

# Phoenixville Area School District Understanding by Design (UbD) Science Template

**Grade** Level 4

**Unit Name:** Soil, Rocks & Landforms

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Stage 1 Desired Results		
<p><b>Overarching NGSS &amp; PA Standards:</b></p> <p><b>3.3.4.A</b> Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.</p> <p><b>3.3.4.B</b> Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.</p> <p><b>3.3.4.C</b> Analyze and interpret data</p>	<i>Transfer</i>	
	<p><i>Students will be able to independently use their learning to...</i></p> <ol style="list-style-type: none"> <li>1. Ask questions and/or define problems</li> <li>2. Develop and/or use models</li> <li>3. Plan and/or carry out investigations</li> <li>4. Analyze and interpret data using computational thinking</li> <li>5. Obtain, evaluate, and communicate information (supported by evidence)</li> <li>6. Construct explanations and design solutions</li> </ol>	
	<i>Meaning-Making</i>	
	<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• Soils can be described by their properties</li> <li>• The surface of Earth is constantly changing; sometimes those changes take a long time to occur and sometimes they happen rapidly</li> <li>• A topographic map uses contour lines to show the shape and elevation of the land</li> <li>• Natural resources are natural materials taken from the environment and used by humans</li> </ul>	<p><b>ESSENTIAL QUESTIONS</b> <i>Students will keep considering...</i></p> <ul style="list-style-type: none"> <li>• How does Earth change over time?</li> <li>• How do soils form?</li> <li>• How do erosion and deposition impact landforms?</li> <li>• What do the location of fossils in rock layers tell us about past life on Earth?</li> <li>• What might reduce the impact of catastrophic Earth surface events?</li> <li>• What are natural resources and how are these resources used by people?</li> </ul>
<i>Knowledge and Skills Acquisition</i>		

from maps to describe patterns of Earth's features.

**3.3.4.D**

Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

**3.3.3.C**

Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.

**Which branch(es) of science apply:**

**E&SS**

**UNDERSTANDINGS**

*Students will know...*

- Soils are composed of different kinds and amounts of earth materials and humus
- Weathering is the breakdown of rocks and minerals at or near Earth's surface
- The physical-weathering processes of abrasion and freezing break rocks and minerals into smaller pieces
- Chemical weathering occurs when exposure to water and air changes rocks and minerals into something new
- Weathered rock material can be reshaped into new landforms by the slow processes of erosion and deposition
- Erosion is the transport (movement) of weathered rock material (sediments) by moving water or wind.
- Deposition is the settling of sediments when the speed of moving water or wind declines
- The rate and volume of erosion relate directly to the amount of energy in moving water or wind
- The energy of moving water depends on the mass of water in motion and its velocity. The greater the mass and velocity, the greater the energy
- Fossils provide evidence of organisms that lived long ago
- The change in elevation between two adjacent contour lines is always uniform. The closer the contour lines, the steeper the slope and vice versa.
- A profile is a side view or cross-section representation of a landform, and can be derived from the information on a topographic map
- Scientists and engineers work together to improve the use of natural resources to make them more durable and useful

**KEY VOCABULARY**

Energy	Range	Earthquake
Environment	Sediment	Formation
Boundary	Topographic map	Fossil
Continent	Temperature	Landscape
Deposition	Trench	Fuel
Erosion	Vegetation	Nonrenewable
Location	Volcano	Renewable
Mountain	Weathering	Resources

*Students will be skilled at...*

- Conducting investigations and drawing conclusions
- Explaining how water moves earth materials from one location to another
- Explaining how physical and chemical weathering can change Earth materials
- Investigating the variables of slope and water quantity
- Explaining how fossils provide evidence of life and landscapes from the ancient past
- Developing explanations for the changing Earth due to landslides, earthquakes, floods, and volcanoes
- generating ideas that engineers and scientists might use to reduce the impact of these Earth changes.
- Differentiating between renewable and nonrenewable natural resources

