

Point Bonita YMCA

Science Curriculum: Next Generation Science Standards & California State Science Standards

The Point Bonita YMCA's Residential Outdoor Education Program is implementing Next Generation Science Standards and Cross-Cutting Concepts. Through our outdoor-based science lessons, we deliver hands-on learning opportunities for students around themes of scientific inquiry and investigation, earth and life science, ecological communities and interdependence, and environmental stewardship. For your reference, here is a sample of Next Generation Science Standards and California State Science Standards that our program can address based on school requests.

Next Generation Science Standards (4th Grade)

4-PS3 Energy

- 4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- 4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide.
 - PS3.A: Definitions of Energy
 - Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3)
 - PS3.B: Conservation of Energy and Energy Transfer
 - Light also transfers energy from place to place. (4-PS3-2)

4-PS4 Waves and their Applications in Technologies for Information Transfer

- PS4.A: Wave Properties
 - Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (Note: This grade band endpoint was moved from K-2.) (4-PS4-1)

4-LS1 From Molecules to Organisms: Structures and Processes

- LS1.A: Structure and Function
 - Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1)
- LS1.D: Information Processing
 - Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)

4-ESS1 Earth's Place in the Universe

- 4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
 - ESS1.C: The History of Planet Earth
 - Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1)

4-ESS2 Earth's Systems

- 4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
 - ESS2.A: Earth Materials and Systems

- Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1)
- ESS2.B: Plate Tectonics and Large-Scale System Interactions
 - The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2)
- ESS2.E: Biogeology
 - Living things affect the physical characteristics of their regions. (4-ESS2-1)

4-ESS3 Earth and Human Activity

- 4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
 - ESS3.A: Natural Resources
 - Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)

Next Generation Science Standards (5th Grade)

5-PS3 Energy

- 5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.
 - PS3.D: Energy in Chemical Processes and Everyday Life
 - The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (5-PS3-1)
 - LS1.C: Organization for Matter and Energy Flow in Organisms
 - Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (secondary to 5-PS3-1)

5-LS1 From Molecules to Organisms: Structure and Processes

- 5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.
 - LS1.C: Organization for Matter and Energy Flow in Organisms
 - Plants acquire their material for growth chiefly from air and water. (5-LS1-1)

5-LS2 Ecosystems: Interactions, Energy, and Dynamics

- 5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
 - LS2.A: Interdependent Relationships in Ecosystems
 - The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of

different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (5-LS2-1)

- (5-LS2-1) LS2.B: Cycles of Matter and Energy Transfer in Ecosystems
 - Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. (5-LS2-1)

5-ESS1 Earth's Place in the Universe

- ESS1.B: Earth and the Solar System
 - The orbits of Earth around the sun and of the moon around earth, together with the rotation of Earth about an axis between its North and South poles cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month and year.

5-ESS2 Earth's System

- 5-ESS2-2. 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.
 - ESS2.A: Earth Materials and Systems
 - Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. (5-ESS2-1)
 - ESS2.C: The Roles of Water in Earth's Surface Processes
 - Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (5-ESS2-2)

5-ESS3 Earth and Human Activity

- 5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
 - ESS3.C: Human Impacts on Earth Systems
 - Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (5-ESS3-1)

Next Generation Science Standards (Middle School 6th/7th/8th Grades)

MS-PS4 Waves and Their Applications in Technologies for Information Transfer

- PS4.A: Wave Properties
 - A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (MS-PS4-1)
 - A sound wave needs a medium through which it is transmitted. (MS-PS4-2)

MS-LS1 From Molecules to Organisms: Structures and Processes

- MS-LS1-4. 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.
- MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
 - LS1.B: Growth and Development of Organisms
 - Animals engage in characteristic behaviors that increase the odds of reproduction. (MS-LS1-4)
 - Plants reproduce in a variety of ways, sometimes depending on animal behavior and specialized features for reproduction. (MS-LS1-4)
 - Genetic factors as well as local conditions affect the growth of the adult plant. (MS-LS1-5)
 - LS1.C: Organization for Matter and Energy Flow in Organisms
 - Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)
 - PS3.D: Energy in Chemical Processes and Everyday Life
 - The chemical reaction by which plants produce complex food molecules (sugars) requires an energy input (i.e., from sunlight) to occur. In this reaction, carbon dioxide and water combine to form carbon-based organic molecules and release oxygen. (secondary to MS-LS1-6)
 - Cellular respiration in plants and animals involve chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials. (secondary to MS-LS1-7)

