SCIENCE 2012

INTRODUCTION

The Science Curriculum is intended for use in all Catholic elementary and middle schools in the Diocese of Raleigh. It is the framework that should guide instruction with textbooks and other materials used as resources. The Curriculum is aligned to the *North Carolina Essential Standards* and includes additional Standards and Objectives as deemed appropriate by the Curriculum Committee for enhancement of instruction in Catholic Schools. The Curriculum allows for depth of study in areas of focus at each grade level. However, it is understood that certain constraints at the local level may interfere with implementing the curriculum in the sequence in which it is written. If Standards and Objectives are not met in the year recommended, the Catholic Schools Office mandates that content for elementary students be taught by the end of Grade 5 and all middle school content by the end of Grade 8.

To effectively implement the curriculum the teacher must first be familiar the format:

Values and Attitudes highlight key principles that will enable students to develop a critical conscience in each content area and recognize that all subjects must be viewed in the light of Gospel teachings. Values and Attitudes are the first Strand of every grade level. They are not necessarily quantifiable but rather identified in a student's respect toward the content area.

Strands are the five overarching areas that connect topics throughout grade levels:

- Strand A Values and Attitudes
- Strand B Physical Science ~ Forces and Motion; Matter; Energy
- Strand C Life Science ~ Ecosystems; Structures and Functions; Evolution and Genetics; Biology; Molecular Biology
- Strand D Earth Science ~ Earth Systems, Structures and Processes; Earth in the Universe; Earth History
- Strand E Science Process Skills

Essential Standards and Objectives (column 1 and 2) are closely related and explain what a student should know and be able to apply in the Strand. The Standard is the broad concept. They increase in complexity from grade to grade. The Essential Standards are noted in parenthesis, e.g., K.E.1 = Kindergarten.Earth.Standard 1. The Curriculum Committee recommended after intense review to modify some of the standards for clarity of understanding. They also suggested the inclusion of additional standards that had not been identified but relevant to the grade. Modifications to Essential Standards are indicated in ***bold*** and ***italicized***.

Strategies (column 3) are methods for a teacher to provide the most effective authentic experiences for students. Decisions for the selection of strategies are at the discretion of the teacher. This blank column provides space to document and comment on the methods used for implementation.

Assessment provides accountability for the progress of student learning. It is a means of determining the level of proficiency that a student has developed with an idea, skill or concept. Assessment also provides a means of evaluating the lessons for future instructional planning.

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GRADE 4 SCIENCE

STRAND A Values And Attitudes

Catholic Schools exist so that curriculum may be taught in the light of Gospel teachings. Teachers must reinforce Gospel truths and values so that students may serve as witnesses to their Catholic faith. The values listed below will help students develop a critical conscience in every content area. Values and Attitudes are not necessarily quantifiable but rather identified in a student's respect toward the content area.

- All people are created with minds and the gift to reason.
- God makes each of us as a unique individual.
- Recognize our talents and share them with one another in order to do God's will.
- There is a sense of order, balance and symmetry in God's universe.
- God provides us with all we need to survive. We must appreciate, care for, and protect these gifts through conservation, preservation, and stewardship of natural resources.
- All living things are dependent on their environment to sustain life.
- The Earth is dynamic and resilient, yet fragile and finite.
- Demonstrate a respect for all forms of life and a growing appreciation for the beauty and diversity of God's world.
- Demonstrate responsible and ethical behavior that exemplifies Catholic values, including respect for all life.

(The first three bullets are common to all areas of curriculum.)

STRAND B Physical Science

Forces in Motion		
ESSENTIAL STANDARDS	**OBJECTIVES**	**STRATEGIES**
1. Understand how the forces of magnetism and electricity affect the motion of an object.	1.1 Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them. (4.P.1.1)	
	1.2 Explain how electrically charged objects push or pull on other electrically charged objects and produce motion. (4.P.1.2)	

Matter, Properties and Change		
ESSENTIAL STANDARDS	**OBJECTIVES**	**STRATEGIES**
2. Understand the composition and properties of matter before and after they undergo a change or interaction. (4.P.2)	2.1 Compare physical properties of solid matter: (strength, hardness, flexibility, ability to conduct heat, ability to conduct electricity, ability to be attracted by magnets, reactions to water and fire). (4.P.2.1)	
	2.2 Recognize changes in physical properties.	

