

August 2018

Dear Catholic school families, educators, leaders and supporters,

The Office of Catholic Schools in the Diocese of Grand Rapids is pleased to present new curriculum standards outlining the academic expectations throughout our alliance of Catholic schools. By our definition, curriculum standards express the skills and content students are expected to demonstrate within courses and across grade levels. These standards provide normative targets for student performance. When a student has successfully completed a course or grade level, he or she will have demonstrated competence in the knowledge, skills, or attitudes required of that course or grade level. We have created these new curriculum standards in order to express the Catholic identity within our curriculum and to articulate the profile of a graduate of our diocesan schools. Developing these curriculum standards has been a two-year process involving educators, administrators and clergy. Like all curriculum revisions, this process is never entirely finished, and an annual review will allow us to update these documents to reflect what is best for our schools.

The sources used to create our diocesan curriculum standards vary by content area, but each is rooted in the Catechism of the Catholic Church and the Cardinal Newman Society's [Catholic Curriculum Standards](#). Additionally, the curriculum standards from various dioceses and national organizations of educators; curriculum guidelines from Michigan and other states; material from professional organizations, such as College Board, which produces the Scholastic Assessment Test (SAT) suite and the Advanced Placement (AP) assessments; and Northwest Evaluation Association (NWEA), which produces the Measure of Academic Progress (MAP) assessments, were used as references. Each of these sources is referenced in the acknowledgements following each content area document. Importantly, we also accounted for the cultures and communities of our local schools, as no standards should be adopted without consideration of the unique and specific desires of the Catholic families in the diocese.

Hundreds of diocesan teachers and administrators worked tirelessly to produce the content and wording of these curriculum standards over eighteen months, from summer 2016 through winter 2017. The curriculum standards were then reviewed by local experts in theology, including diocesan priests and Aquinas College professors. This combination of experts ensures that the curriculum is rooted in our Catholic faith, is interculturally appropriate for our diocese, and provides educational best practices to inspire excellence in Catholic education. The final review was completed by Most Reverend David J. Walkowiak, bishop of Grand Rapids and Mr. David Faber, superintendent of Catholic schools in the Diocese of Grand Rapids.

In sharing these documents with you, we invite you to explore how our alliance of Catholic schools strives to provide our students with an outstanding education that allows them to grow in faith and grace, achieve more in school and life, develop creativity and character, and feel welcome and cherished.

In Christ,



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**Diocese of Grand Rapids
Office of Catholic Schools
Curriculum Standards
for Science
in grades K-12**

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Program Goal

In admiration of the greatness of God, the Creator (CCC 283) and in recognition of God freely creating all from nothing (CCC 296), students use inquiry to develop an understanding of the sciences. Problem-solving through inquiry beyond the traditional science classroom and analyzing scientific discovery using technology, students demonstrate scientific curiosity and confidence in their ability to discuss scientific issues from the Catholic perspective.

Kindergarten Science Curriculum Standards

Students who demonstrate understanding of kindergarten science are able to--

	Full Standard	Report Card Wording
K.Sci.1	Show care for all of God's creation.	Show care for all of God's creation.
K.Sci.2	Give examples of the beauty evident in the world God has created.	Give examples of the beauty evident in the world God has created.
Physical Science		
K.Sci.PS.1	Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.	Plan/conduct investigation to compare effects of pushes/pulls.
K.Sci.PS.2	Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.	Analyze data to determine if a design solution works to change speed/direction of push/pull.
K.Sci.PS.3	Make observations to determine the effect of sunlight on Earth's surface.	Observe effects of sunlight on Earth's surface.
K.Sci.PS.4	Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on an area.	Design structure to reduce effect of sunlight.
Life Science		
K.Sci.LS.1	Use observations to describe patterns of what plants and animals (including humans) need to survive.	Describe patterns of what plants/animals need to survive.
Earth and Space Science		
K.Sci.ESS.1	Use and share observations of local weather conditions to describe patterns over time.	Describe weather patterns over time.

K.Sci.ESS.2	Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.	Construct argument for how plants/animals can change environment to meet their needs.
K.Sci.ESS.3	Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.	Represent relationship between needs of different plants/animals and places they live.
K.Sci.ESS.4	Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.	Ask questions to obtain information about purpose of weather forecasting.
K.Sci.ESS.5	Communicate solutions that can reduce the negative impact of humans on land, water, air, and/or other living things in the local environment, as it is our duty to care for all of God's creation.	Communicate solutions to reduce negative impact of humans on land/water/air.
Engineering Design		
K.Sci.ED.1	Ask questions and make observations about a situation people want to change in order to define a simple problem and offer potential solutions.	Ask question/make observations to define problem/offer solutions.

