

Unit 5: Earth: Rocks and Minerals Inquiry (6 weeks)

Rationale

Why is this unit important and appropriate for this grade level and at this time of the year?

Throughout the study of the earth's surface, rocks and minerals, students will deepen basic skills in inquiry, observing, researching, organizing information and writing a formal opinion letter. Students will build interest, curiosity and expertise in this area of science. This unit is based on the Next Generation Science Standards and the Common Core Literacy Standards.

Enduring Understandings

EU is an overarching understanding. EU is written using teacher language. EU is something the students will remember in five years. Students can use the EU in other disciplines.

Essential Understanding(s):

- The earth's surface is constantly changing.

Essential Questions

EQ is linked to the enduring understanding. EQ is written in student friendly language. EQ stimulates thought and is open-ended. EQ can be answered superficially early on and more deeply as the unit progresses.

Essential Question(s):

- How do natural processes affect the earth's surface?

Learning Outcomes

What do we expect students to know and be able to do at the end of the unit?

Content Learning Outcomes

Students will:

- Identify the four layers of the earth
- Identify the properties of minerals
- Understand the stages of the rock cycle
- Identify the three types of rocks
- Describe the cause and effect relationship of the earth's natural processes: weathering, erosion and geological hazards

Writing Learning Outcomes

Students will:

- Use relevant unit vocabulary to make accurate observations
- Develop and write questions
- Write a caption to align with a visual diagram
- Paraphrase and record notes while researching
- Link cause and effect relationships
- Write a formal opinion letter
 - Provide and organize supporting paragraphs to uphold a claim or thesis
 - Support reasons with facts and details
 - Use craft strategies to elaborate and engage the reader
 - Cite sources and images using EasyBib

Reading Learning Outcomes

Students will:

- Determine the most important information in a text
- Synthesize the main idea in nonfiction texts
- Revise thinking as necessary while reading about a topic across texts
- Compare and contrast different perspectives/points of view for a given topic
- Use district online databases to research

Vocabulary

What vocabulary terms will students be expected to know?

Content Specific Vocabulary Tier 2	Content Specific Vocabulary Tier 3	Opinion Writing Vocabulary
<ul style="list-style-type: none"> • Minerals • Earth • Layers • Formation (relative to Earth's formation) • Texture • Luster • Rock Cycle • Volcanoes • Earthquakes • Lava • Eruption • Properties • Organic • Fossil • Sediment • Pressure • Erupt • Crystals • Streak • Geologist • Weathering • Clarity • Glacier • Opaque • Formed 	<ul style="list-style-type: none"> • Igneous • Sedimentary • Metamorphic • Erosion • Magma • Crust • Mantle • Outer core • Inner core • Vein • Moh's Hardness Scale • Mineral ores • Tectonic plates • Richter Scale • Cleavage 	<ul style="list-style-type: none"> • Thesis • Stance • Opinion • Claim • Proof • Reasons • Linking words/phrases <ul style="list-style-type: none"> ○ For instance ○ In order to ○ In addition ○ Therefore ○ Nonetheless ○ Since ○ For example ○ Consequently ○ Specifically

Mini-lessons/Notes/Tips*What mini-lessons will lead to student learning outcomes?*

Mini-lessons/Learning Activities:

Week 1: Immersion

- Use t-chart to examine the following questions: “What I think I know about the earth, rocks and minerals? What do I want to know about the earth, rocks and minerals?”
- Utilize unit nonfiction texts to define and illustrate content specific vocabulary. Partners can share word cards with peers and categorize terms for class word wall.
- Compare and contrast rock and mineral samples using a Venn diagram **(Assessment, Level 2)**
- Review the structure of a paragraph
- Refer to “Trees Model”: T: Topic Sentence, R: Reason, E: Evidence, E: Evidence, S: Summary
- Craft a paragraph about the similarities and differences observed from Venn diagram
- Document new learning and lingering questions using Post-its, Science Notebooks, graphic organizers, etc.
- Use the BrainPop video: “Earth’s Structure” to introduce the layers of the earth and create a diagram depicting these layers
- Label a diagram of the earth **(Assessment, Level 1)**
- Utilize read aloud time to learn about the layers of the earth
 - *Earth’s Crust* (Early Science Book Pack Series)
- Provide mentor word lists (luster words, etc.) and exemplar observations prior to students’ making their own observations
- Use homework writing response as an opportunity for students to practice writing paragraphs. Choice about topic/text for paragraphs is given to students.

