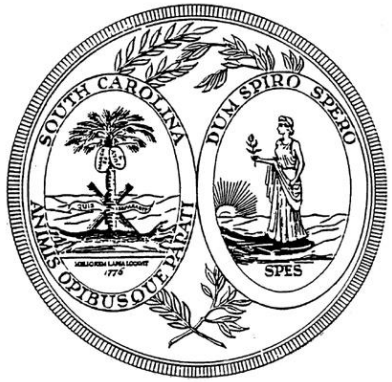
South Carolina Academic Standards and Performance Indicators for Science 2014



Instructional Unit Resource

8th Grade

South Carolina Academic Standards and Performance Indicators for Science 2014
Eighth Grade Science Instructional Unit Resource

As support for implementing the *South Carolina Academic Standards and Performance Indicators for Science 2014*, the standards for Eighth Grade have been grouped into possible units. In the Overview of Units below, the titles for those possible units are listed in columns. Refer to the Overview document to note these unit titles and how Standards, Conceptual Understandings, Performance Indicators, Science and Engineering Practices, and Crosscutting Concepts align. Following the Overview of Units, an Instructional Unit document is provided that delivers guidance and possible resources in teaching our new *South Carolina Academic Standards and Performance Indicators for Science 2014*. The purpose of this document is to provide guidance as to how all the standards in this grade may be grouped into units and how those units might look. Since this document is merely guidance, districts should implement the standards in a manner that addresses the district curriculum and the needs of students. This document is a living document and instructional leaders from around the state will continuously update and expand these resource documents. These documents will be released throughout the 2016-2017 school year with the intentionality of staying ahead of instruction. Teachers should also note that links to the Standards document, A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas, the SEP Support Document, and the Support Document 2.0 are embedded throughout the Instructional Unit format for reference.

Acknowledgments

Jean Baptiste Massieu, famous deaf educator, made a statement that is now considered a French proverb. “Gratitude is the memory of the heart. Indeed, appreciation comes when you feel grateful from the depths of your heart. The head keeps an account of all the benefits you received and gave. But the heart records the feelings of appreciation, humility, and generosity that one feels when someone showers you with kindness.” It is with sincere appreciation that we humbly acknowledge the dedication, hard work and generosity of time provided by teachers and instructional leaders across the state that have made and are continuing to make the Instructional Unit Resources possible.

Grade Eight Overview of Units

Unit 1	Unit 2	Unit 3	
Physical Science: Forces & Motion	Physical Science: Waves	Earth Science: Earth's Place in the Universe	
Standard	**Standard**	**Standard**	
8.P.2	8.P.3	8.E.4	
Conceptual Understanding	**Conceptual Understanding**	**Conceptual Understanding**	**Conceptual Understanding**
8.P.2A	8.P.3A	8.E.4A	8.E.4B
Performance Indicators	**Performance Indicators**	**Performance Indicators**	**Performance Indicators**
8.P.2A.1 8.P.2A.2 8.P.2A.3 8.P.2A.4 8.P.2A.5 8.P.2A.6 8.P.2A.7	8.P.3A.1 8.P.3A.2 8.P.3A.3 8.P.3A.4 8.P.3A.5 8.P.3A.6	8.E.4A.1 8.E.4A.2	8.E.4B.1 8.E.4B.2 8.E.4B.3 8.E.4B.4 8.E.4B.5 8.E.4B.6
Science and Engineering Practices	**Science and Engineering Practices**	**Science and Engineering Practices**	
8.S.1A.2 8.S.1A.3 8.S.1A.4 8.S.1A.5 8.S.1A.6	8.P.1A.2 8.P.1A.4 8.P.1A.6 8.P.1A.8	8.P.1A.2 8.P.1A.4 8.P.1A.6 8.P.1A.7 8.P.1A.8	
Cross Cutting Concepts	**Cross Cutting Concepts**	**Cross Cutting Concepts**	
2, 4, 3,7	1, 2, 6	1, 2, 3, 4	

