East Grand Rapids Public Schools

ELEMENTARY SCIENCE CURRICULUM

Grades K-5

EGRPS
EAST GRAND RAPIDS PUBLIC SCHOOLS

April 2018

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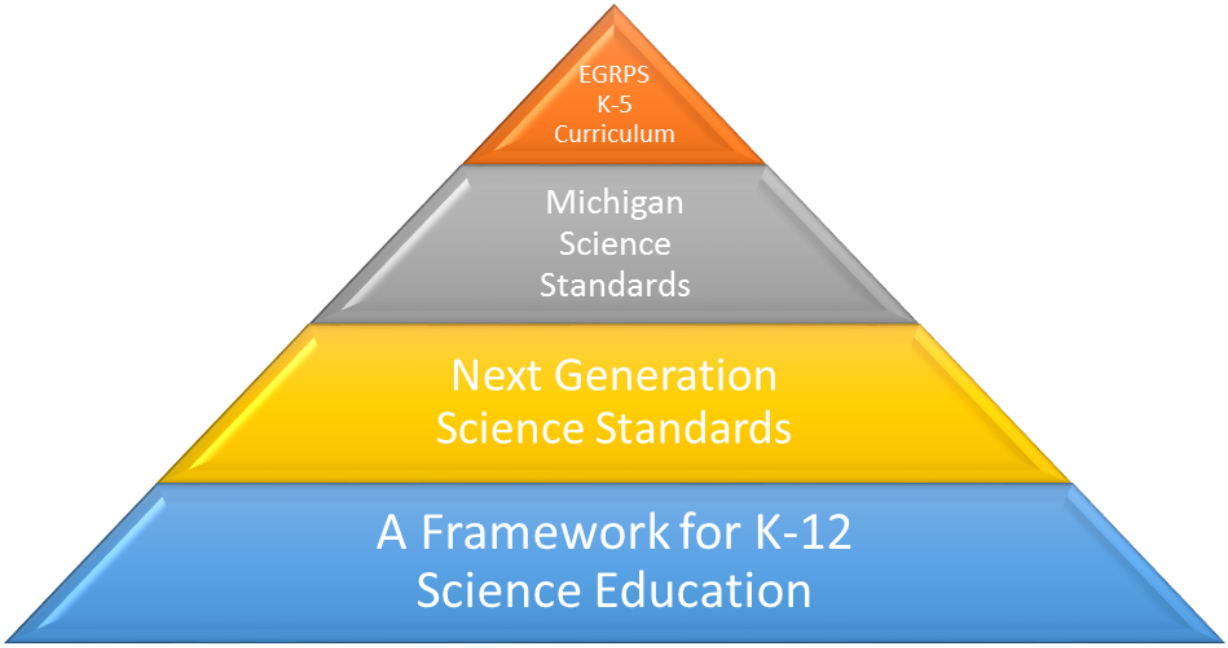
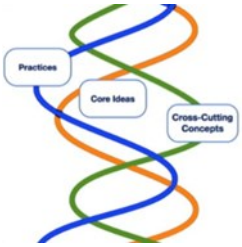
BACKGROUND

The new Michigan Science Standards (MSS) are the performance expectations (PE) outlined in the Next Generation Science Standards, which in turn are based on guidance set forth by the National Research Council in their 2011 publication, *A Framework for K-12 Science Education*.



The Michigan Science Standards, which replace the Grade Level Content Expectations in Science, identify the student performance outcomes in topics of science and engineering outlined in the "*Framework*". These are the standards on which the proposed East Grand Rapids Public Schools K-5 science curriculum was developed.

CURRICULAR APPROACH



The curriculum embraces the three-dimensions of science learning (3D learning) outlined in *A Framework for K-12 Science Education.* 3D learning refers to the thoughtful and deliberate integration of science and engineering practices, core ideas, and cross-disciplinary concepts. Through 3D learning, the Michigan Science Standards and the EGRPS K-5 Science Curriculum emphasize that science is not just a series of isolated facts, but an interrelated world of inquiry and phenomena.

3D SCIENCE LEARNING

DIMENSION ONE:

Science and Engineering Practices

"What students do"

Students need to be engaged in doing science by applying the same practices used by scientists and engineers.

Asking questions and defining problems
Developing and using models
Planning and carrying out investigations
Analyzing and interpreting data
Using mathematics and computational thinking
Constructing explanations and designing solutions
Engaging in argument from evidence

DIMENSION TWO:

Crosscutting Concepts (CCCs)

"How students think"

Students need to see and think about the connections of core ideas to the bigger science concepts that cross disciplinary lines. Students use these overarching and enduring understandings as a means to connect the core ideas from various disciplines into a "cumulative, coherent, and usable understanding of science and engineering" (*Framework*, page. 83).

Patterns
Cause and Effect
Scale, Proportion, and Quantity
Systems and System Models
Energy and Matter in Systems
Structure and Function
Stability and Change of Systems

DIMENSION THREE:

Disciplinary Core Ideas (DCIs)

"What students know"

Students should engage in science and engineering practices in the context of core ideas that become ever more sophisticated as students move through school. The curriculum is organized across four disciplines: Physical Science, Earth Science, Life Science, and Engineering, Technology, and Applications of Science.

Physical Science

Earth and Space Science

Life Science

Engineering, Technology, & Applications of Science

SCIENCE INSTRUCTION

3D learning sees science as an interrelated world of inquiry and phenomena. With this fact in mind, the curriculum presents coherent investigations or engineering problems, where questions and phenomena motivate building and using the disciplinary and crosscutting ideas. For example, kindergarten students investigate the phenomena of a push and a pull by changing the motion of playground equipment. In fifth grade, students solve the problem of an incomplete electrical circuit. By basing the curriculum on questions and phenomena, the learning becomes inquiry-based and integrates the three-dimensions of learning: Science and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas.

This calls for a different approach to teaching science; an approach that engages students in the practices of science and engineering by doing science. Within the context of this curriculum, science instruction will look different.

Science instruction will involve **less**:	Science instruction will involve **more**:
Rote memorization of facts and terminology	Facts and terminology learned as needed while developing explanations and designing solutions supported by evidence-based arguments and reasoning
Learning of ideas disconnected from questions about phenomena	Systems thinking to explain phenomena, giving context for the ideas to be learned and modeled
Teachers providing information to the whole class	Students conducting investigations, solving problems, and engaging in discussions with teachers' facilitation
Teachers posing questions with only one right answer	Students discussing open-ended questions that focus on the strength of the evidence used to generate claims
Students reading textbooks and answering questions at the end of each chapter	Students reading multiple sources and developing summaries of information
Worksheets	Student learning reflected through journals, reports, posters, and media presentations that explain and argue

Source: national Research Council. (2015). Guide to Implementing the Next Generation Science Standards (pp. 8-9). Washington, DC: National Academies Press. http://www.nap.edu/cataog/18802/guide-to-implementin-th-next-generation-science-standards

NEXT GENERATION SCIENCE STANDARDS

DIMENSION 1: Science and Engineering Practices	DIMENSION 2: Crosscutting Concepts (CCC)
• Asking questions and defining problems • Developing and using models • Planning and carrying out investigations • Analyzing and interpreting data • Using mathematics and computational thinking • Constructing explanations and designing solutions • Engaging in argument from evidence • Obtaining, evaluating, and communicating information	• Patterns • Cause and effect: Mechanism and explanation • Scale, proportion, and quantity • Systems and system models • Energy and matter: Flows, cycles, and conservation • Structure and function • Stability and change

DIMENSION 3: Disciplines			
Physical Science	**Life Science**	**Earth and Space Science**	**Engineering, Technology, and Applications of Science**
CORE IDEAS	**CORE IDEAS**	**CORE IDEAS**	**CORE IDEAS**
PS1: Matter and its interactions PS2: Motion and stability: Forces and interactions PS3: Energy PS4: Waves and their applications in technologies for information transfer	LS1: From molecules to organisms: Structures and processes LS2: Ecosystems: Interactions, energy, and dynamics LS3: Heredity: Inheritance and variation of traits LS4: Biological evolution: Unity and diversity	ESS1: Earth's place in the universe ESS2: Earth's systems ESS3: Earth and human activity	ETS1: Engineering design ETS2: Links among engineering, technology, science, and society
SUB IDEAS	**SUB IDEAS**	**SUB IDEAS**	**SUB IDEAS**
PS1: Matter and its interactions PS1.A: Structures and Properties of Matter PS1.B: Chemical Reactions PS1.C: Nuclear Process **PS2: Motion and Stability: Forces and Interactions** PS2.A: Forces and Motions PS2.B: Types of Interactions PS2.C: Stability and Instability in Physical Systems **PS3: Energy** PS3.A: Definitions of Energy PS3.B: Conservation of Energy and Energy Transfer PS3.C: Relationship between Energy and Forces PS3.D: Energy in Chemical Processes and Everyday Life **PS4: Waves and Their Applications in Technologies for Information Transfer** PS4.A: Wave Properties PS4.B: Electromagnetic Radiation PS4.C: Information Technologies and Instrumentation	**LS1: From Molecules to Organisms: Structures/Processes** LS1.A: Structure and Function LS1.B: Growth and Development of Organisms LS1.C: Organization for Matter and Energy Flow in Organisms LS1.D: Information Processing **LS2: Ecosystems: Interactions, Energy, and Dynamics** LS2.A: Interdependent Relationships in Ecosystems LS2.B: Cycles of Matter & Energy Transfer in Ecosystems LS2.C: Ecosystem Dynamics, Functioning, and Resilience LS2.D: Social interactions and Group Behavior **LS 3: Heredity: Inheritance and Variation of Traits** LS3.A: Inheritance of Traits LS3.B: Variation of Traits **LS 4: Biological Evolution: Unity and Diversity** LS4.A: Evidence of Common Ancestry and Diversity LS4.B: Natural Selection LS4.C: Adaptation LS4.D: Biodiversity and Humans	**ESS1: Earth's Place in the Universe** ESS1.A: The Universe and Its Stars ESS1.B: Earth and the Solar System ESS1.C: The History of Planet Earth **ESS2: Earth's Systems** ESS2.A: Earth Materials and Systems ESS2.B: Plate Tectonics and Large-Scale System Interactions ESS2.C: The Roles of Water in Earth's Surface Processes ESS2.D: Weather and Climate ESS2.E: Biogeology **ESS3: Earth and Human Activity** ESS3.A: Natural Resources ESS3.B: Natural Hazards ESS3.C: Human Impacts on Earth Systems ESS3.D: Global Climate Change	**ETS1: Engineering Design** ETS1.A: Defining and Delimiting an Engineering Problem ETS1.B: Developing Possible Solutions ETS1.C: Optimizing the Design Solution **ETS2: Links Among Engineering, Technology, Science, and Society** ETS2.A: Interdependence of Science, Engineering, and Technology ETS2.B: Influence of Engineering, Technology, and Science on Society and the Natural World

DISCIPLINARY CORE IDEAS (DCI): A list of what students should understand about EACH sub-idea at the end of grades 2, 5, 8, and 12.