First Grade Science Curriculum Standards

Students who demonstrate understanding of first grade science are able to--

	Full Standard	Report Card Wording
1.Sci.1	Show care and concern for all of God's creation.	Show care and concern for all of God's creation.
1.Sci.2	Display a sense of wonder and delight about the natural universe and its beauty.	Display sense of wonder/delight about natural universe and its beauty.
Physical Science		
1.Sci.PS.1	Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate.	Plan/conduct investigation to show vibrating materials can make sound.
1.Sci.PS.2	Make observations to construct an evidence-based account that objects can be seen only when illuminated.	Make observations that objects are seen when illuminated.
1.Sci.PS.3	Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light.	Plan/conduct investigation of the effect of placing objects in path of light.
1.Sci.PS.4	Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.	Design/build a device that uses light/sound to communicate.
Life Science		
1.Sci.LS.1	Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.	Design a solution to human problem by mimicking how plants/animals use external parts to survive/grow/meet needs.

1.Sci.LS.2	Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.	Determine patterns in behavior of parents/offspring that help offspring survive.
1.Sci.LS.3	Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.	Make observations that young plants/animals are like their parents.
Earth and Space Sciences		
1.Sci.ESS.1	Use observations of the sun, moon, and stars to describe patterns that can be predicted.	Use observations of sun/moon/stars to describe patterns.
1.Sci.ESS.2	Make observations at different times of year to relate the amount of daylight to the time of year.	Make observations of amount of daylight at different times of year.
Engineering Design		
1.Sci.ED.1	Ask questions, make observations, and gather information about a situation people want to change in order to define a simple problem and offer potential solutions.	Ask questions/make observations/gather information to define simple problem/offer potential solutions.
1.Sci.ED.2	Develop a simple sketch, drawing, or physical model to illustrate how a new or improved object helps to solve a given problem.	Develop physical model to illustrate how new/improved object solves problem.

Second Grade Science Curriculum Standards

Students who demonstrate understanding of second grade science are able to--

	Full Standard	Report Card Wording
2.Sci.1	Show care and concern for all of God's creation, including all stages of life and the environment.	Show care and concern for God's creation.
2.Sci.2	Explain how creation is an outward sign of God's love and goodness and therefore, is sacramental in nature.	Explain how creation is sacramental in nature.
Physical Science		
2.Sci.PS.1	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.	Plan/conduct investigation to describe/classify different materials by properties.
2.Sci.PS.2	Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.	Analyze data to determine which materials have properties best suited for intended purpose.
2.Sci.PS.3	Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.	Construct argument that changes caused by heating/cooling can/not be reversed.
Life Science		
2.Sci.LS.1	Plan and conduct an investigation to determine if plants need sunlight and water to grow.	Plan/conduct investigation of whether plants need sunlight/water to grow.
2.Sci.LS.2	Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.	Develop model that mimics animal dispersing seeds/pollinating plants.

2.Sci.LS.3	Make observations of plants and animals to compare the diversity of life in different habitats.	Make observations to compare diversity of life in different habitats.
Earth and Space Sciences		
2.Sci.ESS.1	Use information from several sources to provide evidence that Earth events can occur quickly or slowly.	Use information to provide evidence that Earth events can occur quickly/slowly.
2.Sci.ESS.2	Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.	Compare multiple solutions designed to slow/prevent wind/water from changing shape of land.
2.Sci.ESS.3	Develop a model to represent the shape and kind of land in an area, and also the bodies of water in that area.	Develop model to represent land/water.
Engineering Design		
2.Sci.ED.1	Ask questions, make observations, and gather information about a situation people want to change in order to define a simple problem that can then be solved through the development of a new or improved object or tool.	Define a simple problem to be solved through development of new/improved object/tool.
2.Sci.ED.2	Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.	Develop physical model to illustrate how shape of object helps it function as needed.
2.Sci.ED.3	Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.	Analyze data of two objects, designed to solve the same problem, to compare how each performs.

Third Grade Science Curriculum Standards

Students who demonstrate understanding of third grade science are able to--

	Full Standard	Report Card Wording
3.Sci.1	Express care and concern for all of God's creation, including all stages of life for each human person as an image and likeness of God, as well as through environmental stewardship.	Express care and concern for all of God's creation.
3.Sci.2	Describe how science answers "how" things physically exist, while our faith in God provides answers to our "why" questions.	Describe how science answers "how" and faith answers "why".
Physical Science		
3.Sci.PS.1	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.	Plan/conduct investigation of effects of balanced/unbalanced forces.
3.Sci.PS.2	Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.	Make observations/measurements of object's motion to predict future motion.
3.Sci.PS.3	Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.	Ask questions to determine cause/effect relationships of electric/magnetic interactions between objects.
3.Sci.PS.4	Define a simple problem that can be solved by applying scientific ideas about magnets.	Define simple problem to be solved by applying scientific ideas about magnets.
Life Science		