**Teachers have the discretion to enhance the selected SEP's and CCC's.*

Grade Eight Overview of Units

Unit 4			Unit 5	
Earth Science: Earth Systems & Resources			Earth Science: Earth's History & Diversity of Life	
Standard			**Standard**	
8.E.5			8.E.6	
Conceptual Understanding	**Conceptual Understanding**	**Conceptual Understanding**	**Conceptual Understanding**	**Conceptual Understanding**
8.E.5A	8.E.5B	8.E.5C	8.E.6A	8.E.6B
Performance Indicators	**Performance Indicators**	**Performance Indicators**	**Performance Indicators**	**Performance Indicators**
8.E.5A.1 8.E.5A.2 8.E.5A.3 8.E.5A.4 8.E.5A.5	8.E.5B.1 8.E.5B.2 8.E.5B.3	8.E.5C.1	8.E.6A.1 8.E.6A.2 8.E.6A.3 8.E.6A.4 8.E.6A.5	8.E.6B.1 8.E.6B.2
Science and Engineering Practices			**Science and Engineering Practices**	
8.P.1A.2 8.P.1A.4 8.P.1A.6 8.P.1A.7 8.P.1A.8 8.S.1B.1			8.P.1A.2 8.P.1A.4 8.P.1A.6 8.P.1A.7 8.P.1A.8 8.S.1B.1	
Cross Cutting Concepts			**Cross Cutting Concepts**	
1, 2, 4, 5, 6, 7			1, 2, 3, 4, 5, 7	

**Teachers have the discretion to enhance the selected SEP's and CCC's.*

Unit Title
Earth Science: Earth Systems & Resources
Standard http://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf
8.E.5 The student will demonstrate an understanding of the processes that alter the structure of Earth and provide resources for life on the planet.

Conceptual Understanding
8.E.5A All Earth processes are the result of energy flowing and matter cycling within and among Earth's systems. Because Earth's processes are dynamic and interactive in nature, the surface of Earth is constantly changing. Earth's hot interior is a main source of energy that drives the cycling and moving of materials. Plate tectonics is the unifying theory that explains the past and current crustal movements at the Earth's surface. This theory provides a framework for understanding geological history.
New Academic Vocabulary **Some students may need extra support with the following academic vocabulary in order to understand what they are being asked to understand and do. Teaching these terms in an instructional context is recommended rather than teaching the words in isolation. A great time to deliver explicit instruction for the terms would be during the modeling process. Ultimately, the student should be able to use the academic vocabulary in conversation with peers and teachers. These terms are pulled from the essential knowledge portion of the Support Doc 2.0 (http://ed.sc.gov/instruction/standards-learning/science/support-documents-and-resources/) and further inquiry into the terms can be found there.**

Weathering (physical, chemical)	Erosion	Deposition	Rock cycle	Igneous	Magma
Lava	Intrusive	Extrusive	Metamorphic	Sedimentary	Sediments
Cementation	Crust	Continental rust	Granite	Oceanic crust	Basalt
Mantle	Lithosphere	Asthenosphere	Outer core	Inner core	Magnetic field
Lithospheric plate	Convection currents	Theory of plate tectonics	Landform	Plate boundary	Continental plate
Divergent boundary	Mid-ocean ridge	Rift zone	Seafloor spreading	Convergent boundary	Subduction

Oceanic plate	Volcano	Subduction zone	Deep-ocean trench	Volcanic island arc	Transform boundary
Pangaea					

Performance Indicators

Text highlighted below in *orange* and *italicized/underlined* shows connections to SEP's.

8.E.5A.1 *Develop and use models* to explain how the process of weathering, erosion, and deposition change surface features in the environment.

8.E.5A.2 *Use the rock cycle model to describe the relationship between* the processes and forces that create igneous, sedimentary, and metamorphic rocks.

8.E.5A.3 *Obtain and communicate information* about the relative position, density, and composition of Earth's layers to describe the crust, mantle, and core.

8.E.5A.4 *Construct explanations* for how the theory of plate tectonics accounts for (1) the motion of lithospheric plates, (2) the geologic activities at plate boundaries, and (3) the changes in landform areas over geologic time.

8.E.5A.5 *Construct and analyze scientific arguments* to support claims that plate tectonics accounts for (1) the distribution of fossils on different continents, (2) the occurrence of earthquakes, and (3) continental and ocean floor features (including mountains, volcanoes, faults and trenches).

