Bethany Lutheran School
Long Beach, CA
Science Content Standards

The study of science promotes the acquisition of skills to extend learning about our universe, our lives, and our God. In the teaching of science we are continually challenged by a changing universe as additional information about natural phenomena is uncovered. Through science education students should experience wonder, joy and excitement in God's creation stimulating curiosity and adventure.

Teachers need to equip students with the ability to practice the thinking skills of process science (observing, classifying, measuring, inferring, interrelating, interpreting, applying, predicting, hypothesizing, relating variables, experimenting) as they learn about God's world. Science skills should be learned through building models, technological supports, hands-on activities and observing nature as well as the printed word.

As God's stewards of the earth we teach our students to care for His creation not to abuse, overuse, or destroy it. Caring for the earth provides us with an opportunity to serve both God and others in grateful response to the love God has shown to us through Christ Jesus. Through the study of science our students can learn to become stewards of God's wonderful creation.

"For by Him all things were created: things in heaven and on earth, visible and invisible, whether thrones or powers or rulers or authorities; all things were created by Him and for Him." Colossians 1:16

Kindergarten Science Standards

Physical Sciences

1. Properties of materials can be observed, measured and predicted. As a basis for understanding this concept, students know:

a. objects can be described in terms of the materials they are made of (clay, cloth, paper, etc.) and their physical properties (color, size, shape, weight, texture, flexibility, attraction to magnets, floating and sinking, etc.).. God is the creator of all things including the senses.

b. water can be a liquid or a solid and can be made to change back and forth from one form to the other.

c. water left in an open container evaporates (goes into the air), but water in a closed container does not.

Life Sciences

2. Different types of plants and animals inhabit the Earth. As a basis for understanding this concept, students know:

a. how to observe and describe similarities and differences in the appearance and behavior of plants and of animals (e.g., seed-bearing plants, birds, fish, insects). God made each person special.

b. stories sometimes give plants and animals attributes they do not really have.

c. how to identify major structures of common plants and animals (e.g., stems, leaves, roots, arms, wings,legs)

Earth Sciences

3. The Earth is composed of land, air and water. As a basis for understanding this oncept, students know:

a. characteristics of mountains, rivers, oceans, valleys, deserts, and local landforms. God created the world.

b. changes in weather occur from day to day and over seasons, affecting the Earth and its inhabitants.

c. how to identify resources from the Earth that are used in everyday life, and that many resources can be conserved.

Investigation and Experimentation

4. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content in the other three strands, students should develop their own questions and perform nvestigations.

Students will:

a. observe common objects using the five senses.

b. describe the properties of common objects.

c. describe the relative position of objects using one reference (e.g., above or below).

d. compare and sort common objects based on one physical attribute (including color, shape, texture, size, weight).

e. communicate observations orally and in drawings.

f. learn about God's world through the Bible.

Grade 1 Science Standards

Physical Sciences

1. Materials come in different forms (states) including solids, liquids, and gases. As a basis for understanding this concept, students know:

a. solids, liquids, and gases have different properties.

b. the properties of substances can change when the substances are mixed, cooled, or heated.

c. the Trinity - 3 in 1.

Life Sciences

2. Plants and animals meet their needs in different ways. As a basis for understanding this concept, students know:

a. different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.

b. plants and animals both need water; animals need food, and plants need light. We need God.

c. animals eat plants or other animals for food and may also use plants or even other animals for shelter and nesting.

d. how to infer what animals eat from the shapes of their teeth (e.g., sharp teeth: eats meat; flat teeth: eats plants).

e. roots are associated with the intake of water and soil nutrients, green leaves with making food from sunlight.

Earth Sciences

3. Weather can be observed, measured and described. As a basis for understanding this concept, students know:

a. how to use simple tools (e.g., thermometer, wind vane) to measure weather conditions and record changes from day to day and over the seasons.

b. the weather changes from day to day, but trends in temperature or of rain (or snow) tend to be predictable during a season.

c. the sun warms the land, air, and water.

d. This is God's world.

Investigation and Experimentation

4. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations.

Students will:

a. draw pictures that portray some features of the thing being described.

b. record observations and data with pictures, numbers, and/or written statements.

c. record observations on a bar graph.

d. describe the relative position of objects using two references (e.g., above and next to, below and left of).

e. make new observations when discrepancies exist between two descriptions of the same object or phenomena.

f. Learn about God by reading the Bible.

