

Kindergarten

Physical Science

- I. The properties of materials can be observed, measured and predicted.
 - A. Students can describe the physical properties of color, size, shape, weight, texture, magnetic attraction, floating and sinking.
 - B. Students know that water can change from a liquid to a solid and from a solid to a liquid.
 - C. Students know that water left in an open container evaporates and that water in a closed container does not.

Life Science

- I. Different types of animals and plants inhabit the Earth.
 - A. Students know how to observe and describe the appearance and behavior of plants and animals.
 - B. Students can group plants and animals by their similarities and sort by their differences.
 - C. Students know that stories sometimes portray animals with fictionalized attributes.
 - D. Students can identify the major structures of plants (stems, leaves and roots) and animals (head, legs, arms, wings and tail).

Earth Science

- I. The Earth is made of land and water and surrounded by air.
 - A. Students can identify mountains, rivers, oceans, valleys and local landforms.
 - B. Students know that some places are very cold (the poles), some places are very hot (the equator) and some are very dry (deserts).
 - C. Students can describe the four seasons.
 - D. Students know that the weather changes from day to day and that certain types of weather occur in each season.

Environmental Science/Stewardship

- I. Identify resources such as metal, paper, plastics that can be recycled and reused
 - A. Students will see teachers model conservation of resources (such as paper) and recycling in the classroom.
 - B. For schools with recycling programs, students are encouraged to utilize recycle bins at snack and lunch time.

Investigation and Experimentation

- I. Perform investigations of the concepts listed above
 - A. Students can observe common objects using the five senses. (Taste and smell must be presented in a manner that maintains controls to provide for the students' safety.)
 - B. Students can describe the properties of common objects.
 - C. Students can describe the relative position of objects using one reference.
 - D. Students can compare and sort common objects by one physical attribute.

Health Science

- I. Identify actions (such as handwashing, covering the mouth) that are essential to good hygiene
 - A. Students can demonstrate practical measures to prevent the spread of bacteria and viruses (germs).
 - B. Students know bacteria and viruses (germs) make you sick.

Grade 1

Physical Science

- I. Materials come in different forms (states), including solids, liquids, plasma and gases.
 - A. Students know solids, liquids, and gases have different properties.
 1. Solids have definite shapes and have a specific volume.
 2. Liquids take the shape of the container and have a specific volume.
 3. Gasses move out to fill their container and do not have a constant volume.
 4. Plasma is what stars are made of.

- B. Students know the properties of substances can change when the substances are cooled or heated.
- I. Melting requires heating and freezing requires chilling.
 - A. Students know that some changes (phases changes) are reversible (ice to water, water to ice).
 - B. Students know that some changes (chemical changes) are irreversible (mixing baking soda with vinegar).

Life Science

- I. Plants and animals meet their needs in different ways.
 - A. Students know different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.
 - B. Students know both plants and animals need water and air, animals need food and plants need light.
 - C. Students know animals eat plants or other animals for food and may also use plants or even other animals for shelter and nesting (i.e., dogs and fleas, crocodiles and toothbrush bird).
- II. There is a relationship between the shape of an animal's teeth and the food it eats.
 - A. Students know that meat eaters have sharp, pointed teeth.
 - B. Students know plant eaters have flat teeth.
- III. There is a relationship between the basic parts of a plant and their function.
 - A. Students know roots take in water and nutrients from the soil.
 - B. Students know that stems hold up the plant's leaves to the sunlight.
 - C. Students know that the plant makes its food in its leaves.

Earth Science

- I. Weather can be observed, measured, described and predicted.
 - A. Students know how to use simple tools (thermometer, wind vane) to measure weather conditions and record changes from day to day and across the seasons.
 - B. Students know that the weather changes from day to day but that trends in temperature or rain (or snow) tend to be predictable during a season.
 - C. Students know the sun warms the land, air, and water.

Environmental Science/Stewardship

- I. Ways to contribute locally and globally to the practice and preservation of habitats
 - A. Students understand how littering affects how animals live and how plants grow.
 - B. Students understand how pollution (from cars and factories) affects the water supply and air we breathe.
- II. Ways to share with others locally and globally in order to provide them with needed items such as pure water, clean air, and wholesome food
 - A. Students are aware of local and international organizations that help provide for the needy (such as the Heifer Project, Operation Rice Bowl, food shelters, food banks, Catholic Relief Services).
 - B. Students know they are part of a global society and that their actions affect others who live close by and far away.

Health Science

- I. Healthy teeth require a daily regime of dental care.
 - A. Students know a daily regime of dental care includes brushing and flossing.
 - B. Students know that baby teeth are replaced by permanent teeth.
- II. Students know that people need clean water and air, and wholesome and nutritious food in order to grow and be healthy.

Investigation and Experimentation

- I. Perform investigations of the concepts listed above
 - A. Students will draw accurate pictures that portray some features of the object being observed or investigated.
 - B. Students will record observations and data with pictures, numbers, or written statements.
 - C. Students will record observations on a bar graph.
 - D. Students will describe the relative position of objects by using two references (e.g., above and next to, below and left of).
 - E. Students will make new observations about discrepancies that may exist between two descriptions of the same object or phenomenon.

Grade 2

Physical Science

- I. Motion of objects can be observed and measured.
 - A. Students know the position of an object can be described by locating it in relation to a stationary object or to the background.
 - B. Students know and use the metric units of meters and centimeters to measure distance.
 - C. Students know an object's motion can be described by recording the change in position of the object over time.
 - D. Students know the way to change how something is moving is by giving it a push or a pull. This push or pull is called a force. The size of the change is related to the strength, or the amount of force, of the push or pull.
 - E. Students know tools and machines are used to apply pushes and pulls (forces) to make things move.
 - F. Students know objects fall to the ground unless something holds them up. The force pulling the objects is due to gravity.
 - G. Students know magnets can be used to make some objects move without being touched.
 - H. The poles of magnets either repel (push) or attract (pull) one another.
 - I. Students know sound is made by vibrating objects.
 - J. Sound can be described by its pitch and volume.

Life Science

- I. Plants and animals have predictable life cycles.
 - A. Students know that organisms reproduce offspring of their own kind and that the offspring resemble their parents and one another.
 - B. Students know the sequential stages of life cycles are different for different animals, such as butterflies, frogs and mice.
 - C. Students know many characteristics of an organism are inherited from the parents. Some characteristics are caused or influenced by the environment.
 - D. Students know there is variation among individuals of one kind within a population.
 - E. Students know light, gravity, touch, or environmental stress can affect the germination, growth and development of plants.
 - F. Students know flowers and fruits are associated with reproduction in plants.

Earth Science

- I. Earth is made of materials that have distinct properties and provides resources for human activities.
 - A. Students know how to compare the physical properties of different kinds of rocks.
 - B. Students know that rocks are composed of different combinations of minerals.
 - C. Students know smaller rocks come from the breakage and weathering of larger rocks.
 - D. Students know that soil is made partly from weathered rock and partly from organic materials.
 - E. Soils differ in their color, texture, capacity to retain water and ability to support the growth of many kinds of plants.
 - F. Students know that fossils provide evidence about the plants and animals that lived long ago.
 - G. Scientists learn about the past history of Earth by studying fossils.
 - H. Students know rock, water, plants, and soil provide many resources that humans use, including food, fuel and building materials.

Environmental Science/Stewardship

- I. Fossil fuels (such as petroleum and coal) were created millions of years ago and cannot be replenished.
 - A. Students know fossil fuel and coal are non-renewable resources.

- B. Students know that some renewable resources (such as water, soil, wind, lumber, solar) can be used again and again with careful management of the environment (such as a garden project, letting a field lie fallow, composting, waste management, wind farms).

Health Science

- I. There are stages of human development (infant to child to adolescent to adult).
- II. Good nutrition, proper sleep and physical activity are important for human health and well-being.
 - A. Students know heart healthy foods.
 - B. Students know the basic food pyramid.
 - C. Students know that 8-10 hours of sleep per night are required for proper growth and health.
 - D. Students know they need 45 minutes of cardiovascular activity at least 3 times a week for proper growth and general health.

Investigation and Experimentation

- I. Perform investigations of the concepts listed above
 - A. Students will measure length in meters and centimeters and be introduced to the metric units and instruments of measure for volume and temperature.
 - B. Students will write or draw accurate pictures that portray some features of the object in a sequence of three steps, events and observations.
 - C. Students will construct bar graphs to record data, using appropriately labeled axes.
 - D. Students will make predictions based on observed patterns and not random guessing.
 - E. Students will compare and sort common objects according to two or more physical attributes (e.g., color, shape, texture, size, weight).
 - F. Students will use magnifiers or microscopes to observe and draw descriptions of small objects or small features of objects.
 - G. Students will follow oral instructions for a scientific investigation.

