SCILLSS Classroom Science Assessment Workshop

## High School Earth and Space Science Completed Unpacking Tool – Activity Answer Key

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| **Grade:**  | High School |  |  |
| **NGSS Performance Expectation: HS-ESS2-5.** Plan and conduct an investigation of the properties of water and their effects on Earth materials, surface processes, and groundwater systems. |
|  | **Science and Engineering Practices (SEP)** | **Disciplinary Core Ideas (DCI)** | **Crosscutting Concepts (CCC)** |
| **SEP:** **Planning and Carrying Out Investigations**Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.  | **DCI:** **ESS2.C: The Roles of Water in Earth's Surface Processes**The abundance of liquid water on Earth’s surface and its unique combination of physical and chemical properties are central to the planet’s dynamics. These properties include water’s exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. | **CCC:** **Structure and Function**The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.  |
| **Key Aspects** | * Plan an investigation individually and collaboratively to produce data to serve as the basis for evidence.
* Conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence.
* Identify relevant independent and dependent variables and to consider possible confounding variables or effects.
* Compare and evaluate alternative methods to determine which design provides the evidence necessary to address the purpose of the investigation.
 | * The abundance of liquid water on Earth’s surface is central to the planet’s dynamics.
* The unique combination of physical and chemical properties of liquid water on Earth’s surface is central to the planet’s dynamics.
* There is a connection between the properties of water and its effects on Earth materials and surface processes.
* The properties of water affect energy transfer.
* The properties of water (e.g., heat capacity, density of different states, polar nature due to molecular structure) that are central to Earth’s surface processes.
* The role of the heat capacity of water to affect the temperature, movement of air, and movement of water on Earth’s surface and the transfer of thermal energy in Earth’s systems.
* The role of flowing water (liquid or solid) in the transportation and deposition of sediments.
* The role of the polarity of water (through cohesion) and soil saturation in erosion.
* The role of the density of water in the liquid and solid states in the breakdown of rock.
* The role of the polar nature of water in the dissolving and precipitation/crystallization of Earth materials.
 | **Structure and Function*** The functions of natural objects can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.
* The properties of natural objects can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.
* The functions of designed objects can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.
* The properties of designed objects can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials.
* The functions of systems can be inferred from their overall structure.
* The properties of systems can be inferred from their overall structure.
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| **Prior Knowledge** | * Describe the purpose of the investigation.
* Measure and observe relevant variables.
* Use appropriate tools for accurate and precise measurements.
* Use observations and/or collected data as evidence for the phenomenon under investigation.
* Use data to answer scientific questions.
* Use data to test design solutions.
* Collect data across a range of conditions.
 | * Water movement causes weathering and erosion, changing landscape features.
* The mechanical effects of water on Earth materials.
* The role of water as a component in chemical reactions that change Earth materials, such as the rusting of iron.
* The chemical effects of water on Earth materials.
* The interacting causes of weather patterns.
* Water cycles among land, ocean, and atmosphere, and is propelled by sunlight and gravity.
* The ways water changes its state as it moves through the multiple pathways of the hydrologic cycle.
* The components of the water cycle including water, energy, gravity, the atmosphere, landforms, and organisms.
* The processes of the water cycle such as transpiration, evaporation, condensation, crystallization, precipitation, and runoff.
* The relationships between the components of the water cycle (e.g., the transfer of energy from the sun drives the evaporation of water).
* The transfer of energy between water and the environment during phase changes drives the cycling of water.
 | **Relationships to SEPs** | * To communicate findings clearly and persuasively may include an analysis of complex structures and systems to describe how they function.
* Often the focus of an investigation is to determine how energy or matter flows through the system.
* Structures and systems can be modeled.
* Systems are described in terms of matter and energy.
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