

RESOURCESCOMMON CORESCIENCE CENTERSYLLABUS

**Topic of Study:** Thinking and Working Like a Scientist & Earth's Structure

**Bodies of Knowledge:** Nature of Science, Earth Science

**Big Ideas:** The Practice of Science, The Characteristics of Scientific Knowledge, The Role of Theories, Laws, Hypothesis, and Models, Earth's Structure

**Essential Question:** 1. What are the types of scientific knowledge?(1-1) 2. How is science done?(1-2) 3. How do scientists organize, analyze, and present data?(1-3) What are minerals, how do they form, and how are they identified? (2-1) What is the rock cycle? (2-2) What are Earth's layers? (2-3) What is plate tectonics? (2-4) How do mountains form? (2-5)What are earthquakes? (2-6) How do volcanoes change Earth's surface? (2-7)

**Vocabulary:** empirical evidence, theory, law, experiment, hypothesis, independent variable, dependent variable, observation, data, model, matter, compound, silicate, material, cleavage, element, mineral, luster, atom silicate mineral, streak, rock cycle, deposition, rift zone, weathering, uplift, erosion, subsidence, core, convection, mesosphere, crust, lithosphere, mantle, asthenosphere, Pangea, sea-floor spreading, convergent boundary, plate tectonics, convection, divergent boundary, transform boundary, tectonic plate, deformation, shear stress, compression, folding, tension, fault, earthquake, fault, tectonic plate boundary, epicenter, elastic rebound, focus, deformation, volcano, vent, magma, tectonic plate, lava, hot spot

**Common Inquiry Labs:**

- **SC.7.N.1.5** - Exploring Convection pgs. 25 – 33
- **SC.7.N.1.2** - Identifying Minerals pgs. 9 – 13
- **SC.7.N.1.4** - Cooling Rate and Crystal Size pgs. 46 – 48
- **SC.7.N.1.7** - Pluto on Trial pgs. 1 – 4
- **SC.7.N.3.1** – Mapping the Ocean Floor pgs. 34 – 41
- **SC.7.N.3.2** – Soil Structure & Water Flow pgs. 14 – 15
- **SC.7.E.6.1** – Layers of the Earth pgs. 59 – 61
- **SC.7.E.6.2** - Crayon Rock Cycle pgs. 52 – 53
- **SC.7.E.6.3** - Ordering Rock Layers pgs. 143 – 146
- **SC.7.E.6.4** - Earth's History pgs. 153 – 155
- **SC.7.E.6.5** - Reconstructing Land Masses pgs. 65 – 67
- **SC.7.E.6.6** - Debating Human Impact pgs. 173 -176
- **SC.7.E.6.7** - Mantle Convection pgs. 68 - 69

	<b>Technology Links:</b>	
<p><b><u>Lab Assistance:</u></b></p> <p><a href="#"><i>Scientific Methods Skills</i></a></p> <p><a href="#"><i>Writing in the Sciences</i></a></p> <p><a href="#"><i>Cooperative Learning Activities</i></a></p>	<p><b><u>Science Links:</u></b></p> <p><a href="#"><i>Vocabulary Strategies</i></a></p> <p><a href="#"><i>Graphic Organizers and Reading Strategies</i></a></p> <p><a href="#"><i>Fold Notes</i></a></p>	<p><b><u>Science Fair Assistance:</u></b></p> <p><a href="#"><i>Math in Science</i></a></p> <p><a href="#"><i>Planning for Science Fair and Competitions</i></a></p>

