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K-8 Science Scope & Sequence

NOTE: Once a concept/skill has been introduced, it is assumed that it will be reinforced as needed or appropriate at subsequent grade levels.

5.1 Scientific Practices – Science is both a body of knowledge and an evidence-based, model building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.

Pre-K/ Kinder.	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
• **Understand Scientific Explanations** Display curiosity about science objects, materials, activities.	• **Understand Scientific Explanations** Display curiosity about science objects, materials, activities, and longer-term investigations in progress.	• **Understand Scientific Explanations** Use outcomes of investigations to build and refine questions, models, and explanations.	• **Understand Scientific Explanations** Demonstrate understanding of the interrelationships among fundamental concepts in the physical, life, and Earth systems sciences.	• **Understand Scientific Explanations** Use scientific facts, measurements, observations, and patterns in nature to build and critique scientific arguments.	• **Understand Scientific Explanations** Use scientific facts, measurements, observations, and patterns in nature to build and critique scientific arguments.	• **Understand Scientific Explanations** Use mathematical, physical, and computational tools to build conceptual-based models and to pose theories.	• **Understand Scientific Explanations** Use scientific principles and models to synthesize scientific arguments.	• **Understand Scientific Explanations** Use scientific principles and models to frame and synthesize scientific arguments and pose theories.
• **Generate Scientific Evidence Through Active Investigations** Observe, question, and investigate materials, objects, during indoor and outdoor classroom activities and during any longer-term investigations; Identify and use basic tools and technology to extend exploration in conjunction with science investigations.	• **Generate Scientific Evidence Through Active Investigations** Observe, question, predict, and investigate materials, objects, and phenomena (e.g., using simple tools to crack a nut and look inside) during indoor and outdoor classroom activities and during any longer-term investigations; Use basic science terms and topic-related science vocabulary.	• **Generate Scientific Evidence Through Active Investigations** Measure, gather, evaluate, and share evidence using tools and technologies.	• **Generate Scientific Evidence Through Active Investigations** Design and follow simple plans using systematic observations to explore questions and predictions.	• **Generate Scientific Evidence Through Active Investigations** Formulate explanations from evidence; Communicate and justify explanations with reasonable and logical arguments.	• **Generate Scientific Evidence Through Active Investigations** Formulate explanations from evidence; Communicate and justify explanations with reasonable and logical arguments.	• **Generate Scientific Evidence Through Active Investigations** Design investigations and use scientific instrumentation to collect, analyze, and evaluate evidence as part of building and revising models and explanations.	• **Generate Scientific Evidence Through Active Investigations** Gather, evaluate, and represent evidence using scientific tools, technologies, and computational strategies.	• **Generate Scientific Evidence Through Active Investigations** Use qualitative and quantitative evidence to develop evidence-based arguments; Use quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations.

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• **Reflect on Scientific Knowledge** Communicate with other children and adults to share observations, pursue questions, and make predictions and/or conclusions • **Participate Productively in Science** Represent observations and work through drawing	• **Reflect on Scientific Knowledge** Communicate with others to pursue questions, and make predictions and/or conclusions • **Participate Productively in Science** Represent observations and work through drawing and recording data	• **Reflect on Scientific Knowledge** Communicate with others to pursue questions, and make predictions and/or conclusions • **Participate Productively in Science** Represent observations and work through drawing, recording data, and "writing"	• **Reflect on Scientific Knowledge** Monitor and reflect on one's own knowledge regarding how ideas change over time • **Participate Productively in Science** Demonstrate how to safely use tools, instruments, and supplies; Handle and treat organisms humanely, responsibly, and ethically	• **Reflect on Scientific Knowledge** Revise predictions or explanations on the basis of learning new information; Present evidence to interpret and/or predict cause-and-effect outcomes of investigations • **Participate Productively in Science** Actively participate in discussions about student data, questions, and understandings; Work collaboratively to pose, refine, and evaluate questions, investigations, models, and theories	• **Reflect on Scientific Knowledge** Revise predictions or explanations on the basis of discovering new evidence or learning new information • **Participate Productively in Science** Demonstrate how to safely use tools, instruments, and supplies; Handle and treat organisms humanely, responsibly, and ethically	• **Reflect on Scientific Knowledge** Revise predictions or explanations on the basis of discovering new evidence, learning new information, or using models • **Participate Productively in Science** Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences	• **Reflect on Scientific Knowledge** Monitor one's own thinking as understandings of scientific concepts are refined • **Participate Productively in Science** Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences	• **Reflect on Scientific Knowledge** Generate new and productive questions to evaluate and refine core explanations • **Participate Productively in Science** Engage in productive scientific discussion practices during conversations with peers, both face-to-face and virtually, in the context of scientific investigations and model-building