***Science and Engineering Practices**

Support for the guidance, overviews of grade level progressions, and explicit details of each SEP can found in the Science and Engineering Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf). It is important that teachers realize that the nine science and engineering practices are not intended to be used in isolation. Even if a performance indicator for a given standard only lists one of the practices as a performance expectation, scientists and engineers do not use these practices in isolation, but rather as part of an overall sequence of practice. When educators design the learning for their students, it is important that they see how a given performance expectation fits into the broader context of the other science and engineering practices. This will allow teachers to provide comprehensive, authentic learning experiences through which students will develop and demonstrate a deep understanding of scientific concepts.

8.S.1A.2 Develop, use, and refine models to (1) understand or represent phenomena, processes, and relationships, (2) test devices or solutions, or (3) communicate ideas to others.

8.S.1A.4 Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation, graphing, or statistical analysis) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs.

8.S.1A.6 Construct explanations of phenomena using (1) primary or secondary scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.

8.S.1A.7 Construct and analyze scientific arguments to support claims, explanations, or designs using evidence from observations, data, or

informational texts.
8.S.1A.8 Obtain and evaluate scientific information to (1) answer questions, (2) explain or describe phenomena, (3) develop models, (4) evaluate hypotheses, explanations, claims, or designs or (5) identify and/or fill gaps in knowledge. Communicate using the conventions and expectations of scientific writing or oral presentations by (1) evaluating grade-appropriate primary or secondary scientific literature, or (2) reporting the results of student experimental investigations.

***Cross Cutting Concepts** **(http://www.nap.edu/read/13165/chapter/8)**

The link above provides support from the Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012) The text in blue and *italicized/underlined* below provides a brief explanation of how the specific content ties to the CCC's.

1. Patterns: The National Research Council (2012) states "observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them" (p. 84). *Data on the frequency and distribution of earthquakes and volcanoes is evidence that supports claims about the relationship that exist at plate boundaries. Activity at plate boundaries results in predictable landforms.*

2. Cause and effect: Mechanism and explanation: The National Research Council (2012) states "events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts" (p. 84). *There is a cause and effect model for why the tectonic plates move. Convection currents cause the asthenosphere to flow slowly carrying the plates of the lithosphere. This movement of the plates changes the size, shape, and positions of Earth's continents and oceans.*

4. Systems and system models: The National Research Council (2012) states "defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering" (p. 84). *The rock cycle can be used to explain the formation and structure of igneous, metamorphic, and sedimentary rock.*

5. Energy and matter: Flows, cycles, and conservation: The National Research Council (2012) states "tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations" (p. 84). *Earth's hot interior is a main source of energy that drives the cycling and moving of materials.*

6. Structure and function: The National Research Council (2012) states "the way in which an object or living thing is shaped and its substructure determine many of its properties and functions" (p. 84). *The relative position of Earth's layers determines its density and composition. Density and*

composition determine the function of each layer.

7. Stability and change: The National Research Council (2012) states "for natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study" (p. 84). *Continents are continually being shaped and reshaped by competing constructive and destructive geologic processes.*

**Teachers have the discretion to enhance the selected SEP's and CCC's.*

Prior Knowledge
• 5.E.3 Natural Processes and human activities affect the features of Earth's landforms and oceans. • 3.E.4 Composition of Earth
Subsequent Knowledge
• H.E.3 Internal and external dynamics of Earth's geosphere • H.E.4 Earth's conditions over geologic time and the diversity of organisms

Possible Instructional Strategies/Lessons

Strategies and lessons that will enable students to master the standard and/or indicator.

- 8.E.5A.1
  - Breaking it down: Weathering and Erosion One of the objectives of these two 45 minute lessons is to model the process of mechanical and chemical weather, drawing conclusions from their results. This resource can be found at http://scetv.pbslearningmedia.org/resource/nat08.earth.geol.eros.lpbreakit/breaking-it-down-weathering-and-erosion/

- 8.E.5A.1
  - Experiments with Weathering, Erosion, and Deposition This series of experiments use a stream table model and is designed to assist students in visualizing how streams form, where streams cause erosion and deposition in a watershed, and where erosion and deposition occur within a stream itself. In the final activity, students design and conduct experiments to explore how surface area relates to the rate of weathering of minerals and rocks. This resource can be found at http://csip.cornell.edu/Curriculum_Resources/CEIRP/streamtable.html