Grade 2 Science Standards

Physical Sciences

1. The motion of objects can be observed and measured. As a basis for understanding this concept, students know:

a. the position of an object can be described by locating it relative to another object or the background.

b. an object's motion can be described by recording the change in its position over time.

c. the way to change how something is moving is to give it a push or a pull. The size of the change is related to the strength, or the amount of "force," of the push or pull. Relate sin to the pull, and grace to push of gravity.

d. tools and machines are used to apply pushes and pulls (forces) to make things move.

e. objects near the Earth fall to the ground unless something holds them up.

f. magnets can be used to make some objects move without being touched.

g. sound is made by vibrating objects and can be described by its pitch and volume.

Life Sciences

2. Plants and animals have predictable life cycles. As a basis for understanding this concept, students know:

a. organisms reproduce offspring of their own kind. The offspring resemble their parents and each other. God gives us our family.

b. the sequential stages of life cycles are different for different animals, for example butterflies, frogs, and mice.

c. many characteristics of an organism are inherited from the parents. Some characteristics are caused by, or influenced by, the environment.

d. there is variation among individuals of one kind within a population.

e. the germination, growth, and development of plants can be affected by light, gravity, touch, or environmental stress.

f. in plants flowers and fruits are associated with reproduction.

g. God gives food for life; eternal life; seed of faith can grow.

Earth Sciences

3. Earth is made of materials that have distinct properties and provide resources for human activities. As the basis for understanding this concept, students know:

a. how to compare the physical properties of different kinds of rocks and that rock is composed of different combinations of minerals.

b. smaller rocks come from the breakage and weathering of larger rocks.

c. soil is made partly from weathered rock and partly from organic materials, and that soils differ in their color, texture, capacity to retain water, and ability to support the growth of many kinds of plants.

d. fossils provide evidence about the plants and animals that lived long ago, and scientists learn about the past history of Earth by studying fossils.

e. rock, water, plants and soil provide many resources including food, fuel, and building materials that humans use.
f. the wonders of creation.

Investigation and Experimentation

4. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations.

Students will:

a. make predictions based on patterns of observation rather than random guessing.
b. measure length, weight, temperature, and liquid volume with appropriate tools and express measurements in standard and non-standard units.
c. compare and sort common objects based on two or more physical attributes (including color, shape, texture, size, weight).
d. write or draw descriptions of a sequence of steps, events, and observations.
e. construct bar graphs to record data using appropriately labeled axes.
f. write or draw descriptions of a sequence of steps, events and observations, and include the use of magnifiers or microscopes to extend senses.
g. follow verbal instructions for a scientific investigation.
h. learn about God's world through His Word.

Grade 3 Science Standards

Physical Sciences

1. Energy and matter have multiple forms and can be changed from one form to another. As a basis for understanding this concept, students know:

a. energy comes from the sun to the Earth in the form of light.

b. sources of stored energy take many forms, such as food, fuel, and batteries.

c. machines and living things convert stored energy to motion and heat.

d. energy can be carried from one place to another by waves, such as water waves and sound, by electric current, and by moving objects.

e. matter has three forms: solid, liquid and gas.

f. evaporation and melting are changes that occur when the objects are heated.

g. when two or more substances are combined a new substance may be formed that can have properties that are different from those of the original materials.

h. all matter is made of small particles called atoms, too small to see with our eyes.

i. people once thought that earth, wind, fire, and water were the basic elements that made up all matter. Science experiments show that there are over 100 different types of atoms which are displayed on the Periodic Table of the Elements.

j. the Gospel messages are different in form, but reinforce each other.

2. Light has a source and travels in a direction. As a basis for understanding this concept, students know:

a. sunlight can be blocked to create shadows.

b. light is reflected from mirrors and other surfaces.

c. the color of light striking an object affects how our eyes see it.

d. we see objects when light traveling from an object enters our eye.

f. God's Son, Jesus, is the light leading us down God's path.

Life Sciences

3. Adaptations in physical structure or behavior may improve an organism's chance for survival. As a basis for understanding this concept, students know:

a. plants and animals have structures that serve different functions in growth, survival, and reproduction.

b. examples of diverse life forms in different environments, such as oceans, deserts, tundra, forests, grasslands, and wetlands.

c. 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. when the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.

e. some kinds of organisms that once lived on Earth have completely disappeared; some of these resembled others that are alive today.

f. Christ as our Savior (faith), gives us survival (heaven).

