



Next Generation Science Standards

Lesson: [Dangerous Currents 101](#)

Prior Knowledge Should Include (learned in K-8th):

- Forces that act at a distance involve fields that can be mapped by their relative strength and effect on an object.
- The effect of unbalanced forces on an object results in a change of motion. Patterns of motion can be used to predict future motion.
- Waves are regular patterns of motion, which can be made in water by disturbing the surface. Waves of the same type can differ in amplitude and wavelength. Waves can make objects move.
- A variety of hazards result from natural processes; humans cannot eliminate hazards but can reduce their impact.

Performance Expectations:

- HS-PS4.1 Waves and Their Applications in Technologies for Information Transfer: Use a mathematical representation to support a claim regarding a relationship among the frequency, wavelength and speed of waves traveling in various media.
- HS-ESS2.5 Earth's Systems: Plan and conduct an investigation of the properties of water and water's effects on Earth materials and surface processes.
- HS-EST1.1 Engineering Design: Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

Disciplinary Core Ideas:

- **PS4.A Wave Properties:** The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing.
- **ETS1.A Defining and Delimiting an Engineering Problem:** Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.
- **ESS2.C The Roles of Water in the 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.



Practices:

- **Asking Questions and Defining Problems (1)** – Progresses to formulating, refining and evaluating empirically testable questions and design problems using models and simulations.
- **Planning and carrying out investigations (3)** – Progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.
- **Using Mathematics and Computational Thinking (5)** – Progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms and computational tools for statistical analysis to analyze, represent and model data.

Crosscutting Concepts:

- **Cause and Effect:** Mechanisms and explanation. Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given context and used to predict and explain events in new contexts.
- **Structure and Function:** The way in which an object or living thing is shaped and its substructure determine many of its properties and functions. 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.
- **Influence of Engineering, Technology and Science on Society and the Natural World:** New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.