Holyoke Public Schools

Science Curriculum Map
Grade 4

Minerals and Rocks Unit

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Holyoke Public Schools

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Overview of Curriculum Maps

Goals:

1. To ensure that students are exposed to a rigorous curriculum in every school and every grade
2. To have consistent instruction and assessment district wide
3. To prepare students for the MCAS test
4. To explain what is expected to be covered in each Science unit of study

Expectations:

The district's expectation is for students to successfully meet the Massachusetts Science and Technology/Engineering Standards, through the use of the English Language Proficiency Benchmarks and Outcomes (ELPBO) to support instruction for English Language Learners (ELLs). Strategies for teaching ELLs are good teaching practice for all learners. In order to help facilitate this teachers are required to follow curriculum maps.

Accountable Talk:

To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the science discipline, and to rigorous thinking.

Feedback to Students:

Feedback needs to happen daily in the classroom. There are many ways to give feedback. Conferencing, observations, questions asked during the workshop, and written responses to students' work and notebook entries.

FIVE ESSENTIAL PRACTICES FOR TEACHING ENGLISH LANGUAGE LEARNERS

The five essential practices for teaching English language learners are practices developed by America's Choice to support the literacy needs of ELL students. These practices are a result of current second language acquisition research, literacy development, and effective classroom practices. *(America's Choice: Teaching English Language Learners: Literacy)*

Essential Practice 1	**Classroom Applications**
Develop Oral Language through Meaningful Conversation and Context. Oral language is the foundation of literacy and a main tool for learning and interacting in both academic and social settings. Natural exposure and planned experiences with oral language facilitates increases expression and understanding of the second language. Oral language also supports vocabulary development in context, paving the way for better comprehension and production. Exposure to rich oral and written language environments is vital for developing literacy and language skills.	• Develop oral language through meaningful conversation by planning language experiences and building consistent time to engage conversation. • Enunciate and rephrase difficult works allow extra time for practice and repetition. • Demonstrate and orally explain activities step-by step. Rephrase difficult instructions • Use think-alouds. Verbally share the comprehension thought process. • Provide opportunity for practice: allow extra time for practice and repetition in oral, reading, and writing activities with appropriate feedback. • Allow students to respond through Turn and Talk activities, oral, choral reading and re-reading. • Use audio recording of a text to provide extended to provide extended literacy opportunities where students listen to the reading of a text independently while developing fluency, accuracy, and language acquisition. • Plan daily read-alouds to model literacy strategies and to scaffold fluency, accuracy, and independent reading.

Essential Practice 2	Classroom Applications
Teach Targeted Skills through Contextualized and Explicit Instruction Full literacy is a fluid combination of oral, reading, and writing skills. These skills must be taught through explicit and contextualized instruction that scaffolds learning. Contextualized instruction provides students with extra linguistic clues that support understanding not only of the content but also of the language being used in the lesson. Combining contextualized practices with the knowledge of phonemic awareness, phonics skills, language structures and functions, text patterns, and literary devices such as metaphors, analogies, figurative language, and unfamiliar cultural concepts, will aid students in achieving stronger literacy skills. Explicit skills give the students the tools they need to comprehend increasingly complex literacy demands.	• Use clues of context to make instruction meaningful. Teach skills and strategies ;using materials, books or writing that students know and understand • Use Big Books or shared reading to teach phonics, vocabulary and language features. • Use student or teacher writing models to teach craft, spelling, and language use conventions. • Teach phonemic awareness within a context. ELL children must attach meaning and experience to phonemes they may never have heard before. Teach phonemic awareness while explicitly teaching vocabulary, meaning, or within-a-story context. • Understand the linguistic background native language and address these issues specifically. • Pay special attention to sounds of letters. Languages have different linguistic features. For example, while the vowel sounds in English vary, Spanish vowel sounds are consistent. Students will transfer what they know about one language and automatically, and sometimes incorrectly, apply it to English. • Use meaningful activities to teach phonemic awareness, such as language games, Word Walls, word banks, songs, poems, and rhymes that focus on particular sounds or letters.

Essential Practice 3	Classroom Applications
Build Vocabulary through Authentic and Meaningful Experiences with Words Developing and deepening a student's understanding of new words is essential for English language learners. Building vocabulary in the context of literature, experiences, and modeled writing ensures that students will own the new words they encounter. Vocabulary building is a lifelong process and students must learn ways to integrate and approach new and challenging words. Discussing, playing with, and using new words allows students to gain new vocabulary through meaningful, and therefore memorable, experiences.	• Vocabulary development must be taught intentionally. Since word knowledge correlates with reading comprehension and meaning-making strategies used in decoding, it must be a focus for instruction. • Vocabulary development must be taught in context. Connect word knowledge with background knowledge and instructional context. ELL students need both meaning and context to acquire new vocabulary. • Facilitate and plan activities that support the three main ways vocabulary is learned: 1. Through meaningful conversations with adults and other students. 2. Listening to adults read at slightly higher levels than the student's independent level. 3. Read extensively on their own at their reading level. • Pre-teach vocabulary words, prefixes/suffix, context clues, and cognates. Build students' skill box with vocabulary and give them tools to understand and connect new vocabulary. • Use content Word Walls or word webs. Support cognitive structuring for ELLs by connecting new vocabulary to themes, ideas, or generalizations. • Explicitly focus on and teach academic language. Students need to be consistently exposed to formal or content specific language and vocabulary. • Explicitly teach the building blocks of language. Students need to learn the connecting and transition words of the English language ("however," "in conclusion", etc.)Teach them in context and teach them explicitly. • Focus teaching Tier 2 words, as well as essential Tier 1 words. Although most explicit vocabulary instruction should focus on Tier 2 words (words with a high frequency in the written language, example: examine), ELLs need instruction around Tier 1, or basic spoken words as well.

Essential Practice 4	Classroom Applications
Build and Activate Background Knowledge Learning is based on establishing neural connections in the brain, drawing on previous experience, background knowledge, and prior and current environments. It is both the teacher's and the student's job to facilitate these connections in order to construct meaning and understand new ideas and concepts while expanding on their own world knowledge. Actively fostering these connections will enable students to more easily interpret their surroundings and assign meaning to new concepts while expanding their own	• Elicit student's experience and comments. Connect school, literary and personal events through talking, writing, and reading. • Consider the cultural background of students when selecting literacy materials such as books and poems. Support language development of Ell students by giving them new English words for experiences that are close to home. Using materials that represent their cultural background increases motivation and supports participation. • Discuss and build language around universal themes. Connect new language to universal experiences. • Build content-based word banks and webs. Connect new language to other known words, experiences, and ideas to support cognitive structuring. • Use native language and value home culture. View home cultures as a resource, rather then a liability. • Use hands-on experience based instruction in all academic areas. Language can be built upon common classroom experiences. • Encourage students to make connections before, during and after reading. • Find out what students know, and build on their experience.

Essential Practice 5	Classroom Applications
Teach and Use Meaning-Making Strategies Intentionally teaching meaning-making strategies provides students with a toolbox to approach future learning challenges. Meaning-making strategies vary from helping students comprehend text to various strategies students can use to understand English-dependent lessons. Modeling appropriate behaviors to students gives them the tools to be autonomous learners and supplies them with options they can use to interpret environmental input, both academically and socially.	• Explicitly teach student meaning-making strategies. Model for students how to visualize, make connections, monitor for meaning, determine importance, etc. • Provide opportunities for practice. Sustain daily work periods in reading and writing for students to practice these strategies. • Systematically assess students and adjust instruction. Monitor progress and use data to adjust the focus of mini-lessons, conferences and small-group instruction. • Model activities and thinking for certain skills. Students need to see and experience what is expected of them before they perform a task. • Beginning ELLs need more than just phonics and English Language Development instruction. EXPOSE STUDENTS RIGHT AWAY TO COMPREHENSION STRATEGIES. Waiting to address skills in chronological order hinders academic growth and English proficiency. • Teach students how to help themselves in English-dependent lessons. Model your thinking and how you approach problems. Build students cognitive toolbox by explicitly teaching the ways to help themselves during difficult language situations.