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5.2 Physical Science – Physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.

Pre-K/Kinder.	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
• **Properties of Matter** Observe, manipulate, sort, and describe objects and materials (e.g., water, sand, clay, paint, glue, various types of blocks, collections of objects, simple household items that can be taken apart, or objects made of wood, metal, or cloth) in the classroom and outdoor environment based on size, shape, color, texture, and weight	• **Properties of Matter** Sort and describe objects based on the materials of which they are made and their physical properties	• **Properties of Matter** Identify common objects as solids, liquids, or gases; Sort and describe objects based on the materials of which they are made and their physical properties	• **Properties of Matter** Plan and carry out an investigation to distinguish among solids, liquids, and gasses; determine the weight and volume of common objects using appropriate tools	• **Properties of Matter** Identify objects that are composed of a single substance and those that are composed of more than one substance using simple tools found in the classroom; categorize objects based on the ability to absorb or reflect light and conduct heat or electricity	• **Properties of Matter** Determine the volume of common objects using water displacement methods; determine the identity of an unknown substance using data about intrinsic properties	• **Properties of Matter** Calculate the density of objects or substances after determining volume and mass; determine the identity of an unknown substance using data about intrinsic properties	• **Properties of Matter** Explain that all matter is made of atoms, and give examples of common elements; use the kinetic molecular model to predict how solids, liquids, and gases would behave under various physical circumstances, such as heating or cooling; identify unknown substances based on data regarding their physical and chemical properties	• **Properties of Matter** Analyze and explain the implications of the statement "all substances are composed of elements"; predict the physical and chemical properties of elements based on their positions on the Periodic Table; determine whether a substance is a metal or nonmetal through student-designed investigations; Determine the relative acidity and reactivity of common acids, such as vinegar or cream of tartar, through a variety of student-designed investigations
• **Changes in Matter** Explore changes in liquids and solids when substances are combined, heated, or cooled (e.g., mix sand or clay with various amounts of water; mix different colors of tempera paints; freeze and melt water and other liquids)	• **Changes in Matter** Explore changes in liquids and solids when substances are combined, heated, or cooled (e.g., mix sand or clay with various amounts of water; mix different colors of tempera paints; freeze and melt water and other liquids)	• **Changes in Matter** Generate accurate data and organize arguments to show that not all substances respond the same way when heated or cooled, using common materials	• **Changes in Matter** **Predict what will happen with a common substance is heated and then cooled**	• **Changes in Matter** Predict and explain what happens when a common substance, such as shortening or candle wax, is heated to melting and then cooled to a solid	• **Changes in Matter** Compare the properties of reactants with the properties of the products when two or more substances are combined and react chemically	• **Changes in Matter** Compare the properties of reactants with the properties of the products when two or more substances are combined and react chemically	• **Changes in Matter** Explain, using an understanding of the concept of chemical change, why the mass of reactants and the mass of products remain constant	• **Changes in Matter** Compare and contrast the physical properties of reactants with products after a chemical reaction, such as those that occur during photosynthesis and cellular respiration