PERFORMANCE EXPECTATIONS (PE): Statements of what students at each grade level should be able to do after instruction; Incorporate the three dimensions into its wording.

TOPICS/BUNDLES: A group of PEs clustered together.

SCOPE AND SEQUENCE OF MICHIGAN K-5 SCIENCE TOPICS

	TOPICS	K	1	2	3	4	5	6-8	9-12
PHYSICAL SCIENCE	Energy					√		√	√
	Structures & Properties of Matter			√			√	√	√
	Waves		√			√		√	√
	Forces & Interactions	√			√			√	√
EARTH SCIENCE	Earth's Systems			√		√	√	√	√
	Weather & Climate	√		√	√			√	√
	Space Systems		√				√	√	√
LIFE SCIENCE	Inheritance and Variation of Traits				√				√
	Interdependent Relationships in Ecosystems	√		√	√			√	√
	Matter and Energy in Organisms and Ecosystems						√	√	√
	Structure, Function & Information Processing		√			√		√	√
ETSA	Engineering & Design	√	√	√	√	√	√	√	√

ETSA: *Engineering, Technology and Applications of Science*

MICHIGAN K-5 SCIENCE STANDARDS: TOPICS AND PERFORMANCE EXPECTATIONS

KINDERGARTEN	
PHYSICAL SCIENCE	**FORCES AND INTERACTIONS: PUSHES AND PULLS**
	K-1PS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the notion of an object. **K-PS2-2** Analyze Data to determining if a design solution works as intended to change the speed or direction of an object with a push and pull.*
EARTH SCIENCE	**WEATHER AND CLIMATE**
	K-PS3-1 Make observations to determine the effect of sunlight on Earth's surface. **K-PS3-2** Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area. * **K-ESS2-1** Use and share observations of local weather conditions to describe patterns over time.+ **K-ESS3-2** Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather. * +
LIFE SCIENCE	**INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS: ANIMALS, PLANTS, AND THEIR ENVIRONMENT**
	K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.+ **K-ESS2-2** Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. **K-ESS3-1** Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. **K-ESS3-3** Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment. * +
ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE	**ENGINEERING DESIGN**
	K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. **K-2-ETS1-2** 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. **K-2-ETS1-3** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

- *Each TOPIC, such as "Weather and Climate," is a summary for a bundle of specific performance expectations at each grade level.*
- *Performance Expectations (PE) are statements of what students at each grade level should be able to do after instruction.*
- *The Michigan Science Standards are the Performance Expectations of the Next Generation Science Standards.*
- *Reference codes, such as K-PS3-2, identify each Performance Expectation in the Michigan Science Standards and the Next Generation Science Standards. For example, K-PS3-2, is a Kindergarten Performance Expectation, linked to the Disciplinary Core Idea of Physical Science, and is the second in a sequence of Performance Expectations linked to PS3.*

KEY

* *Integrates traditional science content with engineering.*

\+ *Allow for local, regional, or Michigan specific contexts or examples in teaching and assessment.*

Includes a Michigan specific performance expectation.

MICHIGAN K-5 SCIENCE STANDARDS: TOPICS AND PERFORMANCE EXPECTATIONS

FIRST GRADE	
PHYSICAL SCIENCE	**WAVES: LIGHT AND SOUND**
	1-PS4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **1-PS4-2** Make observations to construct an evidence-based account that objects can be seen only when illuminated. **1-PS4-3** Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. **1-PS4-4** Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.*
EARTH SCIENCE	**SPACE SYSTEMS: PATTERNS AND CYCLES**
	1-ESS1-1 Use observations of the sun, moon, and stars to describe patterns that can be predicted. **1-ESS1-2** Make observations at different times of year to relate the amount of daylight to the time of year. +
LIFE SCIENCE	**STRUCTURE, FUNCTION, AND INFORMATION PROCESSING**
	1-LS1-1 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. * **1-LS1-2** Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. **1-LS3-1** Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE	**ENGINEERING DESIGN**
	K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. **K-2-ETS1-2** 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. **K-2-ETS1-3** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

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MICHIGAN K-5 SCIENCE STANDARDS: TOPICS AND PERFORMANCE EXPECTATIONS

SECOND GRADE	
PHYSICAL SCIENCE	**STRUCTURE AND PROPERTIES OF MATTER** **2-PS1-1** Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. **2-PS1-2** Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. * **2-PS1-3** Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. **2-PS1-4** Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
EARTH SCIENCE	**EARTH'S SYSTEMS: PROCESSES THAT SHAPE THE EARTH** **2-ESS1-1** Use information from several sources to provide evidence that Earth events can occur quickly or slowly. * **2-ESS2-1** Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. * + **2-ESS2-2** Develop a model to represent the shapes and kinds of land and bodies of water in an area. **2-ESS2-2 MI** Develop a model to represent the state of Michigan and the Great Lakes, or a more local land area and water body. **2-ESS2-3** Obtain information to identify where water is found on Earth and that it can be solid or liquid. + **2-ESS2-3 MI** Obtain information to identify where fresh water is found on Earth, including the Great Lakes and Great Lakes Basin.
LIFE SCIENCE	**INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS** **2-LS2-1** Plan and conduct an investigation to determine if plants need sunlight and water to grow. + **2-LS2-2** Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. * **2-LS4-1** Make observations of plants and animals to compare the diversity of life in different habitats. +
ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE	**ENGINEERING DESIGN** **K-2-ETS1-1** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool. **K-2-ETS1-2** 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. **K-2-ETS1-3** Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

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MICHIGAN K-5 SCIENCE STANDARDS: TOPICS AND PERFORMANCE EXPECTATIONS

THIRD GRADE	
PHYSICAL SCIENCE	**FORCES AND INTERACTIONS**
	3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. **3-PS2-2** Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. **3-PS2-3** Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. **3-PS2-4** Define a simple design problem that can be solved by applying scientific ideas about magnets. *
EARTH SCIENCE	**WEATHER AND CLIMATE**
	3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. **3-ESS2-2** Obtain and combine information to describe climates in different regions of the world. **3-ESS3-1** Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. +
LIFE SCIENCE	**INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS**
	3-LS2-1 Construct an argument that some animals form groups that help members survive. **3-LS4-1** Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. + **3-LS4-3** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. + **3-LS4-4** Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. * +
	INHERITANCE AND VARIATION OF TRAITS: LIFE CYCLES AND TRAITS
	3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. **3-LS3-1** 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. **3-LS3-2** Use evidence to support the explanation that traits can be influenced by the environment. **3-LS4-2** Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

MICHIGAN K-5 SCIENCE STANDARDS: TOPICS AND PERFORMANCE EXPECTATIONS

THIRD GRADE	
	ENGINEERING DESIGN
ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE	**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.

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MICHIGAN K-5 SCIENCE STANDARDS: TOPICS AND PERFORMANCE EXPECTATIONS

FOURTH GRADE	
PHYSICAL SCIENCE	**ENERGY**
	4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object. **4-PS3-2** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. **4-PS3-3** Ask questions and predict outcomes about the changes in energy that occur when objects collide. **4-PS3-4** Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* **4-ESS3-1** Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
	WAVES: WAVES AND INFORMATION
	4-PS4-1 Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. **4-PS4-3** Generate and compare multiple solutions that use patterns to transfer information.*
EARTH SCIENCE	**EARTH'S SYSTEMS: PROCESSES THAT SHAPE THE EARTH**
	4-ESS1-1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. ** **4-ESS1-1** MI Identify evidence from patterns in rock formations and fossils in rock layers to support possible explanations of Michigan's geological changes over time. **4-ESS2-1** Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation** **4-ESS2-2** Analyze and interpret data from maps to describe patterns of Earth's features. **4-ESS3-2** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*+ **4-ESS3-2 MI** Generate and compare multiple solutions to reduce the impacts of natural Earth processes on Michigan's people and places.
LIFE SCIENCE	**STRUCTURE, FUNCTION, AND INFORMATION PROCESSING**
	4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. **4-LS1-1** Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. **4-LS1-2** Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

MICHIGAN K-5 SCIENCE STANDARDS: TOPICS AND PERFORMANCE EXPECTATIONS

FOURTH GRADE	
	ENGINEERING DESIGN
ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE	**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.

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MICHIGAN K-5 SCIENCE STANDARDS: TOPICS AND PERFORMANCE EXPECTATIONS

FIFTH GRADE	
PHYSICAL SCIENCE	**STRUCTURE AND PROPERTIES OF MATTER**
	5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen. **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. **5-PS1-3** Make observations and measurements to identify materials based on their properties. **5-PS1-4** Conduct an investigation to determine whether the mixing of two or more substances results in new substances.
EARTH SCIENCE	**EARTH'S SYSTEMS**
	5-ESS2-1 Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. **5-ESS2-1MI** Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact in Michigan and the Great Lakes basin. **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. **5-ESS2-2MI** Describe and graph the amounts and percentages of water and fresh water in the Great Lakes to provide evidence about the distribution of water on Earth. **5-ESS3-1** Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. +
	SPACE SYSTEMS: STARS AND THE SOLAR SYSTEM
	5-PS2-1 Support an argument that the gravitational force exerted by Earth on objects is directed down. **5-ESS1-1** Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth. **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.
LIFE SCIENCE	**MATTER AND ENERGY IN ORGANISMS AND ECOSYSTEMS**
	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. **5-LS1-1** Support an argument that plants get the materials they need for growth chiefly from air and water. **5-LS2-1** Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

MICHIGAN K-5 SCIENCE STANDARDS: TOPICS AND PERFORMANCE EXPECTATIONS

FIFTH GRADE	
	ENGINEERING DESIGN
ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE	**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.

- *Each TOPIC, such as "Weather and Climate," is a summary for a bundle of specific performance expectations at each grade level.*
- *Performance Expectations (PE) are statements of what students at each grade level should be able to do after instruction.*
- *The Michigan Science Standards are the Performance Expectations of the Next Generation Science Standards.*
- *Reference codes, such as K-PS3-2, identify each Performance Expectation in the Michigan Science Standards and the Next Generation Science Standards. For example, K-PS3-2, is a Kindergarten Performance Expectation, linked to the Disciplinary Core Idea of Physical Science, and is the second in a sequence of Performance Expectations linked to PS3.*

KEY

* *Integrates traditional science content with engineering.*

\+ *Allow for local, regional, or Michigan specific contexts or examples in teaching and assessment.*

Includes a Michigan specific performance expectation.