Resources:

FOSS kit: Earth Materials

Seeds of Science Roots of Reading kit: Gravity and Magnetism

Shaping Earth's Surface, National Geographic Theme Set (New 2010-11)

Using Earth's Resources, National Geographic Theme Set (New 2010-11)

All students should have a science journal and a 3 ring binder or a pocket folder to keep all their science work organized. This should be kept in the classroom so that visitors (such as the principal, vice principal, Leadership team, Curriculum team etc.) can view student work when they do walk throughs.

Big Idea: Rocks are made of minerals/ Las rocas están hechas de minerales

Massachusetts Science and Technology/Engineering Standards

PS # 1. Differentiate between properties of objects (e.g., size, shape, weight) and properties of materials (e.g., color, texture, hardness).

MCAS item analysis (What do students need to be able to do?)

- ✓ Know the difference between the properties of objects and the properties of materials
- ✓ Be able to name several physical properties of materials

ES # 1. Give a simple explanation of what a mineral is and some examples, e.g., quartz, mica.

MCAS item analysis (What do students need to be able to do?)

- ✓ Know that minerals have a specific crystal structure

Guiding Question: What are the properties a geologist might use to describe rocks?/ ¿Cuáles son las propiedades de un geólogo podría utilizar para describir las rocas?

Vocabulary terms: (use word walls, word rings and/or word splash)

Engage:

- o Start this unit off by asking students what they know about **rocks/ rocas** and **minerals/ minerales** (make a KWL chart). *(elicit prior knowledge)*
  - *Employ vocabulary essential for grade-level content learning. (S.1.5)
  - *Recount prior experiences and events of interest, using familiar sentences. (S.2.9)
  - ***From the Massachusetts English Language Proficiency Benchmarks and Outcomes for English Language Learners (ELPBO)**

- o Tell students that they are going to be **geologist/ geólogo** and that the study of the materials that make up the planet Earth is called geology.
  - *Identify words in English that are frequently used in the student's first language.

(S.1.8)
*Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

Explore:

- Students work collaboratively with peers to make and record **observations/ observaciones** of mock rocks (Investigation #1, part 1: Investigating Mock Rocks, pages 8 to 15, *FOSS Earth Materials Teacher Guide*). They compare the **properties/ propiedades** of mock rocks with those of real rocks. Students chose appropriate measuring tools to determine the **diameter/ de diámetro, circumference/ circunferencia, depth/ profundidad**, and **mass/ masa.** Students record their observations in their *Earth Materials Notebook*.

  Note: Mock rocks should be made 1 week before you do this investigation (see Duplication Master No. 2. in the Teacher Guide)

  *Support a conclusion or finding by stating facts or logical reasons. (S.3.64)

- Students add the following vocabulary terms to their glossaries: **geology, geologist, property, circumference, diameter, depth** and **mass.**

  *Demonstrate comprehension of vocabulary essential for grade-level content learning using pictures, actions and/or objects. (S.1.3)
  *Identify words in English that are frequently used in the student's first language. (S.1.8)

- Read Aloud and discuss: Written in Stone, pages 1 to 4 in *Earth Materials: FOSS Science Stories*. (See pages 2 and 3 in the FOSS Science Stories Section of the Teacher Guide). Students read a letter written by a young girl about her summer vacation with her aunt, who is a geologist. As they read, have students look for information about things that scientists do when they study rocks.

  *Identify main event from story that is heard. (S.3.5)

- Students work with a partner to use a nail as a geologist's pick to take apart a mock rock (Investigation #1, part 2: Taking Rocks Apart, pages 16 to 23, *FOSS Earth Materials Teacher Guide*). Their challenge is to separate and identify as many of the ingredients as they can. Students add the gray material to water and make observations and let them settle overnight. Students record their observations in their *Earth Materials Notebook*.

  *Demonstrate comprehension of explanations or instructions, when clarification is given. (S.2.21)
  *Summarize data gathered through research. (R.6.2)

- Students add the following vocabulary terms to their glossaries: **rock** and **mineral**

  *Identify words in English that are frequently used in the student's first language. (S.1.8)
  *Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

Explain:

- Formative Assessment: Students answer the following question: A student wrote in her journal, "A rock is like a chocolate chip cookie." What do you think she meant when she wrote that sentence? Optional: Students could be provided with a real chocolate chip cookie, which they could eat after answering the question.
  *After writing or dictating a composition, identify words and phrases that could be added to make the thought clearer (W.3.4)

Guiding Question: How can you tell if minerals are dissolved in water?/ ¿Cómo puede usted saber si los minerales se disuelven en el agua?

Engage:

- Demonstration: Add some salt to water to show students how it seems to disappear. Ask students what they think happened to the salt.
  *Employ words, phrases, and sentences in social interactions in everyday topics. (S.2.10)

Explore:

- Students work collaboratively with peers to set up evaporation dishes to determine if any ingredients in their mock rocks **dissolved/ disuelto** in water (Investigation #1, part 3: Observing Crystals, pages 24 to 29, *FOSS Earth Materials Teacher Guide*). Students determine what types of **crystals/ cristales** they have in their evaporation dishes. Students record their observations in their *Earth Materials Notebook*.
  *Organize information to be expressed in writing in a way that makes sense for the purpose and audience. (W.1.3)
  *Summarize data gathered through research. (R.6.2)

- Students compare their results of **evaporation/ evaporación** with others. Have students note any similarities and differences among the groups.
  *Compare and contrast information orally. (S.3.21)

- Students add the following vocabulary terms to their glossaries: **dissolve, crystal,** and **evaporate.**
  *Demonstrate comprehension of vocabulary essential for grade-level content learning using pictures, actions and/or objects. (S.1.3)
  *Clarify meanings of words, using dictionaries, glossaries, and other resources. (S.1.24)

- Read Aloud and discuss: Postcards from the Ledge, pages 5 to 7 in the *Earth Materials: FOSS Science Stories*. (See the Science Stories folio for more information). The postcards take students into the world outside the classroom by introducing them to some geologically important, well known rocks. Find the location of each postcard on a world map.
  *Identify main event from story that is heard. (S.3.5)
  *Demonstrate comprehension of main points of a discussion. (S.3.32)

Extend:

- Start a class rock collection or have a "Rock Concert", a day when students bring in special rocks to share with the class. Ask students to describe the special rocks they brought to class. They should tell where they found them and describe the special properties they observed.

  *Demonstrate comprehension of vocabulary essential for grade-level content learning using pictures, actions and/or objects. (S.1.3)

- Invite a local Geologist to class. Have students develop a list of questions to ask the guest speaker before she or he comes. Contact: Gini Traub, Environmental Education Coordinator for the Massachusetts Department of Conservation and Recreation (DCR), Telephone: (413) 584-6788, E-mail: gini.traub@state.ma.us

Evaluate: (MCAS Released questions)

- The questions may be used as a pre/post test, to help students practice MCAS questions, to help students learn how to answer multiple choice questions and/or open-response questions.