Above Level

On Level

Below Level

NGSSS	Outline of Content	Targets
<p><b>SC.7.N.1.1</b> Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific <a href="#">investigation</a> of various types, such as systematic <a href="#">observations</a> or <a href="#">experiments</a>, identify <a href="#">variables</a>, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. Cognitive Complexity: High</p> <p><b>SC.7.N.1.2</b> Differentiate <a href="#">replication</a> (by others) from repetition (multiple trials). Cognitive Complexity: Moderate</p> <p><b>SC.7.N.1.3</b> Distinguish between an <a href="#">experiment</a> (which must involve the identification and control of variables) and other forms of scientific <a href="#">investigation</a> and explain that not all scientific knowledge is derived from experimentation. Cognitive Complexity: Moderate</p> <p><b>SC.7.N.1.4</b> Identify test <a href="#">variables</a> (independent variables) and outcome <a href="#">variables</a> (dependent variables) in an <a href="#">experiment</a>. Cognitive Complexity: Low</p>	<p><b>Unit 1 Lesson 1</b> <b>Nature of Science and Empirical Evidence</b></p> <ol style="list-style-type: none"> <li>Describe the nature of science and introduce some fields of science.</li> <li>Define empirical evidence.</li> <li>Describe the methods used to gain empirical evidence.</li> </ol> <p><b>Theory vs. Law</b></p> <ol style="list-style-type: none"> <li>Define theory.</li> <li>Define law.</li> <li>Explain the difference between a scientific theory and a law.</li> <li>Identify several scientific theories.</li> </ol> <p><b>Scientific Change</b></p> <ol style="list-style-type: none"> <li>Describe how a scientific theory may change with new evidence.</li> <li>Recognize the importance of debate in establishing scientific knowledge.</li> </ol> <p><b>Unit 1 Lesson 2</b> <b>Types of Scientific Investigations</b></p> <ol style="list-style-type: none"> <li>Differentiate between experiments and other scientific investigations.</li> <li>Define experiment.</li> <li>Describe the benefits and limitations of experiments and other investigations.</li> </ol> <p><b>Conducting a Scientific Experiment</b></p> <ol style="list-style-type: none"> <li>Define hypothesis, independent variable, dependent variable, observation, and data.</li> <li>Explain the major processes involved</li> <li>In conducting a scientific investigation.</li> </ol> <p><b>Characteristics of Good Scientific Investigations</b></p> <ol style="list-style-type: none"> <li>List some characteristics of good scientific investigations.</li> <li>Differentiate between replication and repetition.</li> <li>Evaluate the quality of scientific information from different sources.</li> </ol>	<ul style="list-style-type: none"> <li>Plan and carry out scientific investigations.</li> <li>Design an experimental procedure when given a problem.</li> <li>Collect and organize data.</li> <li>Execute and analyze an experimental design for validity (e.g., variables held constant, repetition for validity, systemic observation, procedure for replication, identified tested (independent variable) and outcome variables (dependent variable), control experiment for comparison).</li> <li>Recognize that the experimental procedures are provided to other researchers to allow replication of an experiment.</li> <li>Explain the roles of variables and a control in an experiment.</li> <li>Differentiate between replication (by others) and repetition (multiple trials).</li> <li>Communicate results of an experiment.</li> <li>Defend a conclusion based on available data.</li> <li>Identify advances in research tools that allow new discoveries, for example the effect of radiometric dating on Geologic Time, the Hubble telescope on the farthest galaxies seen and the Scanning Tunneling microscope on nanotechnology.</li> <li>Distinguish the difference between a scientific law and theory vs. a societal law.</li> <li>Give examples of how advances in technology have affected scientific theories and laws.</li> <li>Compare and contrast the terms that describe examples of scientific knowledge such as: theory, law, hypothesis, and</li> </ul>

