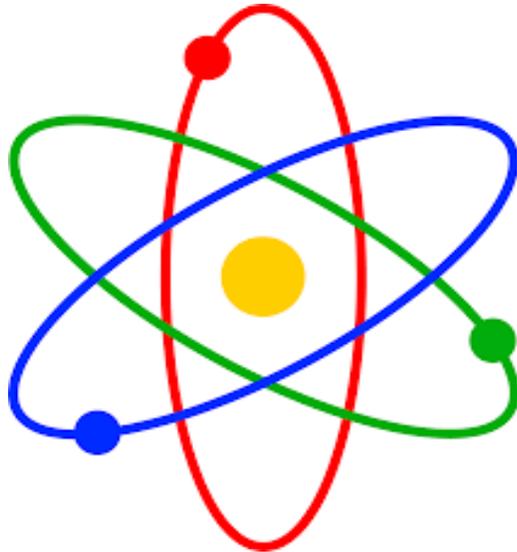


**Diocese of Madison**

**SCIENCE EDUCATION  
STANDARDS & BENCHMARKS**



**Grades K-8**

**Office of Catholic Schools**

The newest edition of the Diocese of Madison Science Standards and Benchmarks by grade level promote a new era of Science Education in our Catholic Schools that is inquiry-based and promote the process by which learning is innocuously incorporated. Not to be viewed as curricular in nature, these Standards are arranged by topic and grade level grouping instead of grade level in order to give teachers greater flexibility when selecting curricular materials that are driven, in large part, by student interest. Problem-solving, flexible thinking, and applying logic to systems are all key underpinnings to the spirit of the Standards.

These Science Standards were authored using the *Next Generation Science Standards* as a guideline. While recognizing that the language used in the *NGSS* is geared towards adults, the committee spent great care and concern to reduce the language so that it is readable by and for students. Students should be at the heart of their learning, and the Standards should be accessible to the grade levels for which they are intended as learning targets.

Particular care should be taken to use curricular materials that fit with each school's underlying philosophy on Science Education. Furthermore, inherent to the Standards are categorical guidelines; while it is up to the school to structure the Science curriculum, the strands suggest a more flexible curricular experience and can be used to vary the curricular design, particularly at the middle school level.

All of the Standards and Benchmarks should promote learning through the tenets of the Scientific Process, which is to:

- Ask questions
- Construct hypotheses
- Conduct experiments
- Collect data
- Analyze data
- Report findings
- Know how to apply findings to conduct future inquiry

There are several new components to the Science Standards, specifically:

- **Human Impacts** - Teased out as a separate category, students are asked to understand the tenets of impact on their surroundings, and vice-versa.
- **STREAM** - As an acronym for the the infusion of Science, Technology, Religion, Engineering, and Math, the Benchmarks within STREAM represent a set of learning targets that ask students to view problem-solving through the lens of Engineering design. STREAM recognizes that the whole is not the sum of the parts of components, but rather, a set of variables that is ever-changing and not finite in either process or product. When designing learning opportunities, the following terms must be accurately applied:
  - Constraints
  - Criteria
  - Design
  - Optimization (in the engineering context)
- **Ethics** - Treated as a component of STREAM, the Benchmarks promote our Ethical responsibilities as Catholics when the field of Science contradicts with our moral obligations as members and defenders of our Faith.
- **Career Aspects** - While not mentioned specifically as a strand of standards, the benchmarks should be used to promote careers in, and around, the field of Science. And while a career in Science may not be of interest to all students, a majority of careers in the 21st century era require the workforce to apply the tenets of Scientific Inquiry to their specific positions.

One of the concerns of the authoring committee members was that of time; specifically, the notion that Science is being decreased in our Catholic Schools as to allot more time to Literacy and Math. To that end, the Standards and Benchmarks can be used in a cross-curricular fashion, but should not be confused with using the Standards solely in other subjects. The Science Standards should stand on their own as a set of progressive learning benchmarks that have less to do with material, and more to do with giving students an experience that may lead them to a career of inquiry.

Overall, the Science Standards promote a lifelong love of learning, of the Scientific Process, and of Science itself. It is up to the teacher and administrator to provide a rich curriculum and methodology that works with the Standards.

#### 2018 Science Standards Committee Members:

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## Science Standards - Grades K-8

### PS. Physical Science

PS.1. Structure and Properties of Matter

PS.2. Forces & Interactions

PS.3. Energy

PS.4. Waves & Electromagnetic Radiation

### LS. Life Science

LS.1. Organisms

LS.2. Ecosystems

LS.3. Inheritance and Adaptations

### ES. Earth Science

ES.1. Earth's Systems

ES.2. Weather and Climate

ES.3. Space Systems

ES.4. History of Earth

### STREAM

STREAM.1. Engineering Design

STREAM.2. Human Impacts

STREAM.3. Ethics

PS. Physical Science			
	K-2	3-5	6-8
<b>PS.1. Structure &amp; Properties of Matter</b>			
A		Describe that matter is made of atoms.	Understand the Atomic Theory of Matter.
B		Understand the structure of an atom.	Demonstrate the atomic composition of simple molecules and extended structures.
C		Identify the periodic table of the elements as a tool to organize the elements of matter.	Understand and apply the periodic table.
D	Identify different kinds of materials by their observable properties.	Describe and classify materials based on their properties.	Understand the changes in states of matter.
E		Understand that total weight of matter is conserved regardless of change (e.g., temperature, mixing).	Understand the Law of Conservation of Matter (e.g., balancing chemical equations, observing chemical reactions).
F	Understand that some changes caused by heating and cooling can be reversed and some cannot.	Understand the difference between physical and chemical changes.	Determine if a chemical reaction has occurred.