  *Respond to factual and inferential questions that are based on academic content. (S.3.39)

Q. Which of the following is one reason that quartz is classified as a mineral? (ES #1)

A. It can be manufactured.

B. It comes in different colors.

C. It has a specifi c crystal structure.

D. It can be melted at high temperatures.

Q. Which of the following objects is probably the **most** flexible? (PS #1)

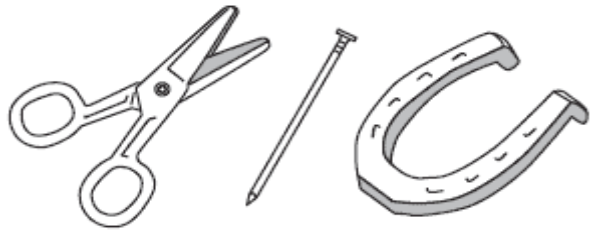
A. a ceramic dish

B. a wooden block

C. a short steel rod

D. a new rubber hose

Q. The picture below shows three metal objects. (PS #1)



Which of the following properties is **most** similar in all three of these objects?

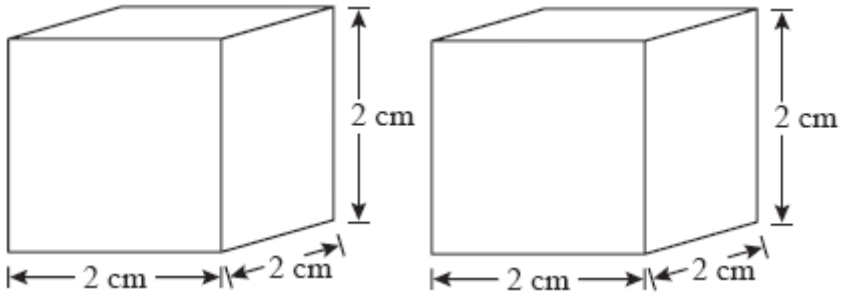
A. hardness

B. shape

C. sharpness

D. weight

Q. Jacob has the two metal cubes pictured below. (PS #1)



One cube is made of aluminum. The other cube is made of steel. Which of the following characteristics will **best** help him distinguish between the two cubes?

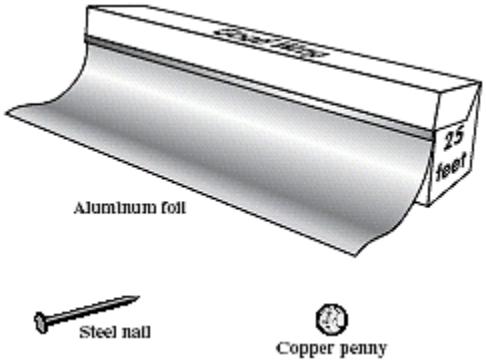
A. shape

B. size

C. texture

D. weight

Q. The picture below shows three objects that can be classified in the same group. (PS #1)



Which of the following statements is true for all three of these objects?

A. They are metals.

B. They rust rapidly.

C. They weigh the same.

D. They are the same color.

Q. Michael has a pencil case made of pine wood. The surface of the pencil case scratches and dents easily. He wants to make a new pencil case that will not scratch or dent easily. (PS #1)

Which of the following should Michael do to make a new pencil case that will **not** scratch or dent easily?

A. make the pencil case a different size

B. use a different material to make the pencil case

C. make the pencil case from another piece of pine wood

D. use a thicker piece of pine wood to make the pencil case

Q. A statue and a table are both made of the same type of marble. Which of the following properties will **most likely** be the same for both of these objects? (PS #1)

A. size

B. shape

C. weight

D. hardness

Q. The picture below shows a group of toys on the floor. (PS #1)

Which property of this set appears to be the same?

A. length

B. pattern

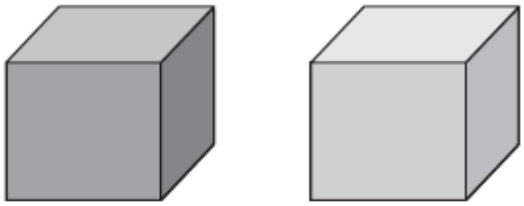
C. shape

D. volume

Open-Response Question This question should be used to help students learn how to answer open-response questions. First, give the question to students and let them answer the question. Next, remove the scores on the samples of student work and give your students the samples of student work with the rubric and have them score the samples. After they score the work and the class discusses the correct scores, have you students go back to their original answers and revise their answers. The goal is for all students to get a perfect score!

*After writing or dictating a composition, identify words and phrases that could be added to make the thought clearer (W.3.4)

Q. The pictures below show two cubes that are the same size. One cube is made of iron metal and the other cube is made of pine wood. (PS #1)



Iron cube Pine cube

The two cubes can be compared by their physical properties. One physical property is color. The iron cube has a gray color and the pine cube has a tan color.

a. Name **two** other physical properties that can be used to compare the cubes.

b. For **each** physical property that you named in part (a), describe how you could measure or test that physical property to compare the cubes.

Scoring Guide and Sample Student Work

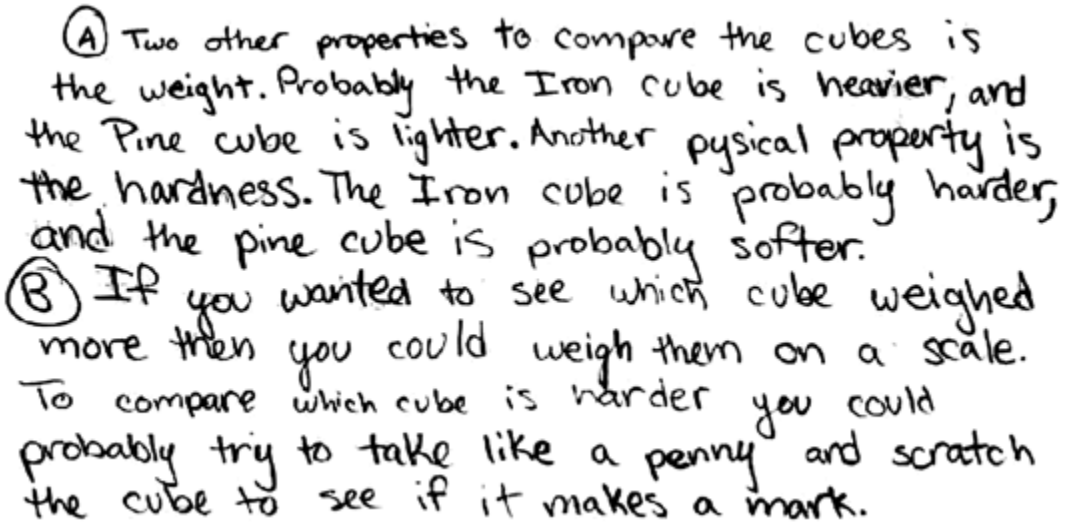
Score	Description
4	The response demonstrates a thorough understanding of the properties of objects and the properties of materials. The response correctly names two physical properties that can be used to compare the cubes and clearly describes how to measure or test each physical property.
4	
3	The response demonstrates a general understanding of the properties of objects and the properties of materials.
2	The response demonstrates a limited understanding of the properties of objects and the properties of materials.
1	The response demonstrates a minimal understanding of the properties of objects and the properties of materials.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Note: There are 2 sample student responses for Score Point 4.

2007 MCAS

Grade 5 Science and Technology/Engineering

Question 37 - Score Point 4



2007 MCAS

Grade 5 Science and Technology/Engineering

Question 37 - Score Point 4

A. Two other physical properties are the weight. It can be used to compare because the iron one would be heavier than the pine. One other physical propertie is it's luster. It can be used to compare them berause the iron cube would be maltelic and the other would be dull.

B. You could measure it in weight by a scale. You would put the iron cube on one side and the pine cube on the other and the heavier one will go down and the pine would go up. To test it's luster you would hold one up to the light and see if it shines or see if it does nothing.

2007 MCAS
Grade 5 Science and Technology/Engineering
Question 37 - Score Point 3

A.) One of the physical Properties is that Iron is heavyer than Pine. The Secend physical Properties is that Iron is more harder than Pine.

