

Standard Course of Study Alignment

Science (2010)



Legend

•	The standard is clearly addressed by program activities.
-	This standard potentially could be addressed as part of FIRST® LEGO® League Discover either by actions that the coach or teacher takes when working with the students or by conditions established by the program.

Grade 4

Essential Standard and Clarifying Objectives	Addressed
Forces and Motion	
4.P.1 Explain how various forces affect the motion of an object.	
4.P.1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them.	-
4.P.1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion.	
Matter: Properties and Change	
4.P.2 Understand the composition and properties of matter before and after they undergo a change or interaction.	
4.P.2.1 Compare the physical properties of samples of matter (strength, hardness, flexibility, ability to conduct heat, ability to conduct electricity, ability to be attracted by magnets, reactions to water and fire).	
4.P.2.2 Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage, and streak.	
4.P.2.3 Classify rocks as metamorphic, sedimentary, or igneous based on their composition, how they are formed and the processes that create them.	
Energy: Conservation and Transfer	
4.P.3 Recognize that energy takes various forms that may be grouped based on their interaction with matter.	
4.P.3.1 Recognize the basic forms of energy (light, sound, heat, electrical, and magnetic) as the ability to cause motion or create change.	-
4.P.3.2 Recognize that light travels in a straight line until it strikes an object or travels from one medium to another, and that light can be reflected, refracted, and absorbed.	
Earth in the Universe	
4.E.1 Explain the causes of day and night and phases of the moon.	
4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis.	
4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth.	
Earth History	
4.E.2 Understand the use of fossils and changes in the surface of the earth as evidence of the history of the Earth and its changing life forms.	
4.E.2.1 Compare fossils (including molds, casts, and preserved parts of plants and animals) to one another and to living organisms.	
4.E.2.2 Infer ideas about Earth's early environments from fossils of plants and animals that lived long ago.	
4.E.2.3 Give examples of how the surface of the earth changes due to slow processes such as erosion and weathering, and rapid processes such as landslides, volcanic eruptions, and earthquakes.	
Ecosystems	
4.L.1 Understand the effects of environmental changes, adaptations and behaviors that enable animals (including humans) to survive in changing habitats.	
4.L.1.1 Give examples of changes in an organism's environment that are beneficial to it and some that are harmful.	
4.L.1.2 Explain how animals meet their needs by using behaviors in response to information received from the environment.	

4.L.1.3 Explain how humans can adapt their behavior to live in changing habitats (e.g., recycling wastes, establishing rain gardens, planting trees and shrubs to prevent flooding and erosion).	
4.L.1.4 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats.	
Molecular Biology	
4.L.2 Understand food and the benefits of vitamins, minerals and exercise.	
4.L.2.1 Classify substances as food or non-food items based on their ability to provide energy and materials for survival, growth, and repair of the body.	
4.L.2.2 Explain the role of vitamins and minerals, and exercise in maintaining a healthy body.	

Grade 5

Essential Standard and Clarifying Objectives	Addressed
Forces and Motion	
5.P.1 Understand force, motion and the relationship between them.	
5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects.	
5.P.1.2 Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel.	•
5.P.1.3 Illustrate the motion of an object using a graph to show a change in position over a period of time.	
5.P.1.4 Predict the effect of a given force or a change in mass on the motion of an object.	
Matter: Properties and Change	
5.P.2 Understand the interactions of matter and energy and the changes that occur.	
5.P.2.1 Explain how the sun's energy impacts the processes of the water cycle (including, evaporation, transpiration, condensation, precipitation and runoff).	
5.P.2.2 Compare the weight of an object to the sum of the weight of its parts before and after an interaction.	
5.P.2.3 Summarize properties of original materials, and the new material(s) formed, to demonstrate that a change has occurred.	
Energy: Conservation and Transfer	
5.P.3 Explain how the properties of some materials change as a result of heating and cooling.	
5.P.3.1 Explain the effects of the transfer of heat (either by direct contact or at a distance) that occurs between objects at different temperatures. (conduction, convection or radiation).	-
5.P.3.2 Explain how heating and cooling affect some materials and how this relates to their purpose and practical applications.	
Earth Systems, Structures and Processes	
5.E.1 Understand weather patterns and phenomena, making connections to the weather in a particular place and time.	
5.E.1.1 Compare daily and seasonal changes in weather conditions (including wind speed and direction, precipitation, and temperature) and patterns.	
5.E.1.2 Predict upcoming weather events from weather data collected through observation and measurements.	
5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation.	
Structures and Functions of Living Organisms	
5.L.1 Understand how structures and systems of organisms (to include the human body) perform functions necessary for life.	
5.L.1.1 Explain why some organisms are capable of surviving as a single cell while others require many cells that are specialized to survive.	
5.L.1.2 Compare the major systems of the human body (digestive, respiratory, circulatory, muscular, skeletal, and cardiovascular) in terms of their functions necessary for life.	
Ecosystems	
5.L.2 Understand the interdependence of plants and animals with their ecosystem.	
5.L.2.1 Compare the characteristics of several common ecosystems, including estuaries and salt marshes, oceans, lakes and ponds, forests, and grasslands.	
5.L.2.2 Classify the organisms within an ecosystem according to the function they serve: producers, consumers, or decomposers (biotic factors).	