OVERVIEW: MICHIGAN K-5 SCIENCE TOPICS ALIGNED TO CEREAL CITY SCIENCE UNITS

KINDERGARTEN TOPICS			
PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE	ETSA
MOTION: PUSHES AND PULLS FORCES AND INTERACTIONS	WEATHER AND CLIMATE	INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS: ANIMALS, PLANTS, AND THEIR ENVIRONMENT	K-2 ENGINEERING DESIGN
Cereal City (KPNG)	Cereal City (KENG)	Cereal City (KLNG)	Embedded

1st GRADE TOPICS			
PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE	ETSA
WAVES: LIGHT AND SOUND	SPACE SYSTEMS: PATTERNS AND CYCLES	STRUCTURE, FUNCTION, AND INFORMATION PROCESSING	K-2 ENGINEERING DESIGN
Cereal City (1PNG)	Cereal City (1ENG)	Cereal City (1LNG)	Embedded

2nd GRADE TOPICS			
PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE	ETSA
STRUCTURE AND PROPERTIES OF MATTER	CHANGING EARTH: PROCESSES THAT SHAPE EARTH	INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS	K-2 ENGINEERING DESIGN
Cereal City (2PNG)	Cereal City (2ENG)	Cereal City (2LNG)	Embedded

3rd GRADE TOPICS				
PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE		ETSA
FORCES AND INTERACTIONS	WEATHER AND CLIMATE	INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS	INHERITANCE AND VARIATION OF TRAITS: LIFE CYCLES AND TRAITS	3-5 ENGINEERING DESIGN
Cereal City (3PNG)	Cereal City (3ENG)	Cereal City (3LNG)		Embedded

4th GRADE TOPICS				
PHYSICAL SCIENCE		EARTH SCIENCE	LIFE SCIENCE	ETSA
ENERGY	WAVES: WAVES AND INFORMATION	EARTH SYSTEM'S: PROCESSES THAT SHAPE EARTH	STRUCTURE, FUNCTION, AND INFORMATION PROCESSING	3-5 ENGINEERING DESIGN
Cereal City (4PNG)		Cereal City (4ENG)	Cereal City (4LNG)	Embedded

5thGRADE TOPICS				
PHYSICAL SCIENCE	EARTH SCIENCE		LIFE SCIENCE	ETSA
STRUCTURE AND PROPERTIES OF MATTER	EARTH'S SYSTEMS	SPACE SYSTEMS: STARS AND THE SOLAR SYSTEM	MATTER AND ENERGY IN ORGANISMS AND ECOSYSTEMS	3-5 ENGINEERING DESIGN
Cereal City (5PNG)	Cereal City (5ENG)		Cereal City (5LNG)	Embedded

LIKE COLORS: *Indicate topics of a similar nature*
ETSA: *Engineering, Technology and Applications of Science*

SCOPE AND SEQUENCE:
MICHIGAN K-2 SCIENCE TOPICS
ALIGNED TO CEREAL CITY SCIENCE UNITS

	PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE
K	Motion: Pushes and Pulls (Forces and Interactions) K-PS2-1 K-PS2-2 Students explore the effects of different strengths and directions of pushes and pulls on the motion of objects.	Weather and Climate K-PS3-1 K-PS3-2 K-ESS2-1 K-ESS3-2 Students explore patterns in weather and how weather changes from day-to-day, using measurement of temperature, wind, cloud cover, and precipitation. They relate their findings to weather forecasting to prepare for severe conditions.	Interdependent Relationships in Ecosystems: Animals, Plants, and their Environment K-LS-1 K-ESS2-2 K-ESS3-1 K-ESS3-3 Students investigate what all plants and animals need to survive and how they find their needs in their environments.
1ST Grade	Waves: Light and Sound 1-PS4-1 1-PS4-3 1-PS4-2 1-PS4-4 Students explore the relationship between vibrations and sound and design instruments or sound makers. Students explore light in terms of light traveling in a straight path from one place to another and placing different objects in the path of light.	Space Systems: Patterns and Cycles 1-ESS1-1 1-ESS1-2 Students make observations of patterns of objects in the sky and they seem to move. Students use patterns in data to predict some movements of objects in the sky.	Structure, Function, and Information Processes 1-LS1-1 1-LS3-1 1-LS1-2 Students explore some ways plants and animals meet their needs to survive and grow.
2ND Grade	Structures and Properties of Matter 2-PS1-1 2-PS1-3 2-PS1-2 2-PS1-4 ETS1.C Students explore the properties of matter and how different properties make material useful in designing and building different items.	Changing Earth: Today and Overtime 2-ESS1-1 2-ESS2-2 2-ESS2-1 2-ESS2-3 Students explore and develop models of different landforms and bodies of water and investigate the causes of land and water changing rapidly or over a long period of time.	Interdependent Relationships in Ecosystems 2-LS2-1 2-LS4-1 2-LS2-2 Students explore the diversity of plants and animals, the dependency of plants on animals, and the dependency of animals on plants.
The discipline of Engineering, Technology, and Applications of Science are embedded across the three disciplines (physical, earth, and life sciences) in all grade levels **K-2-ETS1-1 K-2-ETS1-2 K-2-ETS1-3**			

SCOPE AND SEQUENCE:
MICHIGAN 3-5 SCIENCE TOPICS
ALIGNED TO CEREAL CITY SCIENCE UNITS

	PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE
3RD Grade	Forces and Interactions 3-PS2-1 3-PS3-3 3-PS2-2 3-PS4-4 Students explore the effects of balanced and unbalanced forces on the motion of objects. Their exploration includes non-contact forces using magnets and electricity.	Weather, Climate, and Natural Hazards 3-ESS2-1 3-ESS3-1 3-ESS2-2 Students explore weather in different parts of the world and at different times of the year. They collect and analyze data to use patterns to predict future weather events and seasons.	Interdependent Relationships in Ecosystems & Life Cycles and Traits 3-LS2-1 3-LS1-1 3-LS4-1 3-LS3-1 3-LS4-3 3-LS3-2 3-LS4-4 3-LS4-2
4TH Grade	Energy & Waves 4-PS3-1 4-PS4-1 4-PS3-2 4-PS4-3 4-PS3-3 4-PS4-2 4-PS3-4 ETS1.A ETS1.C Students explore how energy moves from place to place and is observable through sound, light, heat transfer, motion and electric currents.	Processes that Shape the Earth 4-ESS1-1 4-ESS3-2 4-ESS2-1 4-ESS3-1 4-ESS2-2 ETS1.B Students explore the cause and effect relationship of weathering and erosion to Earth's surfaces. They explore changes over time due to Earth's forces and natural hazards.	Structure, Function, and Information Processes 4-PS4-2 4-LS1-2 4-LS1-1
5TH Grade	Structures and Properties of Matter 5-PS1-1 5-PS1-3 5-PS1-2 5-PS1-4 Students explore matter in terms of measurable properties and as made up of particles too small to be seen. Students develop an understanding that the number of particles and weight of matter do not change regardless of the changes it goes through.	Earth & Space Systems 5-ESS2-1 5-ESS1-1 5-ESS2-2 5-ESS1-2 5-ESS3-1 5-PS2-1 Students develop a model to describe ways that the geosphere, atmosphere, and hydrosphere interact. They describe and graph data to provide evidence about the distribution of water on Earth.	Matter and Energy in Organisms and Ecosystems 5-PS3-1 5-LS2-1 5-LS1-1
The discipline of Engineering, Technology, and Applications of Science are embedded across the three disciplines (physical, earth, and life sciences) in all grade levels **3-5-ETS1-1 3-5-ETS1-2 3-5-ETS1-3**			

KINDERGARTEN OVERVIEW

	PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE
	MOTION: PUSHES AND PULLS (Forces and Interactions)	**WEATHER AND CLIMATE**	**INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS: ANIMALS, PLANTS, AND THEIR ENVIRONMENT**
PERFORMANCE EXPECTATIONS *(NGSS, MSS, CCS)*	K-PS2-1 K-PS2-2*	K-PS3-1 K-PS3-2* K-ESS2-1+ K-ESS3-2*+	K-LS-1+ K-ESS2-2 K-ESS3-1 K-ESS3-3*+
DISCIPLINARY CORE IDEAS *(NGSS, CCS)*	PS2.A PS2.B PS3.C ETS1.A	PS3.B ESS2.D ESS3.B ETS1.A	LS1.C ESS2.E ESS3.A ESS3.C ETS1.B
SCIENCE AND ENGINEERING PRACTICES *(NGSS, CCS)*	• Planning and Carrying Out Investigations • Analyzing and Interpreting Data	• Asking Questions and Defining Problems • Planning and Carrying Out Investigations • Analyzing and Interpreting Data • Constructing Explanations and Designing Solutions • Obtaining, Evaluating, and Communication Information • Connections to Nature of Science • Science Knowledge is Based on Empirical Evidence	• Developing and Using Models • Analyzing and Interpreting Data • Engaging in Argument from Evidence • Obtaining, Evaluating, and Communicating Information • Connections to Nature of Science
CROSSCUTTING CONCEPTS *(NGSS, CCS)*	• Cause and Effect • Patterns	• Cause and Effect • Patterns	• Patterns • Cause and Effect • Systems and System Models

PERFORMANCE EXPECTATIONS (PE):
Statements of what students at each grade level should be able to do after instruction.
DISCIPLINARY CORE IDEAS (DCI):
What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.
SCIENCE AND ENGINEERING PRACTICES (SEP):
Essential Practices of Science instruction which reflect those of professional scientists and engineers."Learn Science by Doing Science"
CROSSCUTTING CONCEPTS (CCC):
Concepts that are considered fundamental to understanding the disciplines of science.

NGSS: *Next Generation Science Standards*
MSS: *Michigan Science Standards*
CSS: *Cereal City Science*

KEY
* *Integrates traditional science content with engineering.*
\+ *Allow for local, regional, or Michigan specific contexts or examples in teaching and assessment.*
Includes a Michigan specific performance expectation.

KINDERGARTEN: PHYSICAL SCIENCE

MOTION PUSHES AND PULLS (FORCES AND INTERACTIONS)	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**K-PS2-1 MOTION AND STABILITY: FORCES AND INTERACTIONS** • 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. **K-PS2-2 MOTION AND STABILITY: FORCES AND INTERACTIONS*** • 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.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**PS2.A FORCES AND MOTION** • Pushes and pulls can have different strengths and direction. • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. **PS2.B TYPES OF INTERACTIONS** • When objects touch or collide, they push on one another and can change motion **PS3.C RELATIONSHIP BETWEEN ENERGY AND FORCES** • A bigger push or pull makes things go faster. **ETS1.A DEFINING ENGINEERING PROBLEMS** • A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions.
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**PLANNING AND CARRYING OUT INVESTIGATIONS:** • In order to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • With guidance, plan, and conduct an investigation in collaboration with peers. **ANALYZING AND INTERPRETING DATA:** • Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Analyze data from tests of an object or tool to determine if it works as intended.
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Simple tests can be designed to gather evidence to support or refute students ideas about causes. **PATTERNS** • Patterns in the natural world can be observed and used to describe phenomena, and used as evidence.
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • With prompting and support, ask and answer questions about key details in a text *(RI.K.1).* • Participate in shared research and writing projects *(W.K.7).* • Ask and answer questions in order to seek help, get information, or clarify something that is not understood *(SL.K.3).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Describe measureable attributes of objects, such as length or weight. Describe several measurable attributes of a single object *(K.MD.A.1).* • Directly compare two objects with a measurable attribute in common, to see which object has "more of/less of" the attribute, and describe the difference *(K.MD.A.2*).