B.) I will test the Iron cube by wighting it on a scale and the Pine cube Another way I will test it is be seeing how many Pounds the cubes can hold.

2007 MCAS
Grade 5 Science and Technology/Engineering
Question 37 - Score Point 2

A. The Iron cube is heavy and the pine cube is light weight.

B. You can measure the physical property by using a scale to see the weight of each cube

2007 MCAS

Grade 5 Science and Technology/Engineering

Question 37 - Score Point 1

a) one physical properties is the difference in size. Another physical properties is strenghth.

b) For the difference in size I would measure the two cubes. For the strength I would test them to see with one is heavyer.

2007 MCAS

Grade 5 Science and Technology/Engineering

Question 37 - Score Point 0

(A) 1) Solid, both the iron and the pine cube are solids. 2) Shape bothe the iron and the pine are the same shape.

(B) 1) because, both the cubes take alot of force to deshape. 2) because they look like the same shape.

Big Idea: Minerals can be identified by observing their physical properties/ Los minerales pueden ser identificados mediante la observación de sus propiedades físicas

Massachusetts Science and Technology/Engineering Standards

ES # 2. Identify the physical properties of minerals (hardness, color, luster, cleavage, and streak), and explain how minerals can be tested for these different physical properties.

MCAS item analysis (What do students need to be able to do?)

- ✓ Know how to use the Mohs hardness scale
- ✓ Know how to use data about the properties of minerals to identify minerals
- ✓ Be able to name several physical properties of minerals
- ✓ Know how to test minerals for their physical properties

PS # 1. Differentiate between properties of objects (e.g., size, shape, weight) and properties of materials (e.g., color, texture, hardness).

MCAS item analysis (What do students need to be able to do?)

- ✓ Know the difference between the properties of objects and the properties of materials
- ✓ Be able to name several physical properties of materials

<u>Guiding Questions:</u> What are some of the physical properties of minerals?/ ¿Cuáles son algunas de las propiedades físicas de los minerales? How can minerals be identified using their physical properties?/ ¿Cómo se puede identificar minerales utilizando sus propiedades físicas?

Engage:

- o Review the difference between rocks and minerals. Tell students in the next investigation they will be studying minerals and learning how to use **evidence/ evidencia** to identify minerals.
  *Demonstrate comprehension of main points of a discussion. (S.3.32)

Explore:

- o Students investigate four unknown minerals (Investigation 2: Scratch Test, part 1: Observing Minerals, pages 8 to 13, *FOSS Earth Materials Teacher Guide*). They record observations and find that they need more information to make a confident identification of the minerals. Easily visible **properties/ propiedades** aren't enough. Students record their observations in their *Earth Materials Notebook*.
  *Participate in small group activities, playing a specified role. (S.3.44)
  *Summarize data gathered through research. (R.6.2)

Explain:

- o <u>Formative Assessment</u>: Use Response Sheet No. 15: Scratch Test in *Earth Materials Teacher Guide*, to find out if students understand the relative **hardness/ dureza** of minerals.
  *Select and use words to increase detail in writing. (W.3.3)

Explore:

- Students work collaboratively with peers to use paper clips, pennies, and their fingernails to do the **scratch test/ prueba de la verdad** (Investigation 2: Scratch Test, part 2: Testing for Hardness, pages 15 to 21, *FOSS Earth Materials Teacher Guide*). Students make hardness comparisons, and use this knowledge to identify four minerals by hardness. Students record their observations in their *Earth Materials Notebook*.
  *Participate in reaching consensus in groups. (S.3.38)

- Students add the following vocabulary terms to their glossaries: **hardness/ la dureza** and **scratch test/rasguño prueban**
  *Identify words in English that are frequently used in the student's first language. (S.1.8)

- Read Aloud and discuss: Digging it up: Mining for Minerals pages 12 to 13, and the story Birthstones: A Mineral for each Month, pages 14 to 15, in *FOSS Science Stories: Earth Materials*. Students go home and ask their family and friends when their birthdays are and graph their data (Home School Connections students sheet No. 34).
  *Identify main idea(s) or important information in a literary or an information text. (R.3.1)

Explore:

- Students work collaboratively with peers to investigate what happens to the mineral calcite when it is placed in vinegar, a weak acid (Investigation 3: Calcite Quest, part 1: Detecting Calcite, pages 6 to 13, *FOSS Earth Materials Teacher Guide*). Students place several rock samples in vinegar and look for evidence of calcite as an ingredient. Students record their observations in their *Earth Materials Notebook*.
  *Participate in reaching consensus in groups. (S.3.38)

- Read Aloud and discuss the story called "Old Man and the Rock: A Native American Tale", pages 16 to 19, in *FOSS Science Stories: Earth Materials*. Discuss with students what folktales are and how they compare to factual information. In their science notebooks have students explain why people create folktales.
  *Summarize information from a literary or informational text that is read. (R.3.3)
  *Demonstrate comprehension of main points of a discussion. (S.3.32)

Explain:

- Formative Assessment: Use Response Sheet: Calcite Quest, in *FOSS Earth Materials Teacher Guide,* to find out if students can read the results of an acid test for calcite.
  *Identify and use words and phrases to make ideas clearer or more logical. (W.3.2)
  *Explain the thinking processes used in academic content areas. (S.3.51)

Explore:

- Students work collaboratively with peers to find out if rocks placed in vinegar overnight contain **dissolved/ disuelto** calcite (Investigation 3: Calcite Quest, part 2: Looking for More Evidence, pages 14 to 19, *FOSS Earth Materials Teacher Guide*). Students evaporate the liquid and observe a white needlelike crystal and a powdery white residue in some of the dishes (evidence that calcite is an ingredient). Students record their observations in their *Earth Materials Notebook*.
  *Respond during interpersonal discussions and interactions. (S.2.29)
  *Demonstrate comprehension of oral, multiple-step directions. (S.3.29)

- Read Aloud and discuss the story called "The Two Boys: An Aborigine Story from Australia", pages 20 to 23 in *FOSS Science Stories: Earth Materials*. In their science notebooks have students answer the question: How do folktales explain things?
  *Identify main event from story that is heard. (S.3.5)

- Students read about Earth's Resources: Using Earth's Resources, National Geographic Theme Set (Indonesia's Rain Forests, Greenland's Ocean Region, Australia's Deserts, and Peru's Mountains). Minerals are a natural resource that are found everywhere on Earth. Students learn the difference between **renewable resources/ recursos renovables,** and **non-renewable resources/ no renovables**. Make a class list of ways that people can conserve Earth's resources.
  *Summarize information from a literary or informational text that is read. (R.3.3)

Guiding Question: What is the difference between a rock and a mineral?/ ¿Cuál es la diferencia entre una roca y un mineral?

Explore:

- Students work collaboratively with peers to sort a set of **earth materials/ materiales de la tierra** and find that one is a **rock/ roca** and the rest are **minerals/ minerales**. (Investigation 4: Take it for Granite, part 1: Identifying Minerals in Granite, pages 8 to 13, *FOSS Earth Materials Teacher Guide*). Students record their observations on their Rock and Mineral Identification Sheet.
  *Demonstrate comprehension of oral, multiple-step directions. (S.3.29)

Extend:

- Students gather information about **minerals/ minerales** that are found in the foods they eat by studying food labels, and they learn why we need minerals in our diets. http://www.kidshealth.org/teen/misc/mineral_chart.html
  *Summarize information from a literary or informational text that is read. (R.3.3)

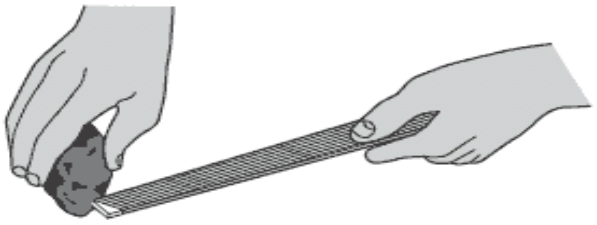
Evaluate: (MCAS Released questions)

- The questions may be used as a pre/post test, to help students practice MCAS questions, to help students learn how to answer multiple choice questions and/or open-response questions.

