

## 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.

## ACKNOWLEDGEMENTS

The Catholic Schools Offices gratefully acknowledges the expertise, dedication and tremendous time commitment of the Science Curriculum Committee:

Mary Barber, Teacher, St. Egbert, Morehead City

Aerin Benavides, Teacher, St. Thomas More, Chapel Hill

Barbara Brodsky-Post, Teacher, St. Patrick, Fayetteville

Maria Gomez, Assistant Principal/Teacher, Blessed Sacrament, Burlington

Alan Johnston, Teacher, Our Lady of Lourdes, Raleigh

Lori Reese, Teacher, St. Mary Magdalene, Apex

Tammy Stys, Teacher, St. Mary Magdalene, Apex

Kerry Wolfe, Teacher, St. Mary, Goldsboro

Mary Womack, Teacher, St. Peter, Greenville

Rosalie Innacelli, Assistant Superintendent for Instructional Services, Catholic Schools Office

### REVISIONS

#### **Our Lady of Lourdes, Raleigh**

Kristen Johnston

Susan Liles

Amy Parent

#### **St. Thomas More, Chapel Hill**

Karen Kingrea

#### **St. Egbert, Morehead City**

Kathleen Ford-Green

Nancy Whipple

Susan Craver

Toni Leatherman

Judy Rhodes

#### **St. Mary Magdalene, Apex**

Bonnie Agnew

Sherri Flannigan

Mary Pat Fronk

Joel Groelle

Maria Madsen

Kelly Nations

Lisbeth Pfeiffer

Amy Reitz

Elizabeth Wiegman

### PILOT PROGRAM 2011-2012

**Blessed Sacrament** Maria Gomez

**Our Lady of Lourdes** Alan Johnston

**St. Egbert** Mary Barber

**St. Mary Magdalene, Apex**

Tammy Stys

Christa Rhodes

Bonnie Agnew

Amy Reitz

Lori Reese

## GRADE 1 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
<p>1. Understand how forces (pushes or pulls) affect the motion of an object. (1.P.1)</p>	<p>1.1 Explain the importance of a push or pull to changing the motion of an object. (1.P.1.1)</p>	
	<p>1.2 Explain how some forces (pushes and pulls) can be used to make things move without touching them, such as magnets. (1.P.1.2)</p>	
	<p>1.3 Recognize that objects initially at rest will move in the direction of the push or pull. (EX.1.P.1.2)</p>	
	<p>1.4 Predict the effect of a given force on the motion of an object, including balanced forces. (1.P.1.3)</p>	
	<p>1.5 Describe how forces affect an object's speed and direction of motion.</p>	

**STRAND C Earth Science**

<b>Earth Systems, Structures and Processes</b>		
<b>ESSENTIAL STANDARD</b>	<b>OBJECTIVES</b>	<b>STRATEGIES</b>
2.1 Understand the physical properties of Earth materials that make them useful in different ways. (1.E.2)	1.1 Identify earth materials: rocks, soils and water. (EX.1.E.2)	
	1.2 Summarize the physical properties of Earth materials, including rocks, soil. (1.E.2.1)	
	1.3 Compare the properties of soil samples from different places relating their capacity to retain water, nourish and to support the growth of certain plants. (1.E.2.2)	

<b>Earth In The Universe</b>		
<b>ESSENTIAL STANDARD</b>	<b>OBJECTIVES</b>	<b>STRATEGIES</b>
2.1 Recognize features and patterns of sun/earth/moon system. (1.E.1)	2.1 Recognize the sun heats the Earth.	
	2.2 Identify the sun as a star that affects our weather.	
	2.3 Recognize features of the day and night sky and apparent movement of objects across the sky. (1.E.1)	
	2.4 Recognize changes in the day and night sky.	

