**Shelby County Schools Science Vision**

Shelby County Schools' vision of science education is to ensure that from early childhood to the end of the 12th grade, all students have heightened curiosity and an increased wonder of science; possess sufficient knowledge of science and engineering to engage in discussions; are able to learn and apply scientific and technological information in their everyday lives; and have the skills such as critical thinking, problem solving, and communication to enter careers of their choice, while having access to connections to science, engineering, and technology.

To achieve this, Shelby County Schools has employed The Tennessee Academic Standards for Science to craft meaningful curricula that is innovative and provide a myriad of learning opportunities that extend beyond mastery of basic scientific principles.

**Introduction**

In 2014, the Shelby County Schools Board of Education adopted a set of ambitious, yet attainable goals for school and student performance. The District is committed to these goals, as further described in our strategic plan, Destination 2025. In order to achieve these ambitious goals, we must collectively work to provide our students with high quality standards aligned instruction. The Tennessee Academic Standards for Science provide a common set of expectations for what students will know and be able to do at the end of each grade, can be located in the Tennessee Science Standards Reference. Tennessee Academic Standards for Science are rooted in the knowledge and skills that students need to succeed in post-secondary study or careers. While the academic standards establish desired learning outcomes, the curricula provide instructional planning designed to help students reach these outcomes. The curriculum maps contain components to ensure that instruction focuses students toward college and career readiness. Educators will use this guide and the standards as a roadmap for curriculum and instruction. The sequence of learning is strategically positioned so that necessary foundational skills are spiraled in order to facilitate student mastery of the standards.

Our collective goal is to ensure our students graduate ready for college and career. Being College and Career Ready entails, many aspects of teaching and learning. We want our students to apply their scientific learning in the classroom and beyond. These valuable experiences include students being facilitators of their own learning through problem solving and thinking critically. The Science and Engineering Practices are valuable tools used by students to engage in understanding how scientific knowledge develops. These practices rest on important "processes and proficiencies" with longstanding importance in science education. The science maps contain components to ensure that instruction focuses students toward understanding how science and engineering can contribute to meeting many of the major challenges that confront society today. The maps are centered around five basic components: the Tennessee Academic Standards for Science, Science and Engineering Practices, Disciplinary Core Ideas, Crosscutting Concepts, and Phenomena.

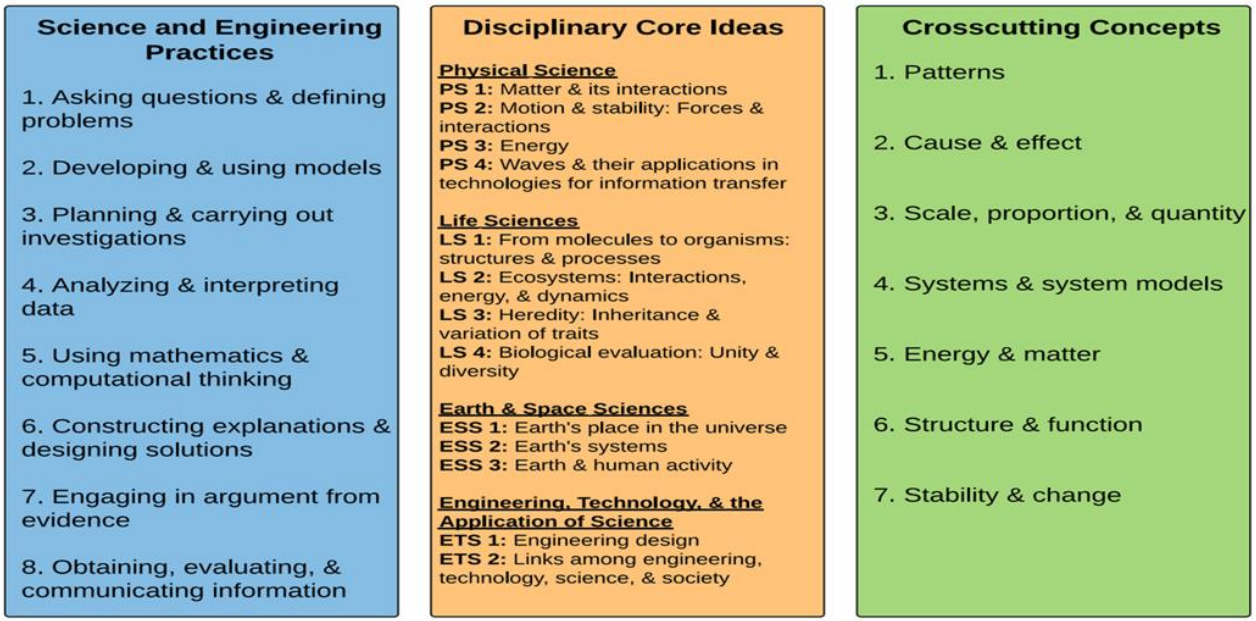
*The Tennessee Academic Standards for Science were developed using the National Research Council's 2012 publication, A Framework for K-12 Science Education as their foundation. The framework presents a new model for science instruction that is a stark contrast to what has come to be the norm in science classrooms. Thinking about science had become memorizing concepts and solving mathematical formulae. Practicing science had become prescribed lab situations with predetermined outcomes. The framework proposes a three-dimensional approach to science education that capitalizes on a child's natural curiosity. The Science Framework for K-12 Science Education* provides the blueprint for developing the effective science practices. The *Framework* expresses a vision in science education that requires students to operate at the nexus of three dimensions of learning: Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas. The *Framework* identified a small number of disciplinary core ideas that all students should learn with increasing depth and sophistication, from Kindergarten through grade twelve. Key to the vision expressed in the *Framework* is for students to learn these disciplinary core ideas in the context of science and engineering practices. The importance of combining Science and Engineering Practices, Crosscutting Concepts and Disciplinary Core Ideas is stated in the *Framework* as follows:

*Standards and performance expectations that are aligned to the framework must take into account that students cannot fully understand scientific and engineering ideas without engaging in the practices of inquiry and the discourses by which such ideas are developed and refined. At the same time, they cannot learn or show competence in practices except in the context of specific content. (NRC Framework, 2012, p. 218)*

To develop the skills and dispositions to use scientific and engineering practices needed to further their learning and to solve problems, students need to experience instruction in which they use multiple practices in developing a particular core idea and apply each practice in the context of multiple core ideas. We use the term "practices" instead of a term such as "skills" to emphasize that engaging in scientific investigation requires not only skill but also knowledge that is specific to each practice. Students in grades K-12 should engage in all eight practices over each grade band**.** Crosscutting concepts have application across all domains of science. As such, they are a way of linking the different domains of science. Crosscutting concepts have value because they provide students with connections and intellectual tools that are related across the differing areas of disciplinary content and can enrich their application of practices and their understanding of core ideas. There are seven crosscutting concepts that bridge disciplinary boundaries, uniting core ideas throughout the fields of science and engineering. Their purpose is to help students deepen their understanding of the disciplinary core ideas and develop a coherent and scientifically based view of the world.