- 8.E.5A.2
  - Diagramming Pathways in the Rock Cycle This lesson requires students to develop a model of the rock cycle and use the model to describe the processes and forces that create igneous, sedimentary, and metamorphic rocks. An example can be found at http://www.sps186.org/downloads/attachments/29055/Rock%20Cycle%20Diagram%20

- 8.E.5A.2
  - The Crayon Rock Cycle: Students use wax crayon shavings to model the processes of erosion, weathering, deposition, sedimentation, metamorphism, melting, and crystallization that result in sedimentary, metamorphic, and igneous rocks. Over the course of the simulation, students analyze and evaluate the causes and effects of each process. An example can be found at http://www.exo.net/~emuller/activities/Crayon-Rock-Cycle.pdf

- 8.E.5A.3
  - Seismic Wave Behavior and Earth's Interior: Students analyze and interpret data using a graph of seismic wave velocities to construct explanations about the relative position, density, and composition of Earth's layers to describe the crust, mantle and core. This resource can be found at http://www.rsc.org/Education/Teachers/Resources/jesei/waves/students.htm

- 8.E.5A.4
  - Discovering Plate Boundaries: In this exercise, students analyze and use data from four global maps: 1) Earthquake location and depth, 2) Location of recent volcanic activity, 3) Seafloor Age, and 4) Topography and Bathymetry to discover the processes that occur at plate tectonic boundaries. This resource can be found at http://plateboundary.rice.edu

- 8.E.5A.4-5
  - Earthquakes and Plate Boundaries: This activity guides students through constructing explanations that use data from a graph of earthquake activity along a plate boundary in South America. Students will evaluate the scientific information to construct a model of a subduction zone and the identification of the continental and ocean floor features. This resource can be found at http://nagt-jge.org/doi/pdf/10.5408/0022-1368-26.2.69

- 8.E.5A.4-5
  - Mountain Maker, Earth Shaker: With this interactive simulation, students work through the processes landforms take at plate boundaries. Students will then construct explanations of the landform formation based on their observations. Background

information and discussion questions are provided. This resource can be found at http://scetv.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.shake/mountain-maker-earth-shaker/

Resources

- This Dynamic Earth: The Story of Plate Tectonics: This booklet gives a brief introduction to the concept of plate tectonics. It highlights some of the people and discoveries that advanced the development of the theory and traces its progress since its proposal. This resource can be found at http://pubs.usgs.gov/gip/dynamic/dynamic.htm

- Modeling Geologic Activity: This website offers free models of plate boundary features. It provides geologic activities that students can build and use to visualize Earth's interior for earthquakes and oceanic crust. This resource can be found at http://www.geoblox.com/FreeModels.html

- Study Jams: Use for reinforcement of weathering and erosion, rock cycle, volcanos, and earthquakes. This resource can be found at http://www.scholastic.com/teachers/activity/rocks-minerals-and-landforms-12-studyjams-interactive-science-activities

- South Carolina Geological Survey Earth Science Education Series: A series that offers the educator an extensive library of resources reviewing earth science concepts and tying them directly to the South Carolina landscape. Presentations, handouts, and classroom posters are available for download in pdf format. Presentations include modules such as Plate Tectonics; Landforms, Topography, and Geomorphology; Igneous Rocks and the Rock Cycle; Metamorphic Rocks and the Rock Cycle; Sedimentary Rocks and the Rock Cycle; Weathering, Erosion, and Mass Wasting Processes. Handouts and posters include Geologic Map of SC, Plate Tectonics, and The Rock Cycle. These resources can be found at http://www.dnr.sc.gov/geology/Education.htm.

Sample Formative Assessment Tasks/Questions

Additional sample formative assessment tasks/questions for grade bands are located at the end of each of the SEP Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf)

Sample Formative Assessment Tasks:

- 8.E.5A.2 Rock Identification Using a Dichotomous Key: Students are provided hand samples of rocks and follow a dichotomous key, classifying rocks into the main groups and identifying the pathway from the rock cycle in which each formed. This resource can be found at http://www.chambersburg.k12.pa.us/education/components/docmgr/default.php?sectiondetailid=24370

- Have students measure the distance between Charleston, South Carolina and the Mid-Atlantic Ridge and determine how many years ago that point was at the ridge.