MS-LS2 Ecosystems: Interactions, Energy, and Dynamics

- MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
 - LS2.A: Interdependent Relationships in Ecosystems
 - Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. (MS-LS2-1)
 - In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1)
 - Growth of organisms and population increases are limited by access to resources. (MS-LS2-1)
 - Similarly, predatory interactions may reduce the number of organisms or eliminate whole populations of organisms. Mutually beneficial interactions, in contrast, may become so interdependent that each organism requires the other for survival. Although the species involved in these competitive, predatory, and mutually beneficial interactions vary across

ecosystems, the patterns of interactions of organisms with their environments, both living and nonliving, are shared. (MS-LS2-2)

- **LS2.B: Cycle of Matter and Energy Transfer in Ecosystems**
 - Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem. (MS-LS2-3)
- **LS2.C: Ecosystem Dynamics, Functioning, and Resilience**
 - Ecosystems are dynamic in nature; their characteristics can vary over time. Disruptions to any physical or biological component of an ecosystem can lead to shifts in all its populations. (MS-LS2-4)
 - Biodiversity describes the variety of species found in Earth’s terrestrial and oceanic ecosystems. The completeness or integrity of an ecosystem’s biodiversity is often used as a measure of its health. (MS-LS2-5)
- **LS4.D: Biodiversity and Humans**
 - Changes in biodiversity can influence humans’ resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5)

MS-LS3 Heredity: Inheritance and Variation of Traits

- **LS1.B: Growth and Development of Organisms**
 - Organisms reproduce, either sexually or asexually, and transfer their genetic information to their offspring. (secondary to MS-LS3-2)
- **LS3.B: Variation of Traits**
 - In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (MS-LS3-1)

MS-LS4 Biological Evolution: Unity and Diversity

- MS-LS4-4. 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.
- MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.
 - **LS4.B: Natural Selection**
 - Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (MS-LS4-4)
 - In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (MS-LS4-5)
 - **LS4.C: Adaptation**
 - Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that

support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (MS-LS4-6)

MS-ESS1 Earth's Place in the Universe

- MS-ESS1-1. 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.
 - ESS1.A: The Universe and Its Stars
 - Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (MS-ESS1-1)
 - Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)
 - ESS1.B: Earth and the Solar System
 - The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MSESS1-3)
 - This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over the short-term but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the differential intensity of sunlight on different areas of Earth across the year. (MS-ESS1-1)
 - ESS1.C: The History of Planet Earth
 - The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock strata and the fossil record provide only relative dates, not an absolute scale. (MS-ESS1-4)

MS-ESS2 Earth's Systems

- MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
- MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
 - ESS1.C: The History of Planet Earth
 - Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches. (HS.ESS1.C GBE) (secondary to MS-ESS2-3)
 - ESS2.A: Earth's Materials and Systems
 - All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)
 - The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)
 - ESS2.B: Plate Tectonics and Large-Scale System Interactions
 - Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart. (MS-ESS2-3)

- ESS2.C: The Roles of Water in Earth's Surface Processes
 - Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land. (MS-ESS2-4)
 - The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns. (MSESS2-5)
 - Global movements of water and its changes in form are propelled by sunlight and gravity. (MS-ESS2-4)
 - Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents. (MS-ESS2-6)
 - Water's movements—both on the land and underground—cause weathering and erosion, which change the land's surface features and create underground formations. (MS-ESS2-2)
- ESS2.D: Weather and Climate
 - Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. (MS-ESS2-6)
 - The ocean exerts a major influence on weather and climate by absorbing energy from the sun, releasing it over time, and globally redistributing it through ocean currents. (MS-ESS2-6)

MS-ESS3 Earth and Human Activity

- MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
- MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
 - ESS3.A: Natural Resources
 - Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1)
 - ESS3.C: Human Impacts on Earth Systems
 - Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3)
 - Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MSESS3-3),(MS-ESS3-4)
 - ESS3.D: Global Climate Change
 - Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)

California State K-12 Science Standards (4th Grade)

Life Sciences

- 2. All organisms need energy and matter to live and grow. As a basis for understanding this concept:
 - 2.a. Students know plants are the primary source of matter and energy entering most food chains.
 - 2.b. Students know producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs and may compete with each other for resources in an ecosystem.
 - 2.c. Students know decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.
- 3. Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept:
 - 3.a. Students know ecosystems can be characterized by their living and nonliving components.
 - 3.b. Students know that in any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.
 - 3.c. Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.

Earth Sciences

- 4. The properties of rocks and minerals reflect the processes that formed them. As a basis for understanding this concept:
 - 4.a. Students know how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to their properties and methods of formation (the rock cycle).
- 5. Waves, wind, water, and ice shape and reshape Earth's land surface. As a basis for understanding this concept:
 - 5.a. Students know some changes in the earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.
 - 5.b. Students know natural processes, including freezing and thawing and the growth of roots, cause rocks to break down into smaller pieces.
 - 5.c. Students know moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).