3.Sci.LS.1	Develop models to describe that all organisms, as God's creation, have unique and diverse life cycles but all have in common the fundamentals of birth, growth, reproduction, and death.	Develop models to describe all organisms have diverse life cycles.
3.Sci.LS.2	Construct an argument that some animals form groups that help members survive.	Construct argument that some animals form groups that help members survive.
3.Sci.LS.3	Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	Analyze/interpret data that plants/animals have traits inherited from parents.
3.Sci.LS.4	Use evidence to support the explanation that traits can be influenced by the environment.	Explain that traits can be influenced by environment.
3.Sci.LS.5	Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.	Analyze/interpret data from fossils.
3.Sci.LS.6	Construct an argument with evidence to explain that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	Explain that in a particular habitat some organisms can/not survive well.
3.Sci.LS.7	Make a claim about the merits of a solution to a problem caused when an environment changes and the types of plants and animals that live there may change, as we care for that which God has given to sustain and delight us.	Make claim about the merits of a solution when environmental changes cause plant/animal changes.
Earth and Space Sciences		
3.Sci.ESS.1	Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.	Represent data to describe typical weather conditions.
3.Sci.ESS.2	Obtain and combine information to describe climates in different regions of the world.	Obtain/combine information to describe climates.

3.Sci.ESS.3	Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.	Make claim about the merit of a design solution that reduces impact of a weather-related hazard.
Engineering Design		
3.Sci.ED.1	Through observation and experience, identify a simple problem to be solved and develop a list of criteria for potential solutions.	Identify problem to be solved/develop a list of criteria for potential solutions.
3.Sci.ED.2	Create and compare multiple potential solutions to a problem, then plan and carry out fair tests to consider how the potential solutions can be improved.	Create/compare solutions to problem and plan/carry out fair tests.

Fourth Grade Science Curriculum Standards

Students who demonstrate understanding of fourth grade science are able to--

	Full Standard	Report Card Wording
4.Sci.1	Share how the unity of faith and reason allows us to know there exists no contradiction between the God of nature and the God of faith.	Share that there exists no contradiction between God of nature/God of faith.
4.Sci.2	Explore the responsibility of using science and technology for the common good of humanity and all of God's creation.	Explore responsibility of using science/technology for common good.
Physical Science		
4.Sci.PS.1	Explain the relationship of the speed of an object to the energy of that object.	Explain relationship of speed/energy of object.
4.Sci.PS.2	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	Make observations to provide evidence that energy is transferred.
4.Sci.PS.3	Ask questions and predict outcomes about the changes in energy that occur when objects collide.	Ask questions/predict outcomes about energy when objects collide.
4.Sci.PS.4	Apply scientific ideas in order to design, test, and refine a device that converts energy from one form to another.	Design/test/refine device that converts energy.
4.Sci.PS.5	Develop a model of waves to describe patterns in terms of amplitude and wavelength and to show that waves can cause objects to move.	Develop model of waves to describe patterns.
4.Sci.PS.6	Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.	Develop model of light allowing objects to be seen.

4.Sci.PS.7	Generate and compare multiple solutions that use patterns to transfer information.	Generate/compare multiple solutions that use patterns to transfer information.
Life Science		
4.Sci.LS.1	Describe how plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Describe how plants/animals have structures to support life.
4.Sci.LS.2	Use a model to describe that animals receive different types of information through their senses, process the information in their brains, and respond to the information in different ways.	Use model to describe how animals receive/process/respond to information.
Earth and Space Sciences		
4.Sci.ESS.1	Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.	Identify evidence in rock formations/fossils to support explanation for changes over time.
4.Sci.ESS.2	Make observations and/or measurements to provide evidence of the effects of weathering, or the rate of erosion, by water, ice, wind, or vegetation.	Provide evidence of effects of weathering/rate of erosion.
4.Sci.ESS.3	Analyze and interpret data from maps to describe patterns of Earth's features.	Analyze/interpret data to describe patterns of Earth's features.
4.Sci.ESS.4	Obtain and combine information to describe that energy and fuels are derived from natural resources and to describe how their uses affect the environment.	Describe that energy/fuels are derived from natural resources.
4.Sci.ESS.5	Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	Generate/compare solutions to reduce impacts of natural Earth processes on humans.
Engineering Design		

4.Sci.ED.1	Through observation and experience, identify a problem to be solved and develop a list of probable solutions, given a limited inventory of materials.	Identify problem/develop list of probable solutions.
4.Sci.ED.2	Create and compare multiple potential solutions to a problem while considering the criteria and constraints of the problem.	Create/compare potential solutions to a problem, considering criteria/constraints.
4.Sci.ED.3	Plan and carry out fair tests in which the variables are controlled and failure points are considered in order to identify aspects of a model or prototype that can be improved.	Plan/carry out fair tests to improve prototype.