The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice. In fact, our goal is not to merely "cover the curriculum," but rather to "uncover" it by developing students' deep understanding of the content and mastery of the standards. Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery. Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other

support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices. However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable. We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.




**Learning Progression**

At the end of the elementary science experience, students can observe and measure phenomena using appropriate tools. They are able to organize objects and ideas into broad concepts first by single properties and later by multiple properties. They can create and interpret graphs and models that explain phenomena. Students can keep notebooks to

record sequential observations and identify simple patterns. They are able to design and conduct investigations, analyze results, and communicate the results to others. Students will carry their curiosity, interest and enjoyment of the scientific world view, scientific inquiry, and the scientific enterprise into middle school.

At the end of the middle school science experience, students can discover relationships by making observations and by the systematic gathering of data. They can identify relevant evidence and valid arguments. Their focus has shifted from the general to the specific and from the simple to the complex. They use scientific information to make wise decision related to conservation of the natural world. They recognize that there are both negative and positive implications to new technologies.

As an SCS graduate, former students should be literate in science, understand key science ideas, aware that science and technology are interdependent human enterprises with strengths and limitations, familiar with the natural world and recognizes both its diversity and unity, and able to apply scientific knowledge and ways of thinking for individual and social purposes.

**Structure of the Standards**

- Grade Level/Course Overview: An overview that describes that specific content and themes for each grade level or high school course.
- Disciplinary Core Idea: Scientific and foundational ideas that permeate all grades and connect common themes that bridge scientific disciplines.
- Standard: Statements of what students can do to demonstrate knowledge of the conceptual understanding. Each performance indicator includes a specific science and engineering practice paired with the content knowledge and skills that students should demonstrate to meet the grade level or high school course standards.


**Purpose of Science Curriculum Maps**

This map is a guide to help teachers and their support providers (e.g., coaches, leaders) on their path to effective, college and career ready (CCR) aligned instruction and our pursuit of Destination 2025. It is a resource for organizing instruction around the Tennessee Academic Standards for Science, which define what to teach and what students need to learn at each grade level. The map is designed to reinforce the grade/course-specific standards and content (scope) and provides *suggested* sequencing, pacing, time frames, and aligned resources. Our hope is that by curating and organizing a variety of standards-aligned resources, teachers will be able to spend less time wondering what to teach and searching for quality materials (though they may both select from and/or supplement those included here) and have more time to plan, teach, assess, and reflect with colleagues to continuously improve practice and best meet the needs of their students.

The map is meant to support effective planning and instruction to rigorous standards. It is *not* meant to replace teacher planning, prescribe pacing or instructional practice. In fact, our goal is not to merely "cover the curriculum," but rather to "uncover" it by developing students' deep understanding of the content and mastery of the standards. Teachers who are knowledgeable about and intentionally align the learning target (standards and objectives), topic, text(s), task, and needs (and assessment) of the learners are best-positioned to make decisions about how to support student learning toward such mastery. Teachers are therefore expected--with the support of their colleagues, coaches, leaders, and other support providers--to exercise their professional judgment aligned to our shared vision of effective instruction, the Teacher Effectiveness Measure (TEM) and related best practices. However, while the framework allows for flexibility and encourages each teacher/teacher team to make it their own, our expectations for student learning are non-negotiable. We must ensure all of our children have access to rigor—high-quality teaching and learning to grade level specific standards, including purposeful support of literacy and language learning across the content areas.

| 4th Grade Quarter 3 Curriculum Map<br>Quarter 3 Curriculum Map Feedback | | | | | | |
|---|---|---|---|---|---|---|
| Quarter 1 | | Quarter 2 | | **Quarter 3** | | Quarter 4 |
| Structure and Routine | Unit 1<br>Interactions of Living Things | Unit 2<br>Energy | Unit 3<br>Wave Patterns and Information Transfer | **Unit 4<br>Earth and Its Resources** | Unit 5<br>Earth and Its Changing Features | Unit 6<br>The Sun and Earth |
| 1 week | 9 weeks | 4.5 weeks | 4.5 weeks | **3 weeks** | 6 weeks | 9 weeks |

**UNIT 4: Earth and Its Resources (3 weeks)**

**Overarching Question(s)**

How do Earth's surface processes and human activities affect each other? How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms? How does biodiversity affect humans?

| Unit 4: Lesson 1 | Lesson Length | Essential Question | Vocabulary |
|---|---|---|---|
| Natural Resources | 1.5 weeks | What are natural resources? | natural resource, nonrenewable resource, fossil fuel, pollution, mineral resource, conservation, renewable resource, alternative energy source |

| Standards and Related Background Information | Instructional Focus | Instructional Resources |
|---|---|---|
| **DCI(s)**<br>4.ESS3 Earth and Human Activity<br>4.LS4 Biological Change: Unity and Diversity<br><br>**Standard(s)**<br>4.ESS3.1: Obtain and combine information to describe that energy and fuels are derived from natural resources and that some energy and fuel sources are renewable (sunlight, wind, water) and some are not (fossil fuels, minerals). | **Learning Outcomes**<br>Students will use print and digital resources to describe how energy and fuels are derived from natural resources.<br><br>**Suggested Phenomena**<br>*Click on the phenomenon picture to view the video.* | **Curricular Resources**<br>Engage<br>Inspire Science TE, p. 125-126<br>TE, p. 125: Phenomenon,<br>Be a Scientist Notebook (Phenomenon): p. 129<br>TE, Essential Question: p. 126<br>TE, Science and Engineering Practices: p. 126<br><br>Explore<br>TE, pp. 127-128<br>*(LAB)* Be a Scientist Notebook, p. 131, Inquiry Activity: Limited Resources |