Sample Formative Assessment Tasks and Questions:

- Describe the differences between in intrusive and extrusive igneous rocks.
- Explain how the heat inside Earth causes the lithospheric plates to move.
- Trace the formation of a grain of sand through the rock cycle starting with its origin at Table Rock in Pickens, South Carolina to Sullivan's Island, South Carolina and how this occurs using the terms weathering, erosion and deposition.
- How do seismic activity, the presence of volcanoes, and other characteristic landforms support the theory of plate tectonics?

Unit Title
Earth Science: Earth Systems & Resources
Standard http://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf
8.E.5 The student will demonstrate an understanding of the processes that alter the structure of Earth and provide resources for life on the planet.

Conceptual Understanding
8.E.5B Natural processes can cause sudden or gradual changes to Earth's systems. Some may adversely affect humans such as volcanic eruptions or earthquakes. Mapping the history of natural hazards in a region, combined with an understanding of related geological forces can help forecast the locations and likelihoods of future events.
New Academic Vocabulary **Some students may need extra support with the following academic vocabulary in order to understand what they are being asked to understand and do. Teaching these terms in an instructional context is recommended rather than teaching the words in isolation. A great time to deliver explicit instruction for the terms would be during the modeling process. Ultimately, the student should be able to use the academic vocabulary in conversation with peers and teachers. These terms are pulled from the essential knowledge portion of the Support Doc 2.0 (http://ed.sc.gov/instruction/standards-learning/science/support-documents-and-resources/) and further inquiry into the terms can be found there.**
Earthquake San Andreas Fault Pacific Ring of Fire Hotspot Hawaiian Islands Fault

Tension	Compression	Shearing	Subduction zone volcanoes	Tsunami	Acid rain

Performance Indicators

Text highlighted below in *orange* and *italicized/underlined* shows connections to SEP's.

8.E.5B.1 *Analyze and interpret data* to describe patterns in the location of volcanoes and earthquakes related to tectonic plate boundaries, interactions, and hot spots.

8.E.5B.2 *Construct explanations* to of how forces inside Earth result in earthquakes and volcanoes.

8.E.5B.3 *Define problems* that may be caused by catastrophic events resulting from plate movements and *design* possible devices or solutions to minimize the effects that event on Earth's surface and/ or human structures.

***Science and Engineering Practices**

Support for the guidance, overviews of grade level progressions, and explicit details of each SEP can be found in the Science and Engineering Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf). It is important that teachers realize that the nine science and engineering practices are not intended to be used in isolation. Even if a performance indicator for a given standard only lists one of the practices as a performance expectation, scientists and engineers do not use these practices in isolation, but rather as part of an overall sequence of practice. When educators design the learning for their students, it is important that they see how a given performance expectation fits into the broader context of the other science and engineering practices. This will allow teachers to provide comprehensive, authentic learning experiences through which students will develop and demonstrate a deep understanding of scientific concepts.

8.S.1A.4 Analyze and interpret data from informational texts, observations, measurements, or investigations using a range of methods (such as tabulation, graphing, or statistical analysis) to (1) reveal patterns and construct meaning or (2) support hypotheses, explanations, claims, or designs.

8.S.1A.6 Construct explanations of phenomena using (1) primary or secondary scientific evidence and models, (2) conclusions from scientific investigations, (3) predictions based on observations and measurements, or (4) data communicated in graphs, tables, or diagrams.

8.S.1B.1 Construct devices or design solutions using scientific knowledge to solve specific problems or needs: (1) ask questions to identify problems or needs, (2) ask questions about the criteria and constraints of the device or solutions, (3) generate and communicate ideas for possible devices or solutions (4) build and test devices or solutions, (5) determine if the devices or solutions solved the problem and refine the design if needed, and (6) communicate the results.

***Cross Cutting Concepts (http://www.nap.edu/read/13165/chapter/8)**

The link above provides support from the Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012) The text in blue and *italicized/underlined* below provides a brief explanation of how the specific content ties to the CCC's.

1. Patterns: The National Research Council (2012) states "Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them" (p. 84). *The motions and interactions of the plates can create patterns in*

the locations of volcanoes and earthquakes that result along plate boundaries.