Earth Sciences

4. Objects in the sky move in regular and predictable patterns. As a basis for understanding this concept, students know:

a. the patterns of stars stay the same, although they appear to move across the sky nightly, and different stars can be seen in different seasons.
b. how the moon's appearance changes during the four week lunar cycle.
c. telescopes magnify the appearance of some distant objects in the sky, including the moon and the planets.
The number of stars that can be seen through telescopes is dramatically greater than can be seen by the unaided eye.
d. the Earth is one of several planets that orbit the sun, and the moon orbits the Earth.
e. the position of the sun in the sky changes during the course of the day and from season to season.
f. God has formed an orderly creation.

Investigation and Experimentation

5. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations.
Students will:

a. repeat observations to improve accuracy, and know that the results of similar scientific investigations seldom turn out exactly the same because of differences in the things being investigated, methods being used, or uncertainty in the observation.
b. differentiate evidence from opinion, and know that scientists do not rely on claims or conclusions unless they are backed by observations that can be confirmed.
c. use numerical data in describing and comparing objects, events and measurements.
d. predict the outcome of a simple investigation, and compare the result to the prediction.
e. collect data in an investigation and analyze them to develop a logical conclusion.
f. learn about God and His world through His Word.

Grade 4 Science Standards

Physical Sciences

1. Electricity and magnetism are related effects that have many useful applications in everyday life. As a basis for understanding this concept, students know:

a. how to design and build simple series and parallel circuits using components such as wires, batteries, and bulbs.

b. how to build a simple compass and use it to detect magnetic effects, including Earth's magnetic field.

c. electric currents produce magnetic fields and how to build a simple electromagnet.

d. the role of electromagnets in the construction of electric motors, electric generators, and simple devices such as doorbells and earphones.

e. electrically charged objects attract or repel each other.

f. magnets have two poles, labeled north and south, and like poles repel each other while unlike poles attract each other.

g. electrical energy can be converted to heat, light and motion.

f. the Holy Spirit is the energy source. Discuss faith and its effect in our life i.e.

Life Sciences

2. All organisms need energy and matter to live and grow. As a basis for understanding this concept, students know:

a. plants are the primary source of matter and energy entering most food chains.

b. 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.

c. decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.

d. fertile ground is needed to bear fruit i.e. parable of the sower.

3. Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept, students know:

a. ecosystems can be characterized in terms of their living and nonliving components.

b. for any particular environment, some kinds of plants and animals survive well, some survive less well, and some cannot survive at all.

c. many plants depend on animals for pollination and seed dispersal, while animals depend on plants for food and shelter.

d. most microorganisms do not cause disease and many are beneficial.

e. the body of Christ has many parts all working together.

Earth Sciences

4. The properties of rocks and minerals reflect the processes that formed them. As a basis for understanding this concept, students know:

a. how to differentiate among igneous, sedimentary, and metamorphic rocks by their properties and methods of formation (the rock cycle).

b. how to identify common rock-forming minerals (including quartz, calcite, feldspar, mica, and hornblende) and ore minerals using a table of diagnostic properties.

c. Man is a reflection of God; works show who we are and what we believe. Faith is reflected in works.

5. Waves, wind, water, and ice shape and reshape the Earth's land surface. As a basis for understanding this concept, students know:

a. some changes in the Earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.

b. natural processes, including freezing/thawing and growth of roots, cause rocks to break down into smaller pieces.

c. 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).

d. creation is an ongoing process. (trials shape us, i.e. Job)

Investigation and Experimentation

6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations.

Students will:

a. differentiate observation from inference (interpretation), and know that scientists' explanations come partly from what they observe and partly from how they interpret their observations.

b. measure and estimate weight, length, or volume of objects.

c. formulate predictions and justify predictions based on cause and effect relationships.

d. conduct multiple trials to test a prediction and draw conclusions about the relationships between results and predictions.

e. construct and interpret graphs from measurements.

f. follow a set of written instructions for a scientific investigation.

g. know that Bible study allows us to grow in our knowledge of God and His world.