Grade 3

Physical Science

- I. Energy and matter have multiple forms and can be changed from one form to another.
 - A. Students know that the major source of energy is the Sun and that the Sun's energy is seen as light and felt as heat.
- II. Students understand that although light and heat are not exactly the same, both are forms of energy.
 - B. Students know sources of stored energy take many forms, such as nutrition, fuel, elevational gravitational potential energy and batteries.
 - C. Students know machines and living things convert stored energy to motion and heat.
 - D. Students know motion is associated with energy.
 - E. Students know matter is a substance that has mass and volume.
 - F. Students know matter in the form of a solid, liquid or gas can be changed from one state to another.
 - G. Students know evaporation and melting are changes that occur when heat energy is applied.
 - H. Students know all matter is made of small particles called atoms, which are indivisible by ordinary means and are too small to see with the naked eye.
 - I. Students know ancient peoples once thought that earth, wind, fire and water were the basic elements that made up all matter.
- III. Light, like heat, is a form of energy, has a source and travels in a direction.
 - A. Students know light has a source and travels away from its source in a straight line.
 - B. Students know light is reflected from mirrors and other shiny surfaces.
 - C. Students know the color of light striking an object affects how our eyes see it.

Life Science

- I. Adaptations in physical structure or behavior may improve an organism's chance survival.
 - A. Students know plants and animals have structures that serve different functions in growth, survival and reproduction.
 - B. Students know examples of diverse life forms in different environments, such as oceans, deserts, tundra, forests, grasslands and wetlands.
 - C. Students know living things cause changes in the environment where they live; some of these changes are detrimental to the organism or other organisms, whereas others are beneficial.
 - D. Students know when the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.
 - E. Students know some kinds of organisms that once lived on Earth have completely disappeared; some of these resembled others that are alive today.

Earth Science

- I. Objects in the sky move in regular and predictable patterns.
 - A. Students know the patterns of stars stay the same in relation to each other and move through the sky in a seasonal cycle.
 - B. Students know the concepts of rotation and revolution.
 - C. Students know the Moon revolves around the Earth and the Earth revolves around the Sun.
 - D. Students know the phases of the Moon.
 - E. Students know telescopes magnify the appearance of distant objects.
 - F. Students know that Earth is one of nine known planets that orbit the Sun.
 - G. Students know the position of the Sun in the sky changes during the course of the day and from season to season.

Environmental Science/Stewardship

- I. There is a cause and effect relationship between humans and the environment.
 - A. Students understand that loss of the rainforests affects world climate.
 - B. Students understand that global climate changes affect animal habitats.
 - C. Students understand the human impact on biomes (overfishing, pollution).
 - D. Students can identify endangered species and the effects humans have on extinction.
 - E. Students understand restoration efforts can make a positive impact on the earth's biomes.

Health Science

- I. Good behaviors and habits ensure safety and good health.
 - A. Students understand the importance of using protective equipment (such as wearing a helmet) while biking.
 - B. Students understand and practice behaviors needed to protect the body (as applying sunscreen and drinking water to prevent dehydration).

Investigation and Experimentation

- I. Perform investigations of the concepts listed above.
 - A. Students will use the scientific process by asking meaningful questions and conducting careful investigations.
 - B. Students will develop their own questions and perform investigations.
 - C. Students will repeat observations to improve accuracy.
 - D. Students will differentiate evidence from opinion.
 - E. Students will predict the outcome of a simple investigation and compare the result with the prediction.
 - F. Students will use magnifiers or microscopes to observe and accurately draw descriptions of small objects or small features of objects.

Grade 4

Physical Science

- I. Electricity and magnetism are related effects that have many useful applications in everyday life.
 - A. Students know how to design and build a complete circuit by using components such as wires, batteries and bulbs.
 - B. Students know how to build a simple compass and use it to detect magnetic effects, including Earth's magnetic field.
 - C. Students know electric currents produce magnetic fields and know how to build a simple electromagnet.
 - D. Students know that magnets have two poles (north and south) and that like poles repel each other while unlike poles attract each other.
 - E. Students know electrically charged objects attract or repel each other.

Life Science

- I. All organisms need energy and matter to live and grow.
 - A. Students know plants use the Sun's energy to manufacture food.
 - B. Students know plants are the primary source of matter and energy entering most food chains.
 - C. 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.
 - D. Students know decomposers, including many fungi, insects and microorganisms, recycle matter from dead plants and animals.
 - E. Students know that plants and animals compete for resources in an environment
- II. Living organisms depend on one another and on their environment for survival.
 - A. Students know that in any particular habitat, some kinds of plants and animals survive well, some survive less well and some cannot survive at all.
 - B. Students know many plants depend on animals for pollination and seed dispersal, and animals depend on plants for food and shelter.
 - C. Students know that most microorganisms do not cause disease and that many are beneficial.
- III. Cells are the smallest unit of function and structure in living things
 - A. Students know that some organisms are uni-cellular (bacteria) and some organisms are multi-cellular (like humans)

Earth Science

- I. The properties of rocks and minerals reflect the processes that formed them.
 - A. Students know igneous, sedimentary and metamorphic rocks, their basic properties and methods of formation (the rock cycle).
 - B. Students know how to identify the basic mineral properties of hardness, cleavage, color and streak (suggested samples include quartz, calcite, feldspar, mica, hornblende, galena and hematite.)

- II. Waves, wind, water and ice are the agents of erosion that shape and reshape Earth's land surface.
 - A. Students know erosion usually causes slow changes.
- III. Some changes are very rapid, like mudslides and landslides.
- IV. Volcanoes create new land, earthquakes move and distort existing land.
 - A. Students know some erosion is mechanical, including freezing and thawing and the growth of roots, which can cause rocks to break down into smaller pieces.
 - B. Students know some erosion is chemical, including oxidation and plant acids.
 - 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)

Environmental Science/Stewardship

- I. Humans have an impact on the earth.
 - A. Students know how humans impact food chains and food webs.
 - B. Students know how humans impact erosion rates.
 - C. Students know how humans cause acid rain and what can be done to reduce it.

Health Science

- I. Healthy habits and behaviors are important in the overall health of the student.
 - A. Students know the symptoms of common illnesses and how they are spread.
 - B. Students know universal precautions that should be employed when dealing with bodily fluids.
 - C. Students understand how a herbivore can live without meat.

Investigation and Experimentation

- I. Perform investigations of the concepts listed above
 - A. Students will measure and estimate the weight, length or volume of objects.
 - B. Students will conduct multiple trials to test a prediction and draw conclusions about the relationships between predictions and results.
 - C. Students will construct and interpret graphs from measurements.
 - D. Students will follow a set of written instructions for a scientific investigation.
 - E. Students will use magnifiers or microscopes to observe and accurately draw descriptions of small rocks, minerals, or organisms or small features of rocks, minerals, or organisms.

Grade 5

Physical Science

- I. All matter is made up of elements and combinations of elements.
 - A. Students know the smallest unit is the atom.
 - B. Students know that elements are made of one kind of atom.
 - C. Students know that the atomic number of an element identifies that element and determines its properties (not mass).
 - D. Students know atoms may combine to form molecules.
 - E. Students know that scientists have arranged the elements on a chart called the Periodic Table and grouped them by their properties.
 - F. Molecules have different properties than the atoms of which they are composed (example: NaCl is salt, but it is made of Na (sodium) – an explosive metal and Cl (chlorine) – a poisonous gas!)
 - G. Students know some elements are metals and have properties in common.
 1. Metals are shiny, conduct heat and electricity, and are malleable.

Life Science

- I. Plants and animals have structures for respiration, waste disposal and transport materials.
 - A. Students know many multi-cellular organisms have specialized structures to support the transport of materials.
 - B. Students know blood circulates through the heart chambers, lungs and body and carbon dioxide (CO₂) and oxygen (O₂) are exchanged in the lungs and tissues.
 - C. Students know plants use photosynthesis, carbon dioxide (CO₂) and energy from sunlight to build molecules of glucose for food and produce oxygen as a by-product.
 - D. Students know plant and animal cells break down glucose to obtain energy (cellular respiration.)
- II. Cells are the smallest unit of function and structure in living things.
 - A. Students know that some organisms are unicellular (bacteria) and some organisms are multi-cellular (like humans).