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• **Forms of Energy** Investigate sound, heat, and light energy (e.g., the pitch and volume of sound made by commercially made and homemade instruments, looking for shadows on the playground over time and under different weather conditions) through one or more of the senses	• **Forms of Energy** Compare, citing evidence, the heating of different colored objects placed in full sunlight	• **Forms of Energy** Apply a variety of strategies to collect evidence that validates the principle that if there is no light, objects cannot be seen	• **Forms of Energy** Present evidence that represents the relationship between a light source, solid object, and the resulting shadow ; draw and label diagrams showing several ways that energy can be transferred from one place to another	• **Forms of Energy** Compare various forms of energy as observed in everyday life and describe their applications; illustrate and explain what happens when light travels from air into water; compare the flow of heat through metals and nonmetals by taking and analyzing measurements	• **Forms of Energy** Predict the path of reflected or refracted light using reflecting and refracting telescopes as examples	• **Forms of Energy** Describe how to prisms can be used to demonstrate that visible light from the Sun is made up of different colors; relate the transfer of heat from oceans and land masses to the evolution of a hurricane	• **Forms of Energy** Structure evidence to explain the relatively high frequency of tornadoes in "Tornado Alley"	• **Forms of Energy** Model and explain current technologies used to capture solar energy for the purposes of converting it to electrical energy
• **Energy Transfer and Conservation** Predict the brightness of a light or the volume of sound	• **Energy Transfer and Conservation** Predict the brightness of a light, the volume of sound, or the amount of heat	• **Energy Transfer and Conservation** Predict and confirm the brightness of a light, the volume of sound, or the amount of heat when given the number of batteries, or the size of batteries	• **Energy Transfer and Conservation** Understand the basics of creating a simple electric circuit	• **Energy Transfer and Conservation** Repair an electric circuit by completing a closed loop that includes wires, a battery (or batteries), and at least one other electrical component to produce observable change	• **Energy Transfer and Conservation** Understand the basics of current flow in a simple electric circuit	• **Energy Transfer and Conservation** Use simple circuits involving batteries and motors to compare and predict the current flow with different circuit arrangements	• **Energy Transfer and Conservation** Relate the kinetic and potential energies of a roller coaster at various points on its path	• **Energy Transfer and Conservation** Describe the flow of energy from the Sun to the fuel tank of an automobile
• **Forces and Motion** Investigate how and why things move	• **Forces and Motion** Investigate and model the various ways that inanimate objects can move	• **Forces and Motion** Predict an object's relative speed, path, or how far it will travel using various forces and surfaces;	• **Forces and Motion** Distinguish a force that acts by direct contact with an object from a force that can act without direct contact (e.g., the attraction between a magnet and a steel paper clip); investigate, construct, and generalize rules for the effect that force of gravity has on balls of different sizes and weights	• **Forces and Motion** Demonstrate through modeling that motion is a change in position over a period of time; Identify the force that starts something moving or changes its speed or direction of motion; investigate and categorize materials based on their interaction with magnets	• **Forces and Motion** Model and explain how the description of an object's motion from one observer's view may be different from a different observer's view; describe the force between two magnets as the distance between them is changed	• **Forces and Motion** Demonstrate and explain the frictional force acting on an object with the use of a physical model; predict if an object will sink or float using evidence and reasoning	• **Forces and Motion** Calculate the speed of an object when given distance and time	• **Forces and Motion** Compare the motion of an object acted on by balanced forces with the motion of an object acted on by unbalanced forces in a given specific scenario

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5.3 Life Science – Life Science principles are powerful conceptual tools for making sense of the complexity, diversity, and interconnectedness of life on Earth. Order in natural systems arises in accordance with rules that govern the physical world, and the order of natural systems can be modeled and predicted through the use of mathematics.