2. Cause and effect: Mechanism and explanation: The National Research Council (2012) states "Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts" (p. 84). *Evidence proves that there is a distinct relationship between seismic activity, volcanic activity, and the lithospheric plate boundaries. The resulting activity causes the types of plate boundaries (convergent, divergent, and transform) and the forces (compression, shearing, and tension) associated with these boundaries.*

4. Systems and system models: The National Research Council (2012) states "Defining the system under study- specifying its boundaries and making explicit a model of that system- provides tools for understanding and testing ideas that are applicable throughout science and engineering" (p. 84). *Mapping the history of natural hazards in a region, combined with an understanding of related geological forces can help forecast the locations and likelihoods of future events.*

5. Energy and matter: Flows, cycles, and conservation: The National Research Council (2012) states "Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations"(p. 84). *A cycling of heat energy by convection currents in the mantle cause lithospheric plate movements. As a consequence, matter is constantly being cycled between the lithospheric plates and the mantle. At a convergent plate boundary where subduction is happening, one lithospheric plate is being pushed into the mantle and melted. At the same time, new lithospheric plate is being created from mantle material at a divergent boundary somewhere else. The heat energy flowing through the mantle results in matter being recycled from one form to another.*

6. Structure and function: The National Research Council (2012) states "The way in which an object or living thing is shaped and its substructure determine many of its properties and functions" (p. 84). *Innovative technologies function to help prevent houses, multi-dwelling units, and skyscrapers to bend instead of break and function during earthquakes to mitigate damage and injury.*

7. Stability and change: The National Research Council (2012) states "For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study"(p. 84). *Changes in weather and climate, aviation safety hazards, tsunamis when volcanic activity occurs under or near oceans, seismic activity accompanying volcanic activity, and the production of acid rain affect can affect life on Earth.*

**Teachers have the discretion to enhance the selected SEP's and CCC's.*

Prior Knowledge
• N/A
Subsequent Knowledge
• H.E.3 Internal and external dynamics of Earth's geosphere.

Possible Instructional Strategies/Lessons
Strategies and lessons that will enable students to master the standard and/or indicator.

- 8.E.5B.1
  - Earthquakes and Plate Boundaries: This activity guides students through graphing, analyzing, and interpreting data in order to construct explanations. Using the data communicated in a graph of earthquake activity along a plate boundary in South America and the evaluation of the scientific information, develop a model of a subduction zone and the identification of the continental and ocean floor features. This resource can be found at http://nagt-jge.org/doi/pdf/10.5408/0022-1368-26.2.69

- 8.E.5B.2
  - Tectonic Plates, Earthquakes, and Volcanoes: This interactive site comes with background information and guided questions to help students understand how patterns of seismic and volcanic activity are indicative of the processes involved at plate boundaries. This resource can be found at http://scetv.pbslearningmedia.org/resource/ess05.sci.ess.earthsys.tectonic/tectonic-plates-earthquakes-and-volcanoes/

- 8.E.5B.3
  - Earthquakes Living Lab: Designing for Disaster: Using online resources and simulations available, through the Earthquakes Living Lab, students explore the problems caused by earthquakes for human structures. Students analyze the consequences of subsurface ground type and building height on the amount of seismic destruction. Working in pairs, students think like engineers to apply what they have learned to design buildings, intended to withstand strong-magnitude earthquakes. A worksheet serves as a student guide for the activity. This resource can be found at https://www.teachengineering.org/activities/view/csm_designingfordisaster_activity1

- 8.E.5B.3
  - Build an Earthquake City: Students design and build miniature model cities using sugar, bouillon and gelatin cubes. The cities are subjected to simulated earthquakes and students observe which cube structures withstand the shaking movements. Students use the information gathered from each earthquake trial to develop more earthquake resistant structures. This resource can be found at

https://www.teachengineering.org/activities/view/earthquake_city

Resources

- This Dynamic Earth: the Story of Plate Tectonics: This booklet gives a brief introduction to the concept of plate tectonics and highlights some of the people and discoveries that advanced the development of the theory and traces its progress since its proposal. This resource can be found at http://pubs.usgs.gov/gip/dynamic/dynamic.html