Earth Science

- I. Water on earth moves between the oceans and land through the processes of evaporation and condensation.
 - A. Students know most of Earth's water is present as salt water in the oceans, which cover most of earth's surface.
 - 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 a solid if cooled below the freezing point of water.
 - C. Students know the water cycle.
 1. 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, sleet or snow.
 - D. Students know that the amount of fresh water located in rivers, lakes, underground sources, ice caps and glaciers is limited and that its availability can be extended by recycling and decreasing the use of water.

- II. Energy from the sun heats the earth unevenly, causing air movements resulting in changing weather patterns.
 - A. Students know uneven heating of earth's atmosphere causes air movements (convection currents).
 - B. Students know the influence that the ocean has on the weather and the role that the water cycle plays in weather patterns.
 - C. Students know the causes and effects of different types of severe weather.
 - D. Students know how to read weather maps.
 - E. Students know that the Earth's atmosphere exerts a pressure that decreases with distance above Earth's surface and that at any point it exerts this pressure equally in all directions.

- III. The solar system consists of planets and other bodies that orbit the Sun in predictable paths.
 - A. Students know the Sun, an average star, is the central and largest body in the solar system and is composed primarily of hydrogen and helium.
 - B. Students know the solar system is part of the Milky Way Galaxy, and includes the planet Earth, the Moon, the Sun, eight other planets and their satellites and smaller objects, such as asteroids and comets.
 - C. Students know the path of a planet around the Sun is due to the gravitational attraction between the Sun and the planet.

Environmental Science/Stewardship

- I. Pollution created by humans has an effect on the Earth's climate.
 - A. Students understand the greenhouse effect.
 - B. Students know how gases created by humans have caused global warming.

Health Science

- I. Maintaining healthy habits and understanding physical changes are important during puberty.
 - A. Students know how smoking and using inhalants negatively affects the body.
 - B. Students know what happens to males and females during puberty.
 - C. Students understand personal hygiene and how to keep the body clean.

Investigation and Experimentation

- I. Perform investigations of the concepts listed above
 - A. Students will classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.
 - B. Students will develop a testable question.
 - C. Students will plan and conduct a simple investigation based on a student-developed question and write instructions others can follow to carry out the procedure.
 - D. Students will identify the dependent and controlled variables in an investigation.
 - E. Students will draw accurate pictures that portray some features of the object being observed or investigated.
 - F. Students will identify a single independent variable in a scientific investigation and explain how this variable can be used to collect information to answer a question about the results of the experiment.

Grades 6-8

Traditional Format

(Areas of Concentration)

In the sixth through eighth grade standards, the scope and sequence to be presented to students within the middle school science program are arranged in a general science format where students are exposed to the three main areas of science each year. This allows for variety during the course of the year as well as building on material that gets increasingly more complex over the three year period. Schools may choose to implement the program in this comprehensive general science format as shown in the guidelines or follow an emphasis driven format of Earth Science in 6th grade, Life Science in 7th grade, and Physical Science in 8th grade. At the conclusion of the three middle school years, all the standards should be covered. This allows schools greater flexibility and is more respectful of the learning styles of the students during this time of marked growth and development.

Grade 6

Earth Science

Plate Tectonics

- I. Plate tectonics accounts for important features of Earth's surface and major geologic events.
 - 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.
 - B. Students know Earth is composed of several layers: a cold, brittle lithosphere, a hot, convecting mantle and a dense, metallic core.
 - C. Students know Earth is composed of three distinct layers: a rocky, thin, fractured outer layer called the crust, a denser and thick middle layer called the mantle and a dense, metallic center called the core. The lithosphere includes the crust and the outermost portion of the mantle and is the part that is broken into the tectonic plates.
 - D. Students know lithospheric plates the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle.
 - E. 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.
 - F. Students know the three major types of volcanic landforms (cone, shield and composite).
 - G. Students know major geologic events, such as earthquakes, volcanic eruptions and mountain building result from plate motions.
 - H. Students know how to explain major features of California geology (including mountains, faults, volcanoes) in terms of plate tectonics.
 - I. Students know how to determine the epicenter of an earthquake and know that the effects of an earthquake on any region vary, depending on the size of the earthquake, the distance of the region from the epicenter, the local geology and the type of construction in the region.

Oceanography

- I. Oceans are large masses of salt water that cover more than 70% of the Earth's surface. They retain heat much longer than air or smaller masses of fresh water. They moisten the air that passes over them.
 - A. Students know the major divisions of the global ocean are the Indian, Pacific, Atlantic and Arctic oceans.
 - B. Students know how to describe the interaction between the oceans and the atmosphere.
- II. The ocean floor is divided into regional divisions.
 - A. Students know how to identify the two major regions of the ocean floor, the continental margin and the deep ocean basin.
 - B. Students know how to classify features of the two major regions.
 - C. Students know sea level and the volume of ocean waters have frequently risen and fallen through geologic time.
 - D. Students know how to describe technologies for studying the ocean floor.

Earth and Life History

- I. Evidence from rocks allows us to understand the evolution of life on Earth.
 - A. Students know Earth processes today are similar to those that occurred in the past and slow geologic processes have large cumulative effects over long periods of time.
 - B. Students know the history of life on Earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impacts of asteroids.
 - C. Students know that the rock cycle includes the formation of new sediment and rocks and that rocks are often found in layers, with the oldest generally on the bottom.
 - D. Students know that evidence from geologic layers and radioactive dating indicates Earth is approximately 4.6 billion years old and that life on this planet has existed for more than 3 billion years.
 - E. Students know fossils provide evidence of how life and environmental conditions have changed.
 - F. Students know how to explain significant developments and extinctions of plant and animal life on the geologic time scale.

Weathering

- I. Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment.
 - A. Students know water is the primary agent in shaping the Earth's landscape.
 - B. Students know earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.

Astronomy

- I. The structure and composition of the universe can be learned from studying stars and galaxies and their evolution.
 - A. Students know galaxies are clusters of billions of stars and may have different shapes.
 - B. Students know the Sun is one of many stars in the Milky Way galaxy and that stars differ in size, temperature, age and color.
 - C. Students know to use astronomical units and light years as measures of distance between the Sun, stars and Earth.
 - D. Students know stars are the source of light for all bright objects in outer space and that the Moon and planets shine by reflected sunlight, not by their own light.
 - E. Students know the appearance, relative position and size and motion of objects in the solar system, including planets, planetary satellites, comets and asteroids.
 - F. Students are familiar with the current scientific theories about the creation and evolution of the universe (The Big Bang Theory).
 1. Students know the church's teaching that God created the earth and, as scientists, we continually explore how that creation came to be (see Religion Curriculum Guidelines).

Solar Energy

- I. The Sun is a constant, close-to-uniform source of energy that is responsible for the climate and weather, drives the water cycle and makes life possible on Earth.
 - 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.
 - B. Students know radiation from the Sun penetrates the atmosphere by heating the air, the oceans and the land. Solar radiation is also converted directly to stored energy in plants through photosynthesis.
 - C. Students know solar energy reaches Earth through radiation, mostly in the form of visible light.
 - D. Students know heat from Earth's interior reaches the surface primarily through convection.
 - E. Students know convection currents distribute heat energy in the atmosphere and oceans.
 - F. Students know differences in pressure, heat, air movement and humidity result in changes of weather.

Thermal Energy

- I. Heat moves in a predictable flow from warmer objects to cooler objects until all the objects are at the same temperature.
 - A. Students know energy can be carried from one place to another by heat flow.
 - B. Students know, when fuel is consumed, most of the energy released becomes heat energy.
 1. When fuel is burned, energy stored in the fuel's chemical bonds is released as heat and light.
 - C. Students know heat flows in solids by conduction (which involves no flow of matter) and in fluids by conduction and by convection (which involves flow of matter).
 - D. Students know heat energy is also transferred between objects by radiation (radiation can travel through space).

Natural Resources

- I. Sources of energy and materials differ in amounts, distribution, usefulness and the time required for their formation.
 - A. Students know the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process.
 - 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.
 - C. Students know the natural origin of the materials used to make common objects.
 - D. Students know the water, Carbon Dioxide and Nitrogen cycles.
 - E. Students can describe the nonliving resources in the oceans including oil, natural gas, fresh water, minerals, tidal energy and wave energy.
 - F. Students know different types of ocean pollution and the means to prevent or minimize it.