Pre-K/Kinder.	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
• **Organization and Development** Investigate and compare the basic physical characteristics of plants, humans, and other animals	• **Organization and Development** Observe similarities and differences in the needs of various living things, and differences between living and nonliving things	• **Organization and Development** Group living and nonliving things according to the characteristics that they share	• **Organization and Development** Develop and use evidence-based criteria to determine if an unfamiliar object is living or nonliving	• **Organization and Development** Compare and contrast structures that have similar functions in various organisms, and explain how those functions may be carried out by structures that have different physical appearances; describe the interactions of systems involved in carrying out everyday life activities	• **Organization and Development** Model the interdependence of the human body's major systems in regulating its internal environment	• **Organization and Development** Model and explain ways in which organelles work together to meet the cell's needs	• **Organization and Development** Relate the structures of cells, tissues, organs, and systems to their functions in supporting life	• **Organization and Development** Compare the benefits and limitations of existing as a single-celled organism and as a multicellular organism
• **Matter and Energy Transformations** Observe and describe how plants and animals obtain food from their environment	• **Matter and Energy Transformations** Observe and describe how plants and animals obtain food from their environment, such as by observing the interactions between organisms in a natural habitat	• **Matter and Energy Transformations** Describe the requirements for the care of plants and animals related to meeting their energy needs; compare how different animals obtain food and water	• **Matter and Energy Transformations** Explain that most plants get water from soil through their roots and gather light through their leaves	• **Matter and Energy Transformations** Identify sources of energy (food) in a variety of settings (farm, zoo, ocean, forest)	• **Matter and Energy Transformations** Illustrate the flow of energy (food) through a community	• **Matter and Energy Transformations** Describe the sources of the reactants of photosynthesis and trace the pathway to the products	• **Matter and Energy Transformations** Relate the energy and nutritional needs of organisms in a variety of life stages and situations, including stages of development and periods of maintenance	• **Matter and Energy Transformations** Analyze the components of a consumer's diet and trace them back to plants and plant products

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• **Interdependence** Observe and describe how natural habitats provide for the basic needs of plants and animals with respect to shelter, food, water, air, and light (e.g., dig outside in the soil to investigate the kinds of animal life that live in and around the ground)	• **Interdependence** Describe the ways in which organisms interact with each other and their habitats in order to meet basic needs	• **Interdependence** Identify the characteristics of a habitat that enable the habitat to support the growth of many different plants and animals; communicate ways that humans protect habitats and/or improve conditions for the growth of the plants and animals that live there, or ways that humans might harm habitats	• **Interdependence** Explain the consequences of rapid ecosystem change (e.g., flooding, wind storms, snowfall, volcanic eruptions), and compare them to consequences of gradual ecosystem change	• **Interdependence** Predict the biotic and abiotic characteristics of an unfamiliar organism's habitat	• **Interdependence** Explain the impact of meeting human needs and wants on local and global environments	• **Interdependence** Predict the impact that altering biotic and abiotic factors has on an ecosystem	• **Interdependence** Describe how one population of organisms may affect other plants and/or animals in an ecosystem	• **Interdependence** Model the effect of positive and negative changes in population size on a symbiotic pairing
• **Heredity and Reproduction** Observe and record change over time and cycles of change that affect living things (e.g., use baby photographs to discuss human change and growth, observe and photograph tree growth and leaf changes throughout the year, monitor the life cycle of a plant)	• **Heredity and Reproduction** Record the observable characteristics of plants and animals to determine the similarities and differences between parents and their offspring	• **Heredity and Reproduction** Determine the characteristic changes that occur during the life cycle of plants and animals by examining a variety of species, and distinguish between growth and development	• **Heredity and Reproduction** Compare the physical characteristics of the different stages of the life cycle of an individual organism	• **Heredity and Reproduction** Compare the physical characteristics of the different stages of the life cycle of an individual organism, and compare the characteristics of life stages among species	• **Heredity and Reproduction** Predict the long-term effect of interference with normal patterns of reproduction	• **Heredity and Reproduction** Explain how knowledge of inherited variations within and between generations is applied to farming and animal breeding; distinguish between inherited and acquired traits/characteristics	• **Heredity and Reproduction** Explain the source of variation among siblings; describe the environmental conditions or factors that may lead to a change in a cell's genetic information or to an organism's development, and how these changes are passed on	• **Heredity and Reproduction** Defend the principle that, through reproduction, genetic traits are passed from one generation to the next, using evidence collected from observations of inherited traits
• **Evolution and Diversity** Describe similarities and differences in observable traits	• **Evolution and Diversity** Describe similarities and differences in observable traits between parents and offspring	• **Evolution and Diversity** Describe how similar structures found in different organisms (e.g., eyes, ears, mouths) have similar functions and enable those organisms to survive in different environments	• **Evolution and Diversity** Evaluate similar populations in an ecosystem with regard to their ability to thrive and grow	• **Evolution and Diversity** Model an adaptation to a species that would increase its chances of survival, should the environment become wetter, dryer, warmer, or colder over time	• **Evolution and Diversity** Describe the impact on the survival of species	• **Evolution and Diversity** Describe the impact on the survival of species during specific times in geologic history when environmental conditions changed	• **Evolution and Diversity** Compare the anatomical structures of a living species with fossil records to derive a line of descent	• **Evolution and Diversity** Organize and present evidence to show how the extinction of a species is related to an inability to adapt to changing environmental conditions using quantitative and qualitative data

