Code: Number = grade.strand.practice.standard.benchmark.

Strand 1: Exploring phenomena or engineering problems

- Practice 1: Asking questions (for science) and defining problems (for engineering)
  - Standard 1: Students will be able to ask questions of each other about the texts they read, the features of the phenomena they observe and the conclusions they draw.
  - Standard 2:Students will be able to ask questions to define the problem to be solved

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grades 9-12 Chemistry	Grades 9-12 Earth and Space Sciences	Grades 9-12 Life Sciences	Grades 9-12 Physics
Standard 1				3.1.1.1.1: Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. (P 1, CC 2, CI PS2)	4.1.1.1.1 Ask questions and predict outcomes about the changes in energy, related to speed, that occur when objects interact. (P: 1, CC: 5, CI: PS3)		6.1.1.1.1 Ask questions about data to determine the factors that affect the strength of electric and magnetic forces. (P: 1, CC: 2, CI: PS2)		8.1.1.1.1 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century. (P: 1, CC: 7, CI: ESS3)			9L.1.1.1.1 Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. (P: 1, CC: 2, CI: LS3)	9P.1.1.1.1 Evaluate questions about the advantages of using digital transmission and storage of information. (P: 1, CC: 7, CI: PS4)
Standard 2	0.1.1.2.1 Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.* (P: 1, CC: 2, CI: ESS3,)			3.1.1.2.1 Define a simple design problem that can be solved by applying scientific ideas about magnets.* (P: 1, CC: -, CI: PS2)					8.1.1.2.1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.* (P: 1, CC: -, CI: ETS1)		9E.1.1.2.1 Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.* (P: 1, CC: -, CI: ETS1)		
	0.1.1.2.2 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.* (P: 1, CC: -, CI: ETS1)			3.1.1.2.2 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.* (P: 1, CC: -, CI: ETS1)									

Strand 1: Exploring phenomena or engineering problems

- Practice 3: Planning and carrying out investigation
  - Standard 1: Students will design and conduct investigations and formulate questions based on observations, organizing and collecting data to make decisions from investigations in the classroom, school laboratory and/or field.

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grades 9-12 Chemistry	Grades 9-12 Earth and Space Sciences	Grades 9-12 Life Sciences	Grades 9-12 Physics
Standard 1	0.1.3.1.1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. (P: 3, CC: 2, CI: PS2)	1.1.3.1.1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. (P: 3, CC: 2, CI: PS4)	2.1.3.1.1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. (P: 3, CC:1, CI: PS1)	3.1.3.1.1 Forces and Interactions: Plan and conduct an investigation to provide evidence of the effects of forces on the motion of an object. (P: 3, CC:2, CI: PS2)	4.1.3.1.1 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. (P: 3, CC: 5, CI: PS3)	5.1.3.1.1 Make observations and measurements to identify materials based on their properties. (P: 3, CC: 3, CI: PS1) 5.1.3.1.1 Conduct an investigation to determine whether the mixing of two or more substances results in new substances. (P: 3, CC: 2, CI: PS1)	6.1.3.1.1 Plan an investigation to provide evidence that the change in an object's motion depends on the qualitative comparisons of balanced and unbalanced forces on the object and the mass of the object. (P: 3, CC: 7, CI: PS2)	7.1.3.1.1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells. (P: 3, CC: 3, CI: LS1)	8.1.3.1.1 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. (P: 3, CC: 2, CI: ESS2)	9C.1.3.1.1 Plan and conduct an investigation to gather evidence, including bulk property data, to compare the structure of substances and infer the strength of electrical forces between particles. (P: 3, CC: 1, CI: PS1)	9E.1.3.1.1 Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. (P: 3, CC:6, CI:ESS2)	9L.1.3.1.1 Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. (P: 3, CC: 7, CI: LS1)	9P.1.3.1.1 Plan and conduct an investigation to gather evidence, including bulk property data, to compare the structure of substances and infer the strength of electrical forces between particles. (P: 3, CC: 1, CI: PS1)
	0.1.3.1.2 Make observations to determine the effect of sunlight on Earth's surface. (P: 3, CC 2, CI: PS3)	1.1.3.1.2 Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light. (P: 3, CC: 2, CI: PS4)	2.1.3.1.2 Plan and conduct an investigation to determine if plants need sunlight and water to grow. (P: 3, CC:2, CI: LS2)	3.1.3.1.2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. (P: 3, CC:1, CI: PS2)	4.1.3.1.2 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by the forces of water, ice, wind, or vegetation. (P: 3, CC: 2, CI: ESS2)		6.1.3.1.2 Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. (P: 3, CC: 2, CI: PS2)						9P.1.3.1.2 Forces and Interactions: Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. (P: 3, CC: 2, CI: PS2)
		1.1.3.1.3 Make observations to make relative comparisons of the amount of daylight in the different times of year. (P: 3, CC: 1, CI:ESS1)	2.1.3.1.3 Make observations of plants and animals to compare the diversity of life in different habitats. (P: 3, CC:-, CI: LS4)			5.1.3.2.1 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.* (P: 3, CC: -, CI: ETS1)	6.1.3.1.3 Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. (P: 3, CC: 3, CI: PS3)						9P.1.3.1.3 Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperatures are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). (P: 3, CC: 3, CI: PS3)