- Earth: The Biography- Volcanoes: Students watch this episode of the film and complete a guided notes sheet. Their notes should support the content related the activity at plate boundaries and how these activities ultimately affect Earth's climate. The film can be found at http://www.dailymotion.com/video/xjzpeb_earth-the-biography-part-01-volcanoes_tech. Sample worksheets can be found at http://moviesheets.com/site/sheets.php?id=368

- The Geological Society: Plate Tectonics: This UK-based website includes interactive maps and clear, concise text, describing the various types of plate boundaries and the geological processes that occur at each. Students may easily apply different filters to a world map to see plate boundaries, earthquake, volcano data, and the general direction of individual plate movement. This resource can be found at http://www.geolsoc.org.uk/Plate-Tectonics

- Global Volcanism Program: The Smithsonian Institution's volcano website contains data and history of current and past eruptions worldwide. The link is available on this site to the "Eruptions, Earthquakes, and Emissions" interactive map. This map shows the occurrence of earthquake and volcanic activity since 1960, with an overlay of the sulfur dioxide emissions since 1978. http://volcano.si.edu/

- Washington State Department of Natural Resources: Geologic Hazards and the Environment: This website is provided by the state of Washington to educate populations living in Cascadia, on the hazards associated with seismic and volcanic activity. There are maps showing areas affected by the various hazards produced in this region, animations of faults, video clips, and images. The images illustrate lahar, liquefaction, pyroclastic flow, tsunami, and ash fall associated with seismic and volcanic activity. Emergency preparedness information for these events is also provided and gives South Carolina students an idea of what it is like to live in a region with these geologic phenomena. http://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards-and-environment

- Stop Disasters: A disaster simulation game from UN/ ISDR: This website is an interactive game which allows students to build earthquake and tsunami resistant structures, implement evacuation procedures, and retrofit existing structures in a populated area. Students must

accomplish this to mitigate damage on a budget and within a set time. http://www.stopdisastersgame.org/en/home.html

- United States Geological Survey Earthquake Hazards Program: This website contains links to rich resources for tracking earthquake occurrences, assessing earthquake impacts and hazards, and researching the causes and effects of earthquakes. The "Latest earthquake map" link where the most recent earthquakes of magnitudes greater than 2.5 are reported for gathering and interpreting data about earthquake prevalence in certain geographical areas. This resource can be found at https://earthquake.usgs.gov

Sample Formative Assessment Tasks/Questions

Additional sample formative assessment tasks/questions for grade bands are located at the end of each of the SEP Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf)

- Explain what causes volcanoes to form at plate boundaries and hot spots.
- How does seismic activity vary at different plate boundaries?
- How can people minimize earthquake damage to buildings?
- Identify the hazards associated with volcanic activity on Earth's surface and people.
- What are some solutions to helping people minimize the effects of a volcanic eruption?

Unit Title

Earth Science: Earth Systems & Resources

Standard

http://ed.sc.gov/scdoe/assets/file/agency/ccr/Standards-Learning/documents/South_Carolina_Academic_Standards_and_Performance_Indicators_for_Science_2014.pdf

8.E.5 The student will demonstrate an understanding of the processes that alter the structure of Earth and provide resources for life on the planet.

Conceptual Understanding

8.E.5C Humans depend upon many Earth resources - some renewable over human lifetimes and some nonrenewable or irreplaceable. Resources are distributed unevenly around the planet as a result of past geological processes.

New Academic Vocabulary

Some students may need extra support with the following academic vocabulary in order to understand what they are being asked to understand and do. Teaching these terms in an instructional context is recommended rather than teaching the words in isolation. A great time to deliver explicit instruction for the terms would be during the

modeling process. Ultimately, the student should be able to use the academic vocabulary in conversation with peers and teachers. These terms are pulled from the essential knowledge portion of the Support Doc 2.0 (http://ed.sc.gov/instruction/standards-learning/science/support-documents-and-resources/) and further inquiry into the terms can be found there.

Physical properties	Chemical properties	Minerals	Hardness	Luster	Color
Texture	Cleavage/ fracture	Flammability	Reactivity	Density	Gypsum
Ores	Bauxite	Fossil fuel			

Performance Indicators

Text highlighted below in *orange* and *italicized/underlined* shows connections to SEP's.

8.E.5C.1 *Obtain and communicate information* regarding the physical and chemical properties of minerals, ores, and fossil fuels to describe their importance as Earth resources.