Grade 5 Science Standards

Physical Sciences

1. Elements and their combinations account for all the varied types of matter in the world. As a basis for understanding this concept, students know:

a. during chemical reactions, the atoms in the reactants rearrange to form products with different properties.

b. all matter is made of atoms, which may combine to form molecules.

c. metals have properties in common, such as electrical and thermal conductivity. Some metals, such as aluminum (Al), iron (Fe), nickel (Ni), copper (Cu), silver (Ag), gold (Au), are pure elements while others, such as steel and brass, are composed of a combination of elemental metals.

d. each element is made of one kind of atom. These elements are organized in the Periodic Table by their chemical properties.

e. scientists have developed instruments that can create images of atoms and molecules showing that they are discrete and often occur in well ordered arrays.

f. differences in chemical and physical properties of substances are used to separate mixtures and identify compounds.

g. properties of solid, liquid, and gaseous substances, such as sugar ($C_6H_{12}O_6$), water (H2O), helium (He), oxygen (O_2), nitrogen (N2),and carbon dioxide (CO_2).

h. living organisms and most materials are composed of just a few elements.

i. common properties of salts, such as sodium chloride (NaCl).

j. creation has rhythms. God made life unique and diverse to bring glory to Himself.

Life Sciences

2. Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials. As a basis for understanding this concept, students know:

a. many multicellular organisms have specialized structures to support the transport of materials.

b. how blood circulates through the heart chambers, lungs, and body, and how carbon dioxide (CO_2) and oxygen (O_2) are exchanged in the lungs and tissues.

c. the sequential steps of digestion, and the roles of teeth and mouth, esophagus, stomach, small intestine, large intestine, and colon in the function of the digestive system.

d. the role of the kidney in removing cellular wastes from blood and converting them into urine, which is stored in the bladder.

e. how sugar, water, and minerals are transported in a vascular plant.

f. plants use carbon dioxide (CO_2) and energy from sunlight to build molecules of sugar and release oxygen.

g. plant and animal cells break down sugar to obtain energy, forming carbon dioxide (CO_2) and water (respiration).

h. the parts work together to benefit the whole – body of Christ.

Earth Sciences

3. Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept, students know:

a. most of the Earth's water is present as salt water in the oceans, which cover most of the Earth's surface.
b. 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. water moves in the air from one place to another in the form of clouds or fog, which are tiny droplets of water or ice, and falls to the Earth as rain, hail, sleet, or snow.
d. the amount of fresh water, located in rivers, lakes, underground sources, and glaciers, is limited, and its availability can be extended through recycling and decreased use.
e. the origin of water used by their local communities.
f. God has a plan for the earth. Relate to Baptism as God's recycling process.

4. Energy from the sun heats the Earth unevenly, causing air movements resulting in changing weather patterns. As a basis for understanding this concept, students know:
a. uneven heating of the Earth causes air movements (convection currents).
b. the influence of the ocean on weather, and the role of the water cycle in weather.
c. causes and effects of different types of severe weather.
d. how to use weather maps and weather forecasts to predict local weather, and that prediction depends on many changing variables.
e. the Earth's atmosphere exerts a pressure that decreases with distance above the Earth's surface, and is the same in all directions.
f. God's power helps us face changes.

5. The solar system consists of planets and other bodies that orbit the sun in predictable paths. As a basis for understanding this concept, students know:
a. the sun, an average star, is the central and largest body in the solar system and is composed primarily of hydrogen and helium.
b. the solar system includes the Earth, moon, sun, eight other planets and their satellites, and smaller objects such as asteroids and comets.
c. the path of a planet around the sun is due to the gravitational attraction between the sun and the planet.
d. the Bible in helps us find answers for the Bible is a systematic plan for life.

Investigation and Experimentation
6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations.
Students will:
a. classify objects (e.g., rocks, plant, leaves) based on appropriate criteria.
b. develop a testable question.
c. plan and conduct a simple investigation based on a student-developed question, and write instructions others can follow to carry out the procedure.

d. identify the dependent and controlled variables in an investigation.
e. identify a single independent variable in a scientific investigation and explain what will be learned by collecting data on this variable.
f. select appropriate tools (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.
g. record data using appropriate graphic representation (including charts, graphs, and labeled diagrams), and make inferences based on those data.
h. draw conclusions based on scientific evidence and indicate whether further information is needed to support a specific conclusion.
i. write a report of an investigation that includes tests conducted, data collected or evidence examined, and conclusions drawn.

