Science Curriculum
For
Emmanuel Lutheran School

The science study curriculum is based on the human interaction with the physical, material, and God's world. All students appreciate God's world through discovery, observation, and discussion. The curriculum covers life science, earth science, physical science, and human body. These concepts are repeated at a higher complexity as the grade level increases. As students gain knowledge of science concepts, they will also develop critical thinking, experimenting, research, and note taking skills. More importantly, student should realize the intricate fashion in which God created the world, and acquire an appreciation and responsibility for the wonders and marvels of God's creation.

<u>Strands</u>
Life Science, Physical Science, Earth Science, and Human Body

Note: All standards and strands are based on North Carolina unless identified by IF (Integrating the Faith) or Concordia (textbook).

KINDERGARTEN

Goal

Students in kindergarten begin their science studies using their five senses to observe animals, earth materials, weather, and other objects. Young students' natural curiosity leads them to investigate the world by observing and manipulating common objects and materials in their environment.

Competency Goal 1: The learner will make observations and build an understanding of similarities and differences in God's creatures.

Objectives

1.01 Observe and describe the similarities and differences among animals including: (IF)

- Structure.
- Growth.
- Changes.
- Movement.

1.02 Observe how animals interact with their surroundings.
1.03 Observe the behaviors of several common animals.
1.04 Decide which animals makes good pets.(IF)
1.05 Demonstrate how to care for a variety of animals.
1.06 Observe the similarities of humans to other animals including:

- Basic needs.
- Growth and change.
- Movement.

Competency Goal 2: The learner will make observations and build an understanding God's world including weather, sky conditions, and the moon.

Objectives

2.01 Observe and report daily weather changes throughout the year.
2.02 Identify different weather features including:

- Precipitation.
- Wind.
- Temperature.
- Cloud cover.

2.03 Use symbols to represent various weather conditions. (IF)
2.04 Identify types of precipitation, changes in wind, force, direction and sky conditions.
2.05 Observe and determine the effects of weather on human activities.
2.06 Use common tools to measure weather.

2.07 Observe the different phases of the moon. (IF)
2.08 Compare the day and night sky. (IF)
2.09 Observe rainbows and state the order of a spectrum. (IF)
2.09 Recognize the globe as the Earth. (IF)

Competency Goal 3: The learner will make observations and build an understanding of the properties of common objects.

Objectives
3.01 Observe and describe the properties of different kinds of objects (clay, wood, cloth, paper, other) and how they are used.
3.02 Develop and use a vocabulary associated with the properties of materials:

- Color.
- Size.
- Shape.
- Texture.

3.03 Describe how objects look, feel, smell, taste, and sound using their own senses.
3.04 Observe that objects can be described and sorted by their properties.
3.05 Identify some common objects and organisms that are considered to be natural resources in our world.

Competency Goal 4: The learner will use appropriate tools and measurements to increase their ability to describe their world.

Objectives
4.01 Describe how tools can be used to make comparisons.
4.02 Observe and describe how various tools and units of measure are useful:

- Scissors.
- Pencils.
- Crayons.
- Paper clips.
- Hammers.

4.03 Use nonstandard units of measure to describe and compare the lengths and weights of objects. (IF)
4.04 Demonstrate the use of standard units of measure and compare with nonstandard units of measure. (Teacher demonstration)
4.05 Demonstrate that standard units of measure produce more consistent results than nonstandard units, allowing information to be shared.(Teacher demonstration)

GRADE ONE
Goal

Science education in first grade extends the foundation that began in kindergarten with the unifying concepts of evidence, explanation and measurement and begins to add order and organization as students devise their own rules to classify living and nonliving objects.

Competency Goal 1: The learner will conduct investigations and make observations to build an understanding of the needs of God's living organisms.

Objectives

1.01 Investigate the needs of a variety of different plants:

- Air.
- Water.
- Light.
- Space.
- Soil.

1.02 Investigate the needs of a variety of different animals:

- Air.
- Water.
- Food.
- Shelter.
- Space.
- Soil.

1.03 Observe the ways in which humans are similar to other organisms.
1.04 Identify local environments that support the needs of common North Carolina plants and animals and defining habitat. (IF)
1.05 Discuss the wide variety of living things on Earth. (IF)

- Habitats
- Animal body coverings
- Plant structures

Competency Goal 2: The learner will make observations and use student-made rules to build an understanding of solid earth materials.

Objectives

2.01 Describe and sort a variety of earth materials based on their properties:

- Color.
- Hardness.
- Shape.
- Size.

2.02 Describe rocks and other earth materials in more than one way. (IF)
2.03 Observe the various components that combine to make soil.
2.04 Compare the components of soil samples from different places.
2.05 Explore where useful earth materials are found and how they are used.
2.06 Observe changes in the weather. (IF)
2.07 Observe how the sky changes daily, monthly, and yearly. (IF)

Competency Goal 3: The learner will make observations and conduct investigations to build an understanding of the properties and relationship of objects.

Objectives
3.01 Describe the differences in the properties of solids and liquids.
3.02 Investigate several ways in which objects can be described, sorted or classified.
3.03 Classify solids according to their properties:

- Color.
- Texture.
- Shape (ability to roll or stack).
- Ability to float or sink in water.

3.04 Determine the properties of liquids:

- Color.
- Ability to float or sink in water.
- Tendency to flow.

3.05 Observe mixtures including:

- Solids with solids.
- Liquids with liquids.
- Solids with liquids.