Physical Science (continued)

Energy: Conservation And Transfer		
ESSENTIAL STANDARDS	**OBJECTIVES**	**STRATEGIES**
3. Understand how a simple circuit works.	3.1 Design and construct a simple electric circuit as a complete pathway with an energy source, energy receiver, and energy conductor.	
	3.2 Show the ability of electric circuits to produce light, heat, sound and magnetic effects.	
	3.3 Analyze the parts of a light bulb.	
4. Recognize that energy takes various forms that may be grouped based on their interaction with matter. (4.P.3)	4.1 Recognize the basic forms of energy (light, sound, heat, electrical, and magnetic) as the ability to cause motion or create change. (4.P.3.1)	
	4.2 Recognize that light travels in a straight line until it strikes an object or travels from one medium to another, and that light can be reflected, refracted, and absorbed. (4.P.3.2)	

STRAND C Earth Science

Earth Systems, Structures and Processes		
ESSENTIAL STANDARD	**OBJECTIVES**	**STRATEGIES**
1. Understand the composition and properties of minerals and rocks, as well as the structures of Earth's surfaces (landforms).	1.1 Compare the Earth's saltwater and freshwater features including: oceans, seas, rivers, lakes, ponds, streams, and glaciers. (3.E.2.1)	
	1.2 Compare Earth's land features including: volcanoes, mountains, valleys, canyons, caverns, and islands, by using models, pictures, diagrams, and maps. (3.E.2.2)	
	1.3 Understand how rocks change over time; what can be learned from these changes; and, how they are used.	
	1.4 ***Understand tests used to identify the properties of minerals.*** Explain how minerals are identified using tests for the physical properties of hardness, color, luster, cleavage and streak. (4.P.2.2)	
	1.5 ***Analyze the mineral composition of rocks.*** Classify rocks as metamorphic, sedimentary or igneous based on their composition, how they are formed and the processes that create them. (4.P.2.3)	

Earth History		
ESSENTIAL STANDARDS	**OBJECTIVES**	**STRATEGIES**
2. ***Recognize how fossils can provide information about organisms of the past and*** is evidence of the history of Earth and its changing life forms. (4.E.2)	2.1 Identify the information that can be interpreted from tracks and footprints.	
	2.2 Compare fossils (including molds, casts, and preserved parts of plants and animals) to one another and to living organisms. (4.E.2.1)	
	2.3 Discuss ideas about Earth's early environment from fossils of plants and animals that lived long ago. (4.E.2.2)	
	2.4 Give examples of how the surface of the earth changes due to slow processes such as erosion and weathering, and rapid processes such as landslides, volcanic eruptions, and earthquakes. (4.E.2.3)	

STRAND D Life Science

Ecosystems		
ESSENTIAL STANDARDS	**OBJECTIVES**	**STRATEGIES**
1. Understand environmental changes, adaptations and behaviors that enable ***organisms*** (including humans) to survive in changing habitats. (4.L.1)	1.1 Understand how organisms are adapted to their environment.	
	1.2 Identify animal behaviors and body structures that have specific growth and survival functions in a particular habitat.	
	1.3 Evaluate living and nonliving things that affect animal life including: other animals, plants, climate, water, air, location.	
	1.4 Give examples of changes in an organism's environment that are beneficial to it and some that are harmful. (4.L.1.1)	
	1.5 Explain how animals meet their needs by using behaviors in response to information received from the environment. (4.L.1.2)	
	1.6 Explain how humans can adapt their behavior to live in changing habitats, e.g., recycling wastes, establishing rain gardens, planting native species to prevent flooding and erosion. (4.L.1.3)	
	1.7 Explain how differences among animals of the same population sometimes give individuals an advantage in surviving and reproducing in changing habitats. (4.L.1.4)	
2. Describe ecosystems and related environmental conditions found in different areas of North Carolina.	2.1 Compare and contrast the components of environment to Ecosystem of three regions of North Carolina.	

Molecular Biology		
ESSENTIAL STANDARDS	**OBJECTIVES**	**STRATEGIES**
3. Understand human needs for nutritional energy. (4.L.2)	3.1 Understand food and as energy.	
	3.2 Classify substances as food or non-food items based on their ability to provide energy and materials for survival, growth and repair of the body. (4.L.2.1)	
	3.3 Understand the effects of healthy and unhealthy food choices.	
	3.4 Explain the role of vitamins, minerals and exercise in maintaining a healthy body. (4.L.2.2)	

STRAND E Process Skills (Grade 4 appropriate skills necessary for asking meaningful questions and conducting careful investigation.)