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| 4.LS4.1: Obtain information about what a fossil is and ways a fossil can provide information about the past.<br><br>**Explanation and Support of Standard**<br>4.ESS3.1:<br>All of the energy and fuel that we use are derived from natural resources, not just the food that we eat. There are processes we use to obtain the materials (fuels and materials) we need from environment. In later grades, these ideas will be used to explain why human populations have settled into the regions where they live now. Before that explanation can be offered, students must understand that we depend on these natural resources for all parts of life.<br><br>These discussions do not need to involve detailed descriptions of the processes, but should focus on the general consequences of obtaining the different types of energy. (e.g., fossil fuels are extracted from deposits below Earth's surface.) The extraction processes used to obtain resources from the earth have effects on the earth. Students should develop an understanding of what differentiates the listed renewable and nonrenewable resources.<br><br>*(A full discussion relating the time to renew resources to human lifetimes will occur in 6.ESS3.1)*<br><br>4.LS4.1 |  <br><br>Phenomenon Explanation:<br>Oil refinery or petroleum refinery is an industrial process plant where crude oil is transformed and refined into more useful products such as petroleum naphtha, gasoline, diesel fuel, asphalt base, heating oil, kerosene, liquefied petroleum gas, jet fuel and fuel oils. | <u>Explain</u><br>TE, pp. 128-136<br>Be A Scientist Notebook, p. 133: Vocabulary<br>Video: Using Nonrenewable Resources<br>Science Handbook/eBook: Nonrenewable Resources<br>Science Handbook/eBook: Mineral Resources<br>Science Handbook/eBook: Conservation<br>Science Handbook/eBook: Renewable Resources and Alternative Energy Sources<br>Digital Interactive: Renewable Hydroelectric and Geothermal Energy<br>*(LAB)* Be a Scientist Notebook, p. 137, Inquiry Activity: Renewable Resources<br><br><u>Elaborate</u><br>TE, pp. 137-139<br>*(LAB)* Be a Scientist Notebook, p. 139, Inquiry Activity/Simulation: Energy Supply<br><br><u>Evaluate</u><br>TE, pp. 139-141<br>*(LAB)* Be A Scientist Notebook, p. 141, Performance Task:<br>Energy Usage Investigation<br>eAssessment<br><br>**Additional Resources**<br>Lesson: <u>Renewable and Nonrenewable Resources</u><br>Lesson: <u>Mining for Ore</u> |

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| Fossils result from processes that occur naturally on Earth, such as the depositing of sediment after an organism dies. In rare instances, fossils may include preserved organisms. More commonly, water passing through the sediment can deposit minerals in the spaces in within bones. This process is somewhat analogous to the scale that builds up on a faucet or shower. Many shell fossils form when the original organism shell decays over very long periods of time, leaving a void to be filled by other materials. Still others may be preserved in resinous materials.<br><br>Fossils allow us to see the types of organisms that live long ago. Within these records we see that many organisms that have lived on Earth in the past are no longer present on Earth. However, we do see that some organisms that we find on Earth do resemble these now extinct organisms.<br><br>Fossils used for examination can include both visible and microscopic.<br><br>**Suggested Science and Engineering Practice(s)**<br>Obtaining, Evaluating, and Communicating Information<br><br>**Suggested Crosscutting Concept(s)**<br>Cause and Effect<br><br>**Teacher Overview** | | Lesson: End Mining Now!<br>Video: Renewable and Nonrenewable Energy<br>Video: Natural Resources of Earth<br><br>**ESL Supports and Scaffolds**<br><br>WIDA Standard 4<br>To support students in speaking refer to this resource:<br>WIDA Doing and Talking Science<br>When applicable- use Home Language do build vocabulary in concepts. Spanish Cognates<br>Interactive Science Dictionary with visuals<br><br>The Language of Science<br>Pre-teach: break down; weathering; derive<br><br>Allow beginning level students to sort pictures of examples of renewable and non-renewable resources<br>Provide sentence frames and word banks to support Els in creating sentences how energy and fuels are derived from natural resources.<br>Energy is derived from_____by_____<br>Weathering causes_____.<br>I noticed that weathering occurred because…..<br><br>Mechanical weathering video<br>Britannica Kids for visuals and online definitions |

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| Fossil fuels, such as oil, coal, and natural gas, are natural resources. However, they are nonrenewable, which means that they cannot be replaced once used. The energy in fossil fuels comes from plants and animals that were alive millions of years ago. The plants captured the Sun's energy during photosynthesis and stored the energy as organic carbon. Animals ate some of these plants and stored the energy from the plants in their bodies. When the organisms died, their remains were buried and, over time, heat and pressure changed them into fossil fuels. When a fossil fuel is burned, it releases stored energy, which people can use for different types of power. Most of the electricity in the United States is generated by burning coal, a fossil fuel.<br><br>**Misconceptions**<br>Many students believe that fossil fuels have been around since the origins of Earth, independent of organic life or photosynthesis. Remind them that most fossil fuels are from ancient plant material. The process of creating fossil fuels takes millions of years. Some students may believe that fossil fuels form only from plant and animal remains deep in the ocean. Coal formed mostly from swamp plants. Petroleum and natural gas formed from organisms deposited in shallow seas. Many students may think that renewable energy sources are always available. Wind and solar energy depend on environmental factors. Some students may believe that renewable energy | | |

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| can completely replace fossil fuels, which is not true with current technology. | | |

| 4th Grade Quarter 3 Curriculum Map<br>Quarter 3 Curriculum Map Feedback | | | | | | |
|---|---|---|---|---|---|---|
| Quarter 1 | | Quarter 2 | | **Quarter 3** | | Quarter 4 |
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| 1 week | 8 weeks | 4.5 weeks | 4.5 weeks | **3 weeks** | 6 weeks | 9 weeks |

**UNIT 4: Earth and Its Resources (3 weeks)**

**Overarching Question(s)**

How do Earth's surface processes and human activities affect each other? How can there be so many similarities among organisms yet so many different kinds of plants, animals, and microorganisms? How does biodiversity affect humans?