Competency Goal 4: The learner will make observations and conduct investigations to build an understanding of balance, motion and weighing of objects.

Objectives
4.01 Describe different ways in which objects can be moved.
4.02 Observe that movement of an object can be affected by pushing or pulling. (IF)
4.03 Investigate and observe that objects can move steadily or change direction.
4.04 Observe and describe balance as a function of position and weight. (IF)
4.05 Describe and observe systems that are unstable and modify them to reach equilibrium.

GRADE TWO

Goal

Science education in the second grade builds on the unifying concepts previously introduced in kindergarten and first grade including the use of evidence, explanation, measurement, order and organization.

Competency Goal 1: The learner will conduct investigations and build an understanding of animal life cycles.

Objectives

1.01 Describe the life cycle of animals including: (IF)

- Birth.
- Developing into an adult.
- Reproducing.
- Aging and death.

1.02 Observe that insects need food, air and space to grow.
1.03 Observe the different stages of an insect life cycle.
1.04 Compare and contrast life cycles of other animals such as mealworms, ladybugs, crickets, guppies or frogs.

Competency Goal 2: The learner will conduct investigations and use appropriate tools to build an understanding of the changes in weather.

Objectives

2.01 Investigate and describe how moving air interacts with objects.
2.02 Observe the force of air pressure pushing on objects.
2.03 Describe weather using quantitative measures of:

- Temperature.
- Wind direction.
- Wind speed.
- Precipitation.

2.04 Identify and use common tools to measure weather:

- Wind vane and anemometer.
- Thermometer.
- Rain gauge.

2.05 Discuss and determine how energy from the sun warms the land, air and water.
2.06 Observe and record weather changes over time and relate to time of day and time of year. (IF)

Competency Goal 3: The learner will observe and conduct investigations to build an understanding of changes in properties.

Objectives

3.01 Identify three states of matter:

- Solid.
- Liquid.
- Gas.

3.02 Observe changes in state due to heating and cooling of common materials.
3.03 Explain how heat is produced and can move from one material or object to another.
3.04 Show that solids, liquids and gases can be characterized by their properties.
3.05 Investigate and observe how mixtures can be made by combining solids, liquids or gases and how they can be separated again.
3.06 Observe that a new material is made by combining two or more materials with properties different from the original material.

Competency Goal 4: The learner will conduct investigations and use appropriate technology to build an understanding of the concepts of sound.

Objectives
4.01 Demonstrate how sound is produced by vibrating objects and vibrating columns of air.
4.02 Show how the frequency can be changed by altering the rate of the vibration. (IF)
4.03 Show how the frequency and pitch can be changed by altering the size and shape of a variety of instruments.
4.04 Show how the human ear detects sound by having a membrane that vibrates when sound reaches it. (IF)
4.05 Observe and describe how sounds are made by using a variety of instruments and other "sound makers" including the human vocal cords.

GRADE THREE

Goal

Third grade continues to use the unifying concepts taught in grades K-2 including evidence, explanation, measurement, order and organization, and change. Students at third grade focus on the study of systems as their unit of investigation. They learn that a system is an interrelated group of objects or components that form a functioning unit.

Competency Goal 1: The learner will conduct investigations and build an understanding of plant growth and adaptations.

Objectives

1.01 Explain classification and classify plants. (IF)
1.02 Identify plant parts, including flower and seed. (IF)
1.02 Observe and measure how the quantities and qualities of nutrients, light, and water in the environment affect plant growth.
1.02 Observe and describe how environmental conditions determine how well plants survive and grow in a particular environment.
1.03 Investigate and describe how plants pass through distinct stages in their life cycle including.

- Growth.
- Survival.
- Reproduction.

1.04 Explain why the number of seeds a plant produces depends on variables such as light, water, nutrients, and pollination.
1.05 Observe and discuss how bees pollinate flowers.
1.06 Observe, describe and record properties of germinating seeds.
1.07 Classify animals.
1.08 Discuss different animal habitats.

Competency Goal 2: The learner will conduct investigations to build understanding of soil properties.

Objectives

2.01 Observe and describe the properties of soil:

- Color.
- Texture.
- Capacity to hold water.

2.02 Investigate and observe that different soils absorb water at different rates.
2.03 Determine the ability of soil to support the growth of many plants, including those important to our food supply.
2.04 Identify the basic components of soil:

- Sand.
- Clay.
- Humus.

2.05 Determine how composting can be used to recycle discarded plant and animal material.
2.06 Determine the relationship between heat and decaying plant matter in a compost pile.

Competency Goal 3: The learner will make observations and use

appropriate technology to build an understanding of God's design found in earth/moon/sun systems.

Objectives
3.01 Observe that light travels in a straight line until it strikes an object and is reflected and/or absorbed.
3.02 Observe that objects in the sky have patterns of movement including:

- Sun.
- Moon.
- Stars.

3.03 Using shadows, follow and record the apparent movement of the sun in the sky during the day.
3.04 Use appropriate tools to make observations of the moon. (IF)
3.05 Observe and record the change in the apparent shape of the moon from day to day over several months and describe the pattern of changes. (IF)
3.06 Observe that patterns of stars in the sky stay the same, although they appear to move across the sky nightly.

Competency Goal 4: The learner will conduct investigations and use appropriate technology to build an understanding of the form and function of the skeletal and muscle systems of the human body.

Objectives
4.01 Identify the skeleton as a system of the human body.
4.02 Describe several functions of bones:

- Support.
- Protection.
- Locomotion.