## STRAND D Life Science

Ecosystems		
ESSENTIAL STANDARD	OBJECTIVES	STRATEGIES
1. Understand the characteristics of various environments and behaviors of humans that enable plants and animals to survive. (1.L.1)	1.1 Understand characteristics of various environments. (EX.1.L.2)	
	1.2 Identify living and nonliving things in indoor and outdoor environments. (EX.1.L.2.2)	
	1.3 Use <b>all five</b> senses to make observations about the environment. (EX.1.L.2.4)	
	1.4 Identify environments that support various types of living organisms.	
	1.5 Recognize that plants and animals need air, water, light space, food and shelter and that these may be found in their environment. (1.L.1.1)	
	1.6 <b>Use</b> examples of how the needs of different plants and animals can be met by their environments. (1.L.1.2)	
	1.7 Summarize ways that humans protect or harm their environment and/or improve conditions for the growth of the plants and animals that live there, e.g., reuse or recycle products to avoid littering. (1.L.1.3)	
2. Summarize the needs of living organisms for energy and growth. (1.L.2)	2.1 Summarize the basic needs of different plants for energy and growth, including air, water, nutrients and light. (1.L.2.1)	
	2.2 Summarize the basic needs (including air, water, and food) of a variety of animals for energy and growth. (1.L.2.2)	
3. Identify characteristics of living organisms.	3.1 Classify objects, people and animals as living or nonliving. (EX1.L.1.2)	
	3.2 Identify self-locomotion as a characteristic of animal life.	

**STRAND E Process Skills** (Grade 1 appropriate skills necessary for asking meaningful questions and conducting careful investigation.)

PLANNING INVESTIGATIONS	COLLECTING DATA	INTERPRETING RESULTS	SAFETY
<ul style="list-style-type: none"> <li>Observe, ask questions, predict and investigate.</li> </ul>	<ul style="list-style-type: none"> <li>Explore a variety of materials using all senses to make observations.</li> </ul>	<ul style="list-style-type: none"> <li>Communicate sequence of steps or observations in a simple scientific investigation.</li> </ul>	<ul style="list-style-type: none"> <li>Understand and follow simple safety rules including listening and asking questions.</li> </ul>
<ul style="list-style-type: none"> <li>Follow oral instructions for a scientific investigation.</li> </ul>	<ul style="list-style-type: none"> <li>Classify physical properties of common objects.</li> </ul>	<ul style="list-style-type: none"> <li>Recognize patterns in data.</li> </ul>	
<ul style="list-style-type: none"> <li>Predict.</li> </ul>	<ul style="list-style-type: none"> <li>Use observed physical characteristics to classify objects.</li> </ul>		
	<ul style="list-style-type: none"> <li>Use simple tools, such as magnifiers, thermometers rulers, and balances to observe and measure objects.</li> </ul>		
	<ul style="list-style-type: none"> <li>Create simple graphs as a group.</li> </ul>		