PLANNING INVESTIGATIONS	COLLECTING DATA	INTERPRETING RESULTS	SAFETY
• Use observations of the environment to ask and answer a scientific question.	• Record data for a scientific investigation.	• Carry out the scientific method by making predictions, collecting data, analyzing data and drawing a conclusion about the results.	• Understand the importance of safety in science and follow simple safety rules and behavior including listening and asking questions.
• Work in groups to plan and conduct a simple investigation.	• Classify objects using specific criteria.	• Draw conclusions about predictions and results in a scientific investigation.	
• Predict the outcome of an investigation based on observation and/or experience.	• Collect data, compare and contrast data, draw conclusions.		
• Formulate and justify predictions based on cause and effect relationships.	• Collect data and measurements with increasing accuracy using more sophisticated instruments such as a graduated cylinder, triple beam balance, and microscope.		
	• Recognize variable and constants in a scientific investigation.		
	• Develop tables and graphs, based on data collected; develop questions as a result of data collected.		

TOPICS BY GRADE

PHYSICAL SCIENCE	K	1	2	3	4	5	6	7	8
FORCES AND MOTION	Position and motion of objects	How forces affect motion	Relationship between sound and vibration	Motion and factors that affect motion	Motion due to magnetism and electricity	Force and motion in relation to simple machines	Waves and energy	Effects of forces on motion and graphical representations	Relationship between sound and energy
MATTER: PROPERTIES AND CHANGE	Physical properties of objects		Physical properties; changes in solids and liquids	Structure and properties of matter Water cycle	Composition and properties before and after a change	Interaction of matter and energy	Structure and physical properties of matter		Chemical and physical properties of matter
ENERGY: CONSERVATION TRANSFER				Energy transfer from object to object	Simple circuits Different forms of energy	Property changes due to heating and cooling	Energy transfer and interactions with matter	Forms, transfer and transformation and conservation of energy	Environmental issues of obtaining, managing and using energy
EARTH SCIENCE	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
EARTH SYSTEMS, STRUCTURES AND PROCESSES	Change and patterns of weather	Physical properties of earth materials	Patterns and factors that affect weather Need for clean air		Composition and properties of minerals and rocks Landforms	Weather patterns and phenomena	Structure and changes in the Earth's surface over time Properties of soil	Cycling of matter in Earth's atmosphere and effect on weather, climate and humans Air Quality	Earth's hydrosphere Humans impact and effects on the hydrosphere
EARTH IN THE UNIVERSE		Features and patterns of sun/earth/moon system		Components and patterns of the solar system Causes of day and night Phases of moon			Solar System Structure and motions of celestial bodies Space technology spin-off		
EARTH HISTORY					Fossils as evidence of earth's history				Evidence of change recorded in fossils and landforms

TOPICS BY GRADE

LIFE SCIENCE	K	1	2	3	4	5	6	7	8
ECOSYSTEMS		Characteristics of environments Characteristics of living organisms Needs of living organisms	Characteristics and resources of environments	Needs of plants for survival	Factors enabling organisms to survive in different environments North Carolina ecosystems	Interdependence of living organisms Organisms in an ecosystem	Flow of energy through ecosystems		Organisms interactions and response to components in the environment
STRUCTURES AND FUNCTIONS OF LIVING ORGANISMS	Living and non-living objects		Animal life cycles	Plant life cycles Essential components of human body systems		Structures and systems necessary to perform life functions	Structures, processes and behaviors of plants Plant parts	Processes, structures and functions of organisms for survival and reproduction	Hazards of agents of disease Biological particles that cause disease Biotechnology used for living organisms
EVOLUTION AND GENETICS			Differences and similarities between parents and their young			Why organisms have similarities and differences to their parents		Cellular reproduction, inheritance and external factors to variation in offspring Ethical and scientific issues of research and application of genetic alterations	Evidence, theories, and processes of the evolution of organisms and landforms
MOLECULAR BIOLOGY					Need for nutritional energy				

SCIENCE PROCESS SKILLS ~ GRADES K to 5

Concept: Science process skills need to be practiced in the learning of science content.