4.03 Describe the functions of different types of joints:

- Hinge.
- Ball and socket.
- Gliding.

4.04 Describe how different kinds of joints allow movement and compare this to the movement of mechanical devices.
4.05 Investigate the role of nutrition in healthy bones and joins.
4.06 Observe and describe how muscles cause the body to move.
4.07 Describe the part of the tongue, eye, and ear. (IF)
4.08 Discuss impairments in any of the senses. (IF)

GRADE FOUR
Goal

The focus for the fourth grade student is on analyzing systems and learning how they work. Thinking about and analyzing systems helps students understand the relationships of mass, energy, objects, and organization.

Competency Goal 1: The learner will make observations and conduct investigations to build an understanding of animal behavior and adaptation.

Objectives

1.01 Observe and describe how all living and nonliving things affect the life of a particular animal including:

- Other animals.
- Plants.
- Weather.
- Climate.

1.02 Observe and record how animals of the same kind differ in some of their characteristics and discuss possible advantages and disadvantages of this variation.

1.03 Observe and discuss how behaviors and body structures help animals survive in a particular habitat. (IF)

- Define ecosystem.
- Explain living and nonliving part of an ecosystem.

1.04 Explain and discuss how humans and other animals can adapt their behavior to live in changing habitats. (IF)

1.05 Compare food chains and food webs. (IF)

1.06 Develop food web. (IF)

Competency Goal 2: The learner will conduct investigations and use appropriate technology to build an understanding of the composition and uses of rocks and minerals.

Objectives

2.01 Describe and evaluate the properties of several minerals.

2.02 Recognize that minerals have a definite chemical composition and structure, resulting in specific physical properties including:

- Hardness.
- Streak color.
- Luster.
- Magnetism.

2.03 Explain how rocks are composed of minerals.
2.04 Show that different rocks have different properties.
2.05 Discuss and communicate the uses of rocks and minerals.
2.06 Classify rocks and rock-forming minerals. (IF)
2.07 Identify and discuss different rocks and minerals in North Carolina including their role in geologic formations and distinguishing geologic regions.

Competency Goal 3: The learner will make observations and conduct investigations to build an understanding of magnetism and electricity.

Objectives
3.01 Observe and investigate the pull of magnets on all materials made of iron and the pushes or pulls on other magnets. (IF)
3.02 Describe and demonstrate how magnetism can be used to generate electricity.
3.03 Design and test an electric circuit as a closed pathway including an energy source, energy conductor, and an energy receiver.
3.04 Explain how magnetism is related to electricity.
3.05 Describe and explain the parts of a light bulb.
3.06 Describe and identify materials that are conductors and nonconductors of electricity.
3.07 Observe and investigate that parallel and series circuits have different characteristics.
3.08 Observe and investigate the ability of electric circuits to produce light, heat, sound, and magnetic effects.
3.09 Recognize lightning as an electrical discharge and show proper safety behavior when lightning occurs.

Competency Goal 4: The learner will conduct investigations and use appropriate technology to build an understanding of how God uses food to provide energy and materials for growth and repair of the body.

Objectives
4.01 Explain why humans require energy to live and grow.
4.02 Show how calories can be used to compare the chemical energy of different foods.
4.03 Discuss how foods provide both energy and nutrients for humans.
4.04 Identify starches and sugars as carbohydrates.
4.05 Determine that foods are made up of a variety of components.
4.06 Discuss health practices, activities, and diets. (IF)
4.07 Label and explain the digestive, circulatory, and respiratory systems. (IF)

GRADE FIVE

Goal

Fifth grade students focus on using evidence, models, and reasoning to form scientific explanations. Evidence consists of observations and data on which scientific explanations are based. Using evidence to understand interactions allows students to predict changes in natural and human-designed systems.

Models are tentative schemes or structures constructed to represent real objects or processes.

Competency Goal 1: The learner will conduct investigations to build an understanding of the interdependence of plants and animals.

Objectives

1.01 Describe and compare several common ecosystems (communities of organisms and their interaction with the environment).
1.02 Identify and analyze the functions of organisms within the population of the ecosystem:

- Producers.
- Consumers.
- Decomposers.

1.03 Explain why an ecosystem can support a variety of organisms.
1.04 Discuss and determine the role of light, temperature, and soil composition in an ecosystem's capacity to support life.
1.05 Determine the interaction of organisms within an ecosystem.
1.06 Explain and evaluate some ways that humans affect ecosystems both positively and negatively.
1.07 Determine how materials are recycled in nature.
1.08 Identify and analyze the part of a plant:

- Roots
- Stems
- Flowers
- Leaves
- Seeds
- Cells

1.09 Learn the reproductive cycle of a plant.

Competency Goal 2: The learner will make observations and conduct investigations of the solar system. (Discovering God's World)

Objectives

2.01 Observe and analyze the movements and patterns of stars.

- Described the method used to measure the distance to a star. (IF)
- Discuss the different qualities of stars – color, brightness, size, and temperature.

2.02 Identify the planets and their unique characteristics.

- Memorize name and order of planets.

2.03 Compare creation with the Big Bang Theory. (ELS)
2.04 Classify and investigate galaxies.
2.05 Make a model of the solar system. (IF)
2.06 Demonstrate lunar and solar eclipses. (IF)
2.07 Identify the two types of telescopes.

Competency Goal 3: The learner will conduct investigations and use

appropriate technology to build an understanding of weather and climate.

Objectives

3.01 Investigate the water cycle including the processes of:

- Evaporation.
- Condensation.
- Precipitation.
- Run-off.