| Unit 4: Lesson 2 | Lesson Length | Essential Question | Vocabulary |
|---|---|---|---|
| Resources from the Past | 1.5 weeks | What are fossils and what can we learn from them? | fossil, amber, imprint, mold, cast |

| Standards and Related Background Information | Instructional Focus | Instructional Resources |
|---|---|---|
| **DCI(s)**<br>4.LS4 Evidence of Common Ancestry and Diversity<br><br>**Standard(s)**<br>4.LS4.1: Obtain information about what a fossil is and ways a fossil can provide information about the past.<br><br>**Explanation and Support of Standard**<br>4.LS4.1<br>Fossils result from processes that occur naturally on Earth, such as the depositing of sediment after an organism dies. In rare instances, fossils may include | **Learning Outcomes**<br>Students will explain what fossils are and what they tell us about the past.<br><br>**Suggested Phenomena**<br>*Click on the phenomenon picture to view the video.* | **Curricular Resources**<br>Engage<br>Inspire Science TE, p. 143-144<br>TE, page 143: Phenomenon<br>Be A Scientist Notebook (Phenomenon): p. 145<br>TE, Essential Question: p. 144<br>TE, Science and Engineering Practices: p. 144<br><br>Explore<br>TE, pp. 144-145<br>*(LAB)* Be a Scientist Notebook, p.147, Inquiry Activity: Footprints |

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| preserved organisms. More commonly, water passing through the sediment can deposit minerals in the spaces in within bones. This process is somewhat analogous to the scale that builds up on a faucet or shower. Many shell fossils form when the original organism shell decays over very long periods of time, leaving a void to be filled by other materials. Still others may be preserved in resinous materials.<br><br>Fossils allow us to see the types of organisms that live long ago. Within these records we see that many organisms that have lived on Earth in the past are no longer present on Earth. However, we do see that some organisms that we find on Earth do resemble these now extinct organisms.<br><br>Fossils used for examination can include both visible and microscopic.<br><br>**Suggested Science and Engineering Practice(s)**<br>Obtain, Evaluate, and Communicate Information<br><br>**Suggested Crosscutting Concept(s)**<br>Scale, Proportion, and Quantity<br><br>**Teacher Overview**<br>Fossils are the remains or impressions of a prehistoric organism preserved in petrified form, as |  <br><br>Phenomenon Explanation:<br>Fossils contain evidence of the types of organisms that lived in the past. | <u>Explain</u><br>TE, pp. 146-150<br>Be A Scientist Notebook, p.149: Vocabulary<br>Science Handbook/eBook: Fossils<br>Science Handbook/eBook: What Fossils Tell Us<br>Video: Animals of Today and Animals of Long Ago<br>Science File: Fossils from Long Ago or Skeletons of Today<br>Simulation: Fossil Dig<br>*(LAB)* Be A Scientist Notebook, 153, Inquiry Activity: Older and Younger<br><br><u>Elaborate</u><br>TE, pp. 150-151<br>*(LAB)* Be a Scientist Notebook, p. 155, Make A Model: Fossil Mystery<br><br><u>Evaluate</u><br>TE, pp. 152-153<br>*(LAB)* Be A Scientist Notebook, p. 158, Performance Task: Tell About Animals and Environments<br>eAssessment<br><br>**Additional Resources**<br>Lesson: Researching Fossils<br>Lesson: How Fossils Form Part 1<br>Lesson: How Fossils Form Part 2<br>Video: Exploring Fossil Records, and How Fossils Are Formed<br>Video: What Are Fossils and How Are They Formed? |

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| a mold, or as a cast in rock. Scientists use fossils to learn about how Earth formed, about past environmental conditions (such as temperature and humidity), and about how that organism might have lived and died. Fossils can help scientists learn more about the structure of those organisms, as well as how the organisms evolved over time.<br><br>**Misconceptions**<br>Students might have misconceptions that fossils can only be pieces of dead animals and plants. They might think that fossils only represent bones and shells of extinct animals. In fact, fossils can be footprints and other kinds of imprints. Students also might think that fossils of tropical plants cannot be found in cold or dry areas. They do not realize that the conditions on the planet today are not the same as in the past. They might also think that all plants and animals become fossils. Students need to understand that fossils do not form easily and are very rare to find. | | **ESL Supports and Scaffolds**<br>WIDA Standard 4- The Language of Science<br><br>To support students in speaking refer to this resource:<br><br>WIDA Doing and Talking Science<br><br>When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates<br><br>Interactive Science Dictionary with visuals<br><br>Provide sentence stems to support students in explaining:<br><br>Fossils are created when…<br><br>A fossil is…..<br><br>I know this is a fossil because….<br><br>Fossils are formed by…. |

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| | | To support students with the scientific explanation:<br><br><u>Question starters</u><br>What's the connection between….?<br>What link do you see between…<br>Why do you think…?<br>What is our evidence that….<br>Do we have enough evidence to make that claim?<br>But what about this other evidence that shows…?<br><br><u>Response Starters</u><br>I agree with you because of (evidence or reasoning)<br>I don't agree with your claim because of (evidence or reasoning)<br>This evidence shows that… |

| 4th Grade Quarter 3 Curriculum Map<br>Quarter 3 Curriculum Map Feedback | | | | | | |
|---|---|---|---|---|---|---|
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| 1 week | 8 weeks | 4.5 weeks | 4.5 weeks | 3 weeks | **6 weeks** | 9 weeks |

| **UNIT 5: Earth and Its Changing Features (6 weeks)** | | | |
|---|---|---|---|
| **Overarching Question(s)** | | | |
| How and why is Earth constantly changing? | | | |
| **Unit 5: Lesson 1** | **Lesson Length** | **Essential Question** | **Vocabulary** |
| Earth and Its Layers | 1.5 weeks | What are the characteristics of Earth's different layers? | crust, mantle, outer core, inner core |

| **Standards and Related Background Information** | **Instructional Focus** | **Instructional Resources** |
|---|---|---|
| **DCI(s)**<br>4.ESS2 Earth's Systems<br><br>**Standard(s)**<br>4.ESS2.4: Analyze and interpret data on the four layers of Earth, including thickness, composition, and physical states of these layers.<br><br>**Explanation and Support of Standard**<br>4.ESS2.4<br>Earth's systems include the atmosphere, hydrosphere, biosphere, and geosphere. This standard elaborates on the internal structure of the geosphere to include: the crust, mantle, outer core, | **Learning Outcomes**<br>Students will be able to analyze and interpret data on the four layers of Earth, including thickness, composition, and physical states of these layers.<br><br>**Suggested Phenomena**<br>*Click on the phenomenon picture to view the video.* | **Curricular Resources**<br>Engage<br>Inspire Science TE, p. 65-66<br>TE, page 65: Phenomenon<br>Be A Scientist Handbook (Phenomenon): p. 65<br>TE, Essential Question: p. 66<br>TE, Science and Engineering Practices: p. 66<br><br>Explore<br>TE, pp. 66-67<br>*(LAB)* Be a Scientist Notebook, p.67, Inquiry Activity: Just Peachy!<br><br>Explain |