Fifth Grade Science Curriculum Standards

Students who demonstrate understanding of fifth grade science are able to--

	Full Standard	Report Card Wording
5.Sci.1	Analyze the false assumption that science can replace faith.	Analyze the false assumption that science can replace faith.
5.Sci.2	Gather information about the processes of conservation, preservation, overconsumption, and environmental stewardship in relation to humans caring for that which God has given to sustain us.	Gather information about processes of environmental stewardship.
5.Sci.3	Describe how individual communities use scientific ideas to protect the Earth's resources and environment.	Describe how individual communities use scientific ideas to protect Earth.
5.Sci.4	Describe how science and technology should always be at the service of humanity and, ultimately, to God, and in harmony with His purpose.	Describe how science/technology should always be at the service of humanity.
Physical Science		
5.Sci.PS.1	Develop a model to describe that matter is made of particles too small to be seen.	Develop model to describe matter is made of particles too small to be seen.
5.Sci.PS.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.	Measure/graph quantities to provide evidence that heating/cooling/mixing conserves total weight.
5.Sci.PS.3	Make observations and measurements to identify materials based on their properties.	Make observations to identify materials based on properties.

5.Sci.PS.4	Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	Determine whether mixing of substances results in new substances.
5.Sci.PS.5	Support an argument that the gravitational force exerted by Earth on objects is directed down.	Support argument that gravitational force exerted by Earth on objects is directed down.
5.Sci.PS.6	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.	Describe that energy in food was once energy from sun.
Life Science		
5.Sci.LS.1	Use evidence and reasoning to support the argument that plants get the materials they need for growth chiefly from air and water.	Support argument that plants get materials they need for growth from air/water.
5.Sci.LS.2	Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	Develop a model to describe movement of matter among plants/animals/decomposers/environment.
Earth and Space Sciences		
5.Sci.ESS.1	Use evidence and reasoning to support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth.	Support argument that differences in brightness of sun/stars is due to relative distances from Earth.
5.Sci.ESS.2	Represent real 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.	Graph real data to reveal patterns of daily changes in sunlight.
5.Sci.ESS.3	Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	Develop model to describe interaction of spheres.

5.Sci.ESS.4	Describe and graph the amounts and percentages of water and fresh water in various reservoirs in order to provide evidence about the distribution of water on Earth.	Describe/graph amounts of water in various reservoirs to discuss distribution of water on Earth.
Engineering Design		
5.Sci.ED.1	Through observations and experience, define a problem to be solved and develop a list of probable solutions in consideration of constraints on materials, time and/or cost.	Define problem/develop probable solutions in consideration of materials/time/cost.
5.Sci.ED.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.	Generate/compare multiple solutions to problem based on likelihood of criteria/constraints.
5.Sci.ED.3	Plan and carry out fair tests in which variables are controlled and failure points are considered in order to identify aspects of a model or prototype that can be improved.	Plan/carry out fair tests in which variables are controlled and failure points are considered.

Sixth, Seventh, and Eighth Grade Science Curriculum Standards

(Compiled list of all standards for all science courses 6-8)

Students who demonstrate understanding of sixth, seventh, and eighth grade science are able to--

	Full Standard	Report Card Wording
6-8.Sci.1	Display a deep sense of wonder and delight about the natural universe, and share how the beauty and goodness of God is reflected in nature.	Display deep sense of wonder/delight about natural universe.
6-8.Sci.2	Describe humanity's natural situation in, and dependence upon, physical reality and how man carries out his role as a cooperator with God in the work of creation.	Describe our natural situation in physical reality/how cooperator with God in creation.
6-8.Sci.3	Relate how the search for truth, even when it concerns a finite reality in the natural world or of man, is never-ending and always points beyond to something higher than the immediate object of study.	Relate how search for truth is never-ending.
6-8.Sci.4	Recognize scientific knowledge as a call to serve and not as a means to gain power, material prosperity, or success.	Recognize scientific knowledge as call to serve.
6-8.Sci.5	Recognize the human soul as something specifically created by God for each human being, not as something that evolved from lesser matter or inherited from parents.	Recognize human soul as something specifically created by God.
6-8.Sci.6	Explore the contributions of significant Catholics to science such as Galileo, Copernicus, Mendel, and others.	Explore contributions of significant Catholics to science.
Physical Science		
6-8.Sci.PS.1	Develop models to describe the atomic composition of simple molecules and	Develop models to describe atomic