5.L.2.3 Infer the effects that may result from the interconnected relationship of plants and animals to their ecosystem.	
Evolution and Genetics	
5.L.3 Understand why organisms differ from or are similar to their parents based on the characteristics of the organism.	
5.L.3.1 Explain why organisms differ from or are similar to their parents based on the characteristics of the organism.	
5.L.3.2 Give examples of likenesses that are inherited and some that are not.	

Grade 6

Essential Standard and Clarifying Objectives	Addressed
Forces and Motion	
6.P.1 Understand the properties of waves and the wavelike property of energy in earthquakes, light and sound.	
6.P.1.1 Compare the properties of waves to the wavelike property of energy in earthquakes, light and sound.	
6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight.	
6.P.1.3 Explain the relationship among the rate of vibration, the medium through which vibrations travel, sound and hearing.	
Matter: Properties and Change	
6.P.2 Understand the structure, classifications and physical properties of matter.	
6.P.2.1 Recognize that all matter is made up of atoms and atoms of the same element are all alike, but are different from the atoms of other elements.	
6.P.2.2 Explain the effect of heat on the motion of atoms through a description of what happens to particles during a change in phase.	
6.P.2.3 Compare the physical properties of pure substances that are independent of the amount of matter present including density, boiling point, melting point and solubility to properties that are dependent on the amount of matter present to include volume, mass and weight.	
Energy: Conservation and Transfer	
6.P.3 Understand characteristics of energy transfer and interactions of matter and energy.	
6.P.3.1 Illustrate the transfer of heat energy from warmer objects to cooler ones using examples of conduction, radiation and convection and the effects that may result.	
6.P.3.2 Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature.	-
6.P.3.3 Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators).	
Earth in the Universe	
6.E.1 Understand the earth/moon/sun system, and the properties, structures, and predictable motions of celestial bodies in the Universe.	
6.E.1.1 Explain how the relative motion and relative position of the sun, Earth and moon affect the seasons, tides, phases of the moon, and eclipses.	
6.E.1.2 Explain why Earth sustains life while other planets do not based on their properties (including types of surface, atmosphere and gravitational force) and location to the Sun.	
6.E.1.3 Summarize space exploration and the understandings gained from them.	
Earth Systems, Structures and Processes	
6.E.2 Understand the structure of the earth and how interactions of constructive and destructive forces have resulted in changes in the surface of the Earth over time and the effects of the lithosphere on humans.	
6.E.2.1 Summarize the structure of the earth, including the layers, the mantle and core based on the relative position, composition and density.	
6.E.2.2 Explain how crustal plates and ocean basins are formed, move and interact using earthquakes, heat flow and volcanoes to reflect forces within the earth.	
6.E.2.3 Explain how the formation of soil is related to the parent rock type and the environment in which it develops.	
6.E.2.4 Conclude that the good health of humans requires: monitoring the lithosphere, maintaining soil quality and stewardship.	
Structures and Functions of Living Organisms	
6.L.1 Understand the structures, processes and behaviors of plants that enable them to survive and reproduce.	

6.L.1.1 Summarize the basic structures and functions of flowering plants required for survival, reproduction and defense.	
6.L.1.2 Explain the significance of the processes of photosynthesis, respiration and transpiration to the survival of green plants and other organisms.	
Ecosystems	
6.L.2 Understand the flow of energy through ecosystems and the responses of populations to the biotic and abiotic factors in their environment.	
6.L.2.1 Summarize how energy derived from the sun is used by plants to produce sugars (photosynthesis) and is transferred within a food chain or food web (terrestrial and aquatic) from producers to consumers to decomposers.	
6.L.2.2 Explain how plants respond to external stimuli (including dormancy and forms of tropism) to enhance survival in an environment.	
6.L.2.3 Summarize how the abiotic factors (such as temperature, water, sunlight, and soil quality) of biomes (freshwater, marine, forest, grasslands, desert, Tundra) affect the ability of organisms to grow, survive and/or create their own food through photosynthesis.	