  *Respond to factual and inferential questions that are based on academic content. (S.3.39)

  *After writing or dictating a composition, identify words and phrases that could be added to make the thought clearer (W.3.4)

Q. The picture below shows a mineral sample being tested with a metal file. (ES #2)



Which property of a mineral is **most likely** tested in this way?

A. color

B. hardness

C. luster

D. streak

Q. Kendra has a mineral that she wants to identify. It is white in color, has a glassy luster, and has a hardness of 5. The table below shows some properties of selected minerals. (ES #2)

Mineral	Color(s)	Luster	Hardness
Calcite	White	Dull or Pearly	3
Fluorite	White, Blue, Green, Violet	Glassy	4
Apatite	White, Green, Brown, Violet	Glassy or Greasy	5
Topaz	Yellow, Red, White, Blue	Glassy	8

Based on the information in the table, Kendra's mineral is **most** similar to

A. calcite.

B. fluorite.

C. apatite.

D. topaz.

Q. A student sorted mineral samples into two groups: dull and shiny. Which of the following properties did the student use to sort the mineral samples into groups? (ES #2)

A. cleavage

B. color

C. luster

D. streak

Q: The Mohs scale for minerals is shown below. (ES #2)

softest → hardest									
1	2	3	4	5	6	7	8	9	10
talc	gypsum	calcite	fluorite	apatite	feldspar	quartz	topaz	corundum	diamond

An unknown mineral can be scratched by topaz, but not by feldspar. According to the Mohs scale, which of the following **best** describes the hardness of the unknown mineral?

A. less than 5

B. more than 8

C. less than 8, but more than 6

D. more than 4, but less than 6

Open-Response Question This question should be used to help students learn how to answer open-response questions. First, give the question to students and let them answer the question. Next, remove the scores on the samples of student work and give your students the samples of student work with the rubric and have them score the samples. After they score the work and the class discusses the correct scores, have you students go back to their original answers and revise their answers. The goal is for all students to get a perfect score!

Q. Elena found a piece of a mineral while on a hike. She wants to identify the mineral she found. (ES #2)

a. Identify **two** physical properties of minerals.
b. Describe how Elena can test the mineral she found for **each** of the physical properties that you identified in part (a).

Scoring Guide and Sample Student Work

Score	Description
4	The response demonstrates a thorough understanding of the physical properties of minerals and how minerals can be tested for different physical properties. The response identifies two physical properties of minerals and clearly describes how to test each property.
4	
3	The response demonstrates a general understanding of the physical properties of minerals and how minerals can be tested for different physical properties.
2	The response demonstrates a limited understanding of the physical properties of minerals and how minerals can be tested for different physical properties.
1	The response demonstrates a minimal understanding of the physical properties of minerals and how minerals can be tested for different physical properties.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Note: There are 2 sample student responses for Score Point 4.

2008 MCAS

Grade 5 Science and Technology/Engineering

Question 19 - Score Point 4

a. Two physical properties of minerals are color and streak.

b. Elena can test the mineral she found for these properties. Color can be tested just by examining the mineral with the naked eye but a magnifying glass can help. To test streak you take a tile and your mineral and rub the mineral across the back of the tile until a streak is left. Most streaks are the same color as the mineral but there are some exceptions to that.

2008 MCAS

Grade 5 Science and Technology/Engineering

Question 19 - Score Point 4

a. Two physid properties of minerals are color and luster.

b. To test for color, she could look under a magnifying glass. To check for luster, she could look under a magnifying glass to see if the mineral she found is metalic, nonmitalic, shines like metal, or not.

2008 MCAS

Grade 5 Science and Technology/Engineering

Question 19 - Score Point 3

(a) She can test a mineral's hardness and it's luster.

(b) To test it's hardness she can use Moh's hardness scale to see how hard it is then look it up. to test it's luster she can see if it's a dull color a brilliant color a metalic color excedera.

2008 MCAS

Grade 5 Science and Technology/Engineering

Question 19 - Score Point 2

A. Two physical properties of minerals are how hard it is and how heavy it is.

B. She could test how hard it is by doing the scratch test. The scratch test is when you use two minerals and see if one scratches. She could test how heavy it is by putting it onto a scale.

2008 MCAS

Grade 5 Science and Technology/Engineering

Question 19 - Score Point 1

(a) hardness and Luster

(b) hardness - you take a tile and flip it over and strach it agianst the back of the tile.

Luster-how Dark it is.

2008 MCAS

Grade 5 Science and Technology/Engineering

Question 19 - Score Point 0

A. a mineral has to be a type of rock. Also it has to come from the earth.

B To test it she can see if the mineral was in the ground when she found it. Another way is she can just look it up on the internet

Big Idea: Rocks are categorized by how they are formed/ Las rocas se clasifican por la forma en que se forman

Massachusetts Science and Technology/Engineering Standards
ES # 3. Identify the three categories of rocks (metamorphic, igneous, and sedimentary) based on how they are formed, and explain the natural and physical processes that create these rocks.

MCAS item analysis (What do students need to be able to do?)

- ✓ Recognize different types of rocks as being metamorphic, igneous, or sedimentary
- ✓ Know the different ways that rocks can be formed
- ✓ Recognize the characteristics of different types of rocks
- ✓ Know the rock cycle

Guiding Question: How are rocks formed?/ ¿Cómo se formaron las rocas?

Engage:

- Students discover how rocks are formed. Students view animations (on website) that show them how the three different kinds of rocks are formed. Students write a brief summary (they should be encouraged to use drawings with labels) about how rocks are formed in their notebooks. Teachers should have access to computers and or a "Smartboard" to use the following link with students. http://www.fi.edu/fellows/payton/rocks/create/index.html
  *Participate in limited discussion using appropriate words and phrases. (S.1.18)

- Students work collaboratively with peers to compare and contrast the three different types of rocks and report out orally.
  *Classify previously learned academic content words and phrases into concept-based categories. (S.1.17)

- Display the following four sets of words: **shiny/dull; hard/soft; rough/smooth; big/little**. Discuss the meaning of each word by showing examples of each and allowing students to feel and see examples. Explain that rocks can be classified by how they look and feel. (see appendix for Types of Rocks and Rock Description Cards)
  *Demonstrate comprehension of oral, multiple-step directions. (S.3.29)

- Students work collaboratively with peers to fill out the Rock Worksheet (see appendix and/or link for worksheet). Students explain how each rock type is formed and give examples of each rock type. Teachers should have access to computers and or a "Smartboard" to use the following link with students. http://www.mcsdk12.org/curr/WebQuests/Rocks/rockswebquest.htm
  *Demonstrate comprehension of vocabulary essential for grade-level content learning using pictures, actions and/or objects. (S.1.3)

- Students go to the following websites to learn about the rock cycle. Teachers should have access to computers and or a "Smartboard" to use the following link

with students. Students make a diagram of the rock cycle, label their diagram, and briefly summarize information.
http://www.minsocam.org/MSA/K12/rkcycle/rkcycleindex.html
http://www.cotf.edu/ete/modules/msese/earthsysflr/rock.html

- Students identify the type of rock in each part of the Rock Cycle (see Rock Cycle sheet in the appendix)
  *Demonstrate comprehension of oral, multiple-step directions. (S.3.29)

- Students make a Rock Cycle Wheel (see appendix). This model depicts how rocks form from other rocks.