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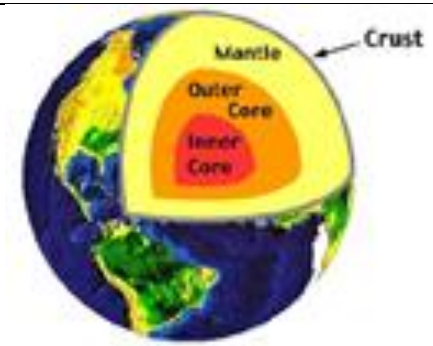
| and inner core. Students should develop an understanding of the relative positions, thicknesses, and compositions of these layers. Knowing the characteristics of each layer prepares students to understand processes such as convection within the mantle or radioactive decay within Earth's interior.<br><br>**Suggested Science and Engineering Practice(s)**<br>Analyzing and Interpreting Data<br><br>**Suggested Crosscutting Concept(s)**<br>Patterns<br><br>**Teacher Overview**<br>The major layers of Earth are the crust at the top; the mantle below it, made of molten rock; and a core of mostly iron. The outer core is liquid, and the inner core is solid. The crust itself is divided into many layers that represent long periods of geological time in which material has been deposited at the surface through processes such as volcanic eruptions. The crust is not one solid piece, but many pieces floating and moving upon the molten mantle. Collisions and divergences of these pieces, called tectonic plates, result in earthquakes and the formation of new land from erupted material. The iron in Earth's core produces the magnetosphere, which is what makes compass |  <br>Phenomenon Explanation:<br>The Earth is composed of four main layers, the inner core, the outer core, the mantle, and the crust. | TE, pp. 68-72<br>Be A Scientist Notebook, p. 69: Vocabulary<br>Digital Interactive: Earth's Layers<br>Science Handbook/eBook: Earth and Its Layers<br><br><u>Elaborate</u><br>TE, pp. 72-73<br>*(LAB)* Be a Scientist Notebook, p. 73, Inquiry Activity: A Slice of Earth<br><br><u>Evaluate</u><br>TE, pp. 74-75<br>*(LAB)* Be A Scientist Notebook, p. 75, Performance Task: A Better Model Earth<br>eAssessment<br><br>**Additional Resources**<br>Lesson: Journey inside the Earth<br>Lesson: The Structure of The Earth<br>Video: Inside the Earth<br><br>**ESL Supports and Scaffolds**<br>WIDA Standard 4- The Language of Science<br><br>To support students in speaking refer to this resource:<br><br><u>WIDA Doing and Talking Science</u> |

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| needles point north, produces auroras at the poles, and shields Earth from dangerous solar winds.<br><br>**Misconceptions**<br>Students may think that Earth's composition is basically uniform throughout. They may not realize that the mantle, which makes up about two-thirds of Earth's mass, is molten rock. To help them realize this, liken the composition of the mantle to lava that erupts from volcanoes. Remind students that Earth is roughly spherical and has layers of different material, which students can model using various materials in this lesson's activities. | | When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates<br><br>Interactive Science Dictionary with visuals<br><br>Provide concept maps and graphic organizers to support students in describing the layers of the earth.<br><br>Provide a word wall with vocabulary you would like students to use in speaking and writing.<br><br>Provide sentence stems to support students in describing:<br><br>The----layer is characterized by….<br>The---layer has….. |

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| | | To support students with the scientific explanation:<br><br><u>Question starters</u><br>What's the connection between….?<br>What link do you see between…<br>Why do you think…?<br>What is our evidence that….<br>Do we have enough evidence to make that claim?<br>But what about this other evidence that shows…?<br><br><u>Response Starters</u><br>I agree with you because of (evidence or reasoning)<br>I don't agree with your claim because of (evidence or reasoning)<br>This evidence shows that… |

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| 1 week | 8 weeks | 4.5 weeks | 4.5 weeks | 3 weeks | **6 weeks** | 9 weeks |

| **UNIT 5: Earth and Its Changing Features (6 weeks)** | | | |
|---|---|---|---|
| **Overarching Question(s)** | | | |
| How and why is Earth constantly changing? | | | |
| **Unit 5: Lesson 2** | **Lesson Length** | **Essential Question** | **Vocabulary** |
| Earth's Landforms and Features | 1.5 weeks | What are Earth's features? | landform, continent, tectonic plate, volcano, earthquake, fault, topographical map |

| **Standards and Related Background Information** | **Instructional Focus** | **Instructional Resources** |
|---|---|---|
| **DCI(s)**<br>4.ESS2 Earth's Systems<br><br>**Standard(s)**<br>4.ESS2.2: Interpret maps to determine that the location of mountain ranges, deep ocean trenches, volcanoes, and earthquakes occur in patterns.<br><br>**Explanation(s)**<br>4.ESS2.2<br>Students should examine the maps with the goal of observing patterns in the distribution of the included features. As cartographers have produced increasingly more detailed maps, including sonar-generated maps | **Learning Outcomes**<br>Students will be able to analyze and interpret data from models to describe patterns in Earth's features.<br><br>**Suggested Phenomena**<br>*Click on the phenomenon picture to view the video.* | **Curricular Resources**<br>Engage<br>Inspire Science TE, p. 77-78<br>TE, page 77: Phenomenon<br>Be A Scientist Notebook (Phenomenon): p. 79<br>TE, Essential Question: p. 78<br>TE, Science and Engineering Practices: p. 78<br><br>Explore<br>TE, pp. 78-79<br>*(LAB)* Be a Scientist Notebook, p. 81, Inquiry Activity: Moving Earth |

