Storyline Unit Design

Understanding by Design (UbD) Template*

Unit	**Earth processes that involve cycling**	Course(s)	
Designed by	**HIgh school Earth Science Teachers (the GOATs)**	Time Frame	**4-5 weeks**

Anchor Model

*UbD Unit Planner is from Wiggins, Grant and McTighe, Jay. Understanding by Design Guide to Creating High-Quality Units. Alexandria, VA: Association for Supervision and Curriculum Development. 2011.

Stage 1: Desired Results

Performance Expectations

HS-ESS2-3: Cycling of Matter in the Earth's Interior

Develop a model based on evidence of earth's interior to describe the cycling of matter by thermal convection. (Energy and Matter)

HS-ESS2-5: Interactions of the Hydrologic and Rock Cycles

Plan and conduct an investigation of the properties of water and its effects on earth materials and surface processes. (Structure and Function)

HS-ESS2-6: Carbon Cycling in Earth's Systems

Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. (Energy and Matter)

Anchoring Phenomenon

Anchoring Phenomenon Worksheet

Enduring Understandings	Essential Questions
The carbon cycle is directly influenced by both biological and geological activities. *The unique properties of water affect the various cycling of energy and matter on Earth.* *Cycling of energy and matter in Earth's crust drive the geologic activity of the planet*	*What is the significance of cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere?* *How do the unique properties of water affect Earth's materials and surface processes?* *How does the cycling of material in Earth's interior through thermal convection affect different surface processes?*

Stage 2: Assessments

HS-ESS2-3	A Future Water World	Assessment	Key	Evidence Statement
HS-ESS2-5	Investigating Erosivity	Assessment	Key	Evidence Statement
HS-ESS2-6	The Carbon Fluxes of North America	Assessment	Key	Evidence Statement

Assessment Screening Tools

Backward Design Elements

What new skills (practices) will students need to learn?	What thinking concepts will students need to learn?	What science concepts will students need to learn?
Type Here • Develop a model based on evidence • Plan and conduct an investigation • Develop a quantitative model to describe	*Type Here* • Energy and Matter • Structure and Function • Stability & Change • Cause & Effect	*Type Here* HS-ESS2-3 Earth's interior Radial layers (crust, mantle, liquid outer core, solid inner core) Mantle convection Plate tectonics Seismic waves Magnetic field Thermal energy Radioactive decay Energy and Matter HS-ESS2-5 Properties of water (e.g. heat capacity, density in liquid and solid states, polar nature) Earth materials Surface processes - Mechanical effects - Chemical effects Hydrologic cycle Rock cycle Structure and Function HS-ESS2-6 Carbon Carbon dioxide Biogeochemical cycling Earth's systems (hydrosphere, atmosphere, geosphere, biosphere) Energy and Matter

Stage 3: Learning Plan

Phenomenon or Problem	Learning Performance - What will they do? The three dimensions woven together into a single learning performance.	Why is this important? How does this activity help build understanding of the anchoring phenomenon.	Learning Experience - How will they do it? Graphic organizers, protocols, scaffolds, labs, mini-lesson, student discourse, etc.
Hudson & Wallkill Rivers	*Type Here*	*Type Here*	*Type Here*
Formative Assessment - What information are you collecting to know that they met the target?			
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Summative Assessment What information are you collecting to know that they met the target?			

Materials / Resources

Vocabulary

HS-ESS2-3
Earth's interior
Radial layers (crust, mantle, liquid outer core, solid inner core)
Mantle convection
Plate tectonics
Seismic waves
Magnetic field
Thermal energy
Radioactive decay
Energy and Matter

HS-ESS2-5
Properties of water (e.g. heat capacity, density in liquid and solid states, polar nature)
Earth materials
Surface processes
- Mechanical effects
- Chemical effects

Hydrologic cycle
Rock cycle
Structure and Function

HS-ESS2-6
Carbon
Carbon dioxide
Biogeochemical cycling
Earth's systems (hydrosphere, atmosphere, geosphere, biosphere)
Energy and Matter

