Annotated Unit Template for NGSS Units of Study (Jean Ward 2015)

Title of Unit	Geology and Geomorphology of Vermont	**Grade Level**	7
Curriculum Area	Life Science	**Time Frame**	4 weeks Fall 2016 4 weeks Spring 2017

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Desired Results (Stage 1)

Performance Expectations:

MS-ESS1-4 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.
MS-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
MS-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.

Content Standard(s) and DCI(s)

Standards:
-MS-ESS1 Earth's Place in the Universe
-MS-ESS2 Earth's Systems

DCIs:
-ESS1.C: The History of Planet Earth
-ESS2.A: Earth's Materials and Systems
-ESS2.B: Plate Tectonics and Large-Scale System Interactions
-ESS2.C: The Roles of Water in Earth's Surface Processes

Integrated Instructional Sequence (Stage 2) and Assessment Evidence (Stage 3)

Overarching Understanding #1:	**Scientists have used tools and developed laws and theories to discover and explain how Earth and life on earth have changed dramatically over time.**
Performance Expectation(s):	**MS-ESS1-4 . 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.** *[Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]*
Crosscutting Concept(s):	**Scale Proportion and Quantity** Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Knowledge from DCI(s) Students will know . . .	**Skills from Science and Engineering Practices** Students will be able to. . . .
ESS1.C: The History of Planet Earth The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale.	**Constructing Explanations and Designing Solutions:** Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Related Misconceptions
● Fossils are pieces of dead animals and plants. ● Fossils of tropical plants cannot be found in cold or dry areas. ● Fossils only represent bones and shells of extinct animals. Soft tissue can never be fossilized.

The fossil record does not support evolution. • There is significant disagreement about earth's age among scientists. • The Earth has always been pretty much the way it is now. • The Earth is as old as the oldest rocks found on its surface, 3.8 billion years old. • All rocks and planets were formed at the same time. • There is one geologic column for the whole earth. • All rocks are more or less the same (a rock is a rock!) • Geologic time can be described using hundreds of years ago. • It is easy to understand the amount of geologic time that has passed for changes on the Earth's surface to occur. • All of the Earth's heat comes from its lingering heat from its formation. • Radioactivity is dangerous. • Pictures from the Hubble Telescope were made by capturing pure visible light. • All uranium ore is highly radioactive. • All radioactivity is destructive. • The rate of radioactive decay can change. • There is a way to define our concept of time. • The Earth is younger than 4.6 billion years old. • People's "traditional" sense of time has always existed.

Instructional Sequence				
Lesson #	**Guiding Questions**	**Tiers 2-3 Vocabulary**	**7 E Activities**	**Assessment: PEs, Formative, Summative**
1	Are modern birds living dinosaurs?	Fossil record	**Engage & Elicit:** Living Dinosaurs: Fact or Fiction?	Pre-assessment
2	How is the skeleton of a chicken similar to dinosaur skeletons?	Digit, phylogenetic tree, comparative anatomy	**Explore:** Comparative Anatomy of the Domestic Chicken	Formative
3	What Vermont's geological story?		**Explain:** -Listen to VT Edition Program, "Digging Into Deep Time:Vermont Geology" -Visit to St. Gaudens National Historic Site to view Mt. Ascutney	Formative
4	How does Vermont's story fit into the geological story of the Earth?		**Elaborate & Extend:** -Create and illustrated timeline of geological history focusing on Vermont	PE

Integrated Instructional Sequence (Stage 2) and Assessment Evidence (Stage 3)	
Overarching Understanding #2:	**The effects from Tropical Storm Irene are evidence of how geoscience processes have changed the surface of the Earth in our local environment.**
Performance Expectation(s):	**MS-ESS2-2: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.** [Clarification Statement: Emphasis is on 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. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]
Crosscutting Concept(s):	**Scale Proportion and Quantity** ● Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.

Knowledge from DCI(s) Students will know . . .	**Skills from Science and Engineering Practices** Students will be able to. . . .
ESS2.A: Earth's Materials and Systems ● The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. **ESS2.C: The Roles of Water in Earth's Surface Processes** ● Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations.	● **Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe nature operate today as they did in the past and will continue to do so in the future.**

Related Misconceptions

Instructional Sequence				
Lesson #	**Guiding Questions**	**Tiers 2-3 Vocabulary**	**7 E Activities**	**Assessment: PEs, Formative, Summative**
1	What is your Irene story?	Tropical Storm simulation	**Engage:** Project Launch Day: An exploration of Irene using all of our senses. -moving silt from a “basement” -experiencing the height of the water from flooding -watching video clips of the storm -hearing audio clips of Irene stories	
2	How and where did TS Irene first form and how and why did the storm change over time?	Annotated map Intensity Torrential rain Low pressure systems High pressure systems	**Explore:** Irene’s Path Investigation	Formative
3	-How did TS Irene impact your place (town, home, school)? -How can we model changes seen in the landscape from TS Irene on the stream table?	See vocabulary in the listening guide.	**Explain:** Stream Table Experiments and	Summative
4	How can we create a lasting reminder of the impact of TS Irene on our school community?		**Elaborate & Extend:** Irene Art Project : Collaborative Mural that	Summative: Quarter-length, co-taught elective course

			shows that things change and then change again Oral Histories: Speak Chorus Presentations	with middle school art teacher Summative: Developed as part of English and Global Studies interdisciplinary work
5	How has the movement of water as a result of TS Irene shaped the local landscape?		**Evaluate:** Explanations	Summative: PE

Integrated Instructional Sequence (Stage 2) and Assessment Evidence (Stage 3)	
Overarching Understanding #3:	***Mount Ascutney (local example may change)*** is a local example of evidence of past plate motions and the effect on the shape of the landscape.
Performance Expectation(s):	**MS-ESS2-3: Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.** [Clarification Statement: Examples of data include 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).] [*Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.*]
Crosscutting Concept(s):	**Scale Proportion and Quantity** ● **Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.**

Knowledge from DCI(s) Students will know . . .	**Skills from Science and Engineering Practices** Students will be able to. . . .
ESS1.C: The History of Planet Earth ● Tectonic processes continually generate new ocean sea floor	● **Analyze and interpret data to provide evidence for**

at ridges and destroy old sea floor at trenches. *(HS.ESS1.C GBE),(secondary)* **ESS2.B: Plate Tectonics and Large-Scale System Interactions** ● 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.	**phenomena.** ***Connections to Nature of Science*** **Scientific Knowledge is Open to Revision in Light of New Evidence** ● **Science findings are frequently revised and/or reinterpreted based on new evidence.**

Related Misconceptions

Instructional Sequence				
Lesson #	**Guiding Questions**	**Tiers 2-3 Vocabulary**	**7 E Activities**	**Assessment: PEs, Formative, Summative**
1	Why does the surface of the earth look the way that it does?	Crust, mantle, core, lithosphere, asthenosphere	**Engage & Elicit:** Discussion Questions	Formative
2	How can the history of life on earth tell scientists about the history of planet earth?		**Explain:** Earth Viewer Investigation Earth Viewer App	Formative
3	(several guiding questions including:) How could species of trilobites be found in Europe and the northwest Pacific coast of America but nowhere in between?	Continental drift	**Elaborate & Extend:** Wegener's Puzzling Evidence	Formative
4	-How does the evidence from your investigations support or refute Wegener's theory that the world's continents once existed	Pangea	**Evaluate:** Continental Drift CER	PE

	as a single land mass?			