<p><b>SC. 7.N.1.5</b> Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics. Cognitive Complexity: Moderate</p> <p><b>SC. 7.N.1.6</b> Explain that empirical evidence is the cumulative body of <a href="#">observations</a> of a natural phenomenon on which scientific explanations are based. Cognitive Complexity: Moderate</p> <p><b>SC.7.N.1.7</b> Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community. Cognitive Complexity: Moderate</p> <p><b>SC.7.N.2.1</b> Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered. Cognitive Complexity: Low</p> <p><b>SC.7.N.3.1</b> Recognize and explain the difference between <a href="#">theories</a> and <a href="#">laws</a> and give several examples of scientific <a href="#">theories</a> and the evidence that supports them. Cognitive Complexity: High</p> <p><b>SC.7.N.3.2</b> Identify the benefits and limitations of the use of scientific <a href="#">models</a>. Cognitive Complexity: Moderate</p>	<p><b>Unit 1 Lesson 3</b></p> <p><b>Tables</b></p> <ol style="list-style-type: none"> <li>1. Construct tables</li> <li>2. Interpret data in tables.</li> </ol> <p><b>Graphs</b></p> <ol style="list-style-type: none"> <li>1. Construct graphs</li> <li>2. Interpret data in graphs.</li> </ol> <p><b>Models</b></p> <ol style="list-style-type: none"> <li>1. Define model.</li> <li>2. Identify benefits of the use of scientific methods.</li> <li>3. Identify limitations of the use of scientific models.</li> <li>4. Use models to represent aspects of the natural world.</li> </ol> <p><b>Lab Safety</b> <b>ScienceSaurus Handbook</b> <b>Lab Equipment (pgs.045 – 052)</b> What are examples of lab equipment in your science classroom? What is the lab equipment used for?</p> <p><b>Lab Safety (pgs. 021 – 045)</b> <b>Teacher note:</b> <i>download and refer to safety contract on resource page.</i> Identify and discuss lab safety equipment in classrooms.</p> <p><b>Science Fair</b> <b>Teacher Note:</b> <i>Refer to ISEF (International Science and Engineering Fair) forms on resource page.</i></p> <p><b>FUSION – Lab Manual</b></p> <ol style="list-style-type: none"> <li>1. Teacher Lab Safety (vii-xi)</li> <li>2. Student Lab Safety (xii-xxi)</li> </ol>	<p>model.</p> <ul style="list-style-type: none"> <li>• Distinguish between a scientific theory and a general claim.</li> <li>• Explain why models are used in science to observe processes that happen too slowly, too quickly, or are too small or vast for direct observation.</li> <li>• Give examples of visual/physical, mathematical, and conceptual models as used in science.</li> <li>• Recognize, identify and know how to safely and accurately use lab equipment.</li> <li>• Explain appropriate science lab behavior (no playing or pushing, no food/drink, no running, do not touch anything until told, etc...).</li> <li>• Describe the importance of following all written or oral directions of the teacher when conducting an investigation.</li> <li>• Identify protective clothing worn in the lab: safety goggles, aprons, gloves.</li> <li>• Recognize that different types of wastes are disposed of in specific ways.</li> <li>• Create a lab safety plan for the Laboratory</li> </ul>
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<p>SC.7.E.6.2 Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and subsurface events (plate tectonics and mountain building). Cognitive Complexity: High</p> <p>SC.912.E.6.2 : Connect surface features to surface processes that are responsible for their formation. Cognitive Complexity: Moderate</p> <p>SC.7.E.6.3 Identify <a href="#">current</a> methods for measuring the age of Earth and its parts, including the <a href="#">law of superposition</a> and <a href="#">radioactive dating</a> . Cognitive Complexity: Moderate</p> <p>SC.912.E.6.1 : Describe and differentiate the layers of Earth and the interactions among them. Cognitive Complexity: Moderate</p> <p>SC.7.E.6.5 Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building. Cognitive Complexity: moderate</p>	<p><b>Unit 2 Lesson 2</b> <b>Weathering</b></p> <ol style="list-style-type: none"> <li>1. Define weathering.</li> <li>2. Define erosion</li> <li>3. Define deposition.</li> </ol> <p><b>Three Classes of Rock</b></p> <ol style="list-style-type: none"> <li>1. Describe sedimentary rock formation.</li> <li>2. Describe igneous rock formation.</li> <li>3. Describe metamorphic rock formation.</li> </ol> <p><b>Rock Cycle</b></p> <ol style="list-style-type: none"> <li>1. Discuss how rock changes as it goes through the rock cycle.</li> </ol> <p><b>Plate Tectonics and the Rock Cycle</b></p> <ol style="list-style-type: none"> <li>1. Define uplift.</li> <li>2. Define subsidence.</li> <li>3. Define rift zone.