Grade 7

Essential Standard and Clarifying Objectives	Addressed
Forces and Motion	
7.P.1 Understand motion, the effects of forces on motion and the graphical representations of motion.	
7.P.1.1 Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object.	
7.P.1.2 Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity and magnets).	-
7.P.1.3 Illustrate the motion of an object using a graph to show a change in position over a period of time.	
7.P.1.4 Interpret distance versus time graphs for constant speed and variable motion.	
Energy: Conservation and Transfer	
7.P.2 Understand forms of energy, energy transfer and transformation and conservation in mechanical systems.	
7.P.2.1 Explain how kinetic and potential energy contribute to the mechanical energy of an object.	
7.P.2.2 Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a moving object (roller coaster, pendulum, or cars on ramps as examples).	
7.P.2.3 Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass.	•
7.P.2.4 Explain how simple machines such as inclined planes, pulleys, levers and wheel and axels are used to create mechanical advantage and increase efficiency.	
Earth Systems, Structures and Processes	
7.E.1 Understand how the cycling of matter (water and gases) in and out of the atmosphere relates to Earth's atmosphere, weather and climate and the effects of the atmosphere on humans.	
7.E.1.1 Compare the composition, properties and structure of Earth's atmosphere to include mixtures of gases and differences in temperature and pressure within layers.	
7.E.1.2 Explain how the cycling of water in and out of the atmosphere and atmospheric conditions relate to the weather patterns on earth.	
7.E.1.3 Explain the relationship between the movement of air masses, high and low pressure systems, and frontal boundaries to storms (including thunderstorms, hurricanes, and tornadoes) and other weather conditions that may result.	
7.E.1.4 Predict weather conditions and patterns based on information obtained from:	
• Weather data collected from direct observations and measurement (wind speed and direction, air temperature, humidity and air pressure).	
• Weather maps, satellites and radar	
• Cloud shapes and types and associated elevation	
7.E.1.5 Explain the influence of convection, global winds and the jet stream on weather and climatic conditions.	
7.E.1.6 Conclude that the good health of humans requires: monitoring the atmosphere, maintaining air quality and stewardship.	
Structures and Functions of Living Organisms	

<p>7.L.1 Understand the processes, structures and functions of living organisms that enable them to survive, reproduce and carry out the basic functions of life.</p> <p>7.L.1.1 Compare the structures and life functions of single-celled organisms that carry out all of the basic functions of life including:</p> <ul style="list-style-type: none"> • Euglena • Amoeba • Paramecium • Volvox <p>7.L.1.2 Compare the structures and functions of plant and animal cells, including major organelles (cell membrane, cell wall, nucleus, chloroplasts, mitochondria, and vacuoles).</p> <p>7.L.1.3 Summarize the hierarchical organization of multi-cellular organisms from cells to tissues to organs to systems to organisms.</p> <p>7.L.1.4 Summarize the general functions of the major systems of the human body (digestion, respiration, reproduction, circulation, and excretion) and ways that these systems interact with each other to sustain life.</p>	
Evolution and Genetics	
<p>7.L.2 Understand the relationship of the mechanisms of cellular reproduction, patterns of inheritance and external factors to potential variation and survival among offspring.</p> <p>7.L.2.1 Explain why offspring that result from sexual reproduction (fertilization and meiosis) have greater variation than offspring that result from asexual reproduction (budding and mitosis).</p> <p>7.L.2.2 Infer patterns of heredity using information from Punnett squares and pedigree analysis.</p> <p>7.L.2.3 Explain the impact of the environment and lifestyle choices on biological inheritance (to include common genetic diseases) and survival.</p>	