Grade 6 Science Standards
Focus on Earth Science

Plate Tectonics and Earth's Structure

1. Plate tectonics explains important features of the Earth's surface and major geologic events. As the basis for understanding this concept, students know:

a. the fit of the continents, location of earthquakes, volcanoes, and midocean ridges, and the distribution of fossils, rock types, and ancient climatic zones provide evidence for plate tectonics.

b. the solid Earth is layered with cold, brittle lithosphere; hot, convecting mantle; and dense, metallic core.

c. lithospheric plates that are the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle.

d. earthquakes are sudden motions along breaks in the crust called faults, and volcanoes/fissures are locations where magma reaches the surface.

e. major geologic events, such as earthquakes, volcanic eruptions, and mountain building result from plate motions.

f. how to explain major features of California geology in terms of plate tectonics (including mountains, faults, volcanoes).

g. how to determine the epicenter of an earthquake and that the effects of an earthquake vary with its size, distance from the epicenter, local geology, and the type of construction involved.

h. changes occurred due to the Flood. God equips His people to deal with change.

Shaping the Earth's Surface

2. Topography is reshaped by weathering of rock and soil and by the transportation and deposition of sediment. As the basis for understanding this concept, students know:

a. water running downhill is the dominant process in shaping the landscape, including California's landscape.

b. rivers and streams are dynamic systems that erode and transport sediment, change course, and flood their banks in natural and recurring patterns.

c. beaches are dynamic systems in which sand is supplied by rivers and moved along the coast by wave action.

d. earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.

e. God permits people to be tested in order to refine them.

Heat (Thermal Energy) (Physical Science)

3. Heat moves in a predictable flow from warmer objects to cooler objects until all objects are at the same temperature. As a basis for understanding this concept, students know:

a. energy can be carried from one place to another by heat flow, or by waves including water waves, light and sound, or by moving objects.

b. when fuel is consumed, most of the energy released becomes heat energy.

c. heat flows in solids by conduction (which involves no flow of matter) and in fluids by conduction and also by convection (which involves flow of matter).

d. heat energy is also transferred between objects by radiation; radiation can travel through space.
e. God works to bring diverse people together.

Energy in the Earth System
4. Many phenomena on the Earth's surface are affected by the transfer of energy through radiation and convection currents. As a basis for understanding this concept, students know:

a. the sun is the major source of energy for phenomena on the Earth's surface, powering winds, ocean currents, and the water cycle.
b. solar energy reaches Earth through radiation, mostly in the form of visible light.
c. heat from Earth's interior reaches the surface primarily through convection.
d. convection currents distribute heat in the atmosphere and oceans.
e. differences in pressure, heat, air movement, and humidity result in changes of weather.

Ecology (Life Science)
5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept, students know:

a. energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis, and then from organism to organism in food webs.
b. over time, matter is transferred from one organism to others in the food web, and between organisms and the physical environment.
*c. populations of organisms can be categorized by the functions they serve in an ecosystem **(** as biome changes and evolves, through succession).*
d. different kinds of organisms may play similar ecological roles in similar biomes.
e. the number and types of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition.

Resources
6. Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. As a basis for understanding this concept, students know:

a. 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. different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and classify them as renewable or nonrenewable.
c. natural origin of the materials used to make common objects.
d. the diversity of talents and spiritual gifts God provides.

Investigation and Experimentation

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations.

Students will:

a. develop a hypothesis.

b. select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.

c. construct appropriate graphs from data and develop qualitative statements about the relationships between variables.

d. communicate the steps and results from an investigation in written reports and verbal presentations using the scientific method.

e. recognize whether evidence is consistent with a proposed explanation.

f. read a topographic map and a geologic map for evidence provided on the maps, and construct and interpret a simple scale map.

g. interpret events by sequence and time from natural phenomena (e.g., relative ages of rocks and intrusions).

h. identify changes in natural phenomena over time without manipulating the phenomena (e.g., a tree limb, a grove of trees, a stream, a hillslope).

i. use the Bible and prayer as a way to investigate our faith and what God would have us do.

GRADE 7 Science Standards
Focus on Life Science

Cell Biology

1. All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. As a basis for understanding this concept, students know:

a. cells function similarly in all living organisms.

b. the characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls.

c. the nucleus is the repository for genetic information in plant and animal cells.

d. mitochondria liberate energy for the work that cells do, and chloroplasts capture sunlight energy for photosynthesis.

e. cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes

f. as multicellular organisms develop, their cells differentiate.

g. faith is also not visible, however fruits of the faith are visible.