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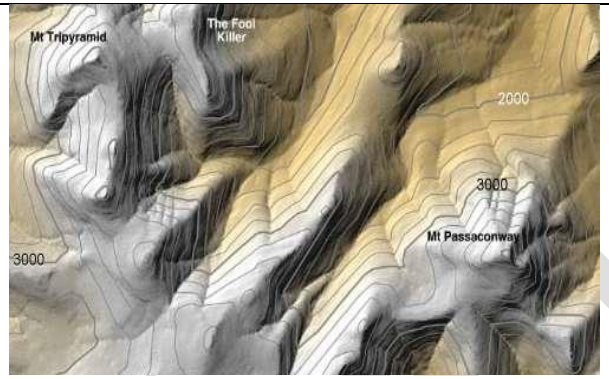
| of the ocean floor, patterns which appeared became incorporated into the origin of tectonic theory. Major trends include that mountain chains form at the inside or edge of continents, and while earthquakes and volcanoes primarily occur where continents meet oceans. Evidence for previous volcanic activity can include the presence of igneous rocks.<br><br>**Suggested Science and Engineering Practice(s)**<br>Analyzing and Interpreting Data<br><br>**Suggested Crosscutting Concept(s)**<br>Patterns<br><br>**Teacher Overview**<br>Earth's surface is broken into large sections called plates. Plates move slowly across Earth's surface, sometimes only a few millimeters a year. Many features on Earth's surface form where plate boundaries meet. Earthquakes, volcanoes, and mountain chains form along plate boundaries when the plates move together and pull apart.<br>Topographical maps show the features on Earth's surface. The maps illustrate changes in the elevation on Earth's surface with contour lines. Closely spaced contour lines show a dramatic change in elevation over a short space. Widely spaced contour lines show a gradual change in elevation over a large space. The same type of map, called a bathymetric map, is produced for the features in the ocean. |  <br>**Topographical Map of Mountains and Canyons**<br><br>Phenomenon Explanation:<br>Topographical maps show the features on Earth's surface. | Explain<br>TE, pp. 80-86<br>Be A Scientist Notebook, p. 83: Vocabulary<br>Science Handbook/eBook: Types of Landforms<br>Science Handbook/eBook: Earth's Ocean Features<br>Science File: How Earthquakes and Volcanoes Shape Earth<br>Simulation: World Earthquakes and Volcanoes<br>Science Handbook/eBook: How Scientists Use Maps<br>Science Handbook/eBook: Topographic Maps<br><br>Elaborate<br>TE, pp. 86-87<br>*(LAB)* Be a Scientist Notebook, p. 89, Inquiry Activity: Patterns on Earth's Surface<br><br>Evaluate<br>TE, pp.<br>*(LAB)* Be A Scientist Notebook, p. 90, Performance Task: Landforms from Another Planet<br>eAssessment<br><br>**Additional Resources**<br>Interactive: Mapping Mountains<br>Video: Exploring Landforms and Bodies of Water<br>Video: How to Read a Topographic Map<br>Lesson: Landforms<br>Lesson: Bird's Eye View |

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| **Misconceptions**<br>Students may believe that earthquakes and volcanic eruptions are rare events. News coverage often focuses only on large, destructive events. In reality, small earthquakes and volcanic eruptions occur somewhere in the world almost daily. Some students may believe that frequent, small earthquakes prevent a large earthquake from happening. It is true that small earthquakes ease stress along a fault line, but small earthquakes do not prevent a large earthquake from happening. Some students may believe that earthquakes cause volcanoes. Although both events may occur in the same area, they follow different processes. Earthquakes usually occur along fault lines. Volcanoes erupt from a magma chamber. | | **ESL Supports and Scaffolds**<br>To support students in speaking refer to this resource:<br>WIDA Doing and Talking Science<br><br>When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates<br><br>Interactive Science Dictionary with visuals<br><br>Provide concept maps and graphic organizers to support students in describing the earth's features.<br><br>Provide a word wall with vocabulary you would like students to use in speaking and writing.<br><br>Provide sentence stems to support students in describing:<br><br>On the map I notice…this indicates a …. |

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| | | To support students with the scientific explanation:<br><br><u>Question starters</u><br>What's the connection between….?<br>What link do you see between…<br>Why do you think…?<br>What is our evidence that….<br>Do we have enough evidence to make that claim?<br>But what about this other evidence that shows…?<br><br><u>Response Starters</u><br>I agree with you because of (evidence or reasoning)<br>I don't agree with your claim because of (evidence or reasoning)<br>This evidence shows that… |

| 4th Grade Quarter 3 Curriculum Map<br>Quarter 3 Curriculum Map Feedback | | | | | | |
|---|---|---|---|---|---|---|
| Quarter 1 | | Quarter 2 | | **Quarter 3** | | Quarter 4 |
| Structure and Routine | Unit 1<br>Interactions of Living Things | Unit 2<br>Energy | Unit 3<br>Wave Patterns and Information Transfer | Unit 4<br>Earth and Its Resources | **Unit 5<br>Earth and Its Changing Features** | Unit 6<br>The Sun and Earth |
| 1 week | 8 weeks | 4.5 weeks | 4.5 weeks | 3 weeks | **6 weeks** | 9 weeks |

| **UNIT 5: Earth and Its Changing Features (6 weeks)** | | | |
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| **Overarching Question(s)** | | | |
| How and why is Earth constantly changing? | | | |
| **Unit 5: Lesson 3** | **Lesson Length** | **Essential Question** | **Vocabulary** |
| Erosion and Weathering | 1.5 weeks | How do living and nonliving things change Earth's surface? | weathering, vegetation, erosion, deposition |

| **Standards and Related Background Information** | **Instructional Focus** | **Instructional Resources** |
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| **DCI(s)**<br>4.ESS1 Earth's Place in the Universe<br><br>4.ESS2 Earth's Systems<br><br>**Standard(s)**<br>4.ESS1.1: Generate and support a claim with evidence that over long periods of time, erosion (weathering and transportation) and deposition have changed landscapes and created new landforms.<br><br>4.ESS2.1: Collect and analyze data from observations to provide evidence that rocks, soils, and sediments are broken into smaller pieces through mechanical | **Learning Outcomes**<br>Students will be able to make observations and measurements that provide evidence to show that erosion and weathering change Earth's surface.<br><br>**Suggested Phenomena**<br>*Click on the phenomenon picture to view the video.* | **Curricular Resources**<br>Engage<br>Inspire Science TE, p. 91-92<br>TE, page 91: Phenomenon<br>Science in My World (Phenomenon): p. 95<br>TE, Essential Question: p. 92<br>TE, Science and Engineering Practices: p. 92<br><br>Explore<br>TE, pp. 92-93<br>*(LAB)* Be a Scientist Notebook, p. 97, Inquiry Activity: Shake, Rattle, and Roll<br><br>Explain |