Stewardship/Environmental Science

- I. All people have a responsibility to use resources in a manner that prevents harm to the environment and provides for those who will need the resources in the future.
 - A. Students will be familiar with strategies that will allow them to practice conservation at school and at home.
 - B. Students participate in activities in their parish and communities that respond to the need for citizens to come together and work towards cleaning up or educating others about active strategies to foster a cleaner environment (examples: coastal cleanup, trail maintenance in parks, painting storm drain messages, recycling paper at school, etc.)

Health Science

- I. Students will understand ways in which they can enhance and maintain their health and well-being.
 - A. Students will be aware of what composes a healthy diet and the benefits of practicing good nutritional habits.
 - B. Students will understand that each body has different requirements for rest and exercise and these requirements will change overtime.
 - C. Students will understand that as their body changes their personal hygiene habits need to change.
 - D. Students will begin identifying a variety of consumer influences and analyzing how those influences affect their decisions.

Investigation and Experimentation

- I. Students should have opportunities to perform investigations of the concepts listed above. 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 above standards, students should develop their own questions and perform investigations.
 - A. Students can develop a hypothesis.
 - B. Students can select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes and binoculars) to perform tests, collect data and accurately create and display data.
 - C. Students can read a topographic map and a geologic map for evidence provided on the maps and construct and interpret a simple scale map.
 - D. Students can interpret events by sequence and time from natural phenomena (e.g., the relative ages of rocks and intrusions).

Grade 7

Life Science

Biology

- I. All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope.
 - A. Students know the major organelles and their functions.
 - B. Students know cells function similarly in all living organisms.
 - C. Students know the characteristics that distinguish plant cells from animal cells (chloroplasts and cell walls.)
 - D. Students know cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes.
 - E. Students know that, as multi-cellular organisms develop, their cells differentiate.
- II. All living things are classified and grouped according to their characteristics and evolutionary relationships.
 - A. Students know living things are grouped into five kingdoms; Monera, Protista, Fungi, Plantae and Animalia. Viruses are not placed into any kingdom.
 - B. Students know living things are placed into progressively smaller groupings, with the final classification being species.
 - C. Students know each species has a unique name, made of two parts, Genus and species. These two names are the same for that species all over the world.

Structure on Function in Living Systems

Students know plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems and the whole organism.

Botany

- I. Plants have shared characteristics, which include: making their own food, have a cuticle, reproduce with spores or sex cells and have cells with cell walls.
 - A. Students know how to identify the characteristics that all plants share.
 - B. Students know the origin of plants.
 - C. Students know how to explain the four main groups of plants and their differences.
- II. Non-Vascular Plants
 - A. Seedless plants include the nonvascular mosses and liverworts and the vascular ferns, horsetails and club mosses.
 1. Students know how to describe the main features of mosses, liverworts, ferns and horsetails.
 2. Students know how plants without seeds are important to humans and to the environment.
- III. Vascular Plants
 - A. Plants with seeds include the vascular gymnosperms and angiosperms.
 1. Students know the difference between a seed and a spore.
 2. Students know the features of a gymnosperm.
 3. Students know the features of flowering plants.
 4. Students know the economic and environmental importance of gymnosperms and angiosperms.
 5. Students know the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruit.
 - B. Structure of Vascular Plants
 1. The physical structures and functions of a plant's root and shoot system are related.
 - (a) Students know the functions of roots.
 - (b) Students know the functions of stems.
 - (c) Students know how the structure of leaves are related to their function.
 - (d) Students know the parts of a flower and their function.

Human Biology

- I. The human body is organized. Cells make up the four tissue types (connective, muscle, cardiac, epithelial, which are organized into organs, and which are arranged into 11 systems.
 - A. Students know how to identify the major tissues found in the body.
 - B. Students know to compare an organ with an organ system.
 - C. Students know how to describe a major function of each organ system.
 - D. Students know organ systems function because of the contributions of individual organs, tissues and cells. The failure of any part can affect the entire system.

Integumentary System

- I. The integumentary system includes skin, hair and nails.
 - A. Students know the major functions of the integumentary system.
 - B. Students know the major parts of the skin and can discuss their functions.
 - C. Students know that the structure and function of hair and nails is for protection.
 - D. Students know some common types of damage that can affect skin.

Skeletal System

- I. The skeletal system includes bones, cartilage and special structures.
 - A. Students know the major organs of the skeletal system.
 - B. Students know how to illustrate the internal structure of bones.
 - C. Students know how to compare three types of joints (pivot, hinge, ball/socket)
 1. Joints confer mechanical advantage.

Muscular System

- I. The muscular system is comprised of different types of muscle and connective tissue.
 - A. Students know the major parts of the muscular system.
 - B. Students know the different types of muscle which include smooth, cardiac and skeletal.
 - C. Students know how skeletal muscles move bones, how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system.

Cardiovascular System

- I. The cardiovascular system transports materials to and from your cells. The cardiovascular system is made up of three parts; blood, the heart and blood vessels.
 - A. Students know the functions of the cardiovascular system.
 - B. Students know the three types of blood vessels: capillaries, veins and arteries.
 - C. Students know the path that blood travels as it circulates through the body.
 - D. Students know the four blood types; A, B, AB and O.

Lymphatic System

- I. The lymphatic system collects the excess fluid and returns it to your blood.
 - A. Students know the functions of the lymphatic system.
 - B. Students know the relationship between lymph and blood.
 - C. Students know the organs of the lymphatic system, which include lymph nodes, the thymus, spleen and tonsils.

Digestive System

- I. Plants and animals have structures for respiration, waste disposal and transport of materials.
 - A. Students know plants use photosynthesis, carbon dioxide (CO₂) and energy from sunlight to build molecules of glucose for food and produce oxygen as a by-product.

Respiratory System

- I. The respiratory system consists of the lungs, throat, and passageways that lead to the lungs.
 - A. Students know and can describe the flow of air through the respiratory system.
 - B. Students know the relationship between the respiratory system and the circulatory system.

Nervous System

- I. The nervous system gathers and interprets information about the body's internal and external environments and responds to that information.
 - A. Students know neurons in the nervous system work together.
 - B. Students know how to compare and contrast the central nervous system and peripheral nervous system.
 - C. Students know the major functions of the four parts of the brain and the spinal cord.

Genetics

- I. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences.
 - A. Students know the differences between the life cycles and reproduction methods of sexual and asexual organisms.
 - B. Students know sexual reproduction produces offspring that inherit half their genes from each parent.
 - C. Students know an inherited trait can be determined by one or more genes.
 - D. Students know plant and animal cells contain many thousands of different genes and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominant in determining the phenotype while the other is recessive.
 - E. Students know DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.

Evolution

- I. Biological evolution accounts for the diversity of species developed through gradual processes over many generations.
 - A. Students know both genetic variation and environmental factors are causes of evolution and diversity of organisms.
 - B. Students know Charles Darwin's theory of natural selection.
 - C. Students know how independent lines of evidence from geology, fossils, and comparative anatomy provide the bases for the theory of evolution.
 - D. Students know that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival.

Ecology

- I. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment.
 - A. Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.
 - B. Students know organic matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
 - C. Students know populations of organisms can be categorized by the functions they serve in an ecosystem.
 - D. Students know different kinds of organisms may play similar ecological roles in similar biomes (predator/prey relationship.)
 - E. Students know the number and types of organisms an ecosystem can support depends on the resources available and on factors such as quantities of light and water, a range of temperatures and soil composition.

Oceanography

- I. Within the ocean are many kinds of ecosystems that can be classified according to depth.
 - A. Students know how to identify and describe the benthic and pelagic environments.
 - B. Students know that, within these two environments, there are zones determined by depth.
 - C. Students know how to identify and describe the three groups of marine organisms: plankton, nekton and benthos.
 - D. Students know methods of harvesting the ocean's living resources, farming and fishing, and their consequences.

Health Sciences

- I. Students are empowered with the facts they need to make healthy life choices in the areas of nutrition, drugs, tobacco, alcohol and sexual behavior.
 - A. Students know the long and short term effects of alcohol, tobacco, inhalants and other drug use.
 - B. Students know the stages of drug dependency and addiction and its effect on the adolescent brain.
 - C. Students know the dangers of secondhand smoke.
 - D. Students know the appropriate use of prescription and Over the Counter (OTC) drugs.
 - E. Students know the effects of alcohol, tobacco and other drug use during pregnancy.
 - F. Students know the effects of alcohol, tobacco, steroids and other drug use on athletic performance.
 - G. Students know the relationship between alcohol and other drug uses on vehicular accidents, injuries, violence, suicide and sexual risk behavior.
- II. Prevention and control of communicable and non-communicable diseases.
 - A. Students know the differences between communicable and non-communicable diseases.
 - B. Students know personal health care practices that prevent the spread of communicable diseases such as HIV/AIDS and Hepatitis.