Extend:

- Students work collaboratively with peers using available books and the internet to create a list of some of the common uses of different kinds of rocks. Teachers should have access to computers and or a "Smartboard" to use the following link with students. Students record this information in their science notebooks. Compile a class chart about rock uses. http://www.rocksforkids.com/RFK/uses.html
  *Respond during interpersonal discussions and interactions. (S.2.29)

- Students learn the lyrics to the "Rock Cycle Song."
  (Sing to the tune of "Row, Row, Row Your Boat")

SEDIMENTARY rock
Has been formed in layers
Often found near water sources
With fossils from decayers

Then there's IGNEOUS rock
Here since Earth was born
Molten Lava, cooled and hardened
That's how it is formed

These two types of rocks
Can also be transformed
With pressure, heat and chemicals
METAMORPHIC they'll become.

Evaluate: (MCAS Released questions)

- The questions may be used as a pre/post test, to help students practice MCAS questions, to help students learn how to answer multiple choice questions and/or open-response questions.
  - *Respond to factual and inferential questions that are based on academic content. (S.3.39)
  - *After writing or dictating a composition, identify words and phrases that could be added to make the thought clearer (W.3.4)

Q. Gavin has two rocks. Both rocks are made up entirely of the same mineral. What other property of his two rocks is **most likely** to be the same? (ES #3)

A. size

B. shape

C. color

D. weight

Q. Ricardo has an igneous rock in his rock collection. Where did this rock **most likely** form? (ES #3)

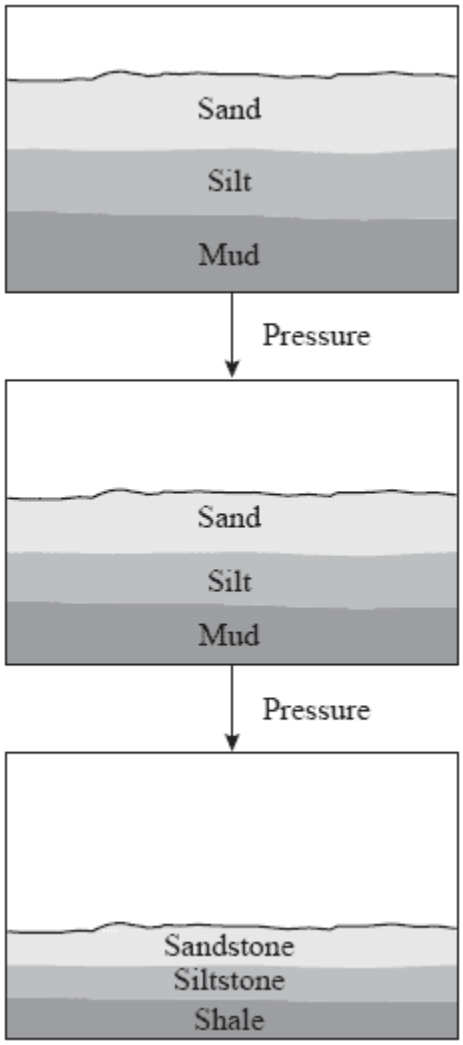
A. in a volcano

B. on a forest floor

C. on a coral reef

D. at the bottom of a river

Q. The diagram below shows how a type of rock is formed over time. (ES #3)



This diagram represents the formation of which of the following types of rock?

A. igneous

B. metamorphic

C. sedimentary

D. volcanic

Q. When a volcano erupts, lava flows out from the top. What type of rock is formed as the lava cools? (ES #3)

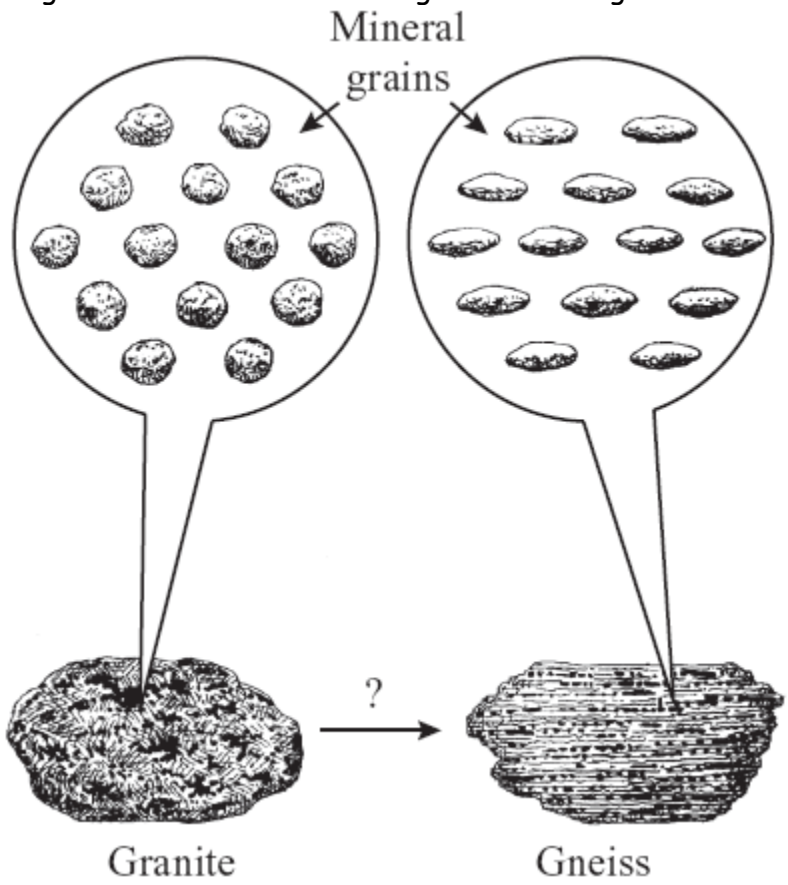
A. magma

B. igneous

C. sedimentary

D. metamorphic

Q. Various processes are involved in the formation of different types of rocks. The diagram below illustrates changes in rock as granite forms gneiss. (ES #3)



In addition to heat, which of the following changes granite to gneiss?

A. acid

B. erosion

C. pressure

D. water

Q. Which type of rock is formed when hot lava cools? (ES #3)

A. coal

B. igneous

C. limestone

D. metamorphic

Q. Dora wrote down some observations of four rock samples she was studying. Based on her observations, which of the following rock samples is **most likely** a sedimentary rock? (ES #3)

A.

has large crystal shape that is almost clear, has smooth sides

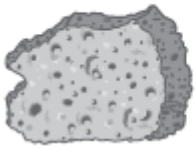
B.

has many very small grains of sand in different layers

C.

has solid black color, looks like smooth glass with sharp edges

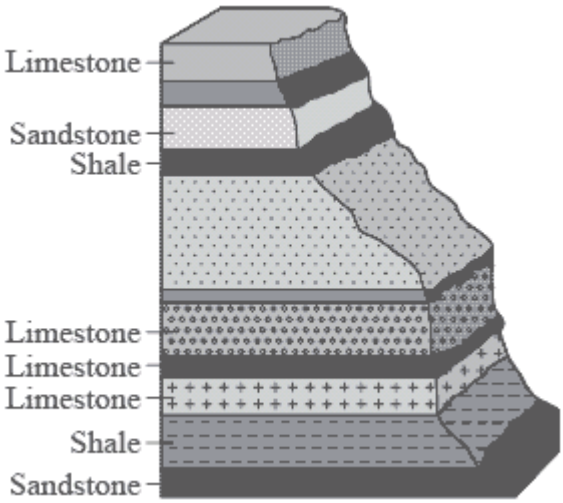
D.



has rough surface full of holes and is light in weight

Q. The diagram below shows some of the layers of rocks found in the Grand Canyon. Scientists find these layers of rock useful for studying fossils. (ES #3)

Grand Canyon Rock Layers



What type of rock is shown labeled in these layers?