KINDERGARTEN: EARTH SCIENCE

WEATHER AND CLIMATE	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**K-PS3-1 ENERGY** • Make observations to determine the effect of sunlight on Earth's surface **K-PS3-2 ENERGY*** • Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth's surface **K-ESS2-1 EARTH'S SYSTEMS+** • Use and share observations of local weather conditions to describe patterns over time **K-ESS3-2 EARTH AND HUMAN ACTIVITY*+** • Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, sever weather
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**PS3.B CONSERVATION OF ENERGY AND ENERGY TRANSFER** • Sunlight warms Earth's surface. **ESS2.D WEATHER AND CLIMATE** • Weather is a combination of sunlight, wind, snow, or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. **ESS3.B NATURAL HAZARDS** • Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. **ETS1.A DEFINING AND DELIMITING AN ENGINEERING PROBLEM** • Asking questions, making observations, and gathering information are helpful in thinking about problems.
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**ASKING QUESTIONS AND DEFINING A PROBLEM:** • Asking questions and defining problems in grades K-2 builds on prior experiences and progresses to simple descriptive questions that can be tested. • Ask questions based on observations to find more information about the designed world. **PLANNING AND CARRYING OUT INVESTIGATIONS:** • In order to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Make observations (firsthand and from media) to collect data that can be used to make comparisons. **ANALYZING AND INTERPRETING DATA:** • Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Use observations (firsthand and from media) to describe patterns in the natural world in order to answer scientific questions. **CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS:** • Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. **OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION:** • Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information. • Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. **CONNECTIONS TO NATURE OF SCIENCE:** • Scientific investigations use a variety of methods. • Scientists use different ways to study the world. • Science knowledge is based on empirical evidence. • Scientists look for patterns and order when making observations about the world.

KINDERGARTEN: EARTH SCIENCE

WEATHER AND CLIMATE	
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Events have causes that generate observable patterns. **PATTERNS** • Patterns in the natural world can be observed and used to describe phenomena, and used as evidence.
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • With prompting and support, ask and answer questions about key details in a text *(RI.K.1).* • Participate in shared research and writing projects *(W.K.7).* • Ask and answer questions in order to seek help, get information, or clarify something that is not understood *(SL.K.3).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Counting and Cardinality *(K.CC).* • Know number names and the count sequence *(K.CC.A).* • Describe measureable attributes of objects, such as length or weight. Describe several measurable attributes of a single object *(K.MD.A.1).* • Directly compare two objects with a measurable attribute in common, to see which object has "more of/less of" the attribute, and describe the difference *(K.MD.A.2*). • Classify objects into given categories; count the number of objects in each category and sort the categories by count *(K.MD.B.3).*

KINDERGARTEN: LIFE SCIENCE

INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS: ANIMALS, PLANTS, AND THEIR ENVIRONMENT	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**K-LS-1 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES+** • Use observations to describe patterns of what plants and animals (including humans) need to survive. **K-ESS2-2 EARTH'S SYSTEMS** • Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. **K-ESS3-1 EARTH AND HUMAN ACTIVITY** • Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. **K-ESS3-3 EARTH AND HUMAN ACTIVITY*+** • Communicate solutions that will reduce the impact of humans on the land, water, air, and or other living things in the local environment.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**LS1.C ORGANIZATION FOR MATTER AND ENERGY FLOW IN ORGANISMS** • All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. **ESS2.E BIOGEOLOGY** • Plants and animals can change their environment. **ESS3.A NATURAL RESOURCES** • Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. **ESS3.C HUMAN IMPACTS ON EARTH SYSTEMS** • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. **ETS1.B DEVELOPING POSSIBLE SOLUTIONS** • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**DEVELOPING AND USING MODELS** • Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, storyboard) that represent concrete events or design solutions. • Use a model to represent relationships in the natural world. *(K-ESS3-1)* **ANALYZING AND INTERPRETING DATA** • Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. *(K-LS1-1)* **ENGAGING IN ARGUMENT FROM EVIDENCE** • Engaging in argument from evidence in K-2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s). • Construct an argument with evidence to support a claim. *(K-ESS2-2)* **OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION** • Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information. • Communicate solutions with others in oral and/or written forms using models and/or drawings that provide detail about scientific ideas. *(K-ESS3-3)* **CONNECTIONS TO NATURE OF SCIENCE** • Scientific Knowledge is Based on Empirical Evidence • Scientists look for patterns and order when making observations about the world. *(K-LS1-1)*

KINDERGARTEN: LIFE SCIENCE

INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS: ANIMALS, PLANTS, AND THEIR ENVIRONMENT	
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Events have causes that generate observable patterns. **PATTERNS** • Patterns in the natural world can be observed and used to describe phenomena, and used as evidence. **SYSTEMS AND SYSTEM MODELS** • Systems in the natural and designed world have parts that work together.
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • With prompting and support, ask and answer questions about key details in a text *(RI.K.1).* • Use a combination of drawing, dictating, and writing to compose opinion pieces in which one tells a reader the topic or the name of the book one is writing about and states an opinion or preference about the topic or book *(W.K.1)* • Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which one names what one is writing about and supply some information about the topic *(W.K.2).* • Participate in shared research and writing projects *(W.K.7).* • Add drawings or other visual displays to descriptions as desired to provide additional detail *(SL.K.5).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Counting and Cardinality *(K.CC).* • Directly compare two objects with a measurable attribute in common, to see which object has “more of/less of” the attribute, and describe the difference *(K.MD.A.2*).

FIRST GRADE OVERVIEW

	PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE
	WAVES: LIGHT AND SOUND	**SPACE SYSTEMS: PATTERNS AND CYCLES**	**STRUCTURE, FUNCTION, AND INFORMATION PROCESSING**
PERFORMANCE EXPECTATIONS *(NGSS, MSS, CCS)*	1-PS4-1 1-PS4-2 1-PS4-3 1-PS4-4*	1-ESS1-1 1-ESS1-2+	1-LS1-1* 1-LS1-2 1-LS3-1
DISCIPLINARY CORE IDEAS *(NGSS, CCS)*	PS4.A PS4.B PS4.C	ESS1.A ESS1.B	LS1.A LS1.B LS1.D LS3.A LS3.B
SCIENCE AND ENGINEERING PRACTICES *(NGSS, CCS)*	• Planning and Carrying Out Investigations • Constructing Explanations and Designing Solutions	• Planning and Carrying Out Investigations • Analyzing and Interpreting Data	• Constructing Explanations and Designing Solutions • Obtaining, Evaluating, and Communicating Information • Connections to Nature of Science
CROSSCUTTING CONCEPTS *(NGSS, CCS)*	• Cause and Effect • Patterns • Connections to Engineering, Technology, and Applications of Science	• Patterns • Scientific Knowledge Assumes an Order and Consistency in Natural Systems	• Patterns • Structure and Function • Connections to Engineering, Technology, and Applications of Science

PERFORMANCE EXPECTATIONS (PE):
Statements of what students at each grade level should be able to do after instruction.
DISCIPLINARY CORE IDEAS (DCI):
What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.
SCIENCE AND ENGINEERING PRACTICES (SEP):
Essential Practices of Science instruction which reflect those of professional scientists and engineers."Learn Science by Doing Science"
CROSSCUTTING CONCEPTS (CCC):
Concepts that are considered fundamental to understanding the disciplines of science.

NGSS: *Next Generation Science Standards*
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CSS: *Cereal City Science*

KEY
* *Integrates traditional science content with engineering.*
\+ *Allow for local, regional, or Michigan specific contexts or examples in teaching and assessment.*
Includes a Michigan specific performance expectation.

FIRST GRADE: PHYSICAL SCIENCE

WAVES: LIGHT AND SOUND	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**1-PS4-1 WAVES AND THEIR APPLICATIONS IN TECHNOLOGIES FOR INFORMATION TRANSFER** • Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. **1-PS4-2 WAVES AND THEIR APPLICATIONS IN TECHNOLOGIES FOR INFORMATION TRANSFER** • Make observations to construct an evidence-based account that objects in darkness can be seen only when illuminated. **1-PS4-3 WAVES AND THEIR APPLICATIONS IN TECHNOLOGIES FOR INFORMATION TRANSFER** • Plan and conduct investigations to determine the effect of placing objects made with different materials in the path of a beam of light. **1-PS4-4 WAVES AND THEIR APPLICATIONS IN TECHNOLOGIES FOR INFORMATION TRANSFER*** • Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**PS4.A WAVE PROPERTIES** • Sound can make matter vibrate, and vibrating matter can make sound. **PS4.B ELECTROMAGNETIC RADIATION** • Objects can be seen if light is available to illuminate them or if they give off their own light. • Some materials allow light to pass through them, others allow only some light through, and others block all the light and create a dark shadow on any surface beyond them, where the light cannot reach. Mirrors can be used to redirect a light beam. **PS4.C INFORMATION TECHNOLOGIES AND INSTRUMENTATION** • People also use a variety of devices to communicate (send and receive information) over long distances.
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**PLANNING AND CARRYING OUT INVESTIGATIONS** • Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Plan and conduct investigations collaboratively to produce evidence to answer a question. **CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS** • Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. • Use tools and materials provided to design a device that solves a specific problem.
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Simple tests can be designed to gather evidence to support or refute student ideas about causes. **PATTERNS** • Patterns in the natural world can be observed and used to describe phenomena, and used as evidence. **CONNECTIONS TO ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE** • Influence of Engineering, Technology, and Science, on Society and the Natural World • People depend on various technologies in their lives; human life would be very different without technology.