- C. Students know abstinence is the safest and most effective method of protection from STD/HIV and pregnancy.
 - D. Students know the impact of alcohol and drug use on sexual decision-making.
- III. With the changes brought by puberty, personal hygiene needs will be different from the needs of childhood.
- A. Students know the body changes that are brought on by puberty.
 - B. Students know different strategies to help address changes such as acne and body odor.

Stewardship/Environmental Science

- I. We are all given the gift of life, and the care of that gift is entrusted to us and nurtured by making positive choices that do not cause our bodies harm.
 - A. Students know a healthy diet, regular exercise and adequate sleep will give their growing bodies what they need to be healthy and strong.
 - B. Students know a healthy body is not defined by the media or images created to promote sales of products.

Investigation and Experimentation

- I. Students should have opportunities to perform investigations of the concepts listed above. 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 above standards, students should develop their own questions and perform investigations.
 - A. Students know how to use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project.
 - B. Students know how to communicate the logical connection among hypotheses, science, concepts, tests conducted, data collected and conclusions drawn from the scientific evidence.
 - C. Students know how to communicate the steps and results from an investigation in written reports and oral presentations.
 - D. Students can select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes and binoculars) to perform tests, collect data and accurately create and display data.

- E. Students know how to construct appropriate graphs from data and develop qualitative statements about the relationships between variables.
 - F. Students can create and accurately construct scale models, maps and appropriately labeled diagrams to communicate scientific knowledge (e.g. cell structure).
 - G. Students will draw accurate pictures that portray some features of the object being observed or investigated.
- II. Students understand that scientists are continuing to make major discoveries and breakthroughs in all areas of science.

Grade 8

Physical Science

Motion

- I. The velocity of an object is the rate of change of its position with respect to time. Position is defined in relation to some choice of a standard reference point and a set of reference directions.
 - A. Students know that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.
 - B. Students know how to solve problems involving distance, time and average speed.
 - C. Students know the velocity of an object must be described by specifying both the direction and the speed of the object.
 - D. Students know changes in velocity may be due to changes in speed, direction or both.
 - E. Students know how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction.

Forces

- I. Unbalanced forces cause changes in acceleration.
 - A. Students know a force has both direction and magnitude. Forces are pushes or pulls.
 - B. Students know, when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces (Newtonian).
 - C. Students know, when the forces on an object are balanced, the motion of the object does not change.
 - D. Students know how to identify separately the two or more forces that are acting on a single static object, including gravity and elastic forces due to tension or compression in matter and friction.
 - E. Students know the force of gravity pulls objects toward the center of the Earth.
 - F. Students know, when the forces on an object are unbalanced, the object will change its acceleration (that is, it will speed up, slow down, or change direction).
 - G. Students know that the greater the mass of an object, the more force is needed to achieve the same rate of change in motion.

Structure of Matter

- I. Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements.
 - A. Students know the structure of the atom and know it is composed of protons, neutrons and electrons.
 - B. Students know compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.
 - C. Students know atoms and molecules form solids by building up repeating patterns, (i.e., the crystal structure of NaCl or long-chain polymers.)
 - D. Students know the states of matter (solid, liquid, gas and plasma) depend on molecular motion.
 1. Students know that, in solids the atoms are closely locked in position and can only vibrate, in liquids the atoms and molecules are more loosely connected and can collide with and move past one another, and in gases the atoms and molecules are free to move independently, colliding frequently.
 - E. Students know the periodic table can be used to identify elements in simple compounds.

Periodic Table

- I. The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms.
 - A. Students know how to identify regions corresponding to metals, non-metals and inert

- gases.
- B. Students know each element has a specific number of protons in the nucleus (the atomic number) and each isotope of the element has a different but specific number of neutrons in the nucleus.
 - C. Students know substances can be classified by their properties, including their melting temperature, density, hardness and thermal and electrical conductivity.

Reactions

- I. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules.
 - A. Students know how to distinguish a chemical change from a physical change. In a physical change one or more physical properties of the material are altered, but the chemical composition (i.e., the arrangement of the atoms in molecules) remains the same. In a chemical change the atoms are rearranged to form new substances with different chemical and physical properties.
 - B. Students know reactant atoms and molecules interact to form products with different chemical properties.
 - C. Students know the idea of atoms explains the conservation of matter: in chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.
 - D. Students know chemical reactions usually liberate heat or absorb heat.
 - E. Students know physical processes include freezing and boiling, in which a material changes form with no chemical reaction.
 - F. Students know how to determine whether a solution is acidic, basic or neutral.

Chemistry of Living Systems

- I. Principles of chemistry underlie the functioning of biological systems.
 - A. Students know Carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.
 - B. Students know living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus and sulfur.
 - C. Student know living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins and DNA.

Physical Principles in Living Systems

- I. Physical principles underlie biological structures and functions.
 - A. Students know visible light is a small band within a very broad electromagnetic spectrum.
 - B. Students know that, for an object to be seen, light emitted by or scattered from it must be detected by the eye.
 - C. Students know light travels in straight lines if the medium it travels through does not change.
 - D. Students know how simple lenses are used in a magnifying glass, the eye, a camera, a telescope and a microscope.
 - E. Students know white light is a mixture of many wavelengths (colors) and that retinal cells react differently to different wavelengths.
 - F. Students know light can be reflected, refracted, transmitted and absorbed by matter.
 - G. Students know the angle of reflection of a light beam is equal to the angle of incidence.

Density, Buoyancy, Fluids and Pressures

- I. All solid objects experience a buoyant force when immersed in a fluid.
 - A. Students will know density is mass per unit volume.
 - B. Students will know the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced (Archimedes Principle).
 - C. Students will know how to predict whether an object will float or sink.
- II. Pressure is related to depth and density.
 - A. Students know how fluids exert pressure.
 - B. Students know fluid depth affects pressure (flowing from high to low).
 - C. Students are introduced to Pascal's Principle (a change in pressure at any point in an enclosed fluid will be transmitted equally to all parts of that fluid).
- III. Differences in fluid pressure can create buoyant force.
 - A. Students know density is mass per unit volume ($D=M/V$).
 - B. Students know how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume.
 - C. Students know how to predict whether an object will float or sink in a fluid.
 - D. Students know how to analyze the role of density in an object's ability to float.

Waves

- I. Waves are means of transmitting energy.
 - A. Students know how to describe how waves transfer energy without transferring matter
 - B. Students know how to distinguish between waves that require a medium and waves that do not.
 - C. Students know how to explain the difference between transverse and longitudinal waves.
- II. Waves have common properties.
 - A. Students know how to identify and describe four wave properties that include frequency, wavelength, amplitude and speed.
 - B. Students know how amplitude and frequency are related to the energy of a wave.

Light Waves

- I. Waves reflect, refract, or diffract when interacting with a different medium or barrier.
 - A. Students know how to describe reflection, refraction, diffraction and interference.
 - B. Students know that visible light is a small band within a very broad electromagnetic spectrum.
 - C. Students know that, for an object to be seen, the eye must detect light emitted or scattered from it.
 - D. Students know light travels in straight lines if the medium it travels through does not change.
 - E. Students know how simple lenses are used in a magnifying glass, the eye, a camera, a telescope and a microscope.
 - F. Students know that white light is a mixture of many wavelengths (colors) and that retinal cells react differently to different wavelengths.
 - G. Students know the angle of reflection of a light beam is equal to the angle of incidence.

Sound Waves

- II. Students know the characteristics and differences between light and sound waves.
 - A. Students know how to compare destructive interference with constructive interference.
 - B. Students know how to describe and give examples of resonance.

Stewardship/Environmental Science

- I. We are all responsible for implementing a variety of strategies to conserve natural resources. These strategies range from simple to complex, done individually or collectively.
 - A. Students will know the sources of air and water pollution.
 - B. Students will know how transportation choices affect our environment and our health.
 - C. Students will know that potentially harmful substances such as lead, asbestos, pesticides and mercury exist in our environment and need to be handled in a safe and lawful manner to prevent contamination (example: proper disposal of TVs, computers).
 - D. Students will know the recycling programs of communities can be very effective if we all cooperate.