Strand 2: Looking at data and empirical evidence to understand phenomena or solve problems

- Practice 4: Analyzing and interpreting data
  - Standard 1: Students will be able to represent observations and data in meaningful ways, including graphically and with mathematics that emphasize patterns in the data and relationships among variables in order for others to understand their evidence and their interpretations.

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grades 9-12 Chem	Grades 9-12 Earth and Space Sciences	Grades 9-12 Life Sciences	Grades 9-12 Phys
Standard 1	0.2.4.1.1 Record and use observations to describe patterns of what plants and animals (including humans) need to survive. (P: 4, CC: 1, CI: LS1)	1.2.4.1.1 Record and use observations of the sun, moon and stars to describe patterns that can be predicted (P: 4, CC: 2, CI: ESS1)		3.2.4.1.1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. (P: 4, CC: 1, CI: LS3)	4.2.4.1.1 Analyze and interpret data from maps to describe patterns of Earth's features. (P: 4, CC: 1, CI: ESS2)	5.2.4.1.1 Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. (P: 4, CC: 1, CI: ESS1)	6.2.4.1.1 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. (P: 4, CC: 1, CI: PS1)	7.2.4.1.2 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. (P: 4, CC: 2, CI: LS2)	8.2.4.1.1 Analyze and interpret data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects in order to determine the kinds of geologic processes occurring on those objects. (P: 4, CC: 3, CI: ESS1)		9E.2.4.1.1 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. (P: 4, CC: 7, CI: ESS2)	9L.2.4.1.1 Apply concepts of statistics and probability to explain and/or predict the variation and distribution of expressed traits in a population. (P: 4, CC: 3, CI: LS3)	
	0.2.4.1.2 Record, use and share observations of local weather conditions to describe patterns over time. (P: 4, CC: 1, CI: ESS2)			3.2.4.1.2 Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. (P: 4, CC: 3, CI: LS4)			6.2.4.1.2 Construct and interpret graphical displays of data to describe the relationship of kinetic energy to the mass of an object and to the speed of an object. (P: 4, CC: 3, CI: PS3)	7.2.4.1.2 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. (P: 4, CC: 1, CI: LS4)	8.2.4.1.2 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. (P: 4, CC: 1, CI: ESS2)		9E.2.4.1.2 Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth's systems. (P: 4, CC: 7, ESS3)	9L.2.4.1.2 Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. (P: 4, CC: 1, CI: LS4)	
				3.2.4.1.3 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. (P: 4, CC: 1, CI: ESS2)				7.2.4.1.3 Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. (P: 4, CC: 1, CI: LS4)	8.2.4.1.3 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. (P: 4, CC: 1, CI: ESS3)				
Standard 2	0.2.4.2.1 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.* (P: 4, CC: 2, CI: PS2)		2.2.4.2.1 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for the intended purpose.* (P: 4, CC: 2, CI: ESS2)								9E.2.4.2.1 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.* (P: 4, CC: -, CI: ETS1)			

			2.2.4.2.2 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.* (P: 4, CC: -, CI: ETS1)										

Strand 2: Looking at data and empirical evidence to understand phenomena or solve problems

- Practice 5: Using mathematics and computational thinking
  - Standard 1: Students will be able to use symbolic representations that can be used to represent data, to predict outcomes, and eventually derive further mathematical or algorithmic relationships that describe or model phenomena.