A. extrusive

B. igneous

C. metamorphic

D. sedimentary

Big Idea: The Earth's surface is constantly changing/ La superficie de la Tierra está en constante cambio

Massachusetts Science and Technology/Engineering Standards
ES # 12. Give examples of how the earth changes due to slow processes such as erosion and weathering, and rapid processes such as landslides, volcanic eruptions, and earthquakes.

MCAS item analysis (What do students need to be able to do?)

- ✓ Recognize processes that cause the Earth's surface to change rapidly
- ✓ Recognize processes that cause the Earth's surface to change slowly
- ✓ Be able to describe how volcanic activity can change the landscape both rapidly and slowly

Guiding Question: What forces of nature cause the Earth's surface to change?/ ¿Qué fuerzas de la naturaleza causa la superficie de la Tierra cambie?

Engage & Explore:

- o Activate Prior Knowledge. Ask students: What is the Earth's surface? What are some different parts of Earth's surface? How do you think these things change or stay the same. With the class make a 2-column chart about Earth's surface, see page 34 in the Shaping Earth's Surface Teacher's Guide, National Geographic Theme Set (Wind, Water, Ice, and Earthquakes and Volcanoes).
  *Respond during interpersonal discussions and interactions. (S.2.29)

- o Introduce key vocabulary words that may be difficult: **effects/ efectos, forces/ fuerzas,** and **landforms/ accidentes geográficos**. See page 35 in Shaping Earth's Surface Teacher's Guide, National Geographic Theme Set.
  *Identify words in English that are frequently used in the student's first language. (S.1.8)

- o Students read about how the Earth's Surface is changing: Shaping Earth's Surface, National Geographic Theme Set (Wind, Water, Ice, and Earthquakes and Volcanoes). Students learn about the forces that change the Earth's surface. Discuss the following questions: *What force of nature did you read about? What are the big ideas in the article? How do these changes to Earth's surface occur? What are some of the effects this type of change has on people's lives?*
  *Identify and apply strategies to enhance comprehension of texts. (R.3.6)

Explain:

- o Students write a short story about how rocks change over time.
  *After writing or dictating a composition, identify words and phrases that could be added to make the thought clearer (W.3.4)

Evaluate: (MCAS Released questions)

- The questions may be used as a pre/post test, to help students practice MCAS questions, to help students learn how to answer multiple choice questions and/or open-response questions.

  *Respond to factual and inferential questions that are based on academic content. (S.3.39)

Q. The picture below shows an island that was formed in an ocean. (ES #12)

Which of the following **most likely** caused the formation of this island?

A. wave erosion

B. sand deposits

C. wind movement

D. volcanic eruptions

Q. All of the processes listed below cause changes in Earth's surface. Which of the following is the slowest to change Earth's surface? (ES #12)

A. earthquake activity

B. landslide

C. volcanic eruption

D. Weathering

Q. The picture below shows the result of a geological event that changed a mountain rapidly. (ES #12)

Which of the following **most likely** caused the rapid change of the mountain?

A. landslide

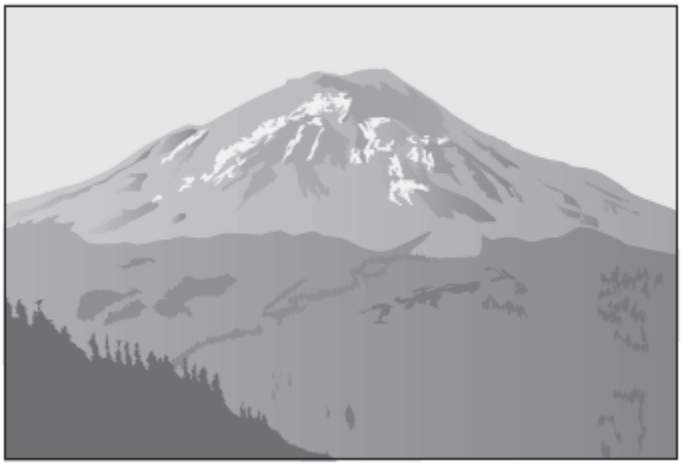
B. snowfall

C. wind erosion

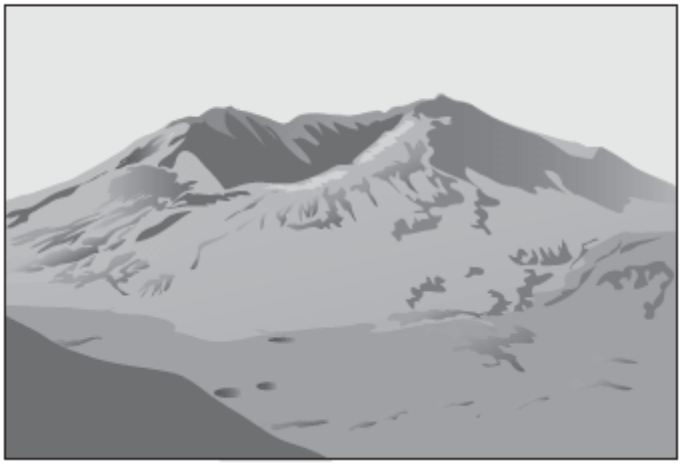
D. volcanic eruption

Q. The pictures below show the same area before and after an event occurred. (ES #12)

Before Event



After Event



Which of the following events **most likely** caused the change in this area?

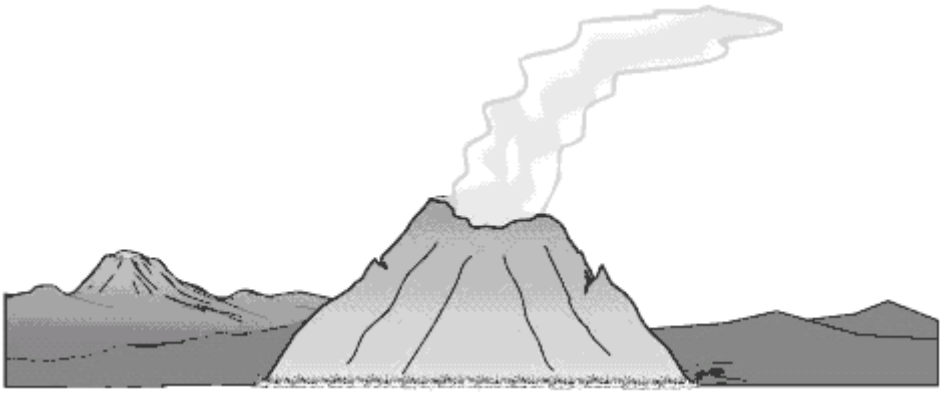
A. a flood

B. a hurricane

C. a volcanic eruption

D. a strong earthquake

Q. The picture below shows an erupting volcano. (ES #12)



Volcanoes sometimes erupt violently for days or weeks. At other times, volcanoes can be quiet, with only a small amount of activity coming from their cores.

a. Describe how volcanoes can change the landscape rapidly. In your description, be sure to include which parts of the landscape change and what materials are involved.
b. Describe how the landscape around the volcano can change over many years. In your description, be sure to include what parts of the landscape are changed and what materials are involved.