Week 2: Minerals

- Observe different mineral samples to generate effective descriptions, detailed sketches and lingering questions
- Test mineral samples for hardness after learning that appearance is not enough to classify a mineral
- Test mineral samples using the streak test
- Generate vocabulary to identify the luster of mineral samples
- Name mineral identification strategies and describe why each is important **(Assessment, Level 1)**
- Use a random mineral sample to write a paragraph that describes the properties of the mineral **(Assessment, Level 3)**
- Provide mentor word lists (luster words, etc.) and exemplar observations prior to students’ making their own observations
- Document new learning and lingering questions using Post-its, Science Notebooks, graphic organizers, etc.
- Utilize read aloud time to learn about minerals.
- *Align with Reading Unit: Nonfiction: Spotlight on Determining Importance and Synthesis
 - Use a variety of strategies to preview texts on minerals
 - Use *Mining for Minerals* article and note taking template included with the unit resources
 - Use *Mining for Minerals* homework recommendation included with the unit resources
 - Access prior knowledge about minerals to get ready to read a nonfiction text
- Use homework writing response as an opportunity for students to practice persuasive letter writing. Choice about topic/purpose/audience for letters is given to students.

Week 3: Rocks

- Learn about the stages of the rock cycle
 - Read *The Rock Factory: A Story about the Rock Cycle* by Jacqui Bailey and Matthew Lilly, and *A Rock is Lively* by Dianna Hutts Aston and Sylvia Long
 - Use multimedia to demonstrate cycle
- Create an original storyboard that depicts the stages of the rock cycle. This storyboard should include both written (using Tier 2 & 3 vocabulary) and visual representations to demonstrate understanding. **(Assessment, Level 2)**
 - Create detailed captions using transition words to align with each stage of the rock cycle **(Assessment, Level 1)**
- Discuss the role of volcanoes in the creation of igneous rocks
- Observe two different igneous rocks (one intrusive and one extrusive) to note visual differences and then independently identify two additional igneous rock samples as either intrusive or extrusive **(Assessment, Level 2)**
- Observe four different sedimentary rocks to hypothesize the composition of each rock **(Assessment, Level 2)**
- Provide the effects weathering and erosion have on the earth's surface **(Assessment, Level 3)**
- Compare and contrast images of metamorphic rocks (original rock form versus current metamorphic state)
- Provide mentor word lists (luster words, etc.) and exemplar observations prior to students' making their own observations
- Identify the types of rocks and their specific properties **(Assessment, Level 1)**
- Use a mystery rock sample to hypothesize the composition of the rock **(Assessment, Level 2)**
- Use classroom rock collection (in addition to FOSS Kit) for further analysis
 - Compare and contrast rock samples from different locations and note the correlation between geographical location and the rock physical properties
- Utilize read aloud time for learning about rocks and erosion
 - *The Rock Factory: A Story About the Rock Cycle* by Jacqui Bailey and Matthew Lilly
 - *Cracking Up A Story About Erosion* by Jacqui Bailey and Matthew Lilly
 - *A Rock Is Lively* by Dianna Hutts Aston and Sylvia Long
- *Align with Reading Unit: Nonfiction: Spotlight on Determining Importance and Synthesis
 - Use a variety of strategies to preview texts on rocks
 - Access prior knowledge about rocks to get ready to read a nonfiction text

Week 4: Geological Hazards

- Identify geological hazards (volcanoes, tornadoes, hurricanes, earthquakes, tsunamis)
- Create a visual and written presentation to depict the cause and effect relationship of how each geological hazard influences the formation of various rocks **(Assessment, Level 3)**
- Present information to include domain Tier 3 specific vocabulary
- Identify and organize cause and effect relationships of geological hazards
 - Refer to "Cause and Effect Web" found on page 196 in *The Common Core Lesson Book K-5* by Gretchen Owocki
- View video clips to learn about various geographical hazards. Recommended Brain Pop videos include *Tsunami, Hurricanes, Natural Disasters, Volcanoes, Plate Tectonics, Earthquakes*
- Utilize read aloud, shared reading and guided reading to learn about various geological hazards as well as DIP.
 - Comprehension Toolkit articles: "On Deadly Ground Storm Surge" and "Tornado!"
 - *Time For Kids* articles: "What Makes a Quake?," "Undersea Volcanoes" and "How a Hurricane Works"
- *Align with Reading Unit: Nonfiction: Spotlight on Determining Importance and Synthesis
 - Synthesize information presented in geological hazard texts and articles
 - Determine the importance of ideas in geological hazard texts and articles to support the main idea

Week 5 & 6: Summative Assessment (Assessment, Level 4)

- *Performance Based Task*
 - *Take on the role of a geologist traveling to an untouched by mankind geographic region*
 - *Describe the surface of the earth in his/her geographic region using a teacher-provided graphic organizer (What rocks are found there? What does the earth's surface look like? What does the earth's surface feel like?)*
 - *Describe the types of rocks and minerals he/she has found and what these findings tell about the natural processes that have occurred in his/her specific geographic region*
 - *Craft a letter to his/her supervisor describing his/her observations and what these findings tell about the development of the geographic region over time*
 - *Offer evidence to support his/her claims*
 - *Use persuasive language to convince supervisor of the writer's findings (e.g., rock types, earths surface)*
 - *Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition)*
 - *Develop visual support to reinforce written work (collaborate with the art teacher)*
 - *Give an oral presentation*

- *Performance Based Task Stages*
 - *Information Gathering*
 - *Utilize research and note taking strategies to gather information*
 - *Generate line of questioning*
 - *Differentiate between thick and thin questions*
 - *Research using print and digital sources. Utilize district online databases including Grolier Encyclopedia, Searchasaurus, World Book Online, TrueFlix and appropriate websites such as www.scienceforkids.org/)*
 - *Paraphrasing while taking notes*
 - *Organize/categorize notes*
 - *Introduction to Formal Letter Writing*
 - *Study mentor examples of persuasive letters to model features, language and structure*
 - *Drafting Stage*
 - *Develop a claim*
 - *Supply reasons to support the claim*
 - *Integrate facts and details to support reasons*

**Refer to pg. 19-26, 32 The Common Core Writing Book, K-5 by Gretchen Owocki*
**Refer to pg. 11-12 The Common Core Writing Book, K-5 by Gretchen Owocki*

 - *Link opinions and reasons using words and phrases (e.g., because, therefore, since, for example, for instance, in order to, in addition)*
 - *Provide a concluding statement or section related to the claim*
 - *Preparing for Publication*
 - *Use EasyBib to cite sources and images*
 - *Review peer editing practices and use checklist to peer assess letter*
 - *Self-assess/peer assess oral presentation using class developed rubric/checklist that reflects on a growth mindset (yes, no, not yet)*

Notes/Tips:

Unit Preparation:

- Create and post a banner of the essential question to hang in classroom
- Create word wall with domain specific vocabulary which includes terms, definitions and visuals
- Gather and explore resources/materials from FOSS Kit and other artifacts to promote hands on experiences
- Invite guest speakers, take field trips, use multimedia (audio, video, images) to study scientific concepts throughout the unit of study.

2014-2015 Grade 4 Writing Units of Study

Week 1:

- Review the structure of a paragraph
- Refer to “Trees Model”: T: Topic Sentence, R: Reason, E: Evidence, E: Evidence, S: Summary
- Utilize read aloud time to learn about the layers of the earth
 - *Earth’s Crust* (Early Science Book Pack Series)
- Provide mentor word lists (luster words, etc.) and exemplar observations prior to students’ making their own observations

Week 2:

- Provide mentor word lists (luster words, etc.) and exemplar observations prior to students’ making their own observations
- Utilize read aloud time to learn about minerals
- *Align with Reading Unit: Nonfiction: Spotlight on Determining Importance and Synthesis
 - Use a variety of strategies to preview texts on minerals
 - Access prior knowledge about minerals to get ready to read a nonfiction text

Week 3:

- Provide mentor word lists (luster words, etc.) and exemplar observations prior to students’ making their own observations
- Utilize read aloud time for learning about rocks and erosion
 - *The Rock Factory- A Story About the Rock Cycle* by Jacqui Bailey and Matthew Lilly
 - *Cracking Up A Story About Erosion* by Jacqui Bailey and Matthew Lilly
 - *A Rock Is Lively* by Dianna Hutts Aston and Sylvia Long
- *Align with Reading Unit: Nonfiction: Spotlight on Determining Importance and Synthesis
 - Use a variety of strategies to preview texts on rocks
 - Access prior knowledge about rocks to get ready to read a nonfiction text

Week 4:

- Help students organize cause and effect relationships of geological hazards
- Refer to “Cause and Effect Web” found on pg. 196 in *The Common Core Lesson Book K-5* by Gretchen Owocki
- Utilize read aloud time for learning about various geological hazards
 - Toolkit Text articles: “On Deadly Ground Storm Surge” and “Tornado”
 - *Time For Kids* articles: “What Makes a Quake?,” “Undersea Volcanoes” and “How a Hurricane Works”
- *Align with Reading Unit: Nonfiction: Spotlight on Determining Importance and Synthesis
 - Synthesize information presented in geological hazard texts and articles
 - Determine the importance of ideas in geological hazard texts and articles to support the main idea

Weeks 1-4:

- Additional website resources to support further learning on rocks and minerals
 - <http://www.learner.org/interactives/rockcycle/>
 - <http://www.fi.edu/fellows/fellow1/oct98/index2.html>
- For additional video content and information, refer to United Streaming website

Week 5 & 6:

- Refer to pg. 19-26, 32 *The Common Core Writing Book, K-5* by Gretchen Owocki
- Refer to pg. 11-12 *The Common Core Writing Book, K-5* by Gretchen Owocki

Assessment*How will student learning be assessed?***Formative Assessments:**

*See Webb's Depth of Knowledge Assessment Attachment

Level 1: Recall & Reproduction

- Label a diagram of the earth (reinforce knowledge of Earth's layers)
- Name mineral identification strategies and describe why each is important
- Identify the types of rocks and their specific properties
- Create detailed captions using transition words to align with each stage of the rock cycle

Level 2: Basic Application of Skills and Concepts

- Compare and contrast rock and mineral samples using a Venn diagram
- Create an original storyboard that depicts the stages of the rock cycle. This storyboard should include both written (using Tier 2 & 3 vocabulary) and visual representations to demonstrate understanding.
- Use a mystery rock sample to hypothesize the composition of the rock
- Observe two different igneous rocks (one intrusive and one extrusive) to note visual differences and then independently identify two additional igneous rock samples as either intrusive or extrusive
- Observe four different sedimentary rocks to hypothesize the composition of each rock

Level 3: Short-term Strategic Thinking

- Create a visual and written presentation to depict the cause and effect relationship of how each geological hazard influences the formation of various rocks
- Provide the effects weathering and erosion have on the earth's surface
- Use a random mineral sample to write a paragraph that describes the properties of the mineral

Performance Based Assessment:**Level 4: Extended Higher Order Thinking**

Students will:

- Take on the role of a geologist traveling to an untouched by mankind geographic region
- Describe the surface of the earth in his/her geographic region using a teacher-provided graphic organizer (What rocks are found there? What does the earth's surface look like? What does the earth's surface feel like?)
- Describe the types of rocks and minerals he/she has found and what these findings tell about the natural processes that have occurred in his/her specific geographic region
- Craft a persuasive letter to his/her supervisor describing his/her observations and what these findings tell about the development of the geographic region over time
 - Offer evidence to support his/her claims
 - Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition)
 - Develop visual support to reinforce written work
- Give an oral presentation

Standards*What standards are addressed during the unit?***CCLS in Science**

- Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes to landforms over time.
- Analyze maps showing a variety of Earth's features and the occurrence of geologic hazards to determine the geographic patterns that emerge.

CCLS in Writing

- **W.4.1:** Write opinion pieces on topics or texts, supporting a point of view with reasons and information
 - a) Introduce a topic or text clearly, state an opinion, and create an organizational structure in which related ideas are grouped to support the writer's purpose.
 - b) Provide reasons that are supported by facts and details.
 - c) Link opinion and reasons using words and phrases (e.g., for instance, in order to, in addition).
 - d) Provide a concluding statement or section related to the opinion presented.
- **W.4.4:** Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.
- **W.4.5:** With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.
- **W.4.6:** With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.
- **W.4.9:** Draw evidence from literary or informational texts to support analysis, reflection and research.
 - b) Apply Grade 4 Reading standards to informational texts.