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grades 9-12 Chemistry	Grades 9-12 Earth and Space Sciences	Grades 9-12 Life Sciences	Grades 9-12 Physics
Standard 1						5.2.5.1.2 Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. (P: 5, CC: 3, CI: ESS2)	6.2.5.1.2 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. (P: 5, CC: 1, CI: PS4)				9E.2.5.1.2 Use a computational simulation or construct simplified spreadsheet calculations to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. (P: 5, CC: 7, CI: ESS3)	9L.2.5.1.2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. (P: 5, CC: 3, CI: LS2)	9P.2.5.1.2 Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. (P: 5, CC: 1, CI: PS2)
											9E.2.5.1.3 Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity. (P: 5, CC: 4, CI: ESS3)	9l.2.5.1.3 Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. (P: 5, CC: 5, CI: LS2)	9P.2.5.1.3 Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in or out of the system are known. (P: 5, CC: 4, CI: PS3)
												9L.2.5.1.4 Create or revise a mathematical model that accurately demonstrates the ecological or economic impacts of human activity on various biodiversity markers. (P: 5, CC: 7, CI: LS4)	9P.2.5.1.4 Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. (P: 5, CC: 2, CI: PS2)
Standard 2											9E.2.5.2.1 Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.* (P: 5, CC: 4, CI: ETS1)		

Strand 3: Developing possible explanations of phenomena or designing solutions to engineering problems

- Practice 2: Developing and using models
  - Standard 1: Students will be able to use diagrams, maps, and other abstract models as tools that enable them to elaborate on their own ideas or findings and present them to others.
  - Standard 2: Students will be able to use models in engineering situations to identify problems, visualize and test solutions, and communicate about a design's features and effectiveness to others.*

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grades 9-12 Chemistry	Grades 9-12 Earth and Space Sciences	Grades 9-12 Life Sciences	Grades 9-12 Physics
Standard 1	0.3.2.1.1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. (P: 2, CC: 4, CI: ESS3)		2.3.2.1.1 Develop a model to represent the shapes and kinds of land and bodies of water in an area. (P: 2, CC: 1, CI: ESS2)	3.3.2.1.1 Construct multiple models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. (P: 2, CC: 1, CI: LS1)	4.3.2.1.1 Construct and evaluate a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. (P: 2, CC: 1, CI: PS4)	5.3.2.1.1 Construct and refine a model to describe that matter is made of particles too small to be seen. (P: 2, CC: 3, CI: PS1)	6.3.2.1.1 Develop models to describe the atomic composition of simple molecules and extended structures. (P: 2, CC: 3, CI: PS1)	7.3.2.1.1 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. (P: 2, CC: 6, CI: LS1)	8.3.2.1.1 Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. (P: 2, CC: 1, CI: ESS1)	9C.3.2.1.1 Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. (P: 2, CC: 1, CI: PS1)	9E.3.2.1.1 Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation. (P: 2, CC: 1, CI: ESS1)	9L.3.2.1.1 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. (P: 2, CC: 6, CI: LS1)	9P.3.2.1.1 Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects). (P: 2, CC: 5, CI: PS3)
					4.3.2.1.2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. (P: 2, CC: 2, CI: PS4)	5.3.2.1.2 Use models to describe that energy in animals' food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun. (P: 2, CC: 5, CI: PS3)	6.3.2.1.2 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. (P: 2, CC: 2, CI: PS1)	7.3.2.1.2 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. (P: 2, CC: 5, CI: LS1)	8.3.2.1.2 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. (P: 2, CC: 4, CI: ESS1)	9C.3.2.1.2 Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. (P: 2, CC: 5, CI: PS1)	9E.3.2.1.2 Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. (P: 2, CC: 7, CI: ESS2)	9L.3.2.1.2 Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. (P: 2, CC: 2, CI: LS1)	9P.3.2.1.2 Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. (P: 2, CC: 2, CI: PS3)
					4.3.2.1.3 Develop a model to represent the shapes and kinds of land and bodies of water in an area. (P: 2, CC: 1, CI: ESS2)	5.3.2.1.3 Construct a model to predict the movement of matter among plants, animals, decomposers, and the environment. (P: 2, CC: 4, CI: LS2)	6.3.2.1.3 Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. (P: 2, CC: 5, CI: PS1)	7.3.2.1.3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. (P: 2, CC: 5, CI: LS2)	8.3.2.1.3 Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. (P: 2, CC: 7, CI: ESS2)	9C.3.2.1.3 Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. (P: 2, CC: 5, CI: PS1)	9E.3.2.1.3 Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. (P: 2, CC: 1, CI: ESS2)	9L.3.2.1.3 Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. (P: 2, CC: 2, CI: LS1)	
						5.3.2.1.4 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. (P: 2, CC: 4, CI: ESS2)	6.3.2.1.4 Develop and compare multiple models to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. (P: 2, CC: 6, CI: PS3)	7.3.2.1.4 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. (P: 2, CC: 6, CI: LS3)	8.3.2.1.4 Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. (P: 2, CC: 5, CI: ESS2)		9E.3.2.1.4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. (P: 2, CC: 5, CI: ESS2)	9L.3.2.1.4 Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. (P: 2, CC: 5, CI: LS1)	