3.02 Discuss and determine how the following are affected by predictable patterns of weather:

- Temperature.
- Wind direction and speed.
- Precipitation.
- Cloud cover.
- Air pressure.

3.03 Describe and analyze the formation of various types of clouds and discuss their relation to weather systems.
3.04 Explain how global atmospheric movement patterns affect local weather.
3.05 Compile and use weather data to establish a climate record and reveal any trends.

Competency Goal 4: The learner will conduct investigations and use appropriate technologies to build an understanding of forces and motion in simple machines. (Discovering God's World)

Objectives

4.01 Determine the motion of an object by following and measuring its position over time.
4.02 Evaluate how pushing or pulling forces can change the position and motion of an object.
4.03 Explain how energy is needed to make machines move.

- Moving air.
- Gravity.

4.04 Determine that an unbalanced force is needed to move an object or change its direction.
4.05 Determine factors that affect motion including:

- Force
- Friction.
- Inertia.
- Momentum

4.06 Build and use a model to solve a mechanical design problem.

- Devise a test for the model.
- Evaluate the results of test.

4.07 Determine how people use simple machines to solve problems. (IF)

- Describe effort, resistance, fulcrum in types of levers, ramps, wheel and axles.
- Give examples of compound and simples machines
- Use a simple machines to show the work (force x distance) is conserved in the system.
- Identify work as a way to measure energy
- Explain that work transfers energy
- Discover the principle of strength
- Differentiate between potential and kinetic energy.

Competency Goal 5: The learner will conduct investigations and use appropriate technologies to build an understanding of light and sound. (Discovering God's World and IF)

1.01 Discover how light and color is related.

- Observe objects through colored filters.
- Show that all colors together make white.
- Memorize color spectrum.

1.02 Discover the laws of reflection.
1.03 Draw ray diagrams to show the line of sight.
1.04 Explain images in convex and concave mirrors.
1.05 Discover that light and sound travel in waves.
1.06 Discover how lenses control light.
1.07 Discover pitch.
1.08 Explain how people hear.
1.09 Explain how sound travels and how it affects humans.

- Construct and use a string phone
- Design and play a rubber band instrument

GRADE SIX

Goal

Sixth grade science builds on the concepts and skills acquired in kindergarten through fifth grade. Instructional design should provide opportunities for understanding: the unifying concepts of science, the strands, conceptual goals and objectives.

Competency Goal 1: The learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.

Objectives

1.01 Identify and create questions and hypotheses that can be answered through scientific investigations.

1.02 Develop appropriate experimental procedures for:

- Given questions.
- Student generated questions.

1.03 Apply safety procedures in the laboratory and in field studies:

- Recognize potential hazards.
- Manipulate materials and equipment.
- Conduct appropriate procedures.

1.04 Analyze variables in scientific investigations:

- Identify dependent and independent.
- Use of a control.
- Manipulate.
- Describe relationships between.
- Define operationally.

1.05 Analyze evidence to:

- Explain observations.
- Make inferences and predictions.
- Develop the relationship between evidence and explanation.

1.06 Use mathematics to gather, organize, and present quantitative data resulting from scientific investigations:

- Measurement.
- Analysis of data.
- Graphing.
- Prediction models.

1.07 Prepare models and/or computer simulations to:

- Test hypotheses.
- Evaluate how data fit.

1.08 Use oral and written language to:

- Communicate findings.
- Defend conclusions of scientific investigations.

1.09 Use technologies and information systems to:

- Research.
- Gather and analyze data.
- Visualize data.
- Disseminate findings to others.

1.10 Analyze and evaluate information from a scientifically literate viewpoint by reading, hearing, and/or viewing:

- Scientific text.
- Articles.
- Events in the popular press.

Competency Goal 2: The learner will demonstrate an understanding of technological design.

Objectives
2.01 Explore evidence that "technology" has many definitions.

- Artifact or hardware.
- Methodology or technique.
- System of production.
- Social-technical system.

2.02 Use information systems to:

- Identify scientific needs, human needs, or problems that are subject to technological solution.
- Locate resources to obtain and test ideas.

2.03 Evaluate technological designs for:

- Application of scientific principles.
- Risks and benefits.
- Constraints of design.
- Consistent testing protocols.

2.04 Apply tenets of technological design to make informed consumer decisions about:

- Products.
- Processes.
- Systems.

Competency Goal 3: The learner will build an understanding of the geological cycles, forces, processes, and agents which shape the lithosphere.

Objectives
3.01 Evaluate the forces that shape the lithosphere including:

- Crustal plate movement.
- Folding and faulting.
- Deposition.
- Volcanic Activity.
- Earthquakes.

3.02 Examine earthquake and volcano patterns.
3.03 Explain the model for the interior of the earth.
3.04 Describe the processes which form and the uses of earth materials.

- Rock cycle.
- Formation of types of rocks (IF)
- Classify and identify minerals. (IF)
- Economic use of rocks and minerals.
- Value of gems and precious metals.
- Identify common gems, minerals, precious metals and rocks found in N.C. (IF)

3.05 Analyze soil properties that can be observed and measured to predict soil quality including:

- Color.
- Horizon profile.
- Infiltration.
- Soil temperature.
- Structure.
- Consistency.
- Texture.
- Particle size.
- pH.
- Fertility.
- Soil moisture.

3.06 Evaluate ways in which human activities have affected Earth's pedosphere

and the measures taken to control the impact:

- Vegetative cover.
- Agriculture.
- Land use.
- Nutrient balance.
- Soil as a vector.