PS. Physical Science			
	K-2	3-5	6-8
<b>PS.2. Forces &amp; Interactions</b>			
A	Compare the effects of pushes and pulls on an object.	Investigate and give evidence of the effects of balanced and unbalanced forces on an object.	Understand and apply Newton's Laws of Motion.
B	Explain how a push or pull affects the speed or direction of an object.	Predict the motion of an object using observations and measurements.	Understand the properties of motion (e.g., speed, displacement, etc.)
C		Determine cause and effect relationships of electric or magnetic interactions.	Demonstrate that fields exist between objects exerting forces on each other even though the objects are not in contact.
D			Understand that mass affects the gravitational force of interacting objects

PS. Physical Science			
	K-2	3-5	6-8
<b>PS.3. Energy</b>			
A		Understand that the speed of an object is related to its energy.	Describe the relationships of kinetic energy to the mass and speed of an object.
B		Differentiate between potential and kinetic energy.	Identify and understand the factors that affect an amount of potential energy and kinetic energy.
C		Understand energy transfer (e.g., sound, light, etc.)	Understand the factors that minimize or maximize thermal energy transfer.
D		Predict outcomes about changes in energy when objects collide.	Understand that energy transfer occurs when the kinetic energy of an object changes.
E		Understand how energy is converted from one form to another.	Demonstrate the Law of Conservation of Energy.

PS. Physical Science			
	K-2	3-5	6-8
<b>PS.4. Waves &amp; Electromagnetic Radiation</b>			
A	Understand the effects of placing different materials in the path of a beam of light.	Identify that light waves carry differing amounts of energy.	Understand and apply properties of light.
B	Understand that vibrating materials can make sound and that sound can make materials vibrate.	Identify that sound waves carry differing amounts of energy.	Understand and apply properties of sound.
C	Understand how light or sound can be used to communicate over a distance.	Understand multiple ways to transfer information using waves.	Understand and apply the behaviors of electromagnetic and mechanical waves.
D			Identify and compare waves on the electromagnetic spectrum.

LS. Life Science			
	K-2	3-5	6-8
<b>LS.1. Organisms</b>			
A	Identify living and nonliving things.	Understand the needs of living organisms.	Understand the characteristics of life.
B	Understand that organisms are comprised of smaller parts.	Identify parts of a cell.	Understand parts of a cell and their functions.
C		Recognize that the Cell Theory exists.	Understand the Cell Theory.
D	Identify that all organisms have in common birth, growth, reproduction, and death (e.g., life cycle).	Understand that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Understand how a multicellular organism is a system of interacting subsystems composed of groups of cells.
E	Identify and understand the five senses.	Understand how organisms respond to their environment.	Understand how organisms respond to stimuli (e.g., homeostasis, tropisms).
F	Identify the external parts of the human body.	Identify the external and internal parts of the human body.	Understand the structure, function, and interactions between systems of the human body.
G	Identify common disorders of the human body.	Understand how lifestyle can be affected by disorders of the human body.	Understand symptoms, prognosis, and treatment of diseases / disorders of each system of the human body.
H	Identify animal groups and the characteristics of each.	Identify the kingdoms of living organisms and the characteristics of each.	Classify organisms using subclassifications of kingdoms.

LS. Life Science			
	K-2	3-5	6-8
<b>LS.2. Ecosystems</b>			
A	Understand what plants and animals need to grow.	Understand food chains and food webs.	Understand the role of photosynthesis and cellular respiration in food chains and food webs.
B	Understand that there are many types of life in different habitats.	Understand that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	Understand how changes in the ecosystem affect populations (e.g., resource availability).
C	Understand how organisms can change the environment to meet their needs.	Understand how changes in the environment affect populations and types of organisms.	Understand the interaction between living and nonliving parts of an ecosystem.