							6.3.2.1.5 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. (P: 2, CC: 4, CI: PS4)	7.3.2.1.5 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. (P: 2, CC: 2, CI: LS3)	8.3.2.1.5 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. (P: 2, CC: 4, CI: ESS2)		9E.3.2.1.5 Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. (P: 2, CC: 4, CI: ESS2)	9L.3.2.1.5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. (P: 2, CC: 7, CI: LS2)	
Standard 2	0.3.2.2.1 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.* (P: 2, CC: 6, CI: ETS1)		2.3.2.2.1 Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.* (P: 2, CC: 6, CI: LS2)				6.3.2.2.1 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.* (P: 2, CC: -, CI: ETS1)	7.3.2.2.1 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.* (P: 2, CC: -, CI: ETS1)	8.3.2.2.1 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.* (P: 2, CC: -, CI: ETS1)				

Strand 3: Developing possible explanations of phenomena or designing solutions to engineering problems

- Practice 6: Constructing explanations and designing solutions
  - Standard 1: Students will be able to apply scientific principles and empirical evidence (primary or secondary) to construct causal explanations of phenomena or identify weaknesses in explanatory accounts developed by themselves or others.
  - Standard 2: Students will be able to use their understanding of scientific principles and the engineering design process to either construct a device or implement a design solution that meets agreed-on criteria and constraints.*

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grades 9-12 Chemistry	Grades 9-12 Earth and Space Sciences	Grades 9-12 Life Sciences	Grades 9-12 Physics
Standard 1	0.3.6.2.1 Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth's surface.* (P: 6, CC: 2, CI: PS3)	1.3.6.1.1 Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated. (P: 6, CC: 2, CI: PS4)	2.3.6.1.1 Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. (P: 6, CC: 5, CI: PS1)	3.3.6.1.1 Use evidence to support the explanation that traits can be influenced by the environment. (P: 6, CC: 2, CI: LS3)	4.3.6.1.1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. (P: 6, CC: 5, CI: PS3)			7.3.6.1.1 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. (P: 6, CC: 2, CI: LS1)	8.3.6.1.1 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. (P: 6, CC: 3, CI: ESS1)	9C.3.6.1.1 Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. (P: 6, CC: 1, CI: PS1)	9E.3.6.1.1 Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe. (P: 6, CC: 5, CI: ESS1)	9L.3.6.1.1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins, which carry out the essential functions of life through systems of specialized cells. (P: 6, CC: 6, CI: LS1)	
		1.3.6.1.2 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. (P: 6, CC: 2, CI: LS3)	2.3.6.1.2 Use information from several sources to provide evidence that Earth events can occur quickly or slowly. (P: 6, CC: 7, CI: ESS1)	3.3.6.1.2 Use evidence to construct an explanation 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)	4.3.6.1.2 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)			7.3.6.1.2 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. (P: 6, CC: 2, CI: LS1)	8.3.6.1.2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. (P: 6, CC: 3, CI: ESS2)	9C.3.6.1.2 Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature and concentration of the reacting particles on the rate at which the reaction occurs (P: 6, CC: 1, CI: PS1)	9E.3.6.1.2 Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. (P: 6, CC: 7, CI: ESS1)	9L.3.6.1.2 Construct and revise an explanation based on evidence for how various elements combine with carbon to form molecules that form the basis for life on Earth. (P: 6, CC: 5, CI: LS1)	
								7.3.6.1.3 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. (P: 6, CC: 1, CI: LS2)	8.3.6.1.3 Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. (P: 6, CC: 2, CI: ESS3)		9E.3.6.1.3 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. (P: 6, CC: 2, CI: ESS3)	9L.3.6.1.3 Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. (P: 6, CC: 5, CI: LS2)	
								7.3.6.1.4 Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms				9L.3.6.1.4 Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase	