Grade 8

Essential Standard and Clarifying Objectives	Addressed
Matter: Properties and Change	
<p>8.P.1 Understand the properties of matter and changes that occur when matter interacts in an open and closed container.</p> <p>8.P.1.1 Classify matter as elements, compounds, or mixtures based on how the atoms are packed together in arrangements.</p> <p>8.P.1.2 Explain how the physical properties of elements and their reactivity have been used to produce the current model of the Periodic Table of elements.</p> <p>8.P.1.3 Compare physical changes such as size, shape and state to chemical changes that are the result of a chemical reaction to include changes in temperature, color, formation of a gas or precipitate.</p> <p>8.P.1.4 Explain how the idea of atoms and a balanced chemical equation support the law of conservation of mass.</p>	
Energy: Conservation and Transfer	
<p>8.P.2 Explain the environmental implications associated with the various methods of obtaining, managing and using energy resources.</p> <p>8.P.2.1 Explain the environmental consequences of the various methods of obtaining, transforming, and distributing energy.</p> <p>8.P.2.2 Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation.</p>	-
Earth Systems, Structures and Processes	
<p>8.E.1 Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans.</p> <p>8.E.1.1 Explain the structure of the hydrosphere including:</p> <ul style="list-style-type: none"> • Water distribution on earth • Local river basin and water availability <p>8.E.1.2 Summarize evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms:</p> <ul style="list-style-type: none"> • Estuaries • Marine ecosystems • Upwelling 	

<ul style="list-style-type: none"> • Behavior of gases in the marine environment • Value and sustainability of marine resources • Deep ocean technology and understandings gained <p>8.E.1.3 Predict the safety and potability of water supplies in North Carolina based on physical and biological factors, including:</p> <ul style="list-style-type: none"> • Temperature • Dissolved oxygen • pH • Nitrates and phosphates • Turbidity • Bio-indicators <p>8.E.1.4 Conclude that the good health of humans requires:</p> <ul style="list-style-type: none"> • Monitoring of the hydrosphere • Water quality standards • Methods of water treatment • Maintaining safe water quality • Stewardship 	
Earth History	
<p>8.E.2 Understand the history of Earth and its life forms based on evidence of change recorded in fossil records and landforms.</p> <p>8.E.2.1 Infer the age of Earth and relative age of rocks and fossils from index fossils and ordering of rock layers (relative dating and radioactive dating).</p> <p>8.E.2.2 Explain the use of fossils, ice cores, composition of sedimentary rocks, faults, and igneous rock formations found in rock layers as evidence of the history of the Earth and its changing life forms.</p>	
Structures and Functions of Living Organisms	
<p>8.L.1 Understand the structure and hazards caused by agents of disease that effect living organisms.</p> <p>8.L.1.1 Summarize the basic characteristics of viruses, bacteria, fungi and parasites relating to the spread, treatment and prevention of disease.</p> <p>8.L.1.2 Explain the difference between epidemic and pandemic as it relates to the spread, treatment and prevention of disease.</p> <p>8.L.2 Understand how biotechnology is used to affect living organisms.</p> <p>8.L.2.1 Summarize aspects of biotechnology including:</p> <ul style="list-style-type: none"> • Specific genetic information available • Careers • Economic benefits to North Carolina • Ethical issues • implications for agriculture 	
Ecosystems	
<p>8.L.3 Understand how organisms interact with and respond to the biotic and abiotic components of their environment.</p> <p>8.L.3.1 Explain how factors such as food, water, shelter and space affect populations in an ecosystem.</p> <p>8.L.3.2 Summarize the relationships among producers, consumers, and decomposers including the positive and negative consequences of such interactions including:</p> <ul style="list-style-type: none"> • Coexistence and cooperation • Competition (predator/prey) • Parasitism • Mutualism <p>8.L.3.3 Explain how the flow of energy within food webs is interconnected with the cycling of matter (including water, nitrogen, carbon dioxide and oxygen).</p>	
Evolution and Genetics	

<p>8.L.4 Understand the evolution of organisms and landforms based on evidence, theories and processes that impact the Earth over time.</p> <p>8.L.4.1 Summarize the use of evidence drawn from geology, fossils, and comparative anatomy to form the basis for biological classification systems and the theory of evolution.</p> <p>8.L.4.2 Explain the relationship between genetic variation and an organism’s ability to adapt to its environment.</p>	
<p>Molecular Biology</p>	
<p>8.L.5 Understand the composition of various substances as it relates to their ability to serve as a source of energy and building materials for growth and repair of organisms.</p> <p>8.L.5.1 Summarize how food provides the energy and the molecules required for building materials, growth and survival of all organisms (to include plants).</p> <p>8.L.5.2 Explain the relationship among a healthy diet, exercise, and the general health of the body (emphasis on the relationship between respiration and digestion).</p>	