Health Science

- I. Students will understand the variety of physical, mental and social changes that occur throughout life.
 - A. Students will know the structure and function of the male and female reproductive system.
 - B. Students will accept individual differences in growth and development.
 - C. Students will develop strategies for coping with concerns and stress associated with their developing sexuality.

- II. Students will understand behaviors that prevent disease.
 - A. Students will understand the necessity for practicing good personal hygiene.
 - B. Students will develop a realistic body image and understand the nature of eating disorders.
 - C. Students will be aware of environmental factors which influence the well-being of both themselves and their community.
- III. Students will continue to be educated in the importance of positive life/health choices regarding alcohol/tobacco and the prevention and control of communicable and non communicable disease (see grade 7 Standards in Health).

Investigation and Experimentation

- I. Students should have opportunities to perform investigations of the concepts listed above. 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 above standards, students should develop their own questions and perform investigations.
 - A. Students will plan and conduct a scientific investigation to test a hypothesis.
 - B. Students will evaluate the accuracy and reproducibility of data.
 - C. Students will use balances and graduated cylinders to determine mass and volume.
 - D. Students will distinguish between variable and controlled parameters in a test.
 - E. Students will recognize the slope of the linear graph as the constant in the relationship $y = kx$ and apply this principle in interpreting graphs constructed from data.
 - F. Students will construct appropriate graphs from data and develop quantitative statements about the relationships between variables.
 - G. Students will apply simple mathematical relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance/time, density = mass/volume, force = pressure x area, volume = area x height).
 - H. Students will select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes and binoculars) to perform tests, collect data and accurately create and display data.

Grades 6-8

General Science Format

In the sixth through eighth grade standards, the scope and sequence to be presented to students within the middle school science program are arranged in a general science format where students are exposed to the three main areas of science each year. This allows for variety during the course of the year as well as building on material that gets increasingly more complex over the three year period. Schools may choose to implement the program in this comprehensive general science format as shown in the guidelines or follow an emphasis driven format of Earth Science in 6th grade, Life Science in 7th grade, and Physical Science in 8th grade. At the conclusion of the three middle school years, all the standards should be covered. This allows schools greater flexibility and is more respectful of the learning styles of the students during this time of marked growth and development.

Grade 6

Earth Science

Plate Tectonics

- I. Plate tectonics accounts for important features of Earth's surface and major geologic events.
 - 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.
 - B. Students know the Earth is composed of several layers: a cold, brittle lithosphere, a hot, convecting mantle and a dense, metallic core.
 - C. Students know the Earth is composed of three distinct layers: a rocky, thin, fractured outer layer called the crust, a denser and thick middle layer called the mantle and a dense, metallic center called the core. The lithosphere includes the crust and the outermost portion of the mantle and is the part that is broken into the tectonic plates.
 - D. Students know lithospheric plates the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle.
 - E. 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.
 - F. Students know the three major types of volcanic landforms (cone, shield and composite).
 - G. Students know major geologic events, such as earthquakes, volcanic eruptions and mountain building result from plate motions.
 - H. Students know how to explain major features of California geology (including mountains, faults, volcanoes) in terms of plate tectonics.
 - I. Students know how to determine the epicenter of an earthquake and know that the effects of an earthquake on any region vary, depending on the size of the earthquake, the distance of the region from the epicenter, the local geology and the type of construction in the region.

Weathering

- I. Topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment.
 - A. Students know water is the primary agent in shaping the Earth's landscape.
 - B. Students know earthquakes, volcanic eruptions, landslides and floods change human and wildlife habitats.

Astronomy

- I. The structure and composition of the universe can be learned from studying stars and galaxies and their evolution.
 - A. Students know galaxies are clusters of billions of stars and may have different shapes.
 - B. Students know the Sun is one of many stars in the Milky Way galaxy and that stars differ in size, temperature, age and color.
 - C. Students know to use astronomical units and light years as measures of distance between the Sun, stars and Earth.

- D. Students know stars are the source of light for all bright objects in outer space and that the Moon and planets shine by reflected sunlight, not by their own light.
- E. Students know the appearance, relative position and size and motion of objects in the solar system, including planets, planetary satellites, comets and asteroids.
- F. Students are familiar with the current scientific theories about the creation and evolution of the universe (The Big Bang Theory).
- G. Students know the church's teaching that God created the earth and, as
- H. scientists, we continually explore how that creation came to be (see Religion Curriculum Guidelines).

Physical Science

Thermal Energy

- I. Heat moves in a predictable flow from warmer objects to cooler objects until all the objects are at the same temperature.
 - A. Students know energy can be carried from one place to another by heat flow.
 - B. Students know, when fuel is consumed, most of the energy released becomes heat energy.
- II. When fuel is burned, energy stored in the fuel's chemical bonds is released as heat and light.
 - A. Students know heat flows in solids by conduction (which involves no flow of matter) and in fluids by conduction and by convection (which involves flow of matter).
 - B. Students know heat energy is also transferred between objects by radiation (radiation can travel through space).

Solar Energy

- I. The Sun is a constant, close-to-uniform source of energy that is responsible for the climate and weather, drives the water cycle and makes life possible on Earth.
 - 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.
 - B. Students know radiation from the Sun penetrates the atmosphere by heating the air, the oceans and the land. Solar radiation is also converted directly to stored energy in plants through photosynthesis.
 - C. Students know solar energy reaches Earth through radiation, mostly in the form of visible light.
 - D. Students know heat from Earth's interior reaches the surface primarily through convection.
 - E. Students know convection currents distribute heat energy in the atmosphere and oceans.
 - F. Students know differences in pressure, heat, air movement and humidity result in changes of weather.

Life Science

Ecology

- I. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment.
 - A. Students know energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis and then from organism to organism through food webs.
 - B. Students know organic matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.
 - C. Students know populations of organisms can be categorized by the functions they serve in an ecosystem.
 - D. Students know different kinds of organisms may play similar ecological roles in similar biomes (predator/prey relationship.)
 - E. Students know the number and types of organisms an ecosystem can support depends on the resources available and on factors such as quantities of light and water, a range of temperatures and soil composition.

Natural Resources

- I. Sources of energy and materials differ in amounts, distribution, usefulness and the time required for their formation.
 - A. Students know the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process.
 - 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.
 - C. Students know the natural origin of the materials used to make common objects.
 - D. Students know the water, Carbon Dioxide and Nitrogen cycles.
 - E. Students can describe the nonliving resources in the oceans including oil, natural gas, fresh water, minerals, tidal energy and wave energy.
 - F. Students know different types of ocean pollution and the means to prevent or minimize it.

Stewardship/Environmental Science

- I. All people have a responsibility to use resources in a manner that prevents harm to the environment and provides for those who will need the resources in the future.
 - A. Students will be familiar with strategies that will allow them to practice conservation at school and at home.
 - B. Students participate in activities in their parish and communities that respond to the need for citizens to come together and work towards cleaning up or educating others about active strategies to foster a cleaner environment. (examples: coastal cleanup, trail maintenance in parks, painting storm drain messages, recycling paper at school, etc.).

Health Science

- I. Students will understand ways in which they can enhance and maintain their health and well-being.
 - A. Students will be aware of what composes a healthy diet and the benefits of practicing good nutritional habits.
 - B. Students will understand that each body has different requirements for rest and exercise and these requirements will change overtime.
 - C. Students will understand that as their body changes their personal hygiene habits need to change.
 - D. Students will begin identifying a variety of consumer influences and analyzing how those influences affect their decisions.

Investigation and Experimentation

- I. Students should have opportunities to perform investigations of the concepts listed above. 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 above standards, students should develop their own questions and perform investigations.
 - A. Students can develop a hypothesis.
 - B. Students can select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes and binoculars) to perform tests, collect data and accurately create and display data.
 - C. Students can read a topographic map and a geologic map for evidence provided on the maps and construct and interpret a simple scale map.
 - D. Students can interpret events by sequence and time from natural phenomena (e.g., the relative ages of rocks and intrusions).