3.07 Assess the use of technology and information systems in monitoring lithospheric phenomenon.
3.08 Conclude that the good health of environments and organisms requires:

- Monitoring of the pedosphere.
- Taking steps to maintain soil quality.
- Stewardship.

Competency Goal 4: The learner will investigate the cycling of matter.

Objectives
4.01 Describe the flow of energy and matter in natural systems:

- Energy flows through ecosystems in one direction, from the sun through producers to consumers to decomposers.
- Matter is transferred from one organism to another and between organisms and their environments.
- Water, nitrogen, carbon dioxide, and oxygen are substances cycled between the living and non-living environments.
- Study protists and fungi. (Concordia)
- Classify bacteria and viruses. (Concordia)

4.02 Evaluate the significant role of decomposers.
4.03 Examine evidence and explain the function of food-making plants. (IF)

- Photosynthesis is a process carried on by green plants and other organisms containing chlorophyll.
- During photosynthesis, light energy is converted into stored energy which the plant, in turn, uses to carry out its life processes.

4.04 Evaluate the significance of photosynthesis to other organisms:

- The major source of atmospheric oxygen is photosynthesis.
- Carbon dioxide is removed from the atmosphere and oxygen is released during photosynthesis.
- Green plants are the producers of food that is used directly or indirectly by consumers.

4.05 Evaluate designed systems for ability to enable growth of certain plants and

animals.

- Observing animal and plant cells. (IF)
- Explore life process of cells. (IF)

Competency Goal 5: The learner will conduct investigations and examine models and devices to build an understanding of the characteristics of energy transfer and/or transformation.

Objectives
5.01 Determine how convection and radiation transfer energy.
5.02 Analyze heat flow through materials or across space from warm objects to cooler objects until both objects are at equilibrium.
5.03 Analyze sound as an example that vibrating materials generate waves that transfer energy.

- Frequency.
- Amplitude.
- Loudness.
- How sound travels through different material.
- Form and function of the human ear.

5.04 Evaluate data for qualitative and quantitative relationships associated with energy transfer and/or transformation.
5.05 Analyze the physical interactions of light and matter:

- Absorption.
- Scattering.
- Color perception.
- Form and function of the human eye.

5.06 Analyze response to heat to determine the suitability of materials for use in technological design:

- Conduction.
- Expansion.
- Contraction.

5.07 Analyze the Law of Conservation of Energy:

- Conclude that energy cannot be created or destroyed, but only changed from one form into another.
- Conclude that the amount of energy stays the same, although within the process some energy is always converted to heat.
- Some systems transform energy with less loss of heat than others.

Competency Goal 6: The learner will conduct investigations and use technologies and information systems to build an understanding of population dynamics.

Objectives
6.01 Describe ways in which organisms interact with each other and with non-living parts of the environment:

- Coexistence/Cooperation/Competition.
- Symbiosis.
- Mutual dependence.

6.02 Investigate factors that determine the growth and survival of organisms including:

- Light.
- Temperature range.
- Mineral availability.
- Soil/rock type.
- Water.
- Energy.

6.03 Explain how changes in habitat may affect organisms.
6.04 Evaluate data related to human population growth, along with problems and solutions:

- Waste disposal.
- Food supplies.
- Resource availability.
- Transportation.
- Socio-economic patterns.

6.05 Examine evidence that overpopulation by any species impacts the environment.
6.06 Investigate processes which, operating over long periods of time, have resulted in the diversity of plant and animal life present today:

- Natural selection.
- Adaptation.

Competency Goal 7: The learner will conduct investigations and utilize appropriate technologies and information systems to build an understanding of the hydrosphere.

Objectives
7.01 Analyze the unique properties of water including:

- Universal solvent.
- Cohesion and adhesion.
- Polarity.
- Density and buoyancy.

- Specific heat.

7.02 Explain the structure of the hydrosphere including:

- Water distribution on earth.
- Local river basin.
- Local water availability.

7.03 Evaluate evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms:

- Estuaries.
- Marine ecosystems.
- Upwelling.
- Behavior of gases in the marine environment.
- Value and sustainability of marine resources.
- Deep ocean technology and understandings gained.

7.04 Describe how terrestrial and aquatic food webs are interconnected.
7.05 Analyze hydrospheric data over time to predict the health of a water system including:

- Temperature.
- Dissolved oxygen.
- pH.
- Nitrates.
- Turbidity.
- Bio-indicators.

7.06 Evaluate technologies and information systems used to monitor the hydrosphere.
7.07 Describe how humans affect the quality of water:

- Point and non-point sources of water pollution in North Carolina.
- Possible effects of excess nutrients in North Carolina waters.
- Economic trade-offs.
- Local water issues.

7.08 Recognize that the good health of environments and organisms requires:

- Monitoring of the hydrosphere.
- Water quality standards.
- Methods of water treatment.
- Maintaining safe water quality.
- Stewardship of God’s gift of water. (IF)

Competency Goal 8: The learner will conduct investigations and utilize

appropriate technologies and information systems to build an understanding of matter, value, mass, and density.
Objectives 8.01 Observe and compare the different characteristics of matter. • Investigate the structure of matter. • Describe how energy affected matter. 8.02 Investigate and classify different kinds of matter. • Metals • Elements • Compounds • Mixtures 8.03 Describe the states of matter.
Competency Goal 9: The learner will conduct investigations and utilize appropriate technologies and information systems to build an understanding of forces and motion.
Objectives 9.01 Define motion and describe how it changes. 9.02 Define gravity and its components. • Measure the force of gravity • Air resistance • Free falling 9.03 Study Newton's Laws of Motion. • Affect of forces on motion • Affect of friction on motion 9.04 Learn how forces are used in real life. • Action-reaction • Flight • Floating

GRADE SEVEN

Goal

Seventh grade science builds on the concepts and skills acquired in kindergarten through sixth grade. Instructional design should provide opportunities for understanding: the unifying concepts of science, the strands, conceptual goals and objectives.