	extended structures.	composition.
6-8.Sci.PS.2	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.	Analyze/interpret data before/after substances interact.
6-8.Sci.PS.3	Gather and make sense of information to describe that synthetic materials come from natural resources and how they may impact society.	Describe that synthetic materials come from natural resources/how impact society.
6-8.Sci.PS.4	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.	Develop model that predicts/describes changes when thermal energy is added/removed.
6-8.Sci.PS.5	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.	Develop a model to describe how total number of atoms does not change in chemical reaction.
6-8.Sci.PS.6	Design, construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes and a device that minimizes or maximizes thermal energy transfer.	Design/construct device to demonstrate thermal energy in a chemical reaction.
6-8.Sci.PS.7	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.	Design solution to problem involving motion of two colliding objects.
6-8.Sci.PS.8	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.	Provide evidence that change in object's motion depends on forces/mass.
6-8.Sci.PS.9	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.	Determine factors that affect strength of electric/magnetic forces.
6-8.Sci.PS.10	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.	Support claim that gravitational interactions are attractive.
6-8.Sci.PS.11	Conduct an investigation and evaluate the experimental design to provide	Provide evidence that fields exist

	evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.	between objects.
6-8.Sci.PS.12	Construct and interpret graphical displays of data to describe the relationship of kinetic energy to the mass of an object and the speed of an object.	Describe relationship of kinetic energy to mass/speed of an object.
6-8.Sci.PS.13	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.	Develop model to describe objects interacting at a distance and its potential energy.
6-8.Sci.PS.14	Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.	Plan an investigation to determine the relationships among the energy transferred in particles.
6-8.Sci.PS.15	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	Support claim that when kinetic energy changes, energy is transferred.
6-8.Sci.PS.16	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.	Describe model for amplitude/energy of wave.
6-8.Sci.PS.17	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	Describe that waves are reflected/absorbed/transmitted.
6-8.Sci.PS.18	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	Support claim that digitized signals are more reliable than analog signals.

	Life Science	
6-8.Sci.LS.1	Discuss the moral issues involved with <i>in vitro</i> fertilization, human cloning, human genetic manipulation, and human experimentation and what the Church teaches regarding work in these areas.	Discuss the moral issues involved with human genetic manipulation.

6-8.Sci.LS.2	Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.	Provide evidence that living things are made of cells.
6-8.Sci.LS.3	Develop and use a model to describe the function of a cell as a whole and how individual parts of a cell contribute to the cell's function.	Develop model to describe function of cell.
6-8.Sci.LS.4	Form an argument, supported by evidence, for how the body is a system of interacting subsystems composed of groups of cells.	Explain how body is a system of interacting subsystems.
6-8.Sci.LS.5	Form an argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	Support explanation for how animal/plant behaviors affect probability of successful reproduction.
6-8.Sci.LS.6	Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	Explain how environmental/genetic factors influence growth of organisms.
6-8.Sci.LS.7	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	Explain role of photosynthesis in cycling of matter and flow of energy.
6-8.Sci.LS.8	Develop a model to describe how food is rearranged through chemical reactions, forming new molecules that support growth and/or release energy as they move through an organism.	Develop model to describe how food is rearranged through chemical reactions.
6-8.Sci.LS.9	Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.	Synthesize information that sensory receptors respond to stimuli.
6-8.Sci.LS.10	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	Provide evidence for effects of resource availability on organisms.
6-8.Sci.LS.11	Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.	Predict patterns of interactions among organisms across multiple

		ecosystems.
6-8.Sci.LS.12	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.	Develop model to describe cycling of matter and flow of energy in ecosystem.
6-8.Sci.LS.13	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	Construct argument that changes to ecosystem affect populations.
6-8.Sci.LS.14	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	Evaluate competing design solutions for maintaining biodiversity/ecosystem services.
6-8.Sci.LS.15	Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.	Develop model to describe why mutations affect proteins.
6-8.Sci.LS.16	Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.	Develop model to describe genetics of asexual/sexual reproduction.
6-8.Sci.LS.17	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth, as humanity carries out a cooperating role in God's creation.	Analyze data in fossil record that document existence/diversity/extinction/change of life forms.
6-8.Sci.LS.18	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.	Explain anatomical similarities/differences among organisms.
6-8.Sci.LS.19	Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.	Compare patterns of similarities in embryological development.

6-8.Sci.LS.20	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	Describe genetic variations of traits.
6-8.Sci.LS.21	Analyze how available technologies have changed the way humans influence the inheritance of desired traits in organisms, and discuss humanity's role as stewards of God's creation, through the evaluation of the potential risks and benefits of our impact and manipulation of the natural world.	Discuss our role as stewards of creation and analyze how humans can use technology to impact inheritance of traits.
6-8.Sci.LS.22	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	Support explanations of how natural selection influences traits over time.