								and between modern and fossil organisms to infer evolutionary relationships. (P: 6, CC: 1, CI: LS4)				in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. (P: 6, CC: 2, CI: LS4)	
								7.3.6.1.5 Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. (P: 6, CC: 2, CI: LS4)				9L.3.6.1.5 Construct an explanation based on evidence for how natural selection leads to adaptation of populations. (P: 6, CC: 2, CI: LS4)	
Standard 2		1.3.6.2.1 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.* (P: 6, CC: -, CI: PS4)	2.3.6.2.1 Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.* (P: 6, CC: 7, CI: ESS2)		4.3.6.2.1 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* (P: 6, CC: 5, CI: PS3)	5.3.6.2.1 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.* (P: 6, CC: 5, CI: ETS1)			8.3.6.2.1 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* (P: 6, CC: 2, CI: ESS3)	9C.3.6.2.1 Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.* (P: 6, CC: 7, CI: PS1)	9E.3.6.2.1 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* (P: 6, CC: 7, CI: ESS3)	9L.3.6.2.1 Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* (P: 6, CC: 7, CI: LS2)	9P.3.6.2.1 Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.* (P: 6, CC: 2, CI: PS2)
		1.3.6.2.2 Use materials to 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.* (P: 6, CC: 6, CI: LS1)			4.3.6.2.2 Generate and compare multiple solutions that use patterns to transfer information.* (P: 6, CC: 1, CI: PS4)		6.3.6.2.2 Construct, test and modify a device that either releases or absorbs thermal energy by chemical processes.* (P: 6, CC: 5, CI: PS1)					9L.3.6.2.2 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.* (P: 6, CC: -, CI: ETS1)	9P.3.6.2.2 Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.* (P: 6, CC: 5, CI: PS3)

					4.3.6.2.3 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.* (P: 6, CC: 2, CI: ESS3)		6.3.6.2.3 Design a solution to a problem involving the motion of two colliding objects using Newton's 3rd Law.* (P: 6, CC: 4, CI: PS2)						9P.3.6.2.1.3 Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.* (P: 6, CC: -, CI: ETS1)
							6.3.6.2.4 Design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* (P: 6, CC: 5, CI: PS3)						

Strand 4: Communicating reasons, arguments and ideas to others

- Practice 7: Arguing from evidence
  - Standard 1: Students will be able to use evidence to engage in argumentation to compare and evaluate competing ideas and methods, and to answer questions.
  - Standard 2: Students will be able to use evidence in the process of constructing an argument necessary for advancing and defending a design solution.*