Competency Goal 1: The learner will design and conduct investigations to demonstrate an understanding of scientific inquiry that God has provided.
Objectives 1.01 Identify and create questions and hypotheses that can be answered through scientific investigations.

1.02 Develop appropriate experimental procedures for:

- Given questions.
- Student generated questions.

1.03 Apply safety procedures in the laboratory and in field studies:

- Recognize potential hazards.
- Manipulate materials and equipment.
- Conduct appropriate procedures.

1.04 Analyze variables in scientific investigations:

- Identify dependent and independent.
- Use of a control.
- Manipulate.
- Describe relationships between.
- Define operationally.

1.05 Analyze evidence to:

- Explain observations.
- Make inferences and predictions.
- Develop the relationship between evidence and explanation.

1.06 Use mathematics to gather, organize, and present quantitative data resulting from scientific investigations:

- Measurement.
- Analysis of data.
- Graphing.
- Prediction models.

1.07 Prepare models and/or computer simulations to:

- Test hypotheses.
- Evaluate how data fit.

1.08 Use oral and written language to:

- Communicate findings.
- Defend conclusions of scientific investigations.

1.09 Use technologies and information systems to:

- Research.
- Gather and analyze data.

- Visualize data.
- Disseminate findings to others.

1.10 Analyze and evaluate information from a scientifically literate viewpoint by reading, hearing, and/or viewing:

- Scientific text.
- Articles.
- Events in the popular press.

Competency Goal 2: The learner will demonstrate an understanding of technological design.

Objectives

2.01 Explore evidence that "technology" has many definitions.

- Artifact or hardware.
- Methodology or technique.
- System of production.
- Social-technical system.

2.02 Use information systems to:

- Identify scientific needs, human needs, or problems that are subject to technological solution.
- Locate resources to obtain and test ideas.

2.03 Evaluate technological designs for:

- Application of scientific principles.
- Risks and benefits.
- Constraints of design.
- Consistent testing protocols.

2.04 Apply tenets of technological design to make informed consumer decisions about:

- Products.
- Processes.
- Systems.

Competency Goal 3: The learner will conduct investigations, use models, simulations, and appropriate technologies and information systems to build an understanding of God's creation of the complementary nature of the human body system.

Objectives

3.01 Analyze how human body systems interact to provide for the needs of the human organism: (IF)

- Musculoskeletal.
- Cardiovascular.
- Endocrine and Nervous.
- Digestive and Circulatory.
- Excretory.
- Reproductive.
- Respiratory.
- Immune.
- Nervous system.

3.02 Describe how systems within the human body are defined by the functions it performs.
3.03 Explain how the structure of an organ is adapted to perform specific functions within one or more systems.

- Liver.
- Heart.
- Lung.
- Brain
- Stomach.
- Kidney.

3.04 Evaluate how systems in the human body help regulate the internal environment.
3.05 Analyze how an imbalance in homeostasis may result from a disruption in any human system.
3.06 Describe growth and development of the human organism.
3.07 Explain the effects of environmental influences on human embryo development and human health including: (IF)

- Smoking.
- Alcohol.
- Drugs.
- Diet.

3.08 Explain how understanding human body systems can help make informed decisions regarding health.
3.09 Identify evidence that some chemicals may contribute to human health conditions including:

- Cancer.
- Autoimmune disease.
- Birth defects.
- Heart disease.

- Diabetes.
- Learning and behavioral disorders.
- Kidney disease.
- Asthma.

3.10 Describe factors that determine the effects a chemical has on a living organism including:

- Exposure.
- Potency.
- Dose and the resultant concentration of chemical in the organism.
- Individual susceptibility.
- Possible means to eliminate or reduce effects.

3.11 Describe risks and benefits of chemicals including:

- Medicines.
- Food preservatives.
- Crop yield.
- Sanitation.

Competency Goal 4: The learner will conduct investigations and utilize appropriate technologies and information systems to build an understanding of heredity and genetics.

Objectives
4.01 Explain the significance of genes to inherited characteristics:

- Genes are the units of information.
- Parents transmit genes to their offspring.
- Some medical conditions and diseases are genetic.

4.02 Explain the significance of reproduction:

- Sorting and recombination of parents' genetic material.
- Potential variation among offspring.

4.03 Identify examples and patterns of human genetic traits:

- Dominant and recessive.
- Incomplete dominance.

4.04 Analyze the role of probability in the study of heredity:

- Role of each parent in transfer of genetic traits.
- Analysis of pedigrees.

4.05 Summarize the genetic transmittance of disease.
4.06 Evaluate evidence that human characteristics are a product of:

- Creation. (IF)
- Inheritance.
- Environmental factors, and
- Lifestyle choices.

Competency Goal 5: The learner will conduct investigations, use models, simulations, and appropriate technologies and information systems to build an understanding of cell theory.

