SCILLSS Classroom Science Assessment Workshop

**Grade 11 SCILLSS Model Unpacking Tools**

## Grade 11 SCILLSS Model Unpacking Tool for HS-ESS1-5

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| **Grade:** | 11 | | |
| **NGSS Performance Expectation: HS-ESS1-5.** Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. [Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust decreasing with distance away from a central ancient core of the continental plate (a result of past plate interactions).] | | | |
|  | **Science and Engineering Practices (SEP)** | **Disciplinary Core Ideas (DCI)** | **Crosscutting Concepts (CCC)** |
| **Foundations** | **SEP: Engaging in Argument from Evidence**  Evaluate evidence behind currently accepted explanations or solutions to determine the merits of arguments. | **ESS1.C: The History of Planet Earth**  Continental rocks, which can be older than 4 billion years, are generally much older than the rocks of the ocean floor, which are less than 200 million years old. | **CCC: Patterns**  Empirical evidence is needed to identify patterns. |
| **Key**  **Aspects** | * Evaluate the claims behind currently accepted explanations to determine the merits of arguments. * Evaluate the claims behind currently accepted solutions to determine the merits of arguments. * Evaluate the evidence behind currently accepted explanations to determine the merits of arguments. * Evaluate the evidence behind currently accepted solutions to determine the merits of arguments. * Evaluate the reasoning behind currently accepted explanations to determine the merits of arguments. * Evaluate the reasoning behind currently accepted solutions to determine the merits of arguments. | * Active geologic processes have destroyed or altered most of the very early rock record on Earth. * Some objects in the solar system have changed very little over billions of years. * Studying these objects can help deduce the solar system’s age and history. | * Identify a pattern in an observed phenomenon. * Explain the pattern in a system under study. * Support a claim about the pattern in a system under study. |

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| **Prior Knowledge** | * Use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. * Analyze situations and solve problems. * Knowledge of how to recognize patterns of association in bivariate data * Write an argument. | * Rock formations and the fossils they contain are used to establish relative ages of major events in Earth’s history. | **Relationships**  **to SEPs** | * Patterns can be used to support an argument. * Data analysis serves to identify and characterize patterns. * Patterns can be used as empirical evidence for causality in supporting explanations of phenomena. |

## Grade 11 SCILLSS Model Unpacking Tool for HS-ESS2-7

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| **Grade:** | 11 | | | |
| **NGSS Performance Expectation: HS-ESS2-7.** Construct an argument based on evidence about the simultaneous coevolution of Earth’s systems and life on Earth. [Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth’s other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth’s surface. Examples include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.] [*Assessment Boundary: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth’s other systems*.] | | | | |
|  | **Science and Engineering Practices (SEP)** | **Disciplinary Core Ideas (DCI)** | **Crosscutting Concepts**  **(CCC)** | |
| **Foundations** | **SEP: Engaging in Argument from Evidence**  Construct an oral and written argument or counter-arguments based on data and evidence. | **DCI: Biogeology**  The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual coevolution of Earth’s surface and the life that exists on it. | **CCC: Stability and Change**  Much of science deals with constructing explanations of how things change and how they remain stable. | |
| **Key Aspects** | * Construct an oral argument based on data and evidence * Construct a written argument based on data and evidence * Construct an oral counter-argument based on data and evidence * Construct a written counter-argument based on data and evidence * Identify possible weaknesses in either data or an argument and explain why their criticism is justified | * Feedback (negative or positive) can stabilize or destabilize a system * The feedbacks between life on Earth and the Earth’s systems cause life on Earth to evolve and the surface of the Earth to undergo changes at the same time * Examples of feedback include how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, thus reducing the amount of sunlight reflected from Earth’s surface, which in turn increases surface temperatures and further reduces the amount of ice | * Construct explanations of how things change * Construct explanations of how things remain stable * Evaluate models of complex systems and comprehend subtle issues of stability or of sudden or gradual change over time | |
| **Prior Knowledge** | * Use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems * Analyze situations and solve problems. Knowledge of how to recognize patterns of association in bivariate data * Write an argument * Use data to evaluate claims about cause and effect * Distinguish among facts, reasoned judgment based on research findings, and speculation in an explanation | * The evolution and proliferation of living things over geological time have changed the rates of weathering and erosion of land surfaces, altered the composition of Earth’s soils and atmosphere, and affected the distribution of water in the hydrosphere | **Relationships to SEPs** | * Observations and data describe how things change * Reasoning and data can be used to explain how things evolved to be the way they are today * Arguments can be supported by quantifying and modeling changes in systems over very short or very long periods of time * Explanations of how things evolved to be the way they are today involves modeling rates of change and conditions under which the system is stable or changes gradually, as well as explanations of any sudden change |

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