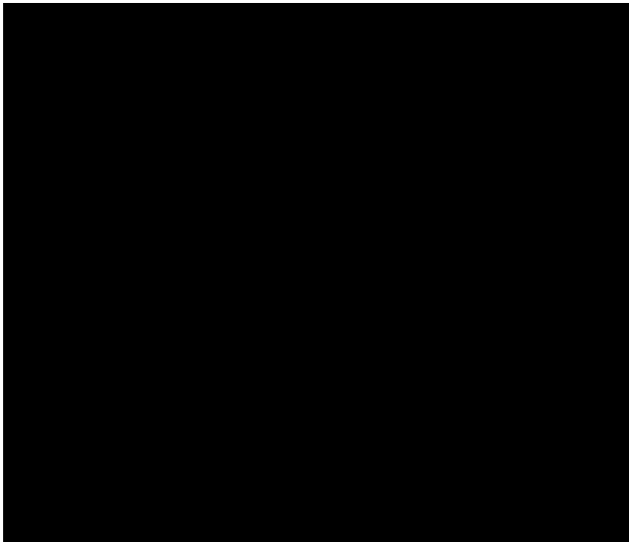
What I learned	Main idea	Supporting details

Appendix D
Lesson 9

Geology Unit Test

Name _____

Section 1 Directions: Identify the layers of the earth in the diagram below, and then answer the questions about the earth's layers in complete sentences.



1. Name the layer of the earth that contains mostly liquid rock.

2. Name Earth's thickest layer. High temperatures can soften this layer and cause it to change shape.

3. Name Earth's thinnest layer.

4. Which layer of Earth is solid due to tremendous pressure?

Section 2 Directions: Write the name of the letter that correctly describes how each mountain is formed.

- _____ 1. Dome mountain
- _____ 2. volcano
- _____ 3. Fold mountain
- _____ 4. Fault-block mountain

a. a mountain that is formed from the accumulation of layers of lava
b. a mountain that is formed when two plates carrying layers of the earth's crust and mantle are pushed and squeezed together
c. a mountain that is formed by magma pushing up from beneath the surface
d. a mountain that is formed when natural fault movement displaces large blocks of rocks to uplift and break them

Section 3 Directions: Complete the following Venn diagram with at least two written details in each part of the circle. When finished, write a paragraph that compares and contrasts volcanoes and mountains using the information from your diagram. Be sure to include a topic sentence, supporting details, and a concluding sentence.