Evaluative Criteria	Assessment Evidence	
<p>What criteria will be used in each assessment to evaluate attainment of the desired results?</p> <p>Rubrics related to each will be developed.</p>	<p style="text-align: center;">PERFORMANCE TASK(S):</p> <p>Investigations:</p> <p>I. <b>Task(s):</b> Students engage firsthand with the phenomenon of soils. They investigate properties of soil by comparing four different soils. They learn that soils are composed of essentially the same types of materials (inorganic earth materials and humus), but the amounts of the materials vary. They begin to explore how rocks break into smaller pieces through physical and chemical weathering. Students go outdoors to explore and compare properties of local soils. <b>Assessment:</b> Investigation 1 I-Check</p> <p>II. <b>Task(s):</b> Students engage with the phenomena of erosion and deposition of weathered earth material by flowing water. They use stream-table models to observe that water moves earth materials from one location to another. They investigate the variables of slope and water quantity and plan and conduct their own stream-table investigations. Students look for evidence of erosion and deposition outdoors.</p> <p>Students pursue explanations for the phenomenon of fossils found in layers of sedimentary rock. They think about what happens to sediments over long periods of time as sediments layer on top of each other. They learn about the different processes that can result in fossils and how fossils provide evidence of life and landscapes from the ancient past. <b>Assessment:</b> Investigation 2 I-Check</p> <p>III. Students engage with the phenomena of Earth’s mountains. They are introduced to the study of topography by building a model of the mountain landform. Students use the foam model of Mount Shasta to create a topographic map and use this map to produce another representation of the landforms— a profile of the mountain. Students learn about volcanoes; they use the topographer’s tools to analyze the impact of the Mount St. Helens eruption. Students are introduced to phenomena that cause rapid changes to Earth’s surface: landslides, earthquakes, floods, and volcanoes, and generate ideas that engineers and scientists might use to reduce the impact of these Earth changes. <b>Assessment:</b> Investigation 3 I-Check</p> <p>IV. <b>Task(s):</b> Students engage with the phenomena of natural resources and how they are used. Students start by reviewing what they have learned in Investigations 1–3. Then they focus on earth materials as renewable and nonrenewable natural resources. They learn the importance of earth materials as resources. The class makes a stepping stone</p>	<p>Differentiation Considerations:</p> <p>For labs, some students may wish to:</p> <ul style="list-style-type: none"> <li>• Explain verbally instead of in a written format</li> <li>• Draw their responses</li> <li>• Write in their first language</li> </ul> <p>If challenges arise with the complexity of the task(s), some students may need:</p> <ul style="list-style-type: none"> <li>• Additional incremental steps</li> <li>• An alternative activity</li> </ul> <p>Other considerations:</p> <ul style="list-style-type: none"> <li>• When grouping students’ various skills sets and strengths will be considered</li> <li>• When asking students to describe a model, opportunities to draw or write it, as well.</li> <li>• Teacher can scribe written responses for students</li> </ul>

	<p>out of concrete and goes on a schoolyard walk to find objects and structures and consider what natural resources were used to construct them.</p> <p><b>Assessment:</b> Investigation 4 I-Check</p>	
<p>What criteria will be used in each assessment to evaluate attainment of the desired results?</p> <p>Rubrics related to each will be developed.</p>	<p style="text-align: center;">OTHER EVIDENCE:</p> <ul style="list-style-type: none"> <li>• Checklists of collaborative behaviors in labs and activities</li> <li>• Checklists of collaborative behaviors in class discussions</li> <li>• Daily journal entries</li> <li>• Self-Assessment Rubrics for all performance tasks</li> <li>• Science Notebook</li> <li>• TO CONSIDER FOR LATER: UNIT TEST(S)</li> </ul>	<p>Differentiation Considerations:</p> <p>For journal entries, consider that some students may wish to:</p> <ul style="list-style-type: none"> <li>• draw instead of write entries</li> <li>• write in their first language</li> <li>• record verbally instead of in a written format</li> </ul>