Earth and Space Sciences		
6-8.Sci.ESS.1	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and the seasons.	Develop model to describe the cyclic patterns of lunar phases/eclipses/seasons.
6-8.Sci.ESS.2	Develop and use a model to describe the role of gravity on the motions within galaxies and the solar system.	Develop model to describe role of gravity on motions within galaxies.
6-8.Sci.ESS.3	Analyze and interpret data to determine scale properties of objects in the solar system.	Determine scale properties of objects in solar system.
6-8.Sci.ESS.4	Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.	Construct explanation from rock strata for the geologic time scale.
6-8.Sci.ESS.5	Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.	Develop model to describe cycling of materials of Earth.
6-8.Sci.ESS.6	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.	Explain how geoscience processes have changed the surface of Earth.

6-8.Sci.ESS.7	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, seafloor structures, and plate tectonics to provide evidence of the past plate motions.	Analyze/interpret data to provide evidence of past plate motions.
6-8.Sci.ESS.8	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.	Develop model to describe cycling of water.
6-8.Sci.ESS.9	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.	Provide evidence for how motion/interaction of air masses results in changes in weather.
6-8.Sci.ESS.10	Develop and use a model to describe how unequal heating and rotation of the Earth causes patterns of atmospheric and oceanic circulation that determine regional climates.	Develop model to describe how unequal heating/rotation of Earth determine regional climates.
6-8.Sci.ESS.11	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.	Explain how uneven distributions of resources are the result of past/current geoscience processes.
6-8.Sci.ESS.12	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects in the future.	Forecast future catastrophic events.
6-8.Sci.ESS.13	Apply scientific principles to design a method for monitoring and minimizing a negative human impact on the environment, as we are called to be responsible for the care of all God's creation (<i>Laudato Si</i> , 25, 117).	Design method for monitoring/minimizing negative human impact on environment.
6-8.Sci.ESS.14	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems in relation to God's call for humanity to exhibit compassionate care for the Earth's resources (<i>Laudato Si</i> , 22-25).	Construct argument for how increases in human population/consumption impact the Earth.
6-8.Sci.ESS.15	Analyze data, such as tables, graphs, and maps of regional temperatures, levels of atmospheric gases, and rates of human activity, to clarify evidence of	Analyze data to clarify evidence of rise in global temperatures.

	the factors that have caused the rise in global temperatures over the past century.	
6-8.Sci.ESS.16	Identify humanity’s role in the stewardship of creation, and describe the scientific, economic, aesthetic, and ethical reasons for environmental stewardship.	Describe the reasons for environmental stewardship.

Engineering Design		
6-8.Sci.ED.1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	Define criteria/constraints of design problem to ensure successful solution.
6-8.Sci.ED.2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	Evaluate competing design solutions.
6-8.Sci.ED.3	Analyze data from tests to determine similarities and differences among several design solutions in order to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	Determine similarities/differences among several design solutions.
6-8.Sci.ED.4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	Develop model to generate data for iterative testing and modification of proposal.

Cross Content Literacy		
6-8.CL.1	Solve authentic problems through open-ended inquiry and ideation to build problem-solving techniques and learning in various contexts.	Solve authentic problems through open-ended inquiry/ideation.

6-8.CL.2	Summarize content-specific traditional texts and digital media in simpler but still accurate terms.	Summarize in simpler/accurate terms.
6-8.CL.3	Determine whether an author's perspective is in accord or discord with Catholic teaching.	Determine whether perspective of author is in accord/discord with Catholic teaching.
6-8.CL.4	Identify omitted information in a piece of published work and infer reasons for such omissions.	Identify omitted information in published work and infer reasons for omissions.
6-8.CL.5	Identify an author's claim, evidence, reasoning, and anticipated counterclaim in a published work.	Identify claim, evidence, reasoning, anticipated counterclaim.
6-8.CL.6	Explain a published work's purpose, tone, and structure in relation to the author's perspective and the intended audience.	Explain purpose/tone/structure.
6-8.CL.7	Determine the meanings of key terms and content-specific vocabulary as used in texts and media.	Determine meanings of key terms and content-specific vocabulary.
6-8.CL.8	Use content-specific vocabulary in the creation of texts or media.	Use content-specific vocabulary.
6-8.CL.9	Compare various domain-specific texts or media (i.e. historical primary sources, scientific research, videos, websites, etc.) in their structural features and design.	Compare various texts/media.
6-8.CL.10	Compare the claims, evidence, and reasoning of various arguments.	Compare claims/evidence/reasoning of various arguments.
6-8.CL.11	Present a clear understanding of a complex topic through the use of multiple relevant and useful sources of information.	Present a clear understanding of a complex topic.
6-8.CL.12	Accurately cite sources of information for use as evidence and reasoning to support an argument.	Accurately cite sources of information.