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| weathering (frost wedging, abrasion, tree root wedging) and are transported by water, ice, wind, gravity, and vegetation.<br><br>4.ESS2.3: Provide examples to support the claim that organisms affect the physical characteristics of their regions.<br><br>**Explanation(s)**<br>4.ESS1.1<br>The Earth has changed over time and its history is recorded in its landforms. Scientists construct a history of Earth by examining features that we see present today, considering the processes (weathering, erosion, and deposition) that created these landforms.<br>Weathering processes are more explicitly addressed in 4.ESS2.1 and pertain to the breaking down of materials. Erosive processes transport these broken down materials, creating new features where they are deposited. These processes occur over very long periods of time. Events such as earthquakes and volcanoes that create sudden dramatic changes to the landscape. However, gradual processes including weathering, erosion, and deposition more slowly reshape Earth's surface features. Landforms should include local, regional, and global examples of rock formations or specific layers of sediment. |  <br><br>Phenomenon Explanation:<br>The processes of weathering and erosion can occur over a very long period, such as the wearing away of mountains, or happen very quickly, such as an eroded river bank during a flood or a beach washed away after a hurricane. | TE, pp. 94-102<br>Be A Scientist Notebook, p. 99: Vocabulary<br>Video: Weathering and Erosion<br>Science Handbook/eBook: Physical Weathering<br>*(LAB)* Be A Scientist Notebook, p. 100, Inquiry Activity: Weathered by Vegetation<br>Science Handbook/eBook: Erosion and Deposition<br>*(LAB)* Be A Scientist Notebook, p.104, Inquiry Activity: Rate of Erosion<br><br><u>Elaborate</u><br>TE, p. 103<br>*(LAB)* Be a Scientist Notebook, p. 106, Inquiry Activity: Effects of Erosion on Landforms Simulation<br><br><u>Evaluate</u><br>TE, pp. 104-105<br>*(LAB)* Be A Scientist Notebook, p. 107, Performance Task: Landslide Experiment<br>eAssessment<br><br>**Additional Resources**<br>Lesson: <u>Weathering and Erosion</u><br>Lesson: <u>How the Grand Canyon Was Formed</u><br>Assessment: <u>Erosion, Weathering, Deposition</u><br>Video: <u>What is Weathering?</u><br>Video: <u>Weathering and Erosion</u> |

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| Students can model the effects of weathering and erosion to create small scale landforms to understand how particular structures and formations may arise from weathering and erosion processes.<br><br>4.ESS2.1<br>The formation and transport of rocks, soils, and sediments are a result of interactions between Earth's different systems: the geosphere (rocks, soils, and sediment), hydrosphere (water and ice), atmosphere (air), and biosphere (living things, including humans).<br>This standard focuses on the actual processes and mechanisms that break down rocks to form soils and sediments and transport these sediments.<br>Mechanical weathering includes wearing of rock by water, ice, wind, living organisms, and gravity. Once broken down, the materials can be moved by a number of different mechanisms.<br>Students can recreate the process of frost wedging by freezing a sealed water bottle and observing the effects. Early introductions to the idea of experimental design can be achieved by freezing an empty water bottle at the same time<br>(4.ESS2.1 focuses on processes of interacting systems whereas 4.ESS1.1 focuses on the landforms affected/created by these processes and the information they hold about Earth's history.)<br><br>4.ESS2.3 | | **ESL Supports and Scaffolds**<br>To support students in speaking refer to this resource:<br><br>WIDA Doing and Talking Science<br><br>When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates<br><br>Interactive Science Dictionary with visuals<br><br>Provide concept maps and graphic organizers to support students in explain how weathering and erosion change the earth's surface.<br><br>Provide a word wall with vocabulary you would like students to use in speaking and writing.<br><br>Provide sentence stems to support students in explaining:<br><br>Weathering effects the surface of the earth by…. |

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| The effects that organisms (including humans) have on their regions can include both short-and-long term effects. Living organisms depend on the Earth to meet basic needs and alter may alter their physical surroundings to have their needs met. Long-term effects include restructuring the surface of the land to suit human needs (e.g. building of roads, dams, fuels, agriculture) or other organisms creating habitats and shelters. Much earlier in Earth's history, it was the dramatic increases of living organisms in certain areas and that created deposits of fossil fuels for the remains of these organisms.<br><br>**Suggested Science and Engineering Practice(s)**<br>Analyzing and Interpreting Data<br>Engaging in Argument from Evidence<br><br>**Suggested Crosscutting Concept(s)**<br>Cause and Effect<br><br>**Teacher Overview**<br>Weathering, erosion, and deposition are three major processes that change Earth's surface. These changes can happen slowly or quickly. The main agents causing weathering, erosion, and deposition on Earth are water, ice, wind, living organisms, and gravity. Weathering can be the effect of rain, ice, and wind on rock. Over a long time, wind can carve sedimentary rock into strange and scary shapes. Hoodoos, such as | | Erosion changes the earth by…..<br><br>To support students with the scientific explanation:<br><br><u>Question starters</u><br>What's the connection between….?<br>What link do you see between…<br>Why do you think…?<br>What is our evidence that….<br>Do we have enough evidence to make that claim?<br>But what about this other evidence that shows…?<br><br><u>Response Starters</u><br>I agree with you because of (evidence or reasoning)<br>I don't agree with your claim because of (evidence or reasoning)<br>This evidence shows that… |