Genetics

2. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept, students know:

a. the differences between the life cycles and reproduction of sexual and asexual organisms.

b. sexual reproduction produces offspring that inherit half their genes from each parent.

c. an inherited trait can be determined by one or more genes.

d. 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. DNA is the genetic material of living organisms, and is located in the chromosomes of each cell. Relate DNA as building blocks of life to spiritual building through means of grace.

Evolution

3. Biological evolution accounts for the diversity of species develop through gradual processes over many generations. As a basis for understanding this concept, students know:

a. both genetic variation and environmental factors are causes of evolution and diversity of organisms.

b. the reasoning used by Darwin in making his conclusion that natural selection is the mechanism of evolution.

c. how independent lines of evidence from geology, fossils, and comparative anatomy provide a basis for the theory of evolution.

d. how to construct a simple branching diagram to classify living groups of organisms by shared derived characteristics, and expand the diagram to include

fossil organisms.
e. extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival.
f. spiritual change and growth occur. Relate to Genesis 1 - God is the creator.

Earth and Life History (Earth Science)
4. Evidence from rocks allows us to understand the evolution of life on Earth. As the basis for understanding this concept, students know:
a. 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. the history of life on Earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impact of an asteroid.
c. the rock cycle includes the formation of new sediment and rocks. Rocks are often found in layers with the oldest generally on the bottom.
d. evidence from geologic layers and radioactive dating indicate the Earth is approximately 4.6 billion years old, and that life has existed for more than 3 billion years.
e. fossils provide evidence of how life and environmental conditions have changed.
f. how movements of the Earth's continental and oceanic plates through time, with associated changes in climate and geographical connections, have affected the past and present distribution of organisms.
g. how to explain significant developments and extinctions of plant and animal life on the geologic time scale.
h. what God reveals about origins in Genesis 1. Talk about God's unfolding plan to bring salvation to us and to all people.

Structure and Function in Living Systems
5. The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept, students know:
a. plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.
b. organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system.
c. how bones and muscles work together to provide a structural framework for movement.
d. how the reproductive organs of the human female and male generate eggs and sperm, and how sexual activity may lead to fertilization and pregnancy.
e. the function of the umbilicus and placenta during pregnancy.
f. the structures and processes by which flowering plants generate pollen and ovules, seeds, and fruit.
g. how to relate the structures of the eye and ear to their functions.
h. God's design for structure and function as evidence of His creative majesty.

Physical Principles in Living Systems (Physical Science)

6. Physical principles underlie biological structures and functions. As a basis for understanding this concept, students know:

a. visible light is a small band within a very broad electromagnetic spectrum.
b. for an object to be seen, light emitted by or scattered from it must enter the eye.
c. light travels in straight lines except when the medium it travels through changes.
d. how simple lenses are used in a magnifying glass, the eye, camera, telescope, and microscope.
e. white light is a mixture of many wavelengths (colors), and that retinal cells react differently with different wavelengths.
f. light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection).
g. the angle of reflection of a light beam is equal to the angle of incidence.
h. how to compare joints in the body (wrist, shoulder, thigh) with structures used in machines and simple devices (hinge, ball-and-socket, and sliding joints).
i. how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system.
j. contractions of the heart generate blood pressure, and heart valves prevent backflow of blood in the circulatory system.
k. God placed natural laws into effect as part of His creative, preserving work.

Investigation and Experimentation

7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations.

Students will:

a. select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
b. utilize a variety of print and electronic resources (including the World Wide Web) to collect information as evidence as part of a research project.
c. communicate the logical connection among hypothesis, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.
d. construct scale models, maps and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).
e. communicate the steps and results from an investigation in written reports and verbal presentations.
d. understand that the Bible and prayer are ways to investigate our faith and what God would have us do.

Grade 8 Science Standards
Focus on Physical Science

Motion

1. The velocity of an object is the rate of change of its position. As a basis for understanding this concept, students know:

a. position is defined relative to some choice of standard reference point and a set of reference directions.

b. average speed is the total distance traveled divided by the total time elapsed. The speed of an object along the path traveled can vary.

c. how to solve problems involving distance, time, and average speed.

d. to describe the velocity of an object one must specify both direction and speed.

e. changes in velocity can be changes in speed, direction, or both.

f. how to interpret graphs of position versus time and speed versus time for motion in a single direction.

g. how God changes the direction of human lives.