Mini Lessons

Structure & Function Level 5 - Molecular-Level Structures
Structure & Function Level 5 - Molecular-Level Structures Thinking Slides
Matter Level 4 - Conservation of Matter
Matter Level 4 - Conservation of Matter Thinking Slides
Matter and Energy Level 5 - Cycles and Flows
Matter and Energy Level 5 - Cycles and Flows Thinking Slides
Energy Level 6 - Conservation of Energy
Energy Level 6 - Conservation of Energy Thinking Slides

Graphic Organizers

Phenomena Observation Graphic Organizer
Questioning Graphic Organizer
Modeling Graphic Organizer
Planning an Investigation Organizer - Experimental
Planning an Investigation Organizer - Observational
Investigation Evidence Organizer
Engaging in Argumentation Organizer

Differentiation / Modifications

Phenomenon Worksheet

Back to Stage 1

◁ **HS-ESS2-3 - Cycling Matter in the Earth's Interior**
◁ **HS-ESS2-5 - Interactions of the Hydrologic and Rock Cycles**
◁ **HS-ESS2-6 - Carbon Cycling in Earth's Systems**
◁ **Local and Relevant**
◁ **Favorite**

Mantle convection and tectonic plates
Radioactive Decay◁
Theory of Continental Drift◁
Climate Change◁
Earthquakes◁
Plate subduction & overriding (mountain building events)
Volcanic Activity ◁ ◁
Magnetic records in rocks ◁
Stream velocity◁◁
Carbon Cycling◁◁
Convection ◁
Weathering ◁◁
Erosion ◁◁
Plate tectonics ◁ ◁
Rock cycle ◁ ◁
Local Spheres of the earth ◁◁◁◁ **not this one**
Water cycle ◁
Drainage patterns ◁
porosity / permeability◁
Pollution ◁
Indistrlation
Hudson & Wallkill Rivers? This one

Screening Tools

Back to Stage 2

HS-ESS2-3: Cycling of Matter in the Earth's Interior

HS-ESS2-3 A Future Water World Assessment Key Evidence Statement

Reflections: *Type Here*

	No	Partial	Yes
1. The assessment contains a **phenomenon** (science) or a **problem** (engineering)			
2. The **prompts** match the Science and Engineering Practice (SEP) and engage students in sense making.			
3. The **stimuli** have multiple and sufficient information needed to utilize the SEP. (e.g. multiple data sets to analyze)			

4. The **prompts** elicit observable understanding of the Disciplinary Core Idea (DCI).			
5. The **prompts** explicitly mention the Crosscutting Concept (CCC).			
6. The **prompts** include language (i.e. bullets) from grade appropriate progressions. (SEP)(DCI)(CCC)			
7. The **graphic organizers** provide space for the observable features (e.g. 1, 2, 3...) in the evidence statement. (e.g. claim, evidence and reasoning)			
8. The **entire assessment** contains information that is scientifically accurate and properly attributed. (e.g. don't make up data and include the source)			
9. The **prompts** point in the direction of explaining a phenomenon (science) or designing a solution (engineering).			
10. The **phenomenon** or **problem** is authentic, interesting, and requires students to figure something out.			
11. The **phenomenon** or **problem** is novel to show the transfer of knowledge. (i.e. not in the unit)			

HS-ESS2-5: Interactions of the Hydrologic and Rock Cycles

Investigating Erosivity Assessment Key Evidence Statement

Reflections: *Type Here*

	No	Partial	Yes
1. The assessment contains a **phenomenon** (science) or a **problem** (engineering)			
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Screening Tools

Back to **Stage 2**

HS-ESS2-6: Carbon Cycling in Earth's Systems

The Carbon Fluxes of North America Assessment Key Evidence Statement

Reflections: *Type Here*

	No	Partial	Yes
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Screening Tools

Back to **Stage 2**

Standard
Evidence Statement
Assessment: (Google Template) (Key Template)

Reflections: *Type Here*

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Screening Tools

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