*Science and Engineering Practices

Support for the guidance, overviews of grade level progressions, and explicit details of each SEP can be found in the Science and Engineering Support Doc (http://ed.sc.gov/scdoe/assets/File/instruction/standards/Science/Support%20Documents/Complete_2014SEPsGuide_SupportDoc2_0.pdf). It is important that teachers realize that the nine science and engineering practices are not intended to be used in isolation. Even if a performance indicator for a given standard only lists one of the practices as a performance expectation, scientists and engineers do not use these practices in isolation, but rather as part of an overall sequence of practice. When educators design the learning for their students, it is important that they see how a given performance expectation fits into the broader context of the other science and engineering practices. This will allow teachers to provide comprehensive, authentic learning experiences through which students will develop and demonstrate a deep understanding of scientific concepts.

8.S.1A.8 Obtain and evaluate scientific information to (1) answer questions, (2) explain or describe phenomena, (3) develop models, (4) evaluate hypotheses, explanations, claims, or designs or (5) identify and/or fill gaps in knowledge. Communicate using the conventions and expectations of scientific writing or oral presentations by (1) evaluating grade-appropriate primary or secondary scientific literature, or (2) reporting the results of student experimental investigations.

*Cross Cutting Concepts (http://www.nap.edu/read/13165/chapter/8)

The link above provides support from the Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas (2012) The text in blue and *italicized/underlined* below provides a brief explanation of how the specific content ties to the CCC's.

5. Energy and matter: Flows, cycles, and conservation. The National Research Council (2012) states "tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations" (p. 84). *Fossil fuels are natural fuels that come from the remains of living things. These fuels, like natural gas, give off energy when they are burned.*

6. Structure and function. The National Research Council (2012) states "the way in which an object or living thing is shaped and its substructure determine many of its properties and functions" (p. 84). *Earth's resources (minerals, ores, and fossil fuels) have physical and chemical properties that make them important and useful.*

Prior Knowledge
• N/A
Subsequent Knowledge
• H.E.3 Internal and external dynamics of Earth's geosphere

Possible Instructional Strategies/Lessons
Strategies and lessons that will enable students to master the standard and/or indicator.

- 8E.5C.1
  - Mineral Identification: Students obtain information regarding the physical and chemical properties of minerals by using the "Become a Mineral" test kit and "unknown" mineral samples. They utilize the data gathered to determine the identity of each mineral sample from an established key. An example of this kind of activity may be found at http://www.uaf.edu/files/olli/Lab1_Final_MineralID.pdf

Resources

- Earth's Natural Resources and Human Impacts: The Department of Natural Resources and the South Carolina Geological Survey developed this PowerPoint to align with the 2005 standards. Information, starting at slide 16, is a good resource for this indicator. This resource can be found at ftp://ftpdata.dnr.sc.gov/geology/Education/PDF/Natural%20Resources.pdf

- Rock Identification and Geologic Mapping: This presentation clearly and concisely explains and provides visuals of the different properties used for mineral identification and elaborates on the common uses of minerals. This resource can be found at http://www.uaf.edu/files/olli/OLLI_Lecture1_Mineral_ID_2015.pdf

- Coal Study Guide: A study guide discussing the history of coal, how and where it is mined, and its uses. This resource can be found at http://energy.gov/fe/downloads/coal-study-guide-middle-school

- Natural Gas Study Guide: A study guide discussing the history of natural gas, how and where it is mined, and its uses. This resource can be found at http://energy.gov/fe/downloads/natural-gas-study-guide-middle-school

- Oil Study Guide: A study guide discussing the history of oil, how and where it is mined, and its uses. This resource can be found at http://energy.gov/fe/downloads/oil-study-guide-middle-school

- Learning about Fossil Fuels: This Department of Energy website contains student-friendly chunks of information about coal, oil, and natural gas. This resource can be found at http://www.fossil.energy.gov/education/energylessons/index.html

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- Write a claim about the refining of bauxite in the production of aluminum. Cite statements from informational texts that support the claim. An example of this is http://www.postandcourier.com/article/20151022/PC05/151029791/power-struggle-aluminum-maker-may-close-south-carolina-smelter-dec-31

- Provide other informational texts and have students create a claim concerning the use of fossil fuels. Use three pieces of evidence from the source to support the claim.

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