Science Curriculum

Fifth Grade

The performance expectations in fifth grade help students formulate answers to questions such as: "When matter changes, does its weight change? How much water can be found in different places on Earth? Can new substances be created by combining other substances? How does matter cycle through ecosystems? Where does the energy in food come from and what is it used for? How do lengths and directions of shadows or relative lengths of day and night change from day to day, and how does the appearance of some stars change in different seasons?"

Students are able to identify relationships between the roles of science, technology, and Catholic ethics in the global community and demonstrate stewardship instilled with Catholic values in the care of local and global environments.

Students are able to describe that matter is made of particles too small to be seen through the development of a model. Students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. Through the development of a model using an example, students are able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. They describe and graph data to provide evidence about the distribution of water on Earth. Students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Students are expected to develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.

Students will be able to demonstrate stewardship instilled with Catholic values in the care of local and global environments. Students will be able to identify relationships between the roles of science, technology, and Catholic ethics in the global community. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment and that energy in animals' food was once energy from the sun.

The crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; energy and matter; and systems and systems models are called out as organizing concepts for these disciplinary core ideas. In the fifth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, engaging in argument from evidence, and obtaining, evaluating, and communicating information; and to use these practices to demonstrate understanding of the core ideas.

Primary Source: Next Generation Science Standards, April, 2013

See www.nextgnscience.org for national science standards and detailed descriptions of cross-cutting concepts, science and engineering practices, flow of core ideas, and ties to Common Core math and language arts standards.

3-5 GRADE CROSS-CUTTING CONCEPTS (to be integrated throughout the curriculum) **Students will:**
Patterns –Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them. • Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena and designed products. • Patterns of change can be used to make predictions. • Patterns can be used as evidence to support an explanation.
Cause and Effect: Mechanism and Prediction –Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering. • Cause and effect relationships are routinely identified, tested, and used to explain change. • Events that occur together with regularity might or might not be a cause and effect relationship.
Scale, Proportion, and Quantity –In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change. • Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods, • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.
Systems and System Models –A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems. • A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. • A system can be described in terms of its components and their interactions.
Energy and Matter: Flows, Cycles, and Conservation –Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior. • Matter is made of particles. • Matter flows and cycles can be tracked in terms of the weight of the substances before and after a process occurs. The total weight of the substances does not change. This is what is meant by conservation of matter. Matter is transported into, out of, and within systems. • Energy can be transferred in various ways and between objects.
Structure and Function–The way an object is shaped or structured determines many of its properties and functions. • Different materials have different substructures, which can sometimes be observed. • Substructures have shapes and parts that serve functions.
Stability and Change–For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand. • Change is measured in terms of differences over time and may occur at different rates. • Some systems appear stable, but over long periods of time will eventually change.

CATHOLIC IDENTITY (to be integrated throughout the curriculum) **Students will:**
ARCHSF-1. Identify relationships between the roles of science, technology, and Catholic ethics in the global community.
ARCHSF-2. Students will be able to demonstrate stewardship instilled with Catholic values in the care of local and global environments.
SCIENTIFIC METHOD (to be integrated throughout the curriculum) **Students will:**
Ask questions and defining problems Form a hypothesis Develop and use models Plan and carry out investigations Analyze and interpret data Construct explanations (for science) and design solutions (for engineering) Obtain, evaluate, and communicate information
ENGINEERING (to be integrated throughout the curriculum) **Students will:**
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

LIFE SCIENCE LEARNING OUTCOMES (What students will be able to do, know, understand and value)	**SAMPLE ASSESSMENT/ STRATEGIES** **(**What evidence will demonstrate that students have achieved the Learning outcome)	
Students will:		
Describe cells in plants and animals and explain how they make up tissues, organs, and systems in multicellular organisms.	• Observe plant and animal cells, and single celled organisms with a microscope. Recall the major parts and functions of plant and animal cells. Create a flow chart that shows how cells create tissues, which create organs, which are part of systems, which are part of bodies.	
Describe the form and functions of major	• Conduct research and present posters or	

organs in the digestive, circulatory, skeletal, muscular, and nervous systems.	illustrated books that show and describe the function of each of the major organs in each system.	
5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water. [*Clarification Statement*: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.]	• Perform experiments on plants manipulating different environments. Chart growth of plants.	
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. [*Clarification Statement:* Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food. Examples of systems could include organisms, ecosystems, and the Earth.] [*Assessment Boundary:* Assessment does not include molecular explanations.]	• Create a flowchart or graphic organizer of movement of matter in environments researched.	
5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun. [Clarification Statement: Examples of models could include diagrams, and flow charts.]	• Create a food web showing the flow of energy through different animals and plants in specific areas including energy from the sun.	

EARTH AND SPACE SCIENCE LEARNING OUTCOMES (What students will be able to do, know, understand and value)	**SAMPLE ASSESSMENT/ STRATEGIES (**What evidence will demonstrate that students have achieved the Learning outcome)	**BEST PRACTICES**
Students will:		
5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth.	• Manipulate models of a star with flashlight and change distances to see differences in brightness.	

[*Assessment Boundary:* Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).]		
5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. [*Clarification Statement*: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [*Assessment Boundary*: Assessment does not include causes of seasons.	• Students graph changes in the daily changes in direction over a given period time. Compare data for Fall, Winter, and Spring.	
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. [*Clarification Statement*: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [*Assessment Boundary*: Assessment is limited to the interactions of two systems at a time.]	• Student draw, label, and identify different spheres of Earth. Make a Venn Diagram of the different characteristics of the spheres. Use arrows to illustrate interactions.	
5-ESS2-2. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.]	• Students make a pie chart of fresh water, ocean, and land.	

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	• Students write a research report on what is being done to protect the environment.	

PHYSICAL SCIENCE LEARNING OUTCOMES (What students will be able to do, know, understand and value)	**SAMPLE ASSESSMENT/ STRATEGIES** **(**What evidence will demonstrate that students have achieved the Learning outcome)	**BEST PRACTICES**
Students will:		
5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down. [*Clarification Statement*: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [*Assessment Boundary*: Assessment does not include mathematical representation of gravitational force.]	• Students build Estes Rockets to test what is being done to manipulate gravitational force.	
Conduct experiments to investigate natural forces such as friction, magnetism, and gravity.	• Research forces and design an experiment to measure their affects.	
Utilize the scientific method to conduct experiments related to motion, speed, velocity, inertia, and momentum.	• Use cars, ramps, and scales to experiment and measure changes in speed, velocity, inertia, and momentum.	
5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. [*Clarification Statement:* Examples of evidence could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [*Assessment Boundary:* Assessment does not include the atomic-scale mechanism of	• Create models of matter that is too small to be seen. Examples could include evaporation of saltwater, inflation, etc.	

evaporation and condensation or defining the unseen particles.]		
5-PS1-2. Measure and graph quantities to provide evidence that, regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. [*Clarification Statement*: Examples of reactions or changes could include phase changes, dissolving, and mixing that forms new substances.] [*Assessment Boundary:* Assessment does not include distinguishing mass and weight.]	• Conduct an experiment and gather data to show conservation of mass during a chemical change.	
5-PS1-3. Make observations and measurements to identify materials based on their properties. [*Clarification Statement:* Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [*Assessment Boundary:* Assessment does not include density or distinguishing mass and weight.]	• Conduct a series of experiments to measure properties such as hardness, conductivity, magnetism, solubility, density, etc.	
5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	• Conduct experiments that differentiate physical and chemical changes.	