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5.4 Earth Systems Science– Earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe.

Kindergarten	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
• **Objects in the Universe** Understand that the Sun and Moon are visible at different times	• **Objects in the Universe** Understand that the Sun and Moon are visible at different times	• **Objects in the Universe** Determine a set of general rules describing when the Sun and Moon are visible based on actual sky observations	• **Objects in the Universe** Formulate a general description of the daily motion of the Sun across the sky based on shadow observations; identify patterns of the Moon's appearance and make predictions about its future appearance based observational data	• **Objects in the Universe** Explain how shadows could be used to tell the time of day; generate a model with explanatory value that explains both why objects roll down ramps as well as why the Moon orbits Earth	• **Objects in the Universe** Analyze and evaluate evidence in the form of data tables and photographs to categorize and relate solar system objects (e.g., planets, dwarf planets, moons, asteroids, and comets); generate and analyze evidence (through simulations) that the Sun's apparent motion across the sky changes over the course of a year; analyze data regarding the motion of comets, planets, and moons to find general patterns of orbital motion	• **Objects in the Universe** Construct and evaluate models demonstrating the rotation of Earth on its axis and the orbit of Earth around the Sun; predict what would happen to an orbiting object if gravity were increased, decreased, or taken away; compare and contrast the major physical characteristics (including size and scale) of solar system objects using evidence in the form of data tables and photographs	• **Objects in the Universe** Analyze moon-phase, eclipse, and tidal data to construct models that explain how the relative positions and motions of the Sun, Earth, and Moon cause these three phenomena	• **Objects in the Universe** Use evidence of global variations in day length, temperature, and the amount of solar radiation striking Earth's surface to create models that explain these phenomena and seasons; predict how the gravitational force between two bodies would differ for bodies of different masses or bodies that are different distances apart
• **History of Earth**	• **History of Earth**	• **History of Earth**	• **History of Earth** Understand that a fossil tells an environmental story	• **History of Earth** Use data gathered from observations of fossils to argue whether a given fossil is terrestrial or marine in origin	• **History of Earth** Interpret a representation of a rock layer sequence to establish oldest and youngest layers, geologic events, and changing life forms; describe methods people use to reduce soil erosion	• **History of Earth** Examine Earth's surface features and identify those created on a scale of human life or on a geologic time scale; determine if landforms were created by processes of erosion based on evidence	• **History of Earth** Correlate the evolution of organisms and the environmental conditions on Earth as they changed throughout geologic time	• **History of Earth** Evaluate the appropriateness of increasing the human population in a region based on the region's history of catastrophic events, such as volcanic eruptions, earthquakes, and floods

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• **Properties of Earth Materials** Explore and describe characteristics of and concepts about soil, rocks, water, and air	• **Properties of Earth Materials** Explore and describe characteristics of and concepts about soil, rocks, water, and air	• **Properties of Earth Materials** Describe Earth materials using appropriate terms, such as hard, soft, dry, wet, heavy, and light	• **Properties of Earth Materials** Create a model to represent how soil is formed	• **Properties of Earth Materials** Categorize unknown samples as either rocks or minerals	• **Properties of Earth Materials** Distinguish physical properties of sedimentary, igneous, or metamorphic rocks and explain how one kind of rock could eventually become a different kind of rock	• **Properties of Earth Materials** Predict the types of ecosystems that unknown soil samples could support based on soil properties; deduce the story of the tectonic conditions and erosion forces that created sample rocks or rock formations	• **Properties of Earth Materials** Determine the chemical properties of soil samples in order to select an appropriate location for a community garden	• **Properties of Earth Materials** Explain how chemical and physical mechanisms (changes) are responsible for creating a variety of landforms; model the vertical structure of the atmosphere using information from active and passive remote-sensing tools (e.g., satellites, balloons, and/or ground-based sensors) in the analysis
• **Tectonics**	• **Tectonics**	• **Tectonics**	• **Tectonics**	• **Tectonics**	• **Tectonics** Locate areas that are being created (deposition) and destroyed (erosion) using maps and satellite images	• **Tectonics** Apply understanding of the motion of lithospheric plates to explain why the Pacific Rim is referred to as the Ring of Fire; apply knowledge of Earth's magnetic fields to successfully complete an orienteering challenge	• **Tectonics** Model the interactions between the layers of Earth	• **Tectonics** Present evidence to support arguments for the theory of plate motion; explain why geomagnetic north and geographic north are at different locations
• **Energy in Earth Systems** Explore the effects of sunlight on living and nonliving things	• **Energy in Earth Systems** Understand how the environment affects growth	• **Energy in Earth Systems** Describe the relationship between the Sun and plant growth	• **Energy in Earth Systems** Predict temperature changes of Earth's materials dependant on placement of Sun	• **Energy in Earth Systems** Develop a general set of rules to predict temperature changes of Earth materials, such as water, soil, and sand, when placed in the Sun and in the shade	• **Energy in Earth Systems** Understand how energy is transferred; make simple predictions	• **Energy in Earth Systems** Generate a conclusion about energy transfer and circulation by observing a model of convection currents	• **Energy in Earth Systems** Explain the basics of how energy from the Sun is transformed or transferred in global wind circulation, ocean circulation, and the water cycle	• **Energy in Earth Systems** Explain how energy from the Sun is transformed or transferred in global wind circulation, ocean circulation, and the water cycle

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• **Climate and Weather** Observe and record weather	• **Climate and Weather** Observe and document daily weather conditions	• **Climate and Weather** Observe and document daily weather conditions and discuss how the weather influences your activities for the day	• **Climate and Weather** Identify patterns in data collected from basic weather instruments	• **Climate and Weather** Identify patterns in data collected from basic weather instruments	• **Climate and Weather** Explain the interrelationships between daily temperature, air pressure, and relative humidity data	• **Climate and Weather** Create climatographs for various locations around Earth and categorize the climate based on the yearly patterns of temperature and precipitation	• **Climate and Weather** Determine the origin of local weather by exploring national and international weather maps	• **Climate and Weather** Explain the mechanisms that cause varying daily temperature ranges in a coastal community and in a community located in the interior of the country; create a model of the hydrologic cycle that focuses on the transfer of water in and out of the atmosphere. Apply the model to different climates around the world
• **Biogeochemical Cycles** Demonstrate emergent awareness for conservation, recycling, and respect for the environment	• **Biogeochemical Cycles** Identify and use water conservation practices; Identify and categorize the basic needs of living organisms as they relate to the environment	• **Biogeochemical Cycles** Observe and discuss evaporation and condensation; identify the natural resources used in the process of making various manufactured products	• **Biogeochemical Cycles** Explain how clouds form; observe daily cloud patterns, types of precipitation, and temperature, and categorize the clouds by the conditions that form precipitation	• **Biogeochemical Cycles** Trace a path a drop of water might follow through the water cycle; model how the properties of water can change as water moves through the water cycle	• **Biogeochemical Cycles** Create a model of ecosystems in two different locations, and compare and contrast the living and nonliving components; describe ways that humans can improve the health of ecosystems around the world	• **Biogeochemical Cycles** Illustrate global winds and surface currents through the creation of a world map of global winds and currents that explains the relationship between the two factors	• **Biogeochemical Cycles** Represent and explain, using sea surface temperature maps, how ocean currents impact the climate of coastal communities	• **Biogeochemical Cycles** Investigate a local or global environmental issue by defining the problem, researching possible causative factors, understanding the underlying science, and evaluating the benefits and risks of alternative solutions