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| the ones found in Bryce Canyon, Utah, or in Drumheller, Alberta, are the result of millions of years of weathering. Acid rain also causes weathering by dissolving rock, leaving pitted surfaces behind. Erosion is the transportation of rock particles and soil from where the material is weathered to where it is deposited. Wind and water are the main vehicles of erosion, although glaciers can also transport massive amounts of eroded material. Glaciers can carry huge boulders many miles, depositing them when the glacier begins to melt and retreat. Deposition is the dropping of particles. Wind on a beach erodes sand, which is deposited to form sand dunes. Waves and currents drop sand and shells and build barrier islands, such as the Outer Banks islands of North Carolina. Deltas that form at the mouths of rivers are also examples of deposition.<br><br>**Misconceptions**<br>Students may have the misconception that the term erosion refers to the breakdown, transport, and depositing of materials in a new location. As students complete the lesson, distinguish between the processes of weathering, erosion, and deposition, emphasizing the fact that these are three separate, though related, processes. | | |

| 4th Grade Quarter 3 Curriculum Map<br>Quarter 3 Curriculum Map Feedback | | | | | | |
|---|---|---|---|---|---|---|
| Quarter 1 | | Quarter 2 | | **Quarter 3** | | Quarter 4 |
| Structure and Routine | Unit 1<br>Interactions of Living Things | Unit 2<br>Energy | Unit 3<br>Wave Patterns and Information Transfer | Unit 4<br>Earth and Its Resources | **Unit 5<br>Earth and Its Changing Features** | Unit 6<br>The Sun and Earth |
| 1 weel | 8 weeks | 4.5 weeks | 4.5 weeks | 3 weeks | **6 weeks** | 9 weeks |

**UNIT 5: Earth and Its Changing Features (6 weeks)**

**Overarching Question(s)**

How and why is Earth constantly changing?

| Unit 5: Lesson 4 | Lesson Length | Essential Question | Vocabulary |
|---|---|---|---|
| Human Activity Affects Earth | 1.5 weeks | What effects have people had on Earth's land and ocean? | chemical weathering, acid rain, sinkhole, fertilizer |

| Standards and Related Background Information | Instructional Focus | Instructional Resources |
|---|---|---|
| **DCI(s)**<br>4.ESS3 Earth and Human Activity<br><br>**Standard(s)**<br>4.ESS3.2: Create an argument, using evidence from research, that human activity (farming, mining, building) can affect the land and ocean in positive and/or negative ways.<br><br>**Explanation(s)**<br>The standard lists human activities needed to support larger numbers of people, and therefore impact Earth on a larger scale. In order to obtain resources from | **Learning Outcomes**<br>Students will create an argument using evidence that human activity can affect the land and ocean in positive and/or negative ways.<br><br>**Suggested Phenomena**<br>*Click on the phenomenon picture to view the video.* | **Curricular Resources**<br>Engage<br>Inspire Science TE, p. 107-108<br>TE, p. 107: Phenomenon<br>Be a Scientist Notebook (Phenomenon): p. 109<br>TE, Essential Question: p. 108<br>TE, Science and Engineering Practices: p. 108<br><br>Explore<br>TE, pp. 109-110<br>*(LAB)* Be a Scientist Notebook, p. 113, Inquiry Activity: Oil Spill Clean up<br><br>Explain |

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| their surrounds, humans impact both terrestrial and aquatic systems.<br>Areas able to support unique ecosystems are impacted by agriculture, mining, larger suburban and rural developments beyond city centers and the roads which connect them. These changes bring about potential for erosion.<br>Human efforts also recognize some of these impacts and use models to predict problems and attempt to alter problematic patterns. Development can be carried out to include measures which deliberately minimize its effects. Examples include treatment of sewage, recycling of resources, and monitoring the byproducts of agricultural activities.<br>(K.ESS3.3 explores the actions individuals take to be more comfortable, whereas 4.ESS3.2 examines the behaviors of people in groups.)<br><br>**Suggested Science and Engineering Practice(s)**<br>Engaging in Argument from Evidence<br><br>**Suggested Crosscutting Concept(s)**<br>Cause and Effect<br><br>**Teacher Overview**<br>Soil is made up of minerals and decayed plant and animal matter. Nutrients in the soil that plants need can be replaced by fertilizers, but care must be taken not to use too much fertilizer. Over-fertilization can make the soil unhealthy to plants, and it increases the |  <br>**Polluted Water**<br><br>Phenomenon Explanation:<br>Humans should recognize the impacts of human created changes to the environment and attempt to alter problematic patterns. | TE, pp. 110-115<br>Be A Scientist Notebook, p. 110: Vocabulary<br>Digital Interactive: People Affect Earth<br>Video:<br>Science Handbook/eBook: Chemical Weathering<br>Science Handbook/eBook: Making Soil More Fertile<br><br>Elaborate<br>TE, pp. 115-116<br>*(LAB)* Be a Scientist Notebook, p. 119, Inquiry Activity: Human Activity Argument<br><br>Evaluate<br>TE, pp. 117-119<br>*(LAB)* Be A Scientist Notebook, p. 121, Performance Task: Protecting Our Resources<br>eAssessment<br><br>**Additional Resources**<br>Video: 15 Drastic Changes on Earth Revealed By NASA<br>Lesson: Human Actions that Affect Streams<br>Lesson: What Is In Our Drinking Water?<br>Lesson: Test of Water Quality<br>Lesson: Change Over Time<br><br>**ESL Supports and Scaffolds** |

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| risk that fertilizer ends up in rivers and lakes and pollutes them. Industrial air pollution includes chemicals that form corrosive acids from rainwater, which cause chemical weathering.<br><br>**Misconceptions**<br>Students may think that materials added to the soil are either good or bad for the soil, but many materials can potentially both help and harm the soil depending on the circumstances. For example, fertilizers enrich the soil and replace nutrients, but excess fertilizer can pollute the soil. It can also wash out of the soil and pollute natural water sources. In regards to air pollution, students may think that pollutants that are in water evaporate with the water and come down later as acid rain. | | To support students in speaking refer to this resource:<br><br>WIDA Doing and Talking Science<br><br>When applicable - use Home Language to build vocabulary in concepts. Spanish Cognates<br><br>Interactive Science Dictionary with visuals<br><br>Provide concept maps and graphic organizers to support students in explain how humans effect the earth's surface.<br><br>Provide a word wall with vocabulary you would like students to use in speaking and writing.<br><br>Provide sentence stems to support students in explaining:<br><br>Humans can impact the surface of the earth by… |

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| | | One way humans positively affect the earth is ….<br><br>A negative affect of humans on the earth is…<br><br>To support students with the scientific explanation:<br><br><u>Question starters</u><br>What's the connection between….?<br>What link do you see between…<br>Why do you think…?<br>What is our evidence that….<br>Do we have enough evidence to make that claim?<br>But what about this other evidence that shows…?<br><br><u>Response Starters</u><br>I agree with you because of (evidence or reasoning)<br>I don't agree with your claim because of (evidence or reasoning)<br>This evidence shows that… |