6-8.CL.13	Construct an argument using a claim, evidence, reasoning, and counterclaim to demonstrate understanding of a content-specific topic of inquiry.	Construct argument using claim, evidence, reasoning, counterclaim
6-8.CL.14	Use collaboration to connect with peers and experts to explore various topics.	Connect with peers/experts to explore topics.
6-8.CL.15	Inform and influence audiences, through verbal communication and the creation of media and writing, in order to proclaim the Word of God, share the teachings of Jesus Christ, and to promote the greater good of the community.	Inform/influence audiences to proclaim Word of God/promote greater good.
6-8.CL.16	Self-reflect, using metacognitive strategies, on the specific and individual processes and techniques used to complete academic tasks in order to assess progress toward academic goals.	Assess progress toward academic goals.

Ninth through Twelfth Grade Science Curriculum Standards
(compiled list of all curriculum standards for science in grades 9-12)

Students who demonstrate understanding of high school science are able to--

HS.Sci.1	Display a deep sense of wonder and awe about the natural universe, and share how the beauty and goodness of God is reflected in nature and in the study of the natural sciences.
HS.Sci.2	Recognize God's gift of human intelligence to be the means through which we inquire and explore the sciences; relate how the search for truth is never-ending and always points beyond to something higher than the immediate object of study, as God is our Creator.
HS.Sci.3	Recognize scientific knowledge as a call to serve and as not a means to gain power, material prosperity, or success; analyze how the pursuit of scientific knowledge, for utilitarian purposes or the misguided manipulation of nature, thwarts the pursuit of authentic Truth and the greater glory of God.
HS.Sci.4	Share the premise that nature should not be manipulated at will or viewed as a thing to be used, but should be respected for its natural purpose, as mankind is called to cooperate with God's plan for humanity and nature.
HS.Sci.5	Recognize God's role as Creator in relation to mankind's explanation of biological evolution, as faith and reason unite with no contradiction.
HS.Sci.6	Explain how the physiological properties of a human being do not address the existence of the transcendent spirit of the human person.
Physical Sciences	
HS.Sci.PS.1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
HS.Sci.PS.2	Explain, using evidence and reasoning, the outcome of a simple chemical reaction based on the outermost electron state of the atom, trends in the periodic table, and knowledge of the patterns of chemical properties.

HS.Sci.PS.3	Use inquiry to gather evidence to compare the structure of substances at the bulk scale and to infer the strength of electrical forces between particles.
HS.Sci.PS.4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
HS.Sci.PS.5	Explain, using scientific principles and evidence, the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
HS.Sci.PS.6	Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
HS.Sci.PS.7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
HS.Sci.PS.8	Develop models to illustrate the changes in the composition of the nucleus of an atom and the energy released during the processes of fission, fusion, and radioactive decay.
HS.Sci.PS.9	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
HS.Sci.PS.10	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
HS.Sci.PS.11	Design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
HS.Sci.PS.12	Describe and predict the gravitational and electrostatic forces between objects, using mathematical representations of Newton's Law of Gravitation and Coulomb's Law.
HS.Sci.PS.13	Use inquiry to find evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.
HS.Sci.PS.14	Describe why the molecular-level structure is important in the functioning of designed materials.

HS.Sci.PS.15	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
HS.Sci.PS.16	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and the relative position of the particles (objects).
HS.Sci.PS.17	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
HS.Sci.PS.18	Use inquiry to find evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics).
HS.Sci.PS.19	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
HS.Sci.PS.20	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
HS.Sci.PS.21	Describe how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.

Life Sciences	
HS.Sci.LS.1	Explain, using evidence and reasoning, how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.
HS.Sci.LS.2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

HS.Sci.LS.3	Use inquiry to describe how feedback mechanisms maintain homeostasis.
HS.Sci.LS.4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
HS.Sci.LS.5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
HS.Sci.LS.6	Explain, using evidence and reasoning, how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
HS.Sci.LS.7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food and oxygen molecules are broken and bonds in new compounds are formed, resulting in a net transfer of energy.
HS.Sci.LS.8	Explain factors that affect carrying capacity of ecosystems at different scales, using mathematical and/or computational representations.
HS.Sci.LS.9	Describe, using evidence and reasoning, the factors affecting biodiversity and populations in ecosystems of different scales.
HS.Sci.LS.10	Use inquiry to describe the cycling of matter and flow of energy in aerobic and anaerobic conditions.
HS.Sci.LS.11	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
HS.Sci.LS.12	Describe the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.
HS.Sci.LS.13	Describe and clarify the relationship between the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
HS.Sci.LS.14	Develop a claim based on evidence and reasoning that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

HS.Sci.LS.15	Explain the variation and distribution of expressed traits in a population, using statistics and probability.
HS.Sci.LS.16	Describe how common ancestry and biological evolution are supported by multiple lines of empirical evidence.
HS.Sci.LS.17	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
HS.Sci.LS.18	Explain, using evidence and reasoning, how natural selection leads to adaptation of populations.