## TOPICS BY GRADE

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

## SCIENCE PROCESS SKILLS ~ GRADES K to 5

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

	<b>K</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>PLANNING INVESTIGATIONS</b>	<ul style="list-style-type: none"> <li>Observe, ask questions, predict.</li> </ul>	<ul style="list-style-type: none"> <li>Observe, ask questions, predict and investigate.</li> </ul>	<ul style="list-style-type: none"> <li>Ask questions and explore ways to get answers through simple investigation.</li> </ul>	<ul style="list-style-type: none"> <li>Use observations of the environment to ask and answer a scientific question.</li> </ul>	<ul style="list-style-type: none"> <li>Use observations of the environment to ask and answer a scientific question.</li> </ul>	<ul style="list-style-type: none"> <li>Recognize and ask testable questions.</li> </ul>
	<ul style="list-style-type: none"> <li>Describe relative position of objects to a reference point.</li> </ul>	<ul style="list-style-type: none"> <li>Follow oral instructions for a scientific investigation.</li> </ul>	<ul style="list-style-type: none"> <li>Follow oral instructions for a scientific investigation.</li> </ul>	<ul style="list-style-type: none"> <li>Follow written instructions for scientific investigation.</li> </ul>	<ul style="list-style-type: none"> <li>Work in groups to plan and conduct a simple investigation</li> </ul>	<ul style="list-style-type: none"> <li>Based on student-developed questions, students should write simple instructions to carry out a procedure to follow.</li> </ul>
	<ul style="list-style-type: none"> <li>Predict.</li> </ul>	<ul style="list-style-type: none"> <li>Predict.</li> </ul>	<ul style="list-style-type: none"> <li>Predict the outcome of an investigation based on observations as opposed to guessing.</li> </ul>	<ul style="list-style-type: none"> <li>Predict the outcome of an investigation based on observation and/or experience.</li> </ul>	<ul style="list-style-type: none"> <li>Predict the outcome of an investigation based on observation and/or experience.</li> </ul>	<ul style="list-style-type: none"> <li>Investigate predictions by conducting multiple trials for consistent results.</li> </ul>
				<ul style="list-style-type: none"> <li>Collect and recognize patterns in data to make a conclusion about the data.</li> </ul>	<ul style="list-style-type: none"> <li>Formulate and justify predictions based on cause and effect relationships.</li> </ul>	<ul style="list-style-type: none"> <li>Understand cause and effect relationships.</li> </ul>
<b>COLLECTING DATA</b>	<ul style="list-style-type: none"> <li>Observe a variety of materials using all five senses.</li> </ul>	<ul style="list-style-type: none"> <li>Explore a variety of materials using all senses to make observations.</li> </ul>	<ul style="list-style-type: none"> <li>Collect data from observations using the senses to classify objects.</li> </ul>	<ul style="list-style-type: none"> <li>Recognize patterns in data to make a conclusion about the data.</li> </ul>	<ul style="list-style-type: none"> <li>Record data for a scientific investigation.</li> </ul>	<ul style="list-style-type: none"> <li>Keep accurate records of data over time for a scientific investigation.</li> </ul>
	<ul style="list-style-type: none"> <li>Identify multiple physical properties of common objects.</li> </ul>	<ul style="list-style-type: none"> <li>Classify physical properties of common objects.</li> </ul>	<ul style="list-style-type: none"> <li>Classify physical properties of common objects.</li> </ul>	<ul style="list-style-type: none"> <li>Classify objects using specific criteria.</li> </ul>	<ul style="list-style-type: none"> <li>Classify objects using specific criteria.</li> </ul>	<ul style="list-style-type: none"> <li>Classify objects using specific criteria.</li> </ul>
	<ul style="list-style-type: none"> <li>Collect and sort common objects by one physical attribute.</li> </ul>	<ul style="list-style-type: none"> <li>Use observed physical characteristics to classify objects.</li> </ul>	<ul style="list-style-type: none"> <li>Compare and sort common objects according to two or more physical attributes.</li> </ul>	<ul style="list-style-type: none"> <li>Collect data, compare and contrast data.</li> </ul>	<ul style="list-style-type: none"> <li>Collect data, compare and contrast data, draw conclusions.</li> </ul>	<ul style="list-style-type: none"> <li>Make predictions, collect and analyze data, and draw conclusions.</li> </ul>
	<ul style="list-style-type: none"> <li>Identify tools used in science to measure length, weight and temperature, e.g., ruler, balance, thermometer.</li> </ul>	<ul style="list-style-type: none"> <li>Use simple tools appropriately, such as magnifiers, thermometers, rulers, and balances to observe and measure objects.</li> </ul>	<ul style="list-style-type: none"> <li>Use simple tools, such as magnifiers, thermometers, rulers, and balances to observe and measure objects.</li> </ul>	<ul style="list-style-type: none"> <li>Use scientific instruments such as magnifiers thermometers, glassware, clamps, balances and stopwatches to collect data and take measurements.</li> </ul>	<ul style="list-style-type: none"> <li>Collect data and measurements with increasing accuracy using more sophisticated instruments such as a graduated cylinder, triple beam balance, and microscope.</li> </ul>	<ul style="list-style-type: none"> <li>Determine appropriate tools to make quantitative measurements including calculators, computers, graduated cylinders, balances, meter sticks, and stopwatches.</li> </ul>