FIRST GRADE: PHYSICAL SCIENCE

WAVES: LIGHT AND SOUND	
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure *(W.1.2).* • Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions) *(W.1.7).* • With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question *(W.1.8).* • Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups *(SL.1.1).* **MATHEMATICS** • Use appropriate tools strategically *(MP.5).* • Order three objects by length; compare the lengths of two objects indirectly by using a third object *(1.MD.A.1).* • Express the length of an object as a whole number of length units, by layering multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps *(1.MD.A.2).*

FIRST GRADE: EARTH SCIENCE

SPACE SYSTEMS: PATTERNS AND CYCLES	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**1-ESS1-1 EARTH'S PLACE IN THE UNIVERSE** • Use observations of the sun, moon, and start to describe the patterns that can be predicted. **1-ESS1-2 EARTH'S PLACE IN THE UNIVERSE+** • Make observations at different times of the year to relate the amount of daylight to the time of year.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**ESS1.A THE UNIVERSE AND ITS STARS** • Patterns of motion of the sun, moon, and stars in the sky can be observed, described, and predicted. **ESS1.B EARTH AND THE SOLAR SYSTEM** • Seasonal patterns of sunrise and sunset can be observed, described, and predicted.
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**PLANNING AND CARRYING OUT INVESTIGATIONS** • Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Make observations (firsthand and from media) to collect data that can be used to make comparisons. **ANALYZING AND INTERPRETING DATA** • Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Use observations (firsthand and from media) to describe patterns in the natural world in order to answer scientific questions.
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**PATTERNS** • Patterns in the natural world can be observed and used to describe phenomena, and used as evidence. **SCIENTIFIC KNOWLEDGE ASSUMES AN ORDER AND CONSISTENCY IN NATURAL SYSTEMS** • Science assumes natural events happen as they happened in the past. • Many events are repeated.
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions) *(W.1.7).* • With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question *(W.1.8).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Use appropriate tools strategically *(MP.5).* • Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations to represent the problem *(1.OA.A.1).* • Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another *(1.MD.C.4).*

FIRST GRADE: LIFE SCIENCE

STRUCTURE, FUNCTION, AND INFORMATION PROCESSING	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**1-LS1-1 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES*** • 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. **1-LS1-2 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES** • Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. **1-LS3-1 HEREDITY: INHERITANCE AND VARIATION OF TRAITS** • Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**LS1.A STRUCTURE AND FUNCTION** • All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. *(1-LS1-1)* **LS1.B GROWTH AND DEVELOPMENT OF ORGANISMS** • Adult plants and animals can have young. In many kinds of animals, parents and the off-spring themselves engage in behaviors that help the offspring to survive. *(1-LS1-2)* **LS1.D INFORMATION PROCESSING** • Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. *(1-LS1-1)* **LS3.A INHERITANCE OF TRAITS** • Young animals are very much, but not exactly like, their parents. Plants also are very much, but not exactly, like their parents. *(1-LS3-1)* **LS3.B VARIATION OF TRAITS** • Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways. *(1-LS3-1)*
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS** • Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. *(1-LS3-1)* • Use materials to design a device that solves a specific problem or a solution to a specific problem. *(1-LS1- 1)* **OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION** • Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information. • Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. *(1-LS1-2)* **CONNECTIONS TO NATURE OF SCIENCE** • Scientific Knowledge is Based on Empirical Evidence • Scientists look for patterns and order when making observations about the world. *(1-LS1-1)*
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**PATTERNS** • Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. *(1-LS1-2),(1-LS3-1)* **STRUCTURE AND FUNCTION** • The shape and stability of structures of natural and designed objects are related to their function(s). *(1-LS1-1)*

FIRST GRADE: LIFE SCIENCE

STRUCTURE, FUNCTION, AND INFORMATION PROCESSING	
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Ask and answer questions about key details in a text *(RI.1.1).* • Identify the main topic and retell key details of a text *(RI.1.2).* • With prompting and support, read informational texts appropriately complex for grade *(RI.1.10).* • Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions) *(W.1.7).* • With guidance and support from adults, recall information from experiences or gather information from provided sources to answer a question *(W.1.8).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Use appropriate tools strategically *(MP.5).* • Compare two two-digit numbers based on the meanings of the tens and one digits, recording the results of comparisons with the symbols >, =, and < *(1.NBT.B.3).* • Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning uses. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten *(1.NBT.C.4).* • Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used *(1.NBT.C.5).* • Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used *(1.NBT.C.6)* • Order three objects by length; compare the lengths of two objects indirectly by using a third object *(1.MD.A.1).*

SECOND GRADE OVERVIEW

	PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE
	STRUCTURE AND PROPERTIES OF MATTER	**EARTH'S SYSTEMS: PROCESSES THAT SHAPE THE EARTH**	**INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS**
PERFORMANCE EXPECTATIONS *(NGSS, MSS, CCS)*	2-PS1-1 2-PS1-2* 2-PS1-3 2-PS1-4	2-ESS1-1* 2-ESS2-1*+ 2-ESS2-2 2-ESS2-3+	2-LS2-1+ 2-LS2-2* 2-LS4-1+
DISCIPLINARY CORE IDEAS *(NGSS, CCS)*	PS1.A PS1.B	ESS1.C ESS2.A ESS2.B ESS2.C ETS1.C	LS2.A LS4.D ETS1.B
SCIENCE AND ENGINEERING PRACTICES *(NGSS, CCS)*	• Planning and Carrying Out Investigations • Analyzing and Interpreting Data • Constructing Explanations and Designing Solutions • Engaging in Argument from Evidence	• Developing and Using Models • Constructing Explanations and Designing Solutions • Obtaining, Evaluating, and Communicating Information	• Developing and Using Models • Planning and Carrying Out Investigations • Connections to Nature of Science
CROSSCUTTING CONCEPTS *(NGSS, CCS)*	• Cause and Effect • Patterns • Energy and Matter • Connections to Engineering, Technology, and Applications of Science	• Patterns • Stability and Change	• Cause and Effect • Structure and Function

PERFORMANCE EXPECTATIONS (PE):
Statements of what students at each grade level should be able to do after instruction.
DISCIPLINARY CORE IDEAS (DCI):
What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.
SCIENCE AND ENGINEERING PRACTICES (SEP):
Essential Practices of Science instruction which reflect those of professional scientists and engineers."Learn Science by Doing Science"
CROSSCUTTING CONCEPTS (CCC):
Concepts that are considered fundamental to understanding the disciplines of science.

NGSS: *Next Generation Science Standards*
MSS: *Michigan Science Standards*
CSS: *Cereal City Science*

KEY
* *Integrates traditional science content with engineering.*
\+ *Allow for local, regional, or Michigan specific contexts or examples in teaching and assessment.*
Includes a Michigan specific performance expectation.

SECOND GRADE: PHYSICAL SCIENCE

STRUCTURE AND PROPERTIES OF MATTER	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**2-PS1-1 MATTER AND ITS INTERACTIONS** • Plan and conduct investigations to describe and classify different kinds of materials by their observable properties. **2-PS1-2 MATTER AND ITS INTERACTIONS*** • Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. **2-PS1-3 MATTER AND ITS INTERACTIONS** • Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. **2-PS1-4 MATTER AND ITS INTERACTIONS** • Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**PS1.A STRUCTURE AND PROPERTIES OF MATTER** • Different kinds of matter exist, and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. • Different properties are suited to different purposes. • A great variety of objects can be built up from a small set of pieces. **PS1.B CHEMICAL REACTIONS** • Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**PLANNING AND CARRYING OUT INVESTIGATIONS** • Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence to answer a question. **ANALYZING AND INTERPRETING DATA** • Analyzing data in K-2 builds on prior experiences and progresses to collecting, recording, and sharing observations. • Analyze data from tests of an object or tool to determine if it works as intended. **CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS** • Constructing explanations and designing solutions in K–2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. **ENGAGING IN ARGUMENT FROM EVIDENCE** • Engaging in argument from evidence in K-2 builds on prior experiences and progresses to comparing ideas and representations about the natural and designed world(s). • Construct an argument with evidence to support a claim.

SECOND GRADE: PHYSICAL SCIENCE

STRUCTURE AND PROPERTIES OF MATTER	
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Events have causes that generate observable patterns. • Simple tests can be designed to gather evidence to support or refute student ideas about causes. **PATTERNS** • Patterns in the natural world can be observed and used to describe phenomena, and used as evidence. **ENERGY AND MATTER** • Objects may break into smaller pieces and be put together into larger pieces, or change shapes. **CONNECTIONS TO ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE** • Influence of Engineering, Technology, and Science, on Society and the Natural World • Every human-made product is designed by applying some knowledge of the natural world and is built by using natural materials.
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text *(RI.2.1).* • Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text *(RI.2.3).* • Describe how reasons support specific points the author makes in a text *(RI.2.8)* • Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section *(W.2.1).* • Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations) *(W.2.7).* • Recall information from experiences or gather information from provided sources to answer a question *(W.2.8).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4)*. • Use appropriate tools strategically *(MP.5).* • Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph *(2.MD.D.10).*

SECOND GRADE: EARTH SCIENCE

EARTH'S SYSTEMS: PROCESSES THAT SHAPE THE EARTH (CHANGING EARTH: TODAY AND OVER TIME)	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**2-ESS1-1 EARTH'S PLACE IN THE UNIVERSE*** • Use information from several sources to provide evidence that Earth events can occur quickly or slowly. **2-ESS2-1 EARTH'S SYSTEMS*+** • Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. **2-ESS2-2 EARTH'S SYSTEMS** • Develop a model to represent the shaped and kinds of land and bodies of water in an area. **2-ESS2-3 EARTH'S SYSTEMS+** • Obtain information to identify where water is found on Earth and that it can be solid or liquid.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**ESS1.C THE HISTORY OF PLANET EARTH** • Some events happen very quickly; others occur very slowly, over a period of time much longer than one can observe. **ESS2.A EARTH MATERIALS AND SYSTEMS** • Wind and water can change the shape of the land. **ESS2.B PLATE TECTONICS AND LARGE-SCALE SYSTEM INTERACTIONS** • Maps show where things are located. One can map the shaped and kinds of land and water in any area. **ESS2.C THE ROLES OF WATER IN EARTH'S SURFACE PROCESSES** • Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. **ETS1.C OPTIMIZING THE DESIGN SOLUTION** • Because there is always more than one possible solution to a problem, it is useful to compare and test designs.
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**DEVELOPING AND USING MODELS** • Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. • Develop a model to represent patterns in the natural world. **CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS** • Constructing explanations and designing solutions in K-2 builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions. • Make observations from several sources to construct an evidence-based account for natural phenomena. • Compare multiple solutions to a problem. **OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION** • Obtaining, evaluating, and communicating information in K-2 builds on prior experiences and uses observations and texts to communicate new information. • Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question.
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**PATTERNS** • Patterns in the natural world can be observed. **STABILITY AND CHANGE** • Things may change slowly or rapidly.