Scoring Guide and Sample Student Work

Score	Description
4	The response demonstrates a thorough understanding of both rapid and slow changes to the landscape from volcanic activity. The response clearly describes how a volcano can change the landscape rapidly and how the landscape around the volcano can change over many years, including what parts of the landscape change and what materials are involved.
3	The response demonstrates a general understanding of both rapid and slow changes to the landscape from volcanic activity.
2	The response demonstrates a limited understanding of both rapid and slow changes to the landscape from volcanic activity.
1	The response demonstrates a minimal understanding of both rapid and slow changes to the landscape from volcanic activity.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

2006 MCAS

Grade 5 Science and Technology/Engineering

Question 19 - Score Point 4

a. Volcanos can change the landscape rapidly in many ways. One way it can change the land scape is by distributing hot steamy lava on the land. The lava can harden very quickly and forms pumice. This can give the land a different shape around the volcano. Another way that a volcano can change a landscape rapidly is to wipe out whole cities and towns. Many volcanos have destroyed cities by despencing hot ash and lava and making some places unpopulated. The air in a landscape can be changed by putting harmful ash and gas in the air.

b A volcano can change a landscape over many years by building up the igneous rock around it. By doing this it can make the volcano larger in size and even create new landforms. Over time minerals such as dimands can be found near a volcano.

2006 MCAS

Grade 5 Science and Technology/Engineering

Question 19 - Score Point 3

A) Volcanos can be dangeroise, but also helpful. Volcanos erupt and the lava makes rocks when it is cooled. The lava also can make land biger when it goes out to the eda of the water it can cool and add to the land. The land around will be black from the lava. Trees can be knocked or burned down or covered over with lava.

B) Over a long time whole lands can form or be made bigger. the area will be black and hot. If the volcano stays erupted for a long time it will be hot, smoky, and dangerouse, Towns and villeges can be desroyed by volcanos.

2006 MCAS

Grade 5 Science and Technology/Engineering

Question 19 - Score Point 2

A. When volcanos erupt near sea or on and island the lava or magma speads to the sea and forms more land and expands the island making the island bigger.

B. The landscape around the volcano expands and makes the land bigger.

2006 MCAS

Grade 5 Science and Technology/Engineering

Question 19 - Score Point 1

(A.) It could change the other volcanoes by having the lava explode then reaching the other Volcanos, It could be destroy the land because when it explodes it could melt all the resources around it.

(B.) The land Scape could Change by being melted and the land having no grass. Magma rocks could have formed and be all rocky. It could have ditches in the ground.

2006 MCAS

Grade 5 Science and Technology/Engineering

Question 19 - Score Point 0

I think that vocano change Because inside the vocano the water can drope outside and it can change

Q. The surface of Earth is always changing. Some natural processes change Earth's surface slowly over time and others change Earth's surface very quickly. The picture below shows an area of Earth's surface that was shaped by natural processes. (ES #12)

Name and describe **three** natural processes that might have helped to shape this area.

Scoring Guide and Sample Student Work

Score	Description
4	The response demonstrates a thorough understanding of how the surface of Earth changes due to slow and rapid natural processes. The response correctly names and clearly describes three natural processes that might have helped to shape the area.
4	
3	The response demonstrates a general understanding of how the surface of Earth changes due to slow and rapid natural processes.
2	The response demonstrates a limited understanding of how the surface of Earth changes due to slow and rapid natural processes.
1	The response demonstrates a minimal understanding of how the surface of Earth changes due to slow and rapid natural processes.
0	The response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Note: There are 2 sample student responses for Score Point 4.

2007 MCAS
Grade 5 Science and Technology/Engineering
Question 18 - Score Point 4

1): One process that might have changed the area is The shifting tectonic plates coming together and jutting upward to form the mountain range.

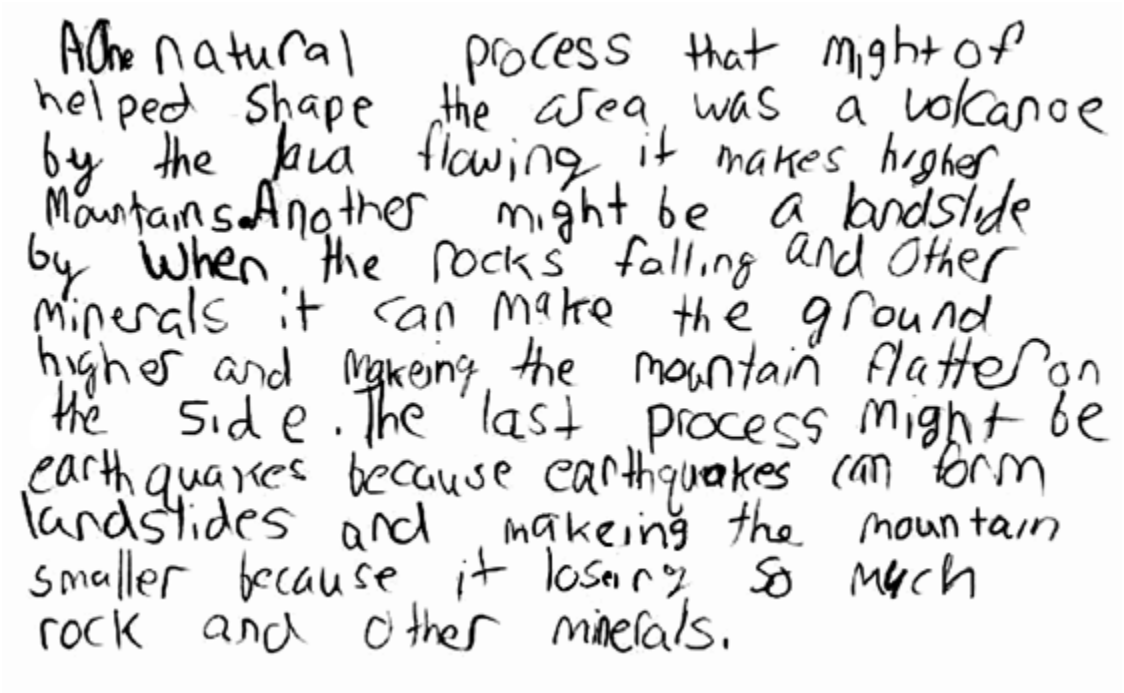
2): Another process could be the wind slowly, over a billion years chipping away at the mountains, and maybe someday causing a landslide.

3): A third process could have been a river long ago cutting a riverbed and someday creating the valley I see.

2007 MCAS

Grade 5 Science and Technology/Engineering

Question 18 - Score Point 4


A The natural process that might of helped Shape the area was a volcanoe by the lava flowing it makes higher Mountains. Another might be a landslide by when the rocks falling and other minerals it can make the ground higher and makeing the mountain flatter on the side. The last process might be earthquakes because earthquakes can form landslides and makeing the mountain smaller because it loseing so much rock and other minerals.

2007 MCAS

Grade 5 Science and Technology/Engineering

Question 18 - Score Point 3

Three Natural process that could have helped to Shaper the Area could have been is a landslide, a earthquake activity, and Weathering that could be thiee Natural process that could have Changed the Area of this surface. The earthquake could have changed it by taking rocks down and putting it in another place. The landslide is going to move stuff from place to place. The Weathering would smooth the land so it would Kind of be smooth.

2007 MCAS

Grade 5 Science and Technology/Engineering

Question 18 - Score Point 2

The wind blows the sand to create mountians. The rain forms the streams The ice melts and carries rocks to the bottom of the mountian.

2007 MCAS

Grade 5 Science and Technology/Engineering

Question 18 - Score Point 1

A glacier might have passed through the area also weathering and erosion might have made this valley

2007 MCAS

Grade 5 Science and Technology/Engineering

Question 18 - Score Point 0

1. Lever
2. mineral
3. color

thoes are 3 natural process that might have helped to shape this area.

Books about Rocks and Minerals

Baylor, Byrd. (1985). *Everybody Needs a Rock.*

Berger, Melvin. (2000). *Why Do Volcanoes Blow Their Tops?: Questions and Answers about Volcanoes and Earthquakes.*

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