Investigation and Experimentation

- 6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
 - 6.a. Differentiate observation from inference (interpretation) and know scientists' explanations come partly from what they observe and partly from how they interpret their observations.

California State K-12 Science Standards (5th Grade)

Life Sciences

- 2. Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials. As a basis for understanding this concept:
 - 2.e Students know how sugar, water, and minerals are transported in a vascular plant.
 - 2.f Students know plants use carbon dioxide (CO₂) and energy from the sunlight to build molecules of sugar and release oxygen.
 - 2.g Students know plant and animal cells break down sugar to obtain energy, a process resulting in carbon dioxide (CO₂) and water (respiration).

Earth Sciences

- 3. Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept:
 - 3.a Students know most of the Earth's water is present as salt water in the oceans, which cover most of the Earth's surface.
 - 3.b Students know when liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled or as solid if cooled below the freezing point of water.
 - 3.c Students know water vapor in the air moves from one place to another and can form fog or clouds, which are tiny droplets of water or ice, and can fall to Earth as rain, hail, or snow.
 - 3.d Students know that the amount of fresh water located in rivers, lakes, underground sources, and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.
 - 3.e Students know the origin of the water used by their local communities.
 - 4.b Students know the influence that the ocean has on the weather and the role that the water cycle plays in weather patterns.
- 5. The solar system consists of planets and other bodies that orbit the Sun in predictable paths. As a basis for understanding this concept:
 - 5.b Students know the solar system includes the planet Earth, the Moon, the Sun, seven other planets and their satellites, and smaller objects, such as asteroids and comets.
 - 5.c Students know the path of a planet around the Sun is due to the gravitational attraction between the sun and the planet.

Investigation and Experimentation

- 6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
 - 6.a Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.
 - 6.b Develop a testable question/hypothesis
 - 6.c Plan and conduct a simple investigation based on a student-developed question and write instructions other can follow to carry out the procedure.
 - 6.f Select and use appropriate tools and technology (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.
 - 6.g Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.
 - 6.h Draw conclusions from scientific evidence and indicate whether further information is needed to support a specific conclusion.

California State K-12 Science Standards (6th Grade)

Plate Tectonics and Earth's Structure

- 1. Plate tectonics accounts for important features of Earth's surface and major geologic events. As a basis for understanding this concept:
 - 1.a Students know evidence of plate tectonics is derived from the fit of the continents; the location of earthquakes, volcanoes, and mid-ocean ridges; and the distribution of fossils, rock types, and ancient climatic zones.
 - 1.b Students know Earth is composed of several layers: a cold, brittle lithosphere; a hot, convecting mantle; and a dense, metallic core.

- 1.c Students know lithosphere plates the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle.
- 1.d Students know that earthquakes are sudden motions along breaks in the crust called faults and that volcanoes and fissures are locations where magma reaches the surface.
- 1.e Students know major geologic events, such as earthquakes, volcanic eruptions, and mountain building, result from plate motions.
- 1.f Students know how to explain major features of California geology (including mountain, faults, and volcanos) in terms of plate tectonics.

Shaping Earth's Surface

- 2. Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment. As a basis for understanding this concept:
 - 2.a Students know water running downhill is the dominate process in shaping the landscape, including California's landscape
 - 2.b Students know rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and reoccurring waves.
 - 2.c Students know beaches are dynamic systems in which the sand is supplied by rivers and moved along the coast by the action of waves.
 - 2.d Students know earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.

Energy in Earth Systems

- 4.a Students know the sun is the major source of energy for phenomena on Earth's surface; it powers winds, ocean currents, and the water cycle.
- 4.b Students know solar energy reaches Earth though radiation, mostly in the form of visible light.
- 4.e Students know differences in pressure, hear, air movement, and humidity result in changes of weather.

Ecology (Life Science)

- 5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept:
 - 5.a Students know energy entering ecosystems as sunlight is transferred by produces into chemical energy through photosynthesis and then from organism to organism thought food webs.
 - 5.b Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
 - 5.c Students know populations of organisms can be categorized by the functions they serve in an ecosystem.
 - 5.d Students know different kinds of organisms may play similar ecological roles in similar biomes.
 - 5.e Students know the number and types of organisms an ecosystem can support depends on the resources available and on the abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.

Resources

- 6. Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. As a basis for understanding this concept:
 - 6.b Students know different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.

- 6.c Students know the natural origin of the materials used to make common objects.

Investigation and Experimentation

- 7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
 - 7.a Develop a testable question/hypothesis
 - 7.b Select and use appropriate tools and technology (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.
 - 7.e Recognize whether evidence is consistent with a proposed explanation.