	K	1	2	3	4	5
PLANNING INVESTIGATIONS	• Observe, ask questions, predict.	• Observe, ask questions, predict and investigate.	• Ask questions and explore ways to get answers through simple investigation.	• Use observations of the environment to ask and answer a scientific question.	• Use observations of the environment to ask and answer a scientific question.	• Recognize and ask testable questions.
	• Describe relative position of objects to a reference point.	• Follow oral instructions for a scientific investigation.	• Follow oral instructions for a scientific investigation.	• Follow written instructions for scientific investigation.	• Work in groups to plan and conduct a simple investigation	• Based on student-developed questions, students should write simple instructions to carry out a procedure to follow.
	• Predict.	• Predict.	• Predict the outcome of an investigation based on observations as opposed to guessing.	• Predict the outcome of an investigation based on observation and/or experience. .	• Predict the outcome of an investigation based on observation and/or experience.	• Investigate predictions by conducting multiple trials for consistent results.
				• Collect and recognize patterns in data to make a conclusion about the data.	• Formulate and justify predictions based on cause and effect relationships.	• Understand cause and effect relationships.
COLLECTING DATA	• Observe a variety of materials using all five senses.	• Explore a variety of materials using all senses to make observations.	• Collect data from observations using the senses to classify objects.	• Recognize patterns in data to make a conclusion about the data.	• Record data for a scientific investigation.	• Keep accurate records of data over time for a scientific investigation.
	• Identify multiple physical properties of common objects.	• Classify physical properties of common objects.	• Classify physical properties of common objects.	• Classify objects using specific criteria.	• Classify objects using specific criteria.	• Classify objects using specific criteria.
	• Collect and sort common objects by one physical attribute.	• Use observed physical characteristics to classify objects.	• Compare and sort common objects according to two or more physical attributes.	• Collect data, compare and contrast data.	• Collect data, compare and contrast data, draw conclusions.	• Make predictions, collect and analyze data, and draw conclusions.
	• Identify tools used in science to measure length, weight and temperature, e.g., ruler, balance, thermometer.	• Use simple tools appropriately, such as magnifiers, thermometers, rulers, and balances to observe and measure objects.	• Use simple tools, such as magnifiers, thermometers, rulers, and balances to observe and measure objects.	• Use scientific instruments such as magnifiers thermometers, glassware, clamps, balances and stopwatches to collect data and take measurements.	• Collect data and measurements with increasing accuracy using more sophisticated instruments such as a graduated cylinder, triple beam balance, and microscope.	• Determine appropriate tools to make quantitative measurements including calculators, computers, graduated cylinders, balances, meter sticks, and stopwatches.

	K	1	2	3	4	5
COLLECTING DATA (continued)					• Recognize variable and constants in a scientific investigation.	• Recognize that a single independent variable must exist to provide a conclusion in an investigation.
	• Create simple graphs as a group.	• Create simple graphs as a group.	• Construct bar graphs to record data using appropriately labeled axes and titles.	• Construct bar graphs to record data using appropriately labeled axes and titles.	• Develop tables and graphs. based on data collected; develop questions as a result of data collected.	• Identify the elements such as labels, title, graph key, to construct a line graph with the proper scale and spacing.
						• Interpret data from a bar, circle and line graph and decide which type of graph best displays given data.
INTERPRETING RESULTS	• Communicate observations orally.	• Communicate sequence of steps or observations.	• Communicate sequence of steps or observations in a simple scientific investigation.	• Carry out the scientific method by making predictions, collecting data, analyzing data and communicating results.	• Carry out the scientific method by making predictions, collecting data, analyzing data and drawing a conclusion about the results.	• Analyze data in a data table to draw conclusions and explain results of a scientific investigation.
	• Recognize patterns in data.	• Recognize patterns in data.	• Communicate results of investigations orally, through drawings, and/or with models.	• Collect and analyze data to formulate logical conclusions.	• Draw conclusions about predictions and results in a scientific investigation.	• Analyze data and formulate logical conclusions.
						• Differentiate opinion and fact based on evidence.
SAFETY	• Understand and follow simple safety rules including listening and asking questions.	• Understand and follow simple safety rules including listening and asking questions.	• Understand and follow simple safety rules including listening and asking questions.	• Understand the importance of safety in science and follow simple safety rules including listening and asking questions.	• Understand the importance of safety in science and follow simple safety rules and behavior including listening and asking questions.	• Understand the importance of safety in science and follow simple safety rules and behavior including listening and asking questions.