Grade 7

Earth Science

Oceanography

- I. Within the ocean are many kinds of ecosystems that can be classified according to depth.
 - A. Students know how to identify and describe the benthic and pelagic environments.
 - B. Students know that, within these two environments, there are zones determined by depth.
 - C. Students know how to identify and describe the three groups of marine organisms: plankton, nekton and benthos.
 - D. Students know methods of harvesting the ocean's living resources, farming and fishing and their consequences.
- II. Oceans are large masses of salt water that cover more than 70% of the Earth's surface. They retain heat much longer than air or smaller masses of fresh water. They moisten the air that passes over them.
 - A. Students know the major divisions of the global ocean are the Indian, Pacific, Atlantic and Arctic oceans.
 - B. Students know how to describe the interaction between the oceans and the atmosphere.
- III. The ocean floor is divided into regional divisions.
 - A. Students know how to identify the two major regions of the ocean floor, the continental margin and the deep ocean basin.
 - B. Students know how to classify features of the two major regions.
 - C. Students know sea level and the volume of ocean waters have frequently risen and fallen through geologic time.
 - D. Students know how to describe technologies for studying the ocean floor.

Physical Science

Motion

- I. The velocity of an object is the rate of change of its position with respect to time. Position is defined in relation to some choice of a standard reference point and a set of reference directions.
 - A. Students know that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.
 - B. Students know how to solve problems involving distance, time and average speed.
 - C. Students know the velocity of an object must be described by specifying both the direction and the speed of the object.
 - D. Students know changes in velocity may be due to changes in speed, direction, or both.
 - E. Students know how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction.

Forces

- I. Unbalanced forces cause changes in acceleration.
 - A. Students know a force has both direction and magnitude. Forces are pushes or pulls.
 - B. Students know, when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces (Newtonian).
 - C. Students know, when the forces on an object are balanced, the motion of the object does not change.
 - D. Students know how to identify separately the two or more forces that are acting on a single static object, including gravity, elastic forces due to tension or compression in matter and friction.
 - E. Students know the force of gravity pulls objects toward the center of the Earth.
 - F. Students know, when the forces on an object are unbalanced, the object will change its acceleration (that is, it will speed up, slow down or change direction).
 - G. Students know that the greater the mass of an object, the more force is needed to achieve the same rate of change in motion.

Density, Buoyancy, Fluids and Pressures

- I. All solid objects experience a buoyant force when immersed in a fluid.
 - A. Students will know density is mass per unit volume.
 - B. Students will know the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced (Archimedes Principle).
 - C. Students will know how to predict whether an object will float or sink.
- II. Pressure is related to depth and density.
 - A. Students know how fluids exert pressure.
 - B. Students know fluid depth affects pressure (flowing from high to low.)
 - C. Students are introduced to Pascal's Principle (a change in pressure at any point in an enclosed fluid will be transmitted equally to all parts of that fluid).
- III. Differences in fluid pressure can create buoyant force.
 - A. Students know density is mass per unit volume ($D=M/V$.)
 - B. Students know how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume.
 - C. Students know how to predict whether an object will float or sink in a fluid.
 - D. Students know how to analyze the role of density in an object's ability to float.

Waves

- I. Waves are a means of transmitting energy.
 - A. Students know how to describe how waves transfer energy without transferring matter.
 - B. Students know how to distinguish between waves that require a medium and waves that do not.
 - C. Students know how to explain the difference between transverse and longitudinal waves.
- II. Waves have common properties.
 - A. Students know how to identify and describe four wave properties that include frequency, wavelength, amplitude and speed.
 - B. Students know how amplitude and frequency are related to the energy of a wave.

Light Waves

- I. Waves reflect, refract, or diffract when interacting with a different medium or barrier.
 - A. Students know how to describe reflection, refraction, diffraction and interference.
 - B. Students know that visible light is a small band within a very broad electromagnetic spectrum.
 - C. Students know that, for an object to be seen, the eye must detect light emitted or scattered from it.
 - D. Students know light travels in straight lines if the medium it travels through does not change.

- E. Students know how simple lenses are used in a magnifying glass, the eye, a camera, a telescope and a microscope.
- F. Students know that white light is a mixture of many wavelengths (colors) and that retinal cells react differently to different wavelengths.
- G. Students know the angle of reflection of a light beam is equal to the angle of incidence.

Sound Waves

- I. Students know the characteristics and differences between light and sound waves.
 - A. Students know how to compare destructive interference with constructive interference.
 - B. Students know how to describe and give examples of resonance.

Life Science

Biology

- I. All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope.
 - A. Students know the organelles and their functions.
 - B. Students know cells function similarly in all living organisms.
 - C. Students know the characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls.
 - D. Students know cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes.
 - E. Students know that, as multi-cellular organisms develop, their cells differentiate.
- II. All living things are classified and grouped according to their characteristics and evolutionary relationships.
 - A. Students know how living things are grouped into five kingdoms: Monera, Protista, Fungi, Plantae and Animalia. Viruses are not placed into any kingdom.
 - B. Students know living things are placed into progressively smaller groupings, with the final classification being species.
 - C. Students know each species has a unique name, made of two parts: Genus and species. These two names are the same for that species all over the world.

Structure and Function in Living Systems

Students know plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems and the whole organism.

Botany

- I. Plants have shared characteristics, which include; making their own food, have a cuticle, reproduce with spores or sex cells and have cells with cell walls.
 - A. Students know how to identify the characteristics that all plants share.
 - 1) Students know the origin of plants.
 - 2) Students know how to explain the four main groups of plants and their differences.

Non-Vascular Plants

- I. Seedless plants include the nonvascular mosses and liverworts and the vascular ferns, horsetails and club mosses.
 - A. Students know how to describe the main features of mosses, liverworts, ferns and horsetails.
 - B. Students know how plants without seeds are important to humans and to the environment.

Vascular Plants

- I. Plants with seeds include the vascular gymnosperms and angiosperms.
 - A. Students know the difference between a seed and a spore.
 - B. Students know the features of a gymnosperm.
 - C. Students know the features of flowering plants.

- D. Students know the economic and environmental importance of gymnosperms and angiosperms.
- E. Students know the structures and processes by which flowering plants generate pollen, ovules, seeds and fruit.
- F. Structure of Vascular Plants
 - 1) The physical structures and functions of a plant's root and shoot system are related.
 - (a) Students know the functions of roots.
 - (b) Students know the functions of stems.
 - (c) Students know how the structure of leaves are related to their function.
 - (d) Students know the parts of a flower and their function.

Human Biology

- I. The human body is organized. Cells make up the four tissue types (connective, muscle, cardiac and epithelial, which are organized into organs and which are arranged into 11 systems.
 - A. Students know how to identify the major tissues found in the body.
 - B. Students know to compare an organ with an organ system.
 - C. Students know how to describe a major function of each organ system.
 - D. Students know organ systems function because of the contributions of individual organs, tissues and cells. The failure of any part can affect the entire system.

Integumentary System

- I. The integumentary system includes skin, hair and nails.
 - A. Students know the major functions of the integumentary system.
 - B. Students know the major parts of the skin and can discuss their functions.
 - C. Students know that the structure and function of hair and nails is for protection.
 - D. Students know some common types of damage that can affect skin.

Skeletal System

- I. The skeletal system includes bones, cartilage and special structures.
 - A. Students know the major organs of the skeletal system.
 - B. Students know how to illustrate the internal structure of bones.
 - C. Students know how to compare three types of joints (pivot, hinge, ball/socket)
 1. Joints confer mechanical advantage.

Muscular System

- I. The muscular system is comprised of different types of muscle and connective tissue.
 - A. Students know the major parts of the muscular system.
 - B. Students know the different types of muscle which include smooth, cardiac and skeletal.
 - C. Students know how skeletal muscles move bones, how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system.

Lymphatic System

- I. The lymphatic system collects the excess fluid and returns it to your blood.
 - A. Students know the functions of the lymphatic system.
 - B. Students know the relationship between lymph and blood.
 - C. Students know the organs of the lymphatic system, which include lymph nodes, the thymus, spleen and tonsils.

Nervous System

- I. The nervous system gathers and interprets information about the body's internal and external environments and responds to that information.
 - A. Students know neurons in the nervous system work together.
 - B. Students know how to compare and contrast the central nervous system and peripheral nervous system.
 - C. Students know the major functions of the four parts of the brain and the spinal cord.