Objectives
5.01 Describe cell theory: (IF)

- All living things are composed of cells.
- Cells provide structure and carry on major functions to sustain life.
- Some organisms are single cell; other organisms, including humans, are multi-cellular.
- Cell function is similar in all living things.

5.02 Analyze structures, functions, and processes within animal cells for:

- Capture and release of energy.
- Feedback information.
- Dispose of wastes.
- Reproduction.
- Movement.
- Specialized needs.

5.03 Compare life functions of protists:

- Euglena.
- Amoeba.
- Paramecium.
- Volvox.

5.04 Conclude that animal cells carry on complex chemical processes to balance the needs of the organism.

- Cells grow and divide to produce more cells.
- Cells take in nutrients to make the energy for the work cells do.
- Cells take in materials that a cell or an organism needs.

Competency Goal 6: The learner will conduct investigations, use models, simulations, and appropriate technologies and information systems to build an

understanding of microbiology.
Objectives 6.01 Compare and contrast microbes: • Size, shape, structure. • Whether they are living cells. 6.02 Describe diseases caused by microscopic biological hazards including: • Viruses. • Bacteria. • Parasites. • Contagions. • Mutagens. 6.03 Analyze data to determine trends or patterns to determine how an infectious disease may spread including: • Carriers. • Vectors. • Conditions conducive to disease. • Calculate reproductive potential of bacteria. 6.04 Evaluate the human attempt to reduce the risk of and treatments for microbial infections including: • Solutions with anti-microbial properties. • Antibiotic treatment. • Research. 6.05 Investigate aspects of biotechnology including: • Specific genetic information available. • Careers. • Economic benefits to North Carolina. • Ethical issues. • Impact for agriculture
Competency Goal 7: The learner will conduct investigations, use models, simulations, and appropriate technologies and information systems to build an understanding of animals.
Objectives 7.01 Study various classifications of animal kingdoms. 7.02 Explore sponges, cnidarians, and worms. 7.03 Describe and explain mollusks, arthropods, and echinoderms. 7.04 Study fishes, amphibians, and reptiles.

7.05 Explore birds and mammals.
7.06 Compare reproduction across the animal kingdom. (IF)
7.07 Explore various responses of living things to stimuli. (IF)
7.08 Explain life cycles of common animals. (IF)
7.09 Investigate animal diversity. (IF)
7.10 Compare transportation and respiration. (IF)

GRADE EIGHT

Goal

Eighth grade science builds on the concepts and skills acquired in kindergarten through seventh grade. Instructional design should provide opportunities for understanding: the unifying concepts of science, the strands, conceptual goals and objectives.

Competency Goal 1: The learner will design and conduct investigations to demonstrate an understanding of scientific inquiry.

Objectives

1.01 Identify and create questions and hypotheses that can be answered through scientific investigations.

1.02 Develop appropriate experimental procedures for:

- Given questions.
- Student generated questions.

1.03 Apply safety procedures in the laboratory and in field studies:

- Recognize potential hazards.
- Manipulate materials and equipment.

- Conduct appropriate procedures.

1.04 Analyze variables in scientific investigations:

- Identify dependent and independent.
- Use of a control.
- Manipulate.
- Describe relationships between.
- Define operationally.

1.05 Analyze evidence to:

- Explain observations.
- Make inferences and predictions.
- Develop the relationship between evidence and explanation.

1.06 Use mathematics to gather, organize, and present quantitative data resulting from scientific investigations:

- Measurement.
- Analysis of data.
- Graphing.
- Prediction models.

1.07 Prepare models and/or computer simulations to:

- Test hypotheses.
- Evaluate how data fit.
- Make predictions.

1.08 Use oral and written language to:

- Communicate findings.
- Defend conclusions of scientific investigations.
- Describe strengths and weaknesses of claims, arguments, and/or data

1.09 Use technologies and information systems to:

- Research.
- Gather and analyze data.
- Visualize data.
- Disseminate findings to others.

1.10 Analyze and evaluate information from a scientifically literate viewpoint by reading, hearing, and/or viewing:

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- Articles.
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Competency Goal 2: The learner will demonstrate an understanding of technological design.

Objectives
2.01 Explore evidence that "technology" has many definitions.

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2.02 Use information systems to:

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2.03 Evaluate technological designs for:

- Application of scientific principles.
- Risks and benefits.
- Constraints of design.
- Consistent testing protocols.

2.04 Apply tenets of technological design to make informed consumer decisions about:

- Products.
- Processes.
- Systems.

Competency Goal 4: The learner will conduct investigations and utilize technology and information systems to build an understanding of chemistry.

Objectives
4.01 Understand that both naturally occurring and synthetic substances are chemicals.
4.02 Evaluate evidence that elements combine in a multitude of ways to produce compounds that account for all living and nonliving substances.
4.03 Explain how the periodic table is a model for:

- Classifying elements.
- Identifying the properties of elements.
- Write chemical sentences and equations. (IF)
- Build molecules for the first 20 atoms. (IF)
- Carbon chemistry.

4.04 Develop an understanding of how scientific processes have led to the current atomic theory. (IF)

- Dalton's atomic theory.
- J.J. Thomson's model of the atom.
- Rutherford's gold foil experiment
- Bohr's planetary model.
- Electron cloud model.

4.05 Examine the nature of atomic structure: (IF)

- Protons.
- Neutrons.
- Electrons.
- Atomic mass.
- Atomic number.
- Isotopes.

4.06 Identify substances through the investigation of physical properties:

- Density.
- Melting point.
- Boiling point.