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grades 9-12 Chemistry	Grades 9-12 Earth and Space Sciences	Grades 9-12 Life Sciences	Grades 9-12 Physics
Standard 1	0.4.7.1.1 Construct an argument based on observational evidence for how plants and animals (including humans) can change the environment to meet their needs. (P: 7, CC: 4, CI: ESS2)		2.4.7.1.1 Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. (P: 7, CC: 2, CI: PS1)	3.4.7.1.1 Construct an argument that some animals form groups that help members survive. (P: 7, CC: 2, CI: LS2)	4.4.7.1.1 Using evidence, construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. (P: 7, CC: 4, CI: LS1)	5.4.7.1.1 Use evidence to support an argument that the gravitational force exerted by Earth on objects is directed down. (P: 7, CC: 2, CI: PS2)	6.4.7.1.1 Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. (P: 7, CC: 3, CI: PS2)	7.4.7.1.1 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. (P: 7, CC: 4, CI: LS1)	8.4.7.1.1 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. (P: 7, CC: 2, CI: ESS3)		9E.4.7.1.1 Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. (P: 7, CC: 1, CI: ESS1)	9L.4.7.1.1 Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. (P: 7, CC: 7, CI: LS2)	9P.4.7.1.1 Evaluate the claims, evidence, and reasoning behind the argument that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. (P: 7, CC: 4, CI: LS2)
				3.4.7.1.2 Construct an argument with evidence that evaluates how in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. (P: 7, CC: 2, CI: LS4)		5.4.7.1.2 Use observational evidence to support an argument that plants get the materials they need for growth chiefly from air and water. (P: 7, CC: 5, CI: LS1)	6.4.7.1.2 Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. (P: 7, CC: 5, CI: PS3)	7.4.7.1.2 Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. (P: 7, CC: 2, CI: LS1)			9E.4.7.1.2 Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. (P: 7, CC: 2, CI: ESS2)	9L.4.7.1.2 Evaluate evidence for the role of group behavior on individual and species' chances to survive and reproduce. (P: 7, CC: 2, CI: LS2)	
						5.4.7.1.3 Use evidence to support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth. (P: 7, CC: 3, CI: ESS1)		7.4.7.1.3 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. (P: 7, CC: 7, CI: LS2)				9L.4.7.1.3 Make and defend a claim based on evidence that inheritable genetic variations may result from (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. (P: 7, CC: 2, CI: LS3)	
												9L.4.7.1.4 Evaluate the evidence supporting claims that changes in environmental conditions may result in (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. (P: 7, CC: 2, CI: LS4)	

Standard 2				3.4.7.2.1 Using evidence, make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.* (3-5, 3) (P: 7, CC: 4, CI: LS2)				7.4.7.2.1 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* (P: 7, CC: 2, CI: LS2)	8.4.7.2.1 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.* (P: 7, CC: -, CI: ETS1)		9E.4.7.2.1 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.* (P: 7, CC: -, CI: ESS3)		
				3.4.7.2.2 Using evidence, make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.* (3-5, 3) (P: 7, CC: 2, CI: ESS3)									

Strand 4: Communicating reasons, arguments and ideas to others

- Practice 8: Obtaining, evaluating and communicating information
  - Standard 1: Students will be able to use scientific resources, observations, evidence and analytical arguments to critically examine and evaluate claims and communicate critical thinking through discussion, and in writing.
  - Standard 2: Students will be able to use appropriate combinations of sketches, modeling and language to communicate and critique proposed engineering design solutions.*

	Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8	Grades 9-12 Chemistry	Grades 9-12 Earth and Space Sciences	Grades 9-12 Life Sciences	Grades 9-12 Physics
Standard 1	0.4.8.2.1 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.* (P: 8, CC: 2, CI: ESS3)	1.4.8.1.1 Read texts and use media to determine patterns in the behavior of parents and offspring that help offspring survive. (P: 8, CC: 1, CI: LS1)	2.4.8.1.1 Obtain and combine information to identify where water is found on Earth and that it can be solid or liquid. (P: 8, CC: 2, CI: ESS2)	3.4.8.1.1 Obtain and combine information to describe climates in different regions of the world. (P: 8, CC: 1, CI: ESS2)	4.4.8.1.1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. (P: 8, CC: 2, CI: ESS3)	5.4.8.1.1 Obtain and combine multiple sources of information about ways individual communities use science ideas to protect the Earth's resources and environment. (P: 8, CC: 4, CI: ESS3)	6.4.8.1.1 Gather and make sense of multiple sources of information to describe that synthetic materials come from natural resources and impact society. (P: 8, CC: 6, CI: PS1)	7.4.8.1.1 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. (P: 8, CC: 2, CI: LS1)			9E.4.8.1.1 Communicate scientific ideas about the way stars, over their life cycle, produce elements. (P: 8, CC: 5, CI: ESS3)	9L.4.8.1.1 Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. (P:8, CC: 1, CI: ESS3)	9P.4.8.1.1 Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. (P: 8, CC: 2, CI: PS4)
							6.4.8.1.2 Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals. (P: 8, CC: 6, CI: PS4)	7.4.8.1.2 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. (P: 8, CC: 2, CI: LS4)					
Standard 2										9C.4.8.2.1 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.* (P: 8, CC: 6, CI: PS6)			9P.4.8.2.1 Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.* (P:8, CC: 2, CI: PS4)
													9P.4.8.2.2 Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.* (P: 8, CC: 6, CI: PS6)