Health Sciences

- I. Students are empowered with the facts they need to make healthy life choices in the areas of nutrition, drugs, tobacco, alcohol and sexual behavior.
 - A. Students know the long and short term effects of alcohol, tobacco, inhalants and other drug use.
 - B. Students know the stages of drug dependency and addiction and its effect on the adolescent brain.
 - C. Students know the dangers of secondhand smoke.
 - D. Students know the appropriate use of prescription and Over the Counter (OTC) drugs.
 - E. Students know the effects of alcohol, tobacco and other drug use during pregnancy.
 - F. Students know the effects of alcohol, tobacco, steroids and other drug use on athletic performance.
 - G. Students know the relationship between alcohol and other drug uses on vehicular accidents, injuries, violence, suicide and sexual risk behavior.
- II. Prevention and control of communicable and non-communicable diseases.
 - A. Students know the differences between communicable and non-communicable diseases.
 - B. Students know personal health care practices that prevent the spread of communicable diseases such as HIV/AIDS and Hepatitis.
 - C. Students know abstinence is the safest and most effective method of protection from STD/HIV and pregnancy.
 - D. Students know the impact of alcohol and drug use on sexual decision-making.

III. With the changes brought by puberty, personal hygiene needs will be different from the needs of childhood.

- A. Students know the body changes that are brought on by puberty.
- B. Students know different strategies to help address changes such as acne and body odor.

Stewardship/Environmental Science

I. We are all given the gift of life, and the care of that gift is entrusted to us and nurtured by making positive choices that do not cause our bodies harm.

- A. Students know a healthy diet, regular exercise and adequate sleep will give their growing bodies what they need to be healthy and strong.
- B. Students know a healthy body is not defined by the media or images created to promote sales of products.

Investigation and Experimentation

I. Students should have opportunities to perform investigations of the concepts listed above. 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 above standards, students should develop their own questions and perform investigations.

- A. Students know how to use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project.
- B. Students know how to communicate the logical connection among hypotheses, science concepts, tests conducted, data collected and conclusions drawn from the scientific evidence.
- C. Students know how to communicate the steps and results from an investigation in written reports and oral presentations.
- D. Students can select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes and binoculars) to perform tests, collect data and accurately create and display data.
- E. Students know how to construct appropriate graphs from data and develop qualitative statements about the relationships between variables.

- F. Students can create and accurately construct scale models, maps and appropriately labeled diagrams to communicate scientific knowledge (e.g. cell structure).
 - G. Students will draw accurate pictures that portray some features of the object being observed or investigated.
- II. Students understand that scientists are continuing to make major discoveries and breakthroughs in all areas of science.

Grade 8

Earth Science

Earth and Life History

- I. Evidence from rocks allows us to understand the evolution of life on Earth.
 - A. Students know Earth processes today are similar to those that occurred in the past and slow geologic processes have large cumulative effects over long periods of time.
 - B. Students know the history of life on Earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impacts of asteroids.
 - C. Students know that the rock cycle includes the formation of new sediment and rocks and that rocks are often found in layers, with the oldest generally on the bottom.
 - D. Students know that evidence from geologic layers and radioactive dating indicates Earth is approximately 4.6 billion years old and that life on this planet has existed for more than 3 billion years.
 - E. Students know fossils provide evidence of how life and environmental conditions have changed.
 - F. Students know how movements of Earth's continental and oceanic plates through time, with associated changes in climate and geographic connections, have affected the past and present distribution of organisms.
 - G. Students know how to explain significant developments and extinctions of plant and animal life on the geologic time scale.

Life Science

Genetics

- I. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences.
 - A. Students know the differences between the life cycles and reproduction methods of sexual and asexual organisms.
 - B. Students know sexual reproduction produces offspring that inherit half their genes from each parent.
 - C. Students know an inherited trait can be determined by one or more genes.
 - D. Students know plant and animal cells contain many thousands of different genes and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominant in determining the phenotype while the other is recessive.
 - E. Students know DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.

Evolution

- I. Biological evolution accounts for the diversity of species developed through gradual processes over many generations.
 - A. Students know both genetic variation and environmental factors are causes of evolution and diversity of organisms.
 - B. Students know Charles Darwin's theory of natural selection.
 - C. Students know how independent lines of evidence from geology, fossils and comparative anatomy provide the bases for the theory of evolution.
 - D. Students know that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival.

Physical Science

Structure of Matter

- I. Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements.
 - A. Students know the structure of the atom and know it is composed of protons, neutrons and electrons.
 - B. Students know compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.
 - C. Students know atoms and molecules form solids by building up repeating patterns (the crystal structure of NaCl or long-chain polymers.)
 - D. Students know the states of matter (solid, liquid, gas and plasma) depend on molecular motion.
 - E. Students know that in solids the atoms are closely locked in position and can only vibrate, in liquids the atoms and molecules are more loosely connected and can collide with and move past one another, and in gases the atoms and molecules are free to move independently, colliding frequently.
 - F. Students know the periodic table can be used to identify elements in simple compounds.

Periodic Table

- I. The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms.
 - A. Students know how to identify regions corresponding to metals, non-metals and inert gases.
 - B. Students know each element has a specific number of protons in the nucleus (the atomic number) and each isotope of the element has a different but specific number of neutrons in the nucleus.
 - C. Students know substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.

Reactions

- I. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules.
 - A. Students know how to distinguish a chemical change from a physical change. In a physical change one or more physical properties of the material are altered, but the chemical composition (i.e., the arrangement of the atoms in molecules) remains the same. In a chemical change the atoms are rearranged to form new substances with different chemical and physical properties.
 - B. Students know reactant atoms and molecules interact to form products with different chemical properties.
 - C. Students know the idea of atoms explains the conservation of matter: in chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.
 - D. Students know chemical reactions usually liberate heat or absorb heat.
 - E. Students know physical processes include freezing and boiling, in which a material changes form with no chemical reaction.
 - F. Students know how to determine whether a solution is acidic, basic or neutral.

Chemistry of Living Systems

- I. Principles of chemistry underlie the functioning of biological systems.
 - A. Student know Carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.
 - B. Students know living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus and sulfur.
 - C. Students know living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins and DNA.

Physical Principles of Living Systems

- I. Physical principles underlie biological structures and functions.
 - A. Students know visible light is a small band within a very broad electromagnetic spectrum.
 - B. Students know that, for an object to be seen, light emitted by or scattered from it must be detected by the eye.
 - C. Students know light travels in straight lines if the medium it travels through does not change.
 - D. Students know how simple lenses are used in a magnifying glass, the eye, a camera, a telescope and a microscope.
 - E. Students know white light is a mixture of many wavelengths (colors) and that retinal cells react differently to different wavelengths.
 - F. Students know light can be reflected, refracted, transmitted and absorbed by matter.
 - G. Students know the angle of reflection of a light beam is equal to the angle of incidence.

Stewardship/Environmental Science

- I. We are all responsible for implementing a variety of strategies to conserve natural resources. These strategies range from simple to complex, done individually or collectively.
 - A. Students will know the sources of air and water pollution
 - B. Students will know how transportation choices affect our environment and our health.
 - C. Students will know that potentially harmful substances such as lead, asbestos, pesticides and mercury exist in our environment and need to be handled in a safe and lawful manner to prevent contamination (example: proper disposal of TVs, computers)
 - D. Students will know the recycling programs of communities can be very effective if we all cooperate.

Health Science

- I. Students will understand the variety of physical, mental and social changes that occur throughout life.
 - A. Students will know the structure and function of the male and female reproductive system.
 - B. Students will accept individual differences in growth and development.
 - C. Students will develop strategies for coping with concerns and stress associated with their developing sexuality.
- II. Students will understand behaviors that prevent disease.
 - A. Students will understand the necessity for practicing good personal hygiene.
 - B. Students will develop a realistic body image and understand the nature of eating disorders.
 - C. Students will be aware of environmental factors which influence the well-being of both themselves and their community.
- III. Students will continue to be educated in the importance of positive life/health choices regarding alcohol/tobacco and the prevention and control of communicable and non communicable disease (see grade 7 Standards in Health)

Investigation and Experimentation

- I. Students should have opportunities to perform investigations of the concepts listed above. 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 above standards, students should develop their own questions and perform investigations.
 - A. Students will plan and conduct a scientific investigation to test a hypothesis.
 - B. Students will evaluate the accuracy and reproducibility of data.
 - C. Students will use balances and graduated cylinders to determine mass and volume.
 - D. Students will distinguish between variable and controlled parameters in a test.
 - E. Students will recognize the slope of the linear graph as the constant in the relationship $y = kx$ and apply this principle in interpreting graphs constructed from data.
 - F. Students will construct appropriate graphs from data and develop quantitative statements about the relationships between variables.

- G. Students will apply simple mathematical relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance/time, density = mass/volume, force = pressure x area, volume = area x height).
- H. Students will select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes and binoculars) to perform tests, collect data and accurately create and display data.