Earth and Space Sciences	
HS.Sci.ESS.1	Develop a model, based on evidence, to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
HS.Sci.ESS.2	Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
HS.Sci.ESS.3	Describe the way stars, over their life cycle, produce elements.
HS.Sci.ESS.4	Predict, using mathematical or computational representations, the motion of orbiting objects in the solar system.
HS.Sci.ESS.5	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
HS.Sci.ESS.6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
HS.Sci.ESS.7	Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.

HS.Sci.ESS.8	Analyze geoscience data that supports the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.
HS.Sci.ESS.9	Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection.
HS.Sci.ESS.10	Use a model to describe how variations in the flow of energy into and out of the Earth's systems can result in changes in climate.
HS.Sci.ESS.11	Use inquiry to investigate the properties of water and its effects on Earth materials and surface processes.
HS.Sci.ESS.12	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
HS.Sci.ESS.13	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
HS.Sci.ESS.14	Explain, using evidence and reasoning, how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
HS.Sci.ESS.15	Describe relationships among management of natural resources, the sustainability of human populations, and biodiversity.
HS.Sci.ESS.16	Analyze geoscience data and the results from global climate models to make an evidence-based claim of the current rate of global or regional climate change and associated future impacts to Earth systems.
HS.Sci.ESS.17	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
HS.Sci.ESS.18	Evaluate various scientific approaches and opinions that aim to offer solutions to issues of the human impact on the environment, such as pollution, climate change, access to drinking water, loss of biodiversity, and global inequalities (Laudato Si 20-61).

HS.Sci.ESS.20	Address mankind's responsibility for environmental stewardship, for unraveling the "myths" of modern utilitarian progress, and for restoring the ecological equilibrium both within the human person and among mankind, the environment, and God (Laudato Si 210).
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Engineering Design	
HS.Sci.ED.1	Analyze a major global challenge, specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS.Sci.ED.2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS.Sci.ED.3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
HS.Sci.ED.4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Cross-Content Literacy	
HS.CL.1	Solve authentic problems through open-ended inquiry and ideation in various contexts.
HS.CL.2	Paraphrase complex content-specific texts and media in simpler but still accurate terms.
HS.CL.3	Determine to what extent an author's work is in accord or discord with Catholic teaching.
HS.CL.4	Identify important issues that remain unresolved in a traditional text or digital media.
HS.CL.5	Identify the perspective, potential bias, and credibility of primary and secondary sources based on their maker, date, place of origin, intended audience, and intended purpose.

HS.CL.6	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as used in content-rich texts.
HS.CL.7	Use content-specific vocabulary in the creation of texts and media.
HS.CL.8	Identify and evaluate the claim, evidence, reasoning and counterclaims in a piece of published work, and verify or challenge the position by using other sources of information.
HS.CL.9	Analyze and compare the elements and structures of domain-specific published work (i.e. historical primary sources, scientific research, videos, websites, etc.).
HS.CL.10	Synthesize information from a range of sources to demonstrate a clear understanding of a complex topic.
HS.CL.11	Precisely and appropriately cite sources of information for use as evidence and reasoning to enhance an argument.
HS.CL.12	Construct an argument using precise claims, counterclaims, reasoning, and evidence to demonstrate understanding of a complex topic of inquiry.
HS.CL.13	Use collaboration to connect with peers and experts to explore various points of view on particular topics in various contexts.
HS.CL.14	Inform and influence audiences, through verbal communication and the creation of media and writing, for a variety of specific purposes, including to proclaim, defend, and share the teachings of our Catholic faith and to promote the greater good of society.
HS.CL.15	Use metacognitive strategies to examine the specific and individual processes and techniques used in completing various academic tasks in order to assess one's progress toward academic goals.

**Diocese of Grand Rapids
Office of Catholic Schools
Curriculum Standards
for Science
in grades K-12**

Acknowledgements for Curriculum Standards for Science

The Diocese of Grand Rapids Office of Catholic Schools Curriculum Standards for Science were drafted in reflection of

AP Biology Course Description. College Board, 2015.

AP Chemistry Course Description. College Board, 2014.

AP Environmental Science Course Description. College Board, 2013.

AP Physics 1 Course Description. College Board, 2017.

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Van Andel Education Institute (VAEI), 2017.

Acknowledgements for Curriculum Standards for Cross-Content Literacy

The Diocese of Grand Rapids Curriculum Standards for Cross-Content Literacy in grades six through twelve were drafted in reflection of

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Test Specifications for the Redesigned SAT. College Board, 2015.

Van Andel Education Institute (VAEI), 2017.

Note on **Shared-Time Teachers**

Shared-time teachers employed by local public school districts must comply with the curriculum guidelines of the local public school districts. Each is a Michigan public school as those terms are defined within the 1998 Public Act 339. The curriculum provided in those programs shall comply with all regulations required by Public Act 339.