LS. Life Science			
	K-2	3-5	6-8
<b>LS.3. Inheritance and Adaptations</b>			
A	Understand that young plants and animals are like, but not exactly like, their parents.	Understand that plants and animals have traits inherited from parents.	Identify differences between sexual reproduction and asexual reproduction regarding genetic variation.
B			Explain how environmental and genetic factors influence the growth of organisms.
C		Understand that organisms within a species will show variations.	Identify if gene mutations have harmful, beneficial, or neutral effects on an organism.
D		Understand how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.	Describe how genetic variations of traits in a population increase the probability of survival and reproduction.
E			Understand that natural selection may lead to the increase or decrease of specific traits in a population over time.
F		Understand that traits can be influenced by the environment.	Identify ways humans influence the ways of desired traits of organisms.
G	Recognize that organisms alive today may resemble extinct organisms.	Explain how extinction may have occurred.	Using a fossil record, identify the existence, diversity, extinction, and change of life forms throughout the history of life on Earth.
H		Understand that fossils provide evidence of previous life forms and can be compared.	Use comparative anatomy, embryology, and DNA to show relationships among modern organisms.

ES. Earth Science			
	K-2	3-5	6-8
<b>ES.1. Earth's Systems</b>			
A	Identify landforms and bodies of water.	Use maps to describe patterns of Earth's features.	Understand the distribution of water on earth.
B	Identify where water is found on earth, and that it can be a solid, liquid, or gas.	Describe the cycling of water through Earth's systems, both above and below the surface.	Describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
C	Understand that the earth provides resources.	Understand the rock cycle.	Explain the uneven distributions of Earth's mineral and energy resources.
D	Identify ways to slow or prevent wind or water from changing the shape of the land.	Understand the effects of weathering on the rate of erosion.	Describe the cycling of Earth's materials and the flow of energy that drives this process.

ES. Earth Science			
	K-2	3-5	6-8
<b>ES.2. Weather and Climate</b>			
A	Understand local weather patterns.	Describe typical weather conditions expected during a particular season.	Understand the effect of air masses on weather conditions.
B	Determine the effect of sunlight on the Earth's surface.	Describe climates in different regions of the world.	Understand how unequal heating and rotation of the Earth determines regional climates.
C	Understand the purpose of weather forecasting.	Identify and understand the tools used for weather forecasting.	Use weather forecasting tools to make simple weather predictions.

ES. Earth Science			
	K-2	3-5	6-8
<b>ES.3. Space Systems</b>			
A	Understand that earth's gravity pulls objects down.	Understand that the gravitational force exerted by Earth is directed towards its center.	Understand the role of gravity in the motion of the solar system.
B	Identify predictable patterns of sun, moon, and stars.	Describe the motion of Earth (e.g., rotations, revolutions).	Understand lunar phases, eclipses of the sun and moon, seasons, and tides.
C	Identify the organization of the solar system.	Understand the properties and characteristics of the solar system.	Determine scale properties of objects in the solar system.
D	Understand that the sun is a star.	Compare Earth's sun to other stars.	Understand the life cycle and properties of a star.
E			Identify the levels of organization of the universe.

ES. Earth Science			
	K-2	3-5	6-8
<b>ES.4. History of Earth</b>			
A	Understand that earth events can occur quickly or slowly.	Identify catastrophic events that have occurred over the history of earth.	Understand how the geologic time scale is organized.
B	Identify properties of earthquakes and volcanoes.	Understand the movement of Earth's plates.	Understand the evidence for the Theory of Plate Tectonics
C		Understand that fossils are evidence of organisms and the environments in which they lived.	Understand that patterns in rock layers and fossils are the result of changes in a landscape over time.
D			Identify ways to determine the age of rocks, fossils, and layers of the Earth.

**STREAM.**

	K-2	3-5	6-8
<b>STREAM.1. Engineering Design</b>			
A	Define a simple problem that can be solved by a new or improved object or tool.	Define a simple design problem based on given criteria and constraints.	Define criteria and constraints of a design problem.
B	Identify strengths and limitations of multiple design solutions.	Generate and compare multiple solutions to a design problem.	Evaluate multiple solutions to a design problem.
C	Identify how the design of an object helps it solve a problem.	Identify aspects of a model or prototype that can be improved.	Conduct testing and modification to optimize a design solution.

**STREAM.**

	K-2	3-5	6-8
<b>STREAM.2. Human impacts</b>			
A	Identify effects of natural catastrophic events on humans.	Generate and compare multiple solutions to lessen the effects of natural catastrophic events.	Understand ways to lessen the effects of natural catastrophic events.
B	Identify ways an individual protects Earth's resources and environment.	Identify ways communities protect Earth's resources and environment.	Identify ways of monitoring and minimizing human impacts on the environment.
C	Identify ways that humans use renewable and non-renewable resources.	Understand how per-capita consumption of natural resources has an effect on the environment.	Identify ways to reduce per-capita consumption of natural resources.

**STREAM.**

	K-2	3-5	6-8
<b>STREAM.3. Ethics</b>			
A	Identify the beneficial and harmful effects of scientific experiments and discoveries.	Understand that science has a morality.	Understand how to apply Catholic morality in scientific decision-making.
B	Understand that life is valuable.	Identify ways to be stewards of God's creation.	Understand how the greater dignity of human life impacts scientific decision-making.
C	Understand that medical decisions can be right or wrong.	Understand the implications of medical decisions.	Understand how to apply Catholic morality in biomedicine.