</li> </ol> <p><b>Unit 2 Lesson 3</b> <b>Earth's Compositional Layers</b></p> <ol style="list-style-type: none"> <li>1. Describe the compositional layers of the Earth.</li> <li>2. Define core.</li> <li>3. Define crust.</li> <li>4. Define mantle.</li> </ol> <p><b>Earth's Physical Layers</b></p> <ol style="list-style-type: none"> <li>1. Describe the physical structure of the Earth.</li> <li>2. Define lithosphere</li> <li>3. Define asthenosphere.</li> <li>4. Define mesosphere.</li> <li>5. Compare the inner and outer cores.</li> </ol> <p><b>Unit 2 Lesson 4</b> <b>Theory of Plate Tectonics</b></p> <ol style="list-style-type: none"> <li>1. Define plate tectonics.</li> <li>2. Define continental drift.</li> <li>3. Discuss scientific evidence Supporting continental drift.</li> </ol> <p><b>Tectonic Plates</b></p> <ol style="list-style-type: none"> <li>1. Define tectonic plate.</li> <li>2. Compare continental and Oceanic crust.</li> </ol> <p><b>Types of Plate Boundaries</b></p> <ol style="list-style-type: none"> <li>1. Define convergent boundary.</li> <li>2. Define divergent boundary.</li> <li>3. Define transform boundary.</li> </ol> <p><b>Causes of Tectonic Plate Motion</b></p> <ol style="list-style-type: none"> <li>1. List three possible causes for the movement of tectonic plates.</li> </ol>	<ul style="list-style-type: none"> <li>• Compare and contrast the role that physical and chemical weathering plays in shaping and reshaping the Earth (e.g. beaches, aquifers, sinkholes, caverns).</li> <li>• Identify the agents of erosion and deposition (water, wind, and gravity).</li> <li>• Describe the formation of igneous rocks.</li> <li>• Describe the formation of sedimentary rocks.</li> <li>• Describe the formation of metamorphic rocks.</li> <li>• Explain how all rocks are connected by the surface and subsurface processes of the rock cycle.</li> <li>• Identify the connection of subsurface events (plate tectonics, mountain building) to the rock cycle. Describe plate tectonics (crust movement and their effects), the formation of land masses, and mountain building.</li> <li>• Identify the agents of erosion and deposition (water, wind, and gravity).</li> </ul>
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<p>SC.912.E.6.3 : Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates. Cognitive Complexity: High</p> <p>SC.7.E.6.1 Describe the layers of the <u>solid</u> Earth, including the <u>lithosphere</u>, the hot convecting mantle, and the dense metallic <u>liquid</u> and <u>solid</u> cores. Cognitive Complexity: Moderate</p> <p>SC.912.E.6.1 : Describe and differentiate the layers of Earth and the interactions among them. Cognitive Complexity: Moderate</p> <p>SC.7.E.6.4 Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time. Cognitive Complexity: High</p> <p>SC.7.E.6.7 Recognize that heat flow and movement of material within Earth causes earthquakes and volcanic eruptions, and creates mountains and ocean basins. Cognitive Complexity: Moderate</p>	<p><b>Unit 2 Lesson 5</b> <b>Deformation and Folding</b></p> <ol style="list-style-type: none"> <li>1. Describe how tectonic plate motion can cause deformation.</li> <li>2. Define folding.</li> <li>3. Compare anticline and syncline folds.</li> </ol> <p><b>Faulting</b></p> <ol style="list-style-type: none"> <li>1. Define faults.</li> <li>2. Compare the three kinds of faults.</li> </ol> <p><b>Mountains</b></p> <ol style="list-style-type: none"> <li>1. Compare the three kinds of mountains.</li> </ol> <p><b>Unit 2 Lesson 6</b> <b>What Earthquakes Are and Why They Happen</b></p> <ol style="list-style-type: none"> <li>1. Define earthquake.</li> <li>2. Explain why earthquakes occur.</li> <li>3. Define epicenter and focus.</li> <li>4. Define elastic rebound.</li> <li>5. Define deformation.</li> </ol> <p><b>Where Earthquakes Happen</b></p> <ol style="list-style-type: none"> <li>1. Describe where earthquakes happen.</li> <li>2. Define tectonic plate boundary.</li> </ol> <p><b>Effects of Earthquakes</b></p> <ol style="list-style-type: none"> <li>1. Describe what can happen at Earth's surface during an earthquake.</li> <li>2. Describe how earthquakes can affect people and structures.</li> </ol> <p><b>Unit 2 Lesson 7</b> <b>Volcanoes</b></p> <ol style="list-style-type: none"> <li>1. Define volcano.</li> <li>2. Define magma and vent.</li> <li>3. Define vent.</li> <li>4. Describe the kinds of materials that erupt from volcanoes.</li> </ol> <p><b>Volcanic Landforms</b></p> <ol style="list-style-type: none"> <li>1. Describe the landforms formed by volcanoes.</li> <li>2. Identify three kinds of volcanic mountains.</li> </ol> <p><b>Where Volcanoes Form</b></p> <ol style="list-style-type: none"> <li>1. Discuss the occurrence of volcanoes at plate boundaries and at hot spots.</li> </ol>	
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