

*Developing Explanations or Designing Solutions - Constructing Explanations and Designing Solutions*

<p><b>3.2.1 Students will be able to apply scientific principles and empirical evidence (primary or secondary) to explain the causes of phenomena or identify weaknesses in explanations developed by the students or others.</b></p>	
<b>3</b>	<p>3L.3.2.1.1 Construct an explanation using evidence from various sources for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. (P: 6, CC: 2, CI: LS4) Examples of cause and effect relationships may include how individual plants of the same species with different length thorns may be more or less likely to be eaten by predators; or animals that have better camouflage coloration than others of their species may be more likely to survive and therefore more likely to leave offspring.</p>
<b>4</b>	<p>4E.3.2.1 1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. (P: 6, CC: 1, CI: ESS1) Examples of evidence from patterns may include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.</p>
<b>5</b>	<p>5P.3.2.1.1 Construct an explanation based on evidence relating the speed of an object to the energy of that object. (P: 6, CC: 5, CI: PS3). The emphasis of the practice is on students identifying the evidence that supports particular points in the explanation. Examples of evidence may include the damage and the height attained when going up a ramp.</p>

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<b>3.2.2 Students will be able to use their understanding of scientific principles and the engineering design process to design solutions that meet established criteria and constraints.*</b>	
<b>K</b>	0P.3.2.2.1 Design and build a structure to reduce the warming effect of sunlight on Earth's surface.* Emphasis of the practice is on choosing appropriate materials and tools to solve a problem. Emphasis of the core idea is on understanding the heating effects of sunlight. Examples of structures may include umbrellas, canopies, and tents.
<b>1</b>	1P.3.2.2.1 Design and build a device that uses light or sound to solve the problem of communicating over a distance.* Examples of devices may include paper cup and string "telephones" and a pattern of drum beats.
<b>1</b>	1L.3.2.2.2 Plan and design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.* Examples of human problems that can be solved by mimicking plant or animal solutions may include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills, and detecting intruders by mimicking eyes and ears.
<b>2</b>	2L.3.2.2.1 Engineer a device that mimics the structures and functions of plants or animals in seed dispersal.* Emphasis is on how specific structures have particular functions. Examples of seed dispersal by animals may include feeding and subsequent elimination of seeds, or attachment of seeds/pollen to animal structures. Examples of seed dispersal by plants may include various wind-catching designs (as in dandelions or maple trees) or colors and smells that attract pollinators.
<b>4</b>	4E.3.2.2.1 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.* Emphasis is on cause and effect relationships to explain change. Examples of solutions may include designing an earthquake resistant building and improving monitoring of volcanic activity.
<b>5</b>	5P.3.2.2.1 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* Examples of devices may include electric circuits that convert electrical energy into motion, light, or sound; and a passive solar heater that converts light into heat. Examples of constraints may include the materials, cost, or time to design the device.