Grade 4

Fourth graders thrive in an active learning environment where they can manipulate physical materials and construct models. They are beginning to provide evidence to support their scientific claims and transition toward more abstract models and explanations. Explicit science instruction is critical for applying scientific literacy to make connections between academic content and the world around them.

Students in Grade 4 learn disciplinary core ideas from the scientific domains of physical, life, and Earth and space sciences. The core ideas from physical sciences are "Energy" and "Waves and Their Applications for Information Transfer." In this domain, students construct explanations based on evidence connecting the speed of an object to its energy, including the transference of energy in its various forms, and develop a model to describe wave patterns with observable wavelengths and amplitudes. Life sciences addresses the core idea "From Molecules to Organisms," in which students compare the internal and external structures of plants and animals and investigate ways animals process information. In Earth and space sciences, which includes "Earth's Systems" and "Earth and Human Activity," students construct explanations for both slow and rapid processes on Earth's land features, describe patterns of Earth's land and water based on maps, and gather information on various energy sources to design solutions to protect humans from natural disasters.

Embedded in the content standards are the disciplinary core ideas of the Engineering, Technology, and Applications of Science (ETS) domain, which require students to use design strategies in conjunction with knowledge and understanding of science and technology to solve practical problems. Engineering standards are denoted with a gear icon⚙. Through guided participation in the engineering design process, students find answers regarding which components of a device change energy from one form to another, how wave patterns can be used to transfer information, and how to limit the effects of harmful natural Earth processes on human life.

Each content standard completes the stem *"**Students will**..."*

Energy		
Speed and Energy	1. Use evidence to explain the relationship between the speed of an object and its energy.	**Cause and Effect**
Transference of Energy	2. Plan and carry out investigations to answer questions regarding changes in energy when objects collide, and predict reasonable outcomes based on observed patterns. *Examples: marbles rolling down a ramp and colliding with each other, chain reactions with dominoes*	**Patterns**
	3. Plan and carry out investigations to provide evidence that energy is transferred by sound, light, heat, and electric currents. *Examples: creating an electric circuit that requires a complete loop* a. Construct an explanation using evidence to support the claim that heat can be produced in many ways. *Examples: rubbing hands together, burning leaves* b. Construct an explanation with evidence supporting the claim that different objects can absorb, reflect, and/or conduct energy. 4. ✪ Design, construct, and test a device that changes energy from one form to another. *Examples: electric circuits converting electrical energy into motion, light, or sound energy; a passive solar heater converting light energy into heat energy*	**Energy and Matter**

Waves and Their Applications in Technologies for Information Transfer		
Wave Properties	5. Develop and use models to describe amplitude and wavelength patterns and how waves can cause objects to move.	**Patterns**
Information Transfer	6. Construct an explanation of how light, sound, and digitized information are transferred by waves. *Examples: using a grid of 1s and 0s representing black and white to send information about a picture, using drums to send coded information through sound waves, and using Morse code to send a message*	
Wave Properties	7. Develop a model to demonstrate that light reflecting from objects and entering the eyes allow objects to be seen. *Example: light reflecting off an apple and back into the eye*	**Cause and Effect**
From Molecules to Organisms: Structures and Processes		
Internal and External Structures	8. Make a claim, using evidence, that the functions of both internal and external structures of plants and animals (including humans) support growth, survival, and behavior. *Examples: In plants, thorns provide protection and stems transport nutrients; in animals, heart pumps blood and skin provides protection.* **Clarification: The emphasis is on the function of individual structures.**	**Structure and Function**
Information Processing	9. Carry out investigations to support a claim that different animals receive information through their senses, process that information, and respond in various ways. *Examples: earthworms tunneling into the soil to avoid light, frogs jumping when startled, dogs moving their ears when reacting to sound*	**Systems and System Models**

Earth's Systems		
Water	10. Develop and use a model to describe how water moves through Earth's systems by the processes of evaporation, condensation, and precipitation.	**Systems and System Models**
Changes Over Time	11. Construct explanations of Earth's changes over time through slow and rapid processes, citing evidence found in rock formations and fossils in rock layers. *Examples: rock layers containing shell fossils appearing above rock layers containing plant fossils but no shells, indicating a change from land to water over time; a canyon with rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock*	**Stability and Change**
	12. Plan and carry out investigations to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, and vegetation, investigating a single form of weathering or erosion at a time. *Examples: angle of slope in downhill movement of water flow, cycles of freezing and thawing of water, cycles of heating and cooling water, speed of wind, relative rate of soil deposition, amount of vegetation compared to rate of erosion*	**Scale, Proportion, and Quantity**
Physical Features	13. Analyze and interpret data from maps to describe patterns of Earth's features on land and in the ocean. *Examples: topographic maps of Earth's land and ocean floor; maps of mountains, continental boundaries, volcanoes, and earthquakes*	**Patterns**

Earth and Human Activity		
Natural Resources	14. Gather information to describe how the use of energy derived from renewable and nonrenewable resources affects the environment. *Examples: Constructing dams harnesses energy from water and changes animal habitats. Burning fossil fuels creates energy and creates air pollution.*	**Cause and Effect**
Natural Hazard Solutions	15. ⚙Design, test, and evaluate a solution that will protect humans from the effects of natural Earth processes. *Examples: designing buildings to resist earthquakes, tornados, or hurricanes; improving monitoring of volcanic activity*	