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

Grade Level: 8th Grade **Unit Name: Earth Systems** **Author: D. Sylvan**

Stage 1 Desired Results

Overarching NGSS & PA Standards:

3.3.6-8.D 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.

3.3.6-8.G Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the

Transfer

Students will be able to independently use their learning to…

1. Ask questions and/or define problems
2. Develop and/or use models
3. Plan and/or carry out investigations
4. Analyze and interpret data using computational thinking
5. Obtain, evaluate, and communicate information (supported by evidence)
6. Construct explanations and design solutions

Meaning-Making

Students will understand that…

- 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.
- Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
- Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
- Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
- Apply scientific principles to design a method for monitoring and minimizing human impact on the environment.
- Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

ESSENTIAL QUESTIONS
Students will keep considering...

ESS 1C: How do people reconstruct and date events in Earths planetary history?

ESS 3A: How do humans depend on Earth's resources?

ESS 3B: How do natural hazards affect individuals and societies?

ESS 3C: How do humans change the planet?

ESS 3D: How do people model and predict the effects of

<table>
<tr><td>past plate motions.</td><td></td><td>human activities on Earth's climate?</td></tr>
<tr><td>3.3.6-8.K
Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

3.3.6-8.L
Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

3.3.6-8.M</td><td colspan="2">Knowledge and Skills Acquisition</td></tr>
<tr><td></td><td>UNDERSTANDINGS
Students will know…

• The geological time scale interpreted from rock strata provides a way to organize Earth’s history.
• Major historical events include the formation of mountain chains and ocean basins, the evolution and extinction of particular living organisms, volcanic eruptions, periods of massive glaciation, and development of watersheds and rivers through glaciation and water erosion.
• Humans depend on Earth’s land, ocean, atmosphere, and biosphere for many different resources. Many of those resources are not renewable and have a wide distribution due to geological processes.
• 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.
• Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of many other species.
• Changes to Earth’s environments can have different impacts (negative and positive) for different living things.
• Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth’s mean surface temperature (global warming).</td><td rowspan="2">Students will be skilled at…

• Constructing explanations based on evidence that explain how the natural world operates.
• Analyzing and interpreting evidence to support a theory such as Plate Tectonics.
• Analyzing and interpreting data to determine the likelihood of a natural disaster.
• Apply scientific principles to identify and design a solution to climate change.
• Construct oral or written arguments for how humans affect the world around them.
• Ask questions and identify variables.</td></tr>
<tr><td></td><td>KEY VOCABULARY

1. Air Mass
2. Air Pressure
3. Atmospheric Movement
4. Climate Change
5. Continental Drift
6. Convection
7. Convergent Boundary
8. Coriolis Effect
9. Dam
10. Divergent Boundary
11. Earthquake</td></tr>
</table>

Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. **3.3.6-8.N** Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. **3.3.6-8.O** Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	12. Elevation 13. Hurricane 14. Greenhouse gas 15. Meteorologist 16. Natural disaster 17. Ocean Currents 18. Plate Tectonic Theory 19. Point/non-point source pollution 20. Pollution 21. Renewable/Non-renewable resources 22. Sea Floor Spreading 23. Subduction 24. Stormwater runoff 25. Surface/Ground water 26. Weather System	

Which branch(es) of science apply: E&SS		

Stage 2 – Evidence		
Evaluative Criteria	***Assessment Evidence***	

Graded tests and quizzes.
 	
Pre-Assessment via online game (quizizz, kahoot! Etc).
 	
Mastery Path Progress
 	
Rubrics related to each.
	PERFORMANCE TASK(S):
	
	Projects, Labs, and Investigations:
	
	• Lab: Rock Formation – Used crayon shavings to make Sedimentary, Metamorphic, then, Igneous rocks. (Old 7th Grade)
	• Lab: Analyze rock strata and fossil found in South America and Africa
	  ○ Identify similarities
	  ○ Determine how organisms and rock could have gotten from one continent to ther other.
	  ○ Identify other potential points where the continents would have been connected.
	• Lab: Plate tectonics – Using graham crackers and icing (if not used by 6th or 7th grade)
	  ○ Model different types of plate movement
	  ○ Identify landforms that would have been created by each.
	  ○ Seafloor spreading and the Atlantic Ridge
	• Project: Natural Disaster News Broadcast or ebook
	  ○ Students research a natural disaster from history or the modern day of their choice.
	  ○ Write and present a news broadcast or eBook describing the natural disaster:
	  ▪ Cause
	  ▪ Impact
	  ▪ Prevention
	• Lab: Examine natural hazard data for a given location
	  ▪ Water levels
	  ▪ Ice melt
	  ▪ Rainfall – drought
		Differentiation Considerations:
		
		Differentiation Considerations:
		
		Different modes of presentation
		
		• PowerPoint
		• poster
		• Student choice
		
		Use of notes and resources
		
		Chunked Assignment
		
		Adapted Assessment
		
		Chunked Assignment
		
		Checklists

	▪ Seismographs o Identify average data and determine what data point would be a cause for concern. o Create a PowerPoint presentation with findings. • Lab: Ground Water Pollution – water testing with aquaponics o Filter out different types of "polluted" water by designing and natural filtration systems using sand, clay, and soil. o Record and analyze data after each test. o Model groundwater pollution. • STEAM: Project: Dream a stream o Resource sharing activity where lab groups each get a section of a stream to develop a sustainable community. o Students are given a budget as well as a resource list. o Later, introduce that all streams are connected by laying them out in sequence. o Students discuss and identify what might happen to those further downstream. o Introduce a man-made disaster to the water, allowing students to determine how to deal with it given their resources and budget. Alternative Projects/Labs/Presentations: • Project: Topographic Maps o Students use a topographic map of a local watershed and trace each gradient on a piece of cardboard. o Cut out cardboard gradients and glue them together to make a 3-D representation of the topographic map. o Plaster may be used to smooth over the layers. • Project: Earth Day and/or Mini Science Fair for climate change o Build useful things out of recycled materials	

Graded tests and quizzes. Pre-Assessment via online game (quizizz, kahoot! Etc). Mastery Path Progress Rubrics related to each.	OTHER EVIDENCE: Teacher Summative: • Geologic History/Plate Tectonics/Continental Drift • Natural Resources/Hazards • Human Impact/Climate Change Common Summative: • Unit Test Participation in hands-on labs a. Checklists of collaborative behaviors in labs and activities Science Notebook/Portfolio a. Concept maps b. Vocabulary/Glossary entries c. Guided Research d. Lab Reports described above e. Daily Journal Entries Checklists of collaborative behaviors in class discussions Self-assessments for Performance Tasks Class Participation	Differentiation Considerations: Differentiation Considerations: Adapted/Modified Quizzes Homogeneously grouped labs to allow for teacher support Pictures to support vocabulary Flexible grouping Peer Mentors Guided Notes/Printed PowerPoint Slides Pictures and videos to support vocabulary Sentence Starters Product modification in place of writing: • Drawing • Verbal explanation