CCLS in Reading

- **RI.4.1:** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- **RI.4.3:** Explain events, procedures, ideas, or concepts in a historical, scientific or technical text, including what happened and why, based on specific information in the text.
- **RI.4.4:** Determine the meaning of general academic and domain specific phrases in a text relevant to a Grade 4 topic or subject area.
- **RI.4.5:** Describe the overall structure (e.g. chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts or information in a text or part of a text.
- **RI.4.7:** Interpret information presented visually, orally, or quantitatively (e.g. in charts, graphs, diagrams, timelines, animations or interactive elements on webpages) and explain how the information contributes to the understanding of the text in which it appears.
- **RI.4.9:** Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably

CCLS in Language

- **L.4.2:** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
 - a) Use correct capitalization.
 - b) Use commas and quotation marks to mark direct speech and quotations from a text.
 - c) Use a comma before a coordinating conjunction in a compound sentence.
 - d) Spell grade appropriate words appropriately consulting references as needed.
- **L.4.4:** Determine or clarify the meaning of unknown and multiple meaning words and phrases based on Grade four reading and content, choosing flexibly from a range of strategies.
 - a) Use context (e.g. definitions, examples, or read statements in a text) as a clue to the meaning of a word or phrase.
 - b) Use common, grade appropriate Greek and Latin affixes and roots as clues to the meanings of a word.
 - c) Consult reference materials (e.g. dictionaries, glossaries, thesauruses) both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases.

Speaking & Listening:

- **SL.4.4:** Report on a topic or text, tell a story, recount an experience in an organized manner using appropriate facts and relevant descriptive details to support main ideas or themes; speak clearly at an understandable pace

Professional & Student Resources

What professional resources will be helpful in planning the unit?

Professional Resources:

- *The Common Core Writing Book K-5* by Gretchen Owocki
- *The Common Core Lesson Book K-5* by Gretchen Owocki
- *Collaboration and Comprehension Inquiry Circles in Action* by Harvey Daniels and Stephanie Harvey
- *Engaging Readers and Writers With Inquiry* by Jeffrey Wilhelm
- *Inquiry Circles* and DVD by Stephanie Harvey and Harvey Daniels
- *Developing More Curious Minds* by John Barell
- *Creating Classrooms for Authors and Inquirers* by Kathy G. Short, Jerome C. Harste with Carolyn Burke
- *Inquiry at the Window* by Phyllis Whitin & David J. Whitin
- *Nonfiction Matters: Reading, Writing and Research in Grades 3-8* by Stephanie Harvey
- *Planning For Inquiry: It's Not an Oxymoron* by Diane Parker
- *Exploring Informational Texts: From Theory to Practice* by Linda Hoyt, Margaret Mooney, and Brenda Parkes
- *Units of Study for Teaching Reading*
 - *Navigating Nonfiction in Expository Texts Determining Importance and Synthesizing* by Lucy Calkins and Kathleen Tolan
- *Units of Study in Opinion, Information, and Narrative Writing Grade 4*
 - *Boxes and Bullets* by Lucy Calkins, Kelly Bolland Hohne and Cory Gillete

Student Resources:

- District Online Databases (e.g., Grolier Encyclopedia, World Book Online, Pebble Go, Searchasaurus, Scholastic TrueFlix)
- *A Rock Is Lively* by Dianna Hutts Aston and Sylvia Long (Read Aloud)
- *Cracking Up A Story About Erosion* by Jacqui Bailey and Matthew Lilly (Read Aloud)
- *The Rock Factory: A Story About the Rock Cycle* by Jacqui Bailey and Matthew Lilly (Read Aloud)
- *Rocks, Hard, Soft, Smooth and Rough* by Natalie Rosinsky
- *How Does it Happen? Variety Pack (Steps to Literacy)* specifically *How Does a Volcano become an Island?* and *How Does an Earthquake become a Tsunami?* (Independent Reading or Research Resource)
- *Early Bird Science Series Variety Pack (Steps to Literacy)* specifically *Minerals, Earth's Crust, Fossils and Erosion* (Independent Reading or Research Resource)
- *Rocks and Minerals Theme Set (Benchmark Education)* specifically *Minerals, The Rock Cycle and Rock Types* (Independent Reading or Research Resource)
- *What Changes Our Earth Theme Set (Benchmark Education)* specifically *Earthquakes, Erosion and Glaciers* (Independent Reading or Research Resource)
- DK Eyewonder *Rocks and Minerals*
- DK Eyewonder *Volcanoes*
- DK Pocket Genius *Rocks and Minerals*
- Crabtree Publishing Series: *What Are Igneous Rocks* by Molly Aloian, *What are Sedimentary Rocks?*, *What Are Fossils?* by Natalie Hyde, *What Are Crystals?* by Molly Aloian, *What Are Metamorphic Rocks?* by Molly Aloian, *What Are Minerals?* by Natalie Hyde, *How To Be A Rock Collector* by Natalie Hyde, *What Is The Rock Cycle?* by Natalie Hyde

Hands-On Resources

- Everyday Uses Rock and Card Set, Educational Insights