4.07 Write chemical sentences for chemical changes. (IF)

4.08 Describe the behavior of acids and bases. (IF)

4.07 Describe the suitability of materials for use in technological design:

- Electrical Conductivity. (IF)
- Density.
- Magnetism.
- Solubility.
- Malleability.

4.08 Identify substances based on characteristic physical properties:

- Solids, liquids, and gases
- Density.

- Boiling/Melting points.
- Solubility.
- Chemical reactivity.
- Specific heat.

4.09 Describe and measure quantities related to chemical/physical changes within a system:

- Temperature.
- Volume.
- Mass.
- Precipitate.
- Gas production.

4.10 Identify evidence supporting the law of conservation of matter.

- During an ordinary chemical reaction matter cannot be created or destroyed.
- In a chemical reaction, the total mass of the reactants equals the total mass of the products mass of the products.

4.11 Analyze the periodic trends in the physical and chemical properties of elements.

- Groups (families).
- Periods.

4.12 Investigate and analyze the formation and nomenclature of simple inorganic compounds.

- Ionic bonds (including oxidation numbers).
- Covalent bonds.
- Metallic bonds.

4.13 Identify the reactants and products of chemical reactions and balance simple equations of various types:

- Single replacement.
- Double replacement.
- Decomposition.
- Synthesis.

4.14 Measure and analyze the indicators of chemical change including:

- Development of a gas.
- Formation of a precipitate.
- Release/absorption of energy (heat or light).

4.15 Investigate and analyze the properties and composition of solutions:

- Solubility curves.
- Concentration.
- Polarity.
- pH scale.
- Electrical conductivity.

4.16 Describe and explain radioactivity and its practical application as an alternative energy source:

- Alpha, beta, and gamma decay.
- Fission.
- Fusion.
- Nuclear waste.

Competency Goal 5: The learner will conduct investigations, use models, simulations, and appropriate technologies and information systems to build an understanding of motion and forces. (IF)

Objectives
5.01 Demonstrate ways that simple machines can change force.
5.02 Analyze simple machines for mechanical advantage and efficiency.
5.03 Evaluate motion in terms of Newton's Laws:

- The force of friction retards motion.
- For every action there is an equal and opposite reaction.
- The greater the force, the greater the change in motion.
- An object's motion is the result of the combined effect of all forces acting on the object:
- A moving object that is not subjected to a force will continue to move at a constant speed in a straight line
- An object at rest will remain at rest.

5.04 Analyze that an object's motion is always judged relative to some other object or point.
5.05 Describe and measure quantities that characterize moving objects and their interactions within a system:

- Time.
- Distance.
- Mass.

- Force.
- Velocity.
- Center of mass.
- Acceleration.

5.06 Investigate and analyze the real world interactions of balanced and unbalanced forces:

- Sports and recreation.
- Transportation.
- The human body.

Competency Goal 6: The learner will analyze energy and its conservation.

Objectives

6.01 Investigate and analyze storage of energy:

- Kinetic energy.
- Potential energies: gravitational, chemical, electrical, elastic, nuclear.
- Thermal energy.

6.02 Investigate and analyze transfer of energy by work:

- Force.
- Distance.

6.03 Investigate and analyze transfer of energy by heating:

- Thermal energy flows from a higher to a lower temperature.
- Energy will not spontaneously flow from a lower temperature to a higher temperature.
- It is impossible to build a machine that does nothing but convert thermal energy into useful work.

6.04 Investigate and analyze the transfer of energy by waves:

- General characteristics of waves: amplitude, frequency, period, wavelength, velocity of propagation.
- Mechanical waves.
- Sound waves.
- Electromagnetic waves (radiation).

Competency Goal 7: The learner will construct an understanding of electricity and magnetism.

Objectives

7.01 Investigate and analyze the nature of static electricity and the conservation

of electrical charge:

- Positive and negative charges.
- Opposite charges attract and like charges repel.
- Analyze the electrical charging of objects due to the transfer of charge.

7.02 Investigate and analyze direct current electrical circuits:

- Ohm's law.
- Series circuits.
- Parallel circuits.

7.03 Investigate and analyze magnetism and the practical applications of the characteristics of magnets.

- Permanent magnets
- Electromagnetism
- Movement of electrical charges

Competency Goal 8: The learner will develop an understanding of wave motion and the wave nature of sound and light.

Objectives
8.01 Analyze, investigate, and evaluate the relationship among the characteristics of waves: (IF)

- Wavelength.
- Frequency.
- Period.
- Amplitude.

8.02 Describe the behavior of waves in various media.
8.03 Analyze the behavior of waves at boundaries between media:

- Reflection, including the Law of Reflection.
- Refraction, including Snell's Law.

8.04 Analyze the relationship between the phenomena of interference and the principle of superposition.
8.05 Analyze the frequency and wavelength of sound produced by a moving source (the Doppler Effect).
8.06 Examine the electromagnetic spectrum.

Competency Goal 9: The learner will build an understanding of static electricity and direct current electrical circuits.

Objectives
Objectives

9.01 Analyze the nature of electrical charges.

- Investigate the electrical charging of objects due to transfer of charge.
- Investigate the conservation of electric charge.
- Analyze the relationship among force, charge and distance summarized in Coulomb's law.

9.02 Analyze and measure the relationship among potential difference, current, and resistance in a direct current circuit.
9.03 Analyze and measure the relationship among current, voltage, and resistance in circuits.

- Series.
- Parallel.
- Series-parallel combinations.

9.04 Analyze and measure the nature of power in an electrical circuit.