Overarching Questions:
How do we know what we know? How does what we know inform our decision-making?

Earth System Science Profound Ideas					
	The Earth is a System of Systems.	**The Flow of Energy Drives the Cycling of Matter.**	**Life, including human life, influences and is influenced by the environment.**	**Physical and chemical principles are unchanging and drive both gradual and rapid changes in the Earth system.**	**To Understand (Deep) Time and the Scale of Space, Models and Maps are Necessary.**
	The Earth System is composed of and part of a multitude of systems, which cycle and interact resulting in dynamic equilibrium (though the system evolves). The Earth is also nested in larger systems including the solar system and the universe. However there is an inherent unpredictability in systems, which are composed of an (effectively) infinite number of interacting parts that follow simple rules. Each system is qualitatively different from, but not necessarily greater than the sum of its parts.	The Earth is an open system – it is the constant flow of solar radiation that powers most surface Earth processes and drives the cycling of most matter at or near the Earth's surface. Earth's internal heat is a driving force below the surface. Energy flows and cycles through the Earth system. Matter cycles within it. Convection drives weather and climate, ocean currents, the rock cycle and plate tectonics.	Photosynthetic bacteria reformulated the atmosphere making Earth habitable. Humans have changed the lay of the land, altered the distribution of flora and fauna and are changing atmospheric chemistry in ways that alter the climate. Earth system processes affect where and how humans live. For example, many people live in the shadow of volcanoes because of the fertile farmland found there, however they must keep a constant vigil to maintain their safety. The human impact on the environment is growing as population increases and the use of technology expands.	Earth processes (erosion, evolution or plate tectonics, for example) operating today are the same as those operating since they arose in Earth history and they are obedient to the laws of chemistry and physics. While the processes constantly changing the Earth are essentially fixed, their rates are not. Tipping points are reached that can result in rapid changes cascading through Earth systems.	The use of models is fundamental to all of the Earth Sciences. Maps and models aid in the understanding of aspects of the Earth system for which direct observation is not possible. Models assist in the comprehension of time and space at both immense and sub-microscopic scales. When compared to the size and age of the universe, humanity is a speck in space and a blip in time.

Duggan-Haas & Miller, 2009; dugganhaas@museumoftheearth.org

Overarching Questions:
How do we know what we know? How does what we know inform our decision making?

Profound Ideas	Ocean	Climate	Atmosphere	Earth Science
Earth is a system of systems.	The ocean is a major influence on weather and climate.	Climate is regulated by complex interactions among components of the Earth system.	Earth's atmosphere continuously interacts with the other components of the Earth System.	Earth is a complex system of interactions between land, water, air and life.
The flow of energy drives the cycling of matter.	The ocean supports a great diversity of life and ecosystems.	Life on Earth depends on, has been shaped by, and affects climate.	Energy from the Sun drives atmospheric processes.	Humans have become a significant agent of change on Earth.
Life, including human life, influences and is influenced by the environment.	The ocean makes Earth habitable.	The Sun is the primary source of energy for Earth's climate system.	Atmospheric circulations transport matter and energy.	Humans depend on Earth for resources.
Physical and chemical principles are unchanging and drive both gradual and rapid changes in the Earth system.	The ocean and humans are inextricably interconnected.	Climate change will have consequences for the Earth system and human lives.	Earth's atmosphere and humans are inextricably linked.	Earth Science reduces the impacts of natural hazards.
To understand (deep) space and time, models and maps are necessary.	The ocean and life in the ocean shape the features of the Earth.	Human activities are impacting the climate system.	Earth has a thin atmosphere that sustains life.	Life evolves on a dynamic Earth and continuously modifies Earth.
	The Earth has one big ocean with many features.	**Humans can take actions to reduce climate change and its impacts.**	Earth's atmosphere changes over time and space, giving rise to weather and climate.	Earth is a continually changing planet.
	The ocean is largely unexplored.	Climate varies over space and time through both natural and man-made processes.	We seek to understand the past, present, and future behavior of Earth's atmosphere through scientific observation and reasoning.	Earth is 4.6 billion years old and the rock record contains its history.
		Our understanding of the climate system is improved through observation, theoretical studies and modeling.		Earth is the water planet.

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