Forces

2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept, students know:

a. a force has both direction and magnitude.

b. when an object is subject to two or more forces at once, the effect is the cumulative effect of all the forces.

c. when the forces on an object are balanced, the motion of the object does not change.

d. how to identify separately two or more forces acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.

e. when the forces on an object are unbalanced the object will change its motion (that is, it will speed up, slow down, or change direction).

f. the greater the mass of an object the more force is needed to achieve the same change in motion.

g. the role of gravity in forming and maintaining planets, stars and the solar system.

h. sin results in unbalance.

Structure of Matter

3. Elements have distinct properties and atomic structure. All matter is comprised of one or more of over 100 elements. As a basis for understanding this concept, students know:

a. the structure of the atom and how it is composed of protons, neutrons and electrons.

b. compounds are formed by combining two or more different elements. Compounds have properties that are different from the constituent elements.

c. atoms and molecules form solids by building up repeating patterns such as the crystal structure of NaCl or long chain polymers.

d. the states (solid, liquid, gas) of matter depend on molecular motion.

e. 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, while in gases the atoms or molecules are free to move independently, colliding frequently.
f. how to use the Periodic Table to identify elements in simple compounds
g. that repeating patterns and orderliness are characteristic of God's creation.

Earth in the Solar System (Earth Science)
4. The structure and composition of the universe can be learned from the study of stars and galaxies, and their evolution. As a basis for understanding this concept, students know:

a. galaxies are clusters of billions of stars, and may have different shapes.
b. the sun is one of many stars in our own Milky Way galaxy. Stars may differ in size, temperature, and color.
c. how to use astronomical units and light years as measures of distance between the sun, stars, and Earth.
d. stars are the source of light for all bright objects in outer space. The moon and planets shine by reflected sunlight, not by their own light.
e. the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.
f. that God created the heavenly bodies, set them in motion and keeps them in motion.

Reactions
5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept, students know:

a. reactant atoms and molecules interact to form products with different chemical properties.
b. 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.
c. chemical reactions usually liberate heat or absorb heat.
d. physical processes include freezing and boiling, in which a material changes form with no chemical reaction.
e. how to determine whether a solution is acidic, basic or neutral.
f. how to compare covalent bonding with sharing God's Word and in the kingdom. Compare ionic bonds with giving up of others, giving up to enter the kingdom of God. As the Holy Spirit works in lives characteristics of Jesus are evident. Use covalent bonds with perfect human relationships e.g. marriage. Discuss human patterns of behavior. Metallic bonds have properties just as the Holy Spirit works His qualities in us.
g. how to relate giving and receiving hydrogen ions to giving and receiving God's love. Relate to God's action in providing an environment for our effective spiritual growth. Relate: water to Baptism; salt to God's preservation.

Chemistry of Living Systems (Life Science)

6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept, students know:

a. 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. living organisms are made of molecules largely consisting of carbon, hydrogen, nitrogen, oxygen, phosphorus and sulfur.

c. 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.

d. the cycle of sin and grace.

Periodic Table

7. The organization of the Periodic Table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept, students know:

a. how to identify regions corresponding to metals, nonmetals and inert gases.

b. elements are defined by the number of protons in the nucleus, which is called the atomic number. Different isotopes of an element have a different number of neutrons in the nucleus.

c. substances can be classified by their properties, including melting temperature, density, hardness, heat, and electrical conductivity.

d.the periodic table helps to explain God's grand design for creation, i.e. intricacy, order, reactivity, rhythms, and care.

Density and Buoyancy

8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept, students know:

a. density is mass per unit volume.

b. how to calculate the density of substances (regular and irregular solids, and liquids) from measurements of mass and volume.

c. the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid it has displaced.

d. how to predict whether an object will float or sink.

e. the Holy Spirit brings resilience to the Christian life through the means of grace. God helps us stay afloat in a world of sin.

Investigation and Experimentation

9. Scientific progress is made by asking meaningful questions an conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, student should develop their own questions and perform investigations.

Students will:

a. plan and conduct a scientific investigation to test a hypothesis.

b. evaluate the accuracy and reproducibility of data.

c. distinguish between variable and controlled parameters in a test.

d. recognize the slope of the linear graph as the constant in the relationship y=kx and apply this to interpret graphs constructed from data.
e. construct appropriate graphs from data and develop quantitative statements about the relationships between variables.
f. apply simple mathematical relationships to determine one quantity given the other two (including speed = distance/time, density = mass/volume, force = pressure x area, volume=area x height).
g. distinguish between linear and non-linear relationships on a graph of data.
h. study the Word to know what God desires of us and for us.