	<b>K</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>COLLECTING DATA (continued)</b>					<ul style="list-style-type: none"> <li>Recognize variable and constants in a scientific investigation.</li> </ul>	<ul style="list-style-type: none"> <li>Recognize that a single independent variable must exist to provide a conclusion in an investigation.</li> </ul>
	<ul style="list-style-type: none"> <li>Create simple graphs as a group.</li> </ul>	<ul style="list-style-type: none"> <li>Create simple graphs as a group.</li> </ul>	<ul style="list-style-type: none"> <li>Construct bar graphs to record data using appropriately labeled axes and titles.</li> </ul>	<ul style="list-style-type: none"> <li>Construct bar graphs to record data using appropriately labeled axes and titles.</li> </ul>	<ul style="list-style-type: none"> <li>Develop tables and graphs. based on data collected; develop questions as a result of data collected.</li> </ul>	<ul style="list-style-type: none"> <li>Identify the elements such as labels, title, graph key, to construct a line graph with the proper scale and spacing.</li> </ul>
						<ul style="list-style-type: none"> <li>Interpret data from a bar, circle and line graph and decide which type of graph best displays given data.</li> </ul>
<b>INTERPRETING RESULTS</b>	<ul style="list-style-type: none"> <li>Communicate observations orally.</li> </ul>	<ul style="list-style-type: none"> <li>Communicate sequence of steps or observations.</li> </ul>	<ul style="list-style-type: none"> <li>Communicate sequence of steps or observations in a simple scientific investigation.</li> </ul>	<ul style="list-style-type: none"> <li>Carry out the scientific method by making predictions, collecting data, analyzing data and communicating results.</li> </ul>	<ul style="list-style-type: none"> <li>Carry out the scientific method by making predictions, collecting data, analyzing data and drawing a conclusion about the results.</li> </ul>	<ul style="list-style-type: none"> <li>Analyze data in a data table to draw conclusions and explain results of a scientific investigation.</li> </ul>
	<ul style="list-style-type: none"> <li>Recognize patterns in data.</li> </ul>	<ul style="list-style-type: none"> <li>Recognize patterns in data.</li> </ul>	<ul style="list-style-type: none"> <li>Communicate results of investigations orally, through drawings, and/or with models.</li> </ul>	<ul style="list-style-type: none"> <li>Collect and analyze data to formulate logical conclusions.</li> </ul>	<ul style="list-style-type: none"> <li>Draw conclusions about predictions and results in a scientific investigation.</li> </ul>	<ul style="list-style-type: none"> <li>Analyze data and formulate logical conclusions.</li> </ul>
						<ul style="list-style-type: none"> <li>Differentiate opinion and fact based on evidence.</li> </ul>
<b>SAFETY</b>	<ul style="list-style-type: none"> <li>Understand and follow simple safety rules including listening and asking questions.</li> </ul>	<ul style="list-style-type: none"> <li>Understand and follow simple safety rules including listening and asking questions.</li> </ul>	<ul style="list-style-type: none"> <li>Understand and follow simple safety rules including listening and asking questions.</li> </ul>	<ul style="list-style-type: none"> <li>Understand the importance of safety in science and follow simple safety rules including listening and asking questions.</li> </ul>	<ul style="list-style-type: none"> <li>Understand the importance of safety in science and follow simple safety rules and behavior including listening and asking questions.</li> </ul>	<ul style="list-style-type: none"> <li>Understand the importance of safety in science and follow simple safety rules and behavior including listening and asking questions.</li> </ul>