SECOND GRADE: EARTH SCIENCE

EARTH'S SYSTEMS: PROCESSES THAT SHAPE THE EARTH (CHANGING EARTH: TODAY AND OVER TIME)	
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text *(RI.2.1).* • Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text *(RI.2.3).* • Compare and contrast the most important points presented by two texts on the same topic *(RI.2.9).* • With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers *(W.2.6).* • Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations) *(W.2.7).* • Recall information from experiences or gather information from provided sources to answer a question *(W.2.8).* • Recount or describe key ideas or details from a text read aloud or information presented orally or through other media *(SL.2.2).* • Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings *(SL.2.5).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Use appropriate tools strategically *(MP.5).* • Understand place value *(2.NBT.A).* • Read and write numbers to 1000 using base-ten numerals, number names, and expanded form *(2.NBT.A.3).* • Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem *(2.MD.B.5).*

SECOND GRADE: LIFE SCIENCE

INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**2-LS2-1 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS+** • Plan and conduct an investigation to determine if plants need sunlight and water to grow. **2-LS2-2 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS*** • Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. **2-LS4-1 BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY+** • Make observations of plants and animals to compare the diversity of life in different habitats.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**LS2.A INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS** • Plants depend on water and light to grow. *(2-LS2-1)* • Plants depend on animals for pollination or to move their seeds around. *(2-LS2-2)* **LS4.D BIODIVERSITY AND HUMANS** • There are many different kinds of living things in any area, and they exist in different places on land and in water. *(2-LS4-1)* **ETS1.B DEVELOP POSSIBLE SOLUTIONS** • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. *(secondary to 2-LS2-2)*
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**DEVELOPING AND USING MODELS** • Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions. • Develop a simple model based on evidence to represent a proposed object or tool. *(2-LS2-2)* **PLANNING AND CARRYING OUT INVESTIGATIONS** • Planning and carrying out investigations to answer questions or test solutions to problems in K-2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions. • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. *(2-LS2-1)* • Make observations (firsthand or from media) to collect data which can be used to make comparisons. *(2-LS4-1)* **CONNECTIONS TO NATURE OF SCIENCE** • Scientific Knowledge is Based on Empirical Evidence • Scientists look for patterns and order when making observations about the world. *(2-LS4-1)*
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Events have causes that generate observable patterns. *(2-LS2-1)* **STRUCTURE AND FUNCTION** • The shape and stability of structures of natural and designed objects are related to their function(s). *(2-LS2-2)*

SECOND GRADE: LIFE SCIENCE

INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS	
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations) *(W.2.7).* • Recall information from experiences or gather information from provided sources to answer a question *(W.2.8).* • Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings *(SL.2.5).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Use appropriate tools strategically *(MP.5).* • Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph *(2.MD.D.10).*

THIRD GRADE OVERVIEW

	PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE
	FORCES AND INTERACTIONS	**WEATHER, CLIMATE, AND NATURAL HAZARDS**	**INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS INHERITANCE AND VARIATION OF TRAITS: LIFE CYCLES AND TRAITS**
PERFORMANCE EXPECTATIONS *(NGSS, MSS, CCS)*	3-PS2-1 3-PS2-2 3-PS2-3 3-PS2-4*	3-ESS2-1 3-ESS2-2 3-ESS3-1+	3-LS2-1 3-LS4-1+ 3-LS4-3+ 3-LS4-4*+ 3-LS1-1 3-LS3-1 3-LS3-2 3-LS4-2
DISCIPLINARY CORE IDEAS *(NGSS, CCS)*	PS2.A PS2.B	ESS2.D ESS3.B	LS2.C LS1.B LS2.D LS3.A LS4.A LS3.B LS4.C LS4.B LS4.D
SCIENCE AND ENGINEERING PRACTICES *(NGSS, CCS)*	• Asking Questions and Defining Problems • Planning and Carrying Out Investigations	• Analyzing and Interpreting Data • Engaging in Argument from Evidence • Obtaining, Evaluating, and Communicating Information	• Analyzing and Interpreting Data • Engaging in Argument from Evidence • Developing and Using Models • Constructing Explanations and Designing Solutions • Connections to Nature of Science
CROSSCUTTING CONCEPTS *(NGSS, CCS)*	• Patterns • Cause and Effect • Interdependence of Science, Engineering, and Technology	• Cause and Effect • Patterns	• Cause and Effect • Scale, Proportion, and Quantity • Systems and System Models • Connections to Engineering, Technology and Applications of Science • Connections to Nature of Science • Patterns

PERFORMANCE EXPECTATIONS (PE):
Statements of what students at each grade level should be able to do after instruction.
DISCIPLINARY CORE IDEAS (DCI):
What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.
SCIENCE AND ENGINEERING PRACTICES (SEP):
Essential Practices of Science instruction which reflect those of professional scientists and engineers."Learn Science by Doing Science"
CROSSCUTTING CONCEPTS (CCC):
Concepts that are considered fundamental to understanding the disciplines of science.

NGSS: *Next Generation Science Standards*
MSS: *Michigan Science Standards*
CSS: *Cereal City Science*

KEY
* *Integrates traditional science content with engineering.*
\+ *Allow for local, regional, or Michigan specific contexts or examples in teaching and assessment.*
Includes a Michigan specific performance expectation.

THIRD GRADE: PHYSICAL SCIENCE

FORCES AND INTERACTIONS	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**3-PS2-1 MOTION AND STABILITY: FORCES AND INTERACTIONS** • Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. **3-PS2-2 MOTION AND STABILITY: FORCES AND INTERACTIONS** • Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. **3-PS2-3 MOTION AND STABILITY: FORCES AND INTERACTIONS** • Ask questions to determine cause-and-effect relationships of electric or magnetic interactions between two objects not in contact with each other. **3-PS2-4 MOTION AND STABILITY: FORCES AND INTERACTIONS*** • Define a simple design problem that can be solved by applying scientific ideas about magnets.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**PS2.A FORCES AND MOTION** • Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. **PS2.B TYPES OF INTERACTIONS** • Objects in contact exert forces on each other. **PS2.A FORCES AND MOTION** • The patterns of an object's motion in various situations can be observed and measured; when the past motion exhibits a regular pattern, future motion can be predicted from it. **PS2.B TYPES OF INTERACTIONS** • Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**ASKING QUESTIONS AND DEFINING PROBLEMS** • Ask questions that can be investigated based on patterns such as cause-and-effect relationships. • Define a simple problem that can be solved through the development of a new or improved object or tool. **PLANNING AND CARRYING OUT INVESTIGATIONS** • Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**PATTERNS** • Patterns of change can be used to make predictions. **CAUSE AND EFFECT** • Cause and effect relationships are routinely identified. • Cause-and-effect relationships are routinely identified, tested, and used to explain change. **INTERDEPENDENCE OF SCIENCE, ENGINEERING, AND TECHNOLOGY** • Scientific discoveries about the natural world can often lead to new and improved technologies, which are developed through the Engineering Design Process.

THIRD GRADE: PHYSICAL SCIENCE

FORCES AND INTERACTIONS	
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers *(RI.3.1).* • Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect *(RI.3.3).* • Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence) *(RI.3.8).* • Conduct short research projects that build knowledge about a topic *(W.3.7).* • Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories *(W.3.8).* • Ask and answer questions about information from a speaker, offering appropriate elaboration and detail *(SL.3.3).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Use appropriate tools strategically *(MP.5).* • Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem *(3.MD.A.2).*

THIRD GRADE: EARTH SCIENCE

WEATHER, CLIMATE, AND NATURAL HAZARDS	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**3-ESS2-1 EARTH'S SYSTEMS** • Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. **3-ESS2-2 EARTH'S SYSTEMS** • Obtain and combine information to describe climates in different regions of the world. **3-ESS3-1 EARTH AND HUMAN ACTIVITY+** • Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**ESS2.D WEATHER AND CLIMATE** • Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. • Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. **ESS3.B NATURAL HAZARDS** • A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**ANALYZING AND INTERPRETING DATA** • Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Represent data in tables and various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. **ENGAGING IN ARGUMENT FROM EVIDENCE** • Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. **OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION** • Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. • Obtain and combine information from books and other reliable media to explain phenomena.
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Cause-and-effect relationships are routinely identified, tested, and used to explain change. **PATTERNS** • Patterns of change can be used to make predictions.

THIRD GRADE: EARTH SCIENCE

WEATHER, CLIMATE, AND NATURAL HAZARDS	
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers *(RI.3.1).* • Compare and contrast the most important points and key details presented in two texts on the same topic *(RI.3.9).* • Write opinion pieces on topics or texts, supporting a point of view with reasons *(W.3.1).* • Conduct short research projects that build knowledge about a topic *(W.3.7).* • Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories *(W.3.9).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Use appropriate tools strategically *(MP.5).* • Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem *(3.MD.A.2).* • Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in bar graphs *(3.MD.B.3).*

THIRD GRADE: LIFE SCIENCE

INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS: ENVIRONMENTAL IMPACTS ON ORGANISMS INHERITANCE AND VARIATION OF TRAITS: LIFE CYCLES AND TRAITS	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**3-LS2-1 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS** • Construct an argument that some animals form groups that help members survive. **3-LS4-1 BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY+** • Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. **3-LS4-3 BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY+** • Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. **3-LS4-4 BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY*+** • Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change. **3-LS1-1 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES** • Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. **3-LS3-1 HEREDITY: INHERITANCE AND VARIATION OF TRAITS** • 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. **3-LS3-2 HEREDITY: INHERITANCE AND VARIATION OF TRAITS** • Use evidence to support the explanation that traits can be influenced by the environment. **3-LS4-2 BIOLOGICAL EVOLUTION: UNITY AND DIVERSITY** • Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.

THIRD GRADE: LIFE SCIENCE

INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS: ENVIRONMENTAL IMPACTS ON ORGANISMS INHERITANCE AND VARIATION OF TRAITS: LIFE CYCLES AND TRAITS	
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**LS2.C ECOSYSTEM DYNAMICS, FUNCTIONING, AND RESILIENCE** • When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. *(secondary to 3-LS4-4)* **LS2.D SOCIAL INTERACTIONS AND GROUP BEHAVIOR** • Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size *(Note: Moved from K-2). (3-LS2-1)* **LS4.A EVIDENCE OF COMMON ANCESTRY AND DIVERSITY** • Some kinds of plants and animals that once lived on Earth are no longer found anywhere. *(Note: moved from K-2) (3-LS4-1)* • Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. *(3-LS4-1)* **LS4.C ADAPTATION** • For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. *(3-LS4-3)* **LS4.D BIODIVERSITY AND HUMANS** • Populations live in a variety of habitats, and change in those habitats affects the organisms living there. *(3-LS4-4)* **LS1.B GROWTH AND DEVELOPMENT OF ORGANISMS** • Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1) **LS3.A INHERITANCE OF TRAITS** • Many characteristics of organisms are inherited from their parents. *(3-LS3-1)* • Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. *(3-LS3-2)* **LS3.B VARIATION OF TRAITS** • Different organisms vary in how they look and function because they have different inherited information. *(3-LS3- 1)* • The environment also affects the traits that an organism develops. *(3-LS3-2)* **LS4.B NATURAL SELECTION** • Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. *(3-LS4-2)*

THIRD GRADE: LIFE SCIENCE

INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS: ENVIRONMENTAL IMPACTS ON ORGANISMS INHERITANCE AND VARIATION OF TRAITS: LIFE CYCLES AND TRAITS	
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**ANALYZING AND INTERPRETING DATA** • Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Analyze and interpret data to make sense of phenomena using logical reasoning. *(3-LS4-1), (3-LS3-1)* **ENGAGING IN ARGUMENT FROM EVIDENCE** • Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Construct an argument with evidence, data, and/or a model. *(3-LS2-1)* • Construct an argument with evidence. *(3-LS4-3)* • Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. *(3-LS4-4)* **DEVELOPING AND USING MODELS** • Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop models to describe phenomena. *(3-LS1-1)* **CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS** • Constructing explanations and designing solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Use evidence (e.g., observations, patterns) to support an explanation. *(3-LS3-2)* • Use evidence (e.g., observations, patterns) to construct an explanation. *(3-LS4-2)* **CONNECTIONS TO NATURE OF SCIENCE** • Scientific Knowledge is Based on Empirical Evidence • Science findings are based on recognizing patterns. *(3-LS4-2)*
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Cause and effect relationships are routinely identified and used to explain change. *(3-LS2-1),(3-LS4-3), (3-LS3-2),(3-LS4-2)* **SCALE, PROPORTION, AND QUANTITY** • Observable phenomena exist from very short to very long time periods. *(3-LS4-1)* **SYSTEMS AND SYSTEM MODELS** • A system can be described in terms of its components and their interactions. *(3-LS4-4)* **CONNECTIONS TO ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE** • Interdependence of Science, Engineering, and Technology • Knowledge of relevant scientific concepts and research findings is important in engineering. *(3-LS4-3)* **CONNECTIONS TO NATURE OF SCIENCE** • Scientific knowledge assumes an order and consistency in natural systems. • Science assumes consistent patterns in natural systems. *(3-LS4-1)* **PATTERNS** • Similarities and differences in patterns can be used to sort and classify natural phenomena. *(3-LS3-1)* • Patterns of change can be used to make predictions. *(3-LS1-1)*

THIRD GRADE: LIFE SCIENCE

INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS: ENVIRONMENTAL IMPACTS ON ORGANISMS INHERITANCE AND VARIATION OF TRAITS: LIFE CYCLES AND TRAITS	
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers *(RI.3.1).* • Determine the main idea of a text; recount the key details and explain how they support the main idea *(RI.3.2).* • Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect *(RI.3.3).* • Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur) *(RI.3.7).* • Write opinion pieces on topics or texts, supporting a point of view with reasons *(W.3.1).* • Write informative/explanatory texts to examine a topic and convey ideas and information clearly *(W.3.2).* • Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories *(W.3.9).* • Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace *(SL.3.4).* • Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details *(SL.3.5).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Use appropriate tools strategically *(MP.5).* • Number and Operations in Base Ten *(3.NBT).* • Number and Operations-Fractions *(3.NF).* • Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs *(3.MD.B.3).* • Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters *(3.MD.B.4).*

FOURTH GRADE OVERVIEW

	PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE
	ENERGY WAVES: WAVES AND INFORMATION	**EARTH'S SYSTEMS: PROCESSES THAT SHAPE EARTH**	**STRUCTURE, FUNCTION, AND INFORMATION PROCESSING**
PERFORMANCE EXPECTATIONS *(NGSS, MSS, CCS)*	4-PS3-1 4-PS3-2 4-PS3-3 4-PS3-4* 4-ESS3-1 4-PS4-1 4-PS4-3*	4-ESS1-1+ 4-ESS2-1+ 4-ESS2-2 4-ESS3-2*+ 4-ESS3-1	4-PS4-2 4-LS1-1 4-LS1-2
DISCIPLINARY CORE IDEAS *(NGSS, CCS)*	PS3.A PS3.B PS3.C PS3.D PS4.A PS4.C ESS3.A ETS1.A ETS1.C	ESS1.C ESS2.A ESS2.B ESS2.E ESS3.B ETS1.B ESS3.A	PS4.B LS1.A LS1.D
SCIENCE AND ENGINEERING PRACTICES *(NGSS, CCS)*	• Asking Questions and Defining Problems • Planning and Carrying Out Investigations • Constructing Explanation and Designing Solutions • Obtaining, Evaluating, and Communicating Information • Developing and Using Models	• Planning and Carrying Out Investigations • Analyzing and Interpreting Data • Constructing Explanation and Designing Solutions • Obtaining, Evaluating, and communicating Information	• Developing and Using Models • Engaging in Argument from Evidence
CROSSCUTTING CONCEPTS *(NGSS, CCS)*	• Cause and Effect • Energy and Matter • Patterns • Connections to Engineering, Technology, and Applications of Science • Connections to Nature of Science	• Cause and Effect • Patterns • Connections to Engineering, Technology, and Applications of Science • Connections to Nature of Science	• Cause and Effect • System and System Models

PERFORMANCE EXPECTATIONS (PE):
Statements of what students at each grade level should be able to do after instruction.
DISCIPLINARY CORE IDEAS (DCI):
What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.
SCIENCE AND ENGINEERING PRACTICES (SEP):
Essential Practices of Science instruction which reflect those of professional scientists and engineers."Learn Science by Doing Science"
CROSSCUTTING CONCEPTS (CCC):
Concepts that are considered fundamental to understanding the disciplines of science.

NGSS: *Next Generation Science Standards*
MSS: *Michigan Science Standards*
CSS: *Cereal City Science*

KEY
* *Integrates traditional science content with engineering.*
\+ *Allow for local, regional, or Michigan specific contexts or examples in teaching and assessment.*
Includes a Michigan specific performance expectation.

FOURTH GRADE: PHYSICAL SCIENCE

ENERGY WAVES: WAVES AND INFORMATION	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**4-PS3-1 ENERGY** • Use evidence to construct an explanation relating the speed of an object to the energy of that object. **4-PS3-2 ENERGY** • Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. **4-PS3-3 ENERGY** • Ask questions and predict outcomes about the changes in energy that occur when objects collide. **4-PS3-4 ENERGY*** • Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. **4-ESS3-1 EARTH AND HUMAN ACTIVITY** • Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. **4-PS4-1 WAVES AND THEIR APPLICATIONS IN TECHNOLOGIES FOR INFORMATION TRANSFER** • Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. **4-PS4-3 WAVES AND THEIR APPLICATIONS IN TECHNOLOGIES FOR INFORMATION TRANSFER*** • Generate and compare multiple solutions that use patterns to transfer information.

FOURTH GRADE: PHYSICAL SCIENCE

ENERGY WAVES: WAVES AND INFORMATION	
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**PS3.A DEFINITIONS OF ENERGY** • The faster a given object is moving, the more energy it possesses. • Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **PS3.B CONSERVATION OF ENERGY AND ENERGY TRANSFER** • Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. • Light also transfers energy from place to place. • Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. **PS3.C RELATIONSHIP BETWEEN ENERGY AND FORCES** • When objects collide, the contact forces transfer energy so as to change the objects' motions. **PS3.D ENERGY IN CHEMICAL PROCESSES AND EVERYDAY LIFE** • The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. **PS4.A WAVE PROPERTIES** • Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; it does not move in the direction of the wave except when the water meets the beach. • Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). **PS4.C INFORMATION TECHNOLOGIES AND INSTRUMENTATION** • Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. **ESS3.A NATURAL RESOURCES** • Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. **ETS1.A DEFINING ENGINEERING PROBLEMS** • Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. **ETS1.C OPTIMIZING THE DESIGN SOLUTION** • Different solutions need to be tested in order to determine which of them best solves the problem, given criteria and the constraints.

FOURTH GRADE: PHYSICAL SCIENCE

ENERGY WAVES: WAVES AND INFORMATION	
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**ASKING QUESTIONS AND DEFINING PROBLEMS** • Asking questions and defining problems in grades 3-5 builds on grades K-2 experiences and progresses to specifying qualitative relationships. • Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause-and-effect relationships. **PLANNING AND CARRYING OUT INVESTIGATIONS** • Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. *(4-PS3-2)* **CONSTRUCTING EXPLANATIONS AND DESIGNING SOLUTIONS** • Constructing explanations and designing solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Use evidence (e.g., measurements, observations, patterns) to construct an explanation. *(4-PS3-1)* • Apply scientific ideas to solve design problems. *(4-PS3-4)* **OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION** • Obtaining, evaluating, and communicating information in 3-5 builds on K-2 experiences and progresses to evaluate the merit and accuracy of ideas and methods. • Obtain and combine information from books and other reliable media to explain phenomena. **DEVELOPING AND USING MODELS** • Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model using an analog, example, or abstract representation to describe a scientific principle.
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Cause-and-effect relationships are routinely identified, tested, and used to explain change. **ENERGY AND MATTER** • Energy can be transferred in various ways and between objects. **PATTERNS** • Similarities and differences in patterns can be used to sort and classify natural phenomena. • Similarities and differences in patterns can be used to sort and classify designed products. **CONNECTIONS TO ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE** • Interdependence of Science, Engineering, and Technology. • Knowledge of relevant scientific concepts and research findings is important in engineering. • Influence of Engineering, Technology, and Science on Society and the Natural World • Engineers improve existing technologies or develop new ones. • Over time, people's needs and wants change, as do their demands for new and improved technologies. **CONNECTIONS TO NATURE OF SCIENCE** • Science is a Human Endeavor. • Most scientists and engineers work in teams. • Science affects everyday life.

FOURTH GRADE: PHYSICAL SCIENCE

ENERGY WAVES: WAVES AND INFORMATION	
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text *(RI.4.1).* • Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text *(RI.4.3).* • Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably *(RI.4.9).* • Write informative/explanatory texts to examine a topic and convey ideas and information clearly *(W.4.2).* • Conduct short research projects that build knowledge through investigation of different aspects of a topic *(W.4.7).* • Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources *(W.4.8).* • Draw evidence from literary or informational texts to support analysis, reflection, and research *(W.4.9).* • Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes *(SL.4.5).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations *(4.OA.A.1).* • Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding *(4.OA.A.3).* • Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures *(4.G.A.1).*

FOURTH GRADE: EARTH SCIENCE

EARTH'S SYSTEMS: PROCESSES THAT SHAPE EARTH	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**4-ESS1-1 EARTH'S PLACE IN THE UNIVERSE+** • Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. **4-ESS2-1 EARTH'S SYSTEMS+** • Make observations and/or measurements to provide evidence of the effects of weathering on the rate of erosion by water, ice, wind, or vegetation. **4-ESS2-2 EARTH'S SYSTEMS** • Analyze and interpret data from maps to describe patterns of Earth's features. **4-ESS3-2 EARTH AND HUMAN ACTIVITY*+** • Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. **4-ESS3-1 EARTH AND HUMAN ACTIVITY** • Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**ESS1.C THE HISTORY OF PLANET EARTH** • Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. **ESS2.A EARTH'S MINERALS AND SYSTEMS** • Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break down rocks, soils, and sediments into smaller particles and move them around. **ESS2.B PLATE TECTONICS AND LARGE-SCALE SYSTEM INTERACTIONS** • The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along boundaries between continents and oceans. Major mountain chains form inside continents or near the edges. Maps can help locate the different land and water features and other areas of Earth. **ESS2.E BIOGEOLOGY** • Living things affect the physical characteristics of their regions. **ESS3.B NATURAL HAZARDS** • A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. **ETS1.B DESIGNING SOLUTIONS TO ENGINEERING PROBLEMS** • Testing a solution involves investigating how well it performs under a range of likely conditions. **ESS3.A NATURAL RESOURCES** • Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

FOURTH GRADE: EARTH SCIENCE

EARTH'S SYSTEMS: PROCESSES THAT SHAPE EARTH	
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**PLANNING AND CARRYING OUT INVESTIGATIONS** • Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. **ANALYZING AND INTERPRETING DATA** • Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. Analyze and interpret data to make sense of phenomena using logical reasoning. **CONSTRUCTING EXPLANATION AND DESIGNING SOLUTIONS** • Constructing explanations and designing solutions in 3-5 builds on K-2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. • Identify the evidence that supports particular points in an explanation. • Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. **OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION** • Obtaining, evaluating, and communicating information in 3-5 builds on K-2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. • Obtain and combine information from books and other reliable media to explain phenomena.
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Cause-and-effect relationships are routinely identified, tested, and used to explain change. **PATTERNS** • Patterns can be used as evidence to support an explanation. **CONNECTIONS TO ENGINEERING, TECHNOLOGY, AND APPLICATIONS OF SCIENCE** • Interdependence of Science, Engineering, and Technology • Knowledge of relevant scientific concepts and research findings is important in engineering. **INFLUENCE OF ENGINEERING, TECHNOLOGY, AND SCIENCE ON SOCIETY AND THE NATURAL WORLD** • Engineers improve existing technologies or develop new ones. • Over time, people's needs and wants change, as do their demands for new and improved technologies. **CONNECTIONS TO NATURE OF SCIENCE** • Scientific Knowledge Assumes an Order and Consistency in Natural Systems • Science assumes consistent patterns in natural systems.

FOURTH GRADE: EARTH SCIENCE

EARTH'S SYSTEMS: PROCESSES THAT SHAPE EARTH	
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text *(RI.4.1).* • Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears *(RI.4.7).* • Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably *(RI.4.9).* • Conduct short research projects that build knowledge through investigation of different aspects of a topic *(W.4.7).* • Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources *(W.4.8).* • Draw evidence from literary or informational texts to support analysis, reflection, and research *(W.4.9).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Use appropriate tools strategically *(MP.5).* • Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table *(4.MD.A.1).* • Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale *(4.MD.A.2).* • Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations *(4.OA.A.1).*

FOURTH GRADE: LIFE SCIENCE

STRUCTURE, FUNCTION, AND INFORMATION PROCESSING	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**4-PS4-2 WAVES AND THEIR APPLICATIONS IN TECHNOLOGIES FOR INFORMATION TRANSFER** • Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. **4-LS1-1 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES** • Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. **4-LS1-2 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES** • Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**PS4.B ELECTROMAGNETIC RADIATION** • An object can be seen when light reflected from its surface enters the eyes. *(4-PS4-2)* **LS1.A STRUCTURE AND FUNCTION** • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. *(4-LS1-1)* **LS1.D INFORMATION PROCESSING** • Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. *(4-LS1-2)*
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**DEVELOPING AND USING MODELS** • Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model to describe phenomena. *(4-PS4-2)* • Use a model to test interactions concerning the functioning of a natural system. *(4-LS1-2)* **ENGAGING IN ARGUMENT FROM EVIDENCE** • Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Construct an argument with evidence, data, and/or a model. *(4-LS1-1)*
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Cause and effect relationships are routinely identified and used to explain change. *(4-PS4-2)* **SYSTEMS AND SYSTEM MODELS** • A system can be described in terms of its components and their interactions. *(4-LS1-1,4-LSI-2)*
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Write opinion pieces on topics or texts, supporting a point of view with reasons and information *(W.4.1).* • Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes *(SL.4.5).* **MATHEMATICS** • Model with mathematics *(MP.4).* • Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures *(4.G.A.1).* • Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry *(4.G.A.3).*

FIFTH GRADE OVERVIEW

	PHYSICAL SCIENCE	EARTH SCIENCE	LIFE SCIENCE
	STRUCTURE AND PROPERTIES OF MATTER	**EARTH'S SYSTEMS SPACE SYSTEMS: STARS AND THE SOLAR SYSTEM**	**MATTER AND ENERGY IN ORGANISMS AND ECOSYSTEMS**
PERFORMANCE EXPECTATIONS *(NGSS, MSS, CCS)*	5-PS1-1 5-PS1-2 5-PS1-3 5-PS1-4	5-ESS2-1 5-ESS2-2 5-ESS3-1+ 5-PS2-1 5-ESS1-1 5-ESS1-2	5-PS3-1 5-LS1-1 5-LS2-1
DISCIPLINARY CORE IDEAS *(NGSS, CCS)*	PS1.A PS1.B	ESS2.A ESS2.C ESS3.C PS2.B ESS1.A ESS1.B	PS3.D LS1.C LS2.A LS2.B
SCIENCE AND ENGINEERING PRACTICES *(NGSS, CCS)*	• Developing and Using Models • Planning and Carrying Out Investigations • Using Mathematics and Computational Thinking	• Developing and Using Models • Using Mathematics and Computational Thinking • Obtaining, Evaluating, and communicating Information • Analyzing and Interpreting Data • Engaging in Argument from Evidence	• Developing and Using Models • Engaging in Argument from Evidence • Connections to Nature of Science
CROSSCUTTING CONCEPTS *(NGSS, CCS)*	• Cause and Effect • Scale, Proportion, and Quantity • Patterns • Connections to Nature of Science	• Scale Proportion, and Quantity • Systems and System Models • Patterns • Cause and Effect • Connections to Nature of Science	• System and System Models • Energy and Matter

PERFORMANCE EXPECTATIONS (PE):
Statements of what students at each grade level should be able to do after instruction.
DISCIPLINARY CORE IDEAS (DCI):
What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.
SCIENCE AND ENGINEERING PRACTICES (SEP):
Essential Practices of Science instruction which reflect those of professional scientists and engineers."Learn Science by Doing Science"
CROSSCUTTING CONCEPTS (CCC):
Concepts that are considered fundamental to understanding the disciplines of science.

NGSS: *Next Generation Science Standards*
MSS: *Michigan Science Standards*
CSS: *Cereal City Science*

KEY
* *Integrates traditional science content with engineering.*
\+ *Allow for local, regional, or Michigan specific contexts or examples in teaching and assessment.*
Includes a Michigan specific performance expectation.

FIFTH GRADE: PHYSICAL SCIENCE

STRUCTURE AND PROPERTIES OF MATTER	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**5-PS1-1 MATTER AND ITS INTERACTIONS** • Develop a model to describe that matter is made of particles too small to be seen. **5-PS1-2 MATTER AND ITS INTERACTIONS** • 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. **5-PS1-3 MATTER AND ITS INTERACTIONS** • Make observations and measurements to identify materials based on properties. **5-PS1-4 MATTER AND ITS INTERACTIONS** • Conduct an investigation to determine whether the mixing of two or more substances results in a new substance.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**PS1.A STRUCTURE AND PROPERTIES OF MATTER** • Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. • The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. • Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) **PS1.B CHEMICAL REACTIONS** • When two or more different substances are mixed, a new substance with different properties may be formed. • No matter what reaction or change in properties occurs, the total weight of the substances does not change.
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**DEVELOPING AND USING MODELS** • Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model to describe phenomena. **PLANNING AND CARRYING OUT INVESTIGATIONS** • Planning and carrying out investigations to answer questions or test solutions to problems in 3-5 builds on K-2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. • Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. • Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. **USING MATHEMATICS AND COMPUTATIONAL THINKING** • Mathematical and computational thinking in 3-5 builds on K-2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. • Measure and graph quantities such as weight to address scientific and engineering questions and problems.

FIFTH GRADE: PHYSICAL SCIENCE

STRUCTURE AND PROPERTIES OF MATTER	
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**CAUSE AND EFFECT** • Cause-and-effect relationships are routinely identified, tested, and used to explain change. **SCALE, PROPORTION, AND QUANTITY** • Natural objects exist from the very small to the immensely large. • Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. **CONNECTIONS TO NATURE OF SCIENCE** • Scientific Knowledge Assumes an Order and Consistency in Natural Systems • Science assumes consistent patterns in natural systems.
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently *(RI.5.7).* • Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic *(W.5.7).* • Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources *(W.5.8).* • Draw evidence from literary or informational texts to support analysis, reflection, and research *(W.5.9).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Use appropriate tools strategically *(MP.5).* • Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10 *(5.NBT.A.1).* • Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions *(5.NF.B.7).* • Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems *(5.MD.A.1).* • Recognize volume as an attribute of solid figures and understand concepts of volume measurement *(5.MD.C.3).* • Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units *(5.MD.C.4).*

FIFTH GRADE: EARTH SCIENCE

EARTH'S SYSTEMS SPACE SYSTEMS: STARS AND THE SOLAR SYSTEM	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**5-ESS2-1 EARTH'S SYSTEMS** • Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. **5-ESS2-2 EARTH'S SYSTEMS** • 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. **5-ESS3-1 EARTH AND HUMAN ACTIVITY+** • Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment. **5-PS2-1 MOTION AND STABILITY: FORCES AND INTERACTIONS** • Support an argument that the gravitational force exerted by Earth on objects is directed down. **5-ESS1-1 EARTH'S PLACE IN THE UNIVERSE** • Support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth. **5-ESS1-2 EARTH'S PLACE IN THE UNIVERSE** • 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.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**ESS2.A EARTH MATERIALS AND SYSTEMS** • Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather. **ESS2.C THE ROLES OF WATER IN EARTH'S SURFACE PROCESSES** • Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. **ESS3.C HUMAN IMPACTS ON EARTH SYSTEMS** • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. **PS2.B TYPES OF INTERACTIONS** • The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. **ESS1.A THE UNIVERSE AND ITS STARS** • The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. **ESS1.B EARTH AND THE SOLAR SYSTEM** • The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.

FIFTH GRADE: EARTH SCIENCE

EARTH'S SYSTEMS SPACE SYSTEMS: STARS AND THE SOLAR SYSTEM	
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**DEVELOPING AND USING MODELS** • Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Develop a model using an example to describe a scientific principle. **USING MATHEMATICS AND COMPUTATIONAL THINKING** • Mathematical and computational thinking in 3-5 builds on K-2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions. • Describe and graph quantities such as area and volume to address scientific questions. **OBTAINING, EVALUATING, AND COMMUNICATING INFORMATION** • Obtaining, evaluating, and communicating information in 3-5 builds on K-2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. **ANALYZING AND INTERPRETING DATA** • Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. • Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. **ENGAGING IN ