

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

**Grade Level: 6**

**Unit Name: Earth Systems**

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## Stage 1 Desired Results

<b>Transfer</b>		
<p><b>Overarching NGSS &amp; PA Standards:</b></p> <p><b>3.3.6-8.D</b> Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6 billion-year-old history.</p> <p><b>3.3.6-8.E</b> Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.</p> <p><b>3.3.6-8.F</b> Develop a model to describe the</p>	<p>Students will be able to independently use their learning to...</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>	
	<b>Meaning-Making</b>	
<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> <li>• All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior.</li> <li>• The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms.</li> <li>• The motion of the Earth's plates produces changes on a planetary scale over a range of time periods from millions to billions of years. Evidence for the motion of plates can explain large-scale features of the Earth's surface (e.g., mountains, distribution of continents) and how they change.</li> <li>• Regions of different continents that share similar fossils and similar rocks suggest that, in the geologic past, those sections of continent were once attached and have since separated.</li> <li>• Weather and climate are influenced by interactions involving sunlight, the ocean, and the atmosphere.</li> <li>• Water continually cycles among land, ocean, and the atmosphere.</li> </ul>	<p><b>ESSENTIAL QUESTIONS</b> <i>Students will keep considering...</i></p> <ol style="list-style-type: none"> <li>1. How do the hydrosphere, geosphere, and atmosphere interact?</li> <li>2. How does the sun's energy affect us on Earth?</li> <li>3. How has Earth changed over time? What was the cause of these changes?</li> <li>4. How does matter cycle within the Earth?</li> <li>5. How does the structure and composition of Earth affect where we live?</li> <li>6. What causes weather?</li> <li>7. How can weather be predicted?</li> </ol>	

<b>Knowledge and Skills Acquisition</b>		
<p>cycling of Earth's materials and the flow of energy that drives this process.</p> <p><b>3.3.6-8.G</b> Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.</p> <p><b>3.3.6-8.H</b> Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.</p>	<p><b>UNDERSTANDINGS</b></p> <p><i>Students will know...</i></p> <ul style="list-style-type: none"> <li>• Earth's atmosphere has a specific structure and composition with certain properties.</li> <li>• The geosphere, hydrosphere, and atmosphere are all part of Earth that interact with one another.</li> <li>• Global heating by the sun is the driving force behind weather and climate patterns with understanding of heat transfer – Convection, Conduction, Radiation</li> <li>• All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems.</li> <li>• Earth's internal heat energy drives processes such as melting, crystallization, and deformation that change the atomic arrangement of elements in rocks and that move and push rock material to the Earth's surface.</li> <li>• How processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events.</li> <li>• Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.</li> <li>• Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.</li> <li>• Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things.</li> <li>• The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.</li> <li>• Information from weather data can be used to make predictions about weather conditions.</li> </ul>	<p><i>Students will be skilled at...</i></p> <ul style="list-style-type: none"> <li>• Differentiating between the layers of the atmosphere and their role in protecting life on Earth</li> <li>• Modeling Earth's structure and composition and impacts that cause change to these structures.</li> <li>• Demonstrating an understanding of different Earth through the cycling of Earth's materials</li> <li>• Modeling energy flow from the sun and other heat sources</li> <li>• Analyzing and interpreting examples of data including similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches)</li> </ul>

## KEY VOCABULARY

### 3.3.6-8.I

Develop and use a model to describe how unequal heating and rotation of Earth cause patterns of atmospheric and oceanic circulation that determine regional climate.

### 3.3.6-8.J

Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

### 3.2.6-8.M

Apply scientific principles to design, construct, and test a device that either minimizes or maximizes

- Atmosphere (Troposphere, Stratosphere, Mesosphere, Thermosphere, Exosphere)
- Heat Transfer – Conduction, Convection, and Radiation
- Earth's Structure/Composition (Crust, Mantle, Outer Core, Inner Core)
- Pangaea
- Plate Tectonics – Continental Plates, Oceanic Plates, Subduction, Faults, Earthquakes
- The Rock Cycle (Igneous Rock, Sedimentary Rock, Metamorphic Rock)
- Water Cycle and Watersheds – (Evaporation, Transpiration, Condensation, Precipitation, Run-Off, Ground Water)
- Weathering and Erosion – Water, Ice, Gravity, Wind
- Weather
- Air Mass
- Front
- Clouds – Cirrus, Cumulus, Stratus, Nimbo-, -Nimbus
- High Pressure
- Low Pressure
- Density
- Climate – Tropic, Temperate, Polar

- Provide evidence for causes of catastrophic events (e.g., earthquakes, volcanoes, meteor impacts)
- Describing/Modeling the water cycle and its connection to weather
- Interpreting data (temperature, humidity, air pressure) gathered about the atmosphere is used to make predictions about weather conditions.
- Explaining how the uneven heating of the Earth causes local winds patterns and their effect on weather and climate.
- Relating the movement of air masses and low- and high-pressure systems to the formation of weather conditions.
- Creating and interpreting weather maps as a tool to predict weather.



	OTHER EVIDENCE:	Differentiation Considerations:
Content Criteria/ Observation	1. Layers of the atmosphere foldable <ul style="list-style-type: none"> <li>• Make a model of Earth’s 5 layers of the atmosphere</li> <li>• Troposphere, Stratosphere, Mesosphere, Thermosphere, Exosphere clearly labeled on each tab</li> <li>• Distance labeled for each layer and pictures and descriptions to go with items occurring in that layer</li> </ul>	Modified Quizzes
Content Criteria/ Observation	2. Heat Transfer <ul style="list-style-type: none"> <li>• Heat Transfer Sort</li> <li>• Heat Energy and Transfer Task Cards</li> </ul>	Flexible grouping
Graded Quizzes	3. Atmosphere and Heat Transfer Quiz	Guided/Cloze Notes
Content Criteria/ Observation	4. 3D Model of Earth’s Layers Using Recycled Materials <ul style="list-style-type: none"> <li>• Students create a model with recycled materials to show crust, mantle, outer core, inner core</li> <li>• Website for 3D model ideas</li> </ul>	Pictures and videos to support vocabulary
Graded Answers to Questions on Lab Sheet (linked)	5. Plate Tectonics Plate Tectonics Puzzle Plate Tectonics WebQuest Plate Boundaries and The Ring of Fire Plate Tectonic Jeopardy Game Plate Tectonic Quiz (TS)	Sentence Starters
Graded Quizzes	6. Plate Tectonic Quiz and Science Scenario <ul style="list-style-type: none"> <li>• Students will analyze the scientific validity of movie clips based on their knowledge of the structure of Earth and plate tectonics</li> </ul> Science Scenario - Plate Tectonics (CS)	Product modification in place of writing: -Drawing -Verbal explanation
Lab Sheet (linked)	7. Minerals VS. Rocks <ul style="list-style-type: none"> <li>• Lab - Students use scientific tests to identify minerals</li> </ul> Mineral Classification Chart	Homogeneously grouped labs to allow for teacher support
Content Criteria/ Observation	<ul style="list-style-type: none"> <li>• Lab – Rock Identification</li> </ul> Rock Identification Chart	

<p>Content Criteria/ Observation</p> <p>Observation</p>	<p>8. The Rock Cycle Starburst Lab to Model Rock Cycle</p> <ul style="list-style-type: none"> <li>• Students investigate the cycle by taking a journey through the rock cycle learning how rocks are formed, shaped, and changed throughout the process</li> <li>• Students note their journey and discuss with peers</li> </ul> <p>Journey Through the Rock Cycle Stations Journey Through the Rock Cycle Tracking and Questions</p> <p>9. The Rock Cycle Quiz (TS)</p> <p>10. Lab – Water in our Atmosphere Water Cycle Journey</p> <p>11. Let’s Get Breezy Lab</p> <ul style="list-style-type: none"> <li>• Follow the Scientific method to form a hypothesis, gather evidence, and form a conclusion</li> <li>• Students set up samples of land and water</li> <li>• Use temperature probes to measure the heating (every minute for 10 minutes) and cooling (every minute for 10 minutes) of “land” and “water”</li> <li>• Let’s Get Breezy Lab – Scientific Method</li> </ul> <p>12. Weather Booklet – Air Masses, Fronts, Clouds, Air Pressure, Wind, Humidity, Dew Point</p> <ul style="list-style-type: none"> <li>• Students design an informational book with words and pictures are they learn about the weather</li> </ul> <p>Air Masses Fronts Air Pressure and Winds Humidity and Dew Point</p> <p>13. Science Notebook Entries</p> <ul style="list-style-type: none"> <li>• Concept maps</li> <li>• Vocabulary/Glossary entries</li> <li>• Guided Research</li> </ul> <p>13. Class Participation</p> <ul style="list-style-type: none"> <li>• Volunteering</li> <li>• Note-taking</li> <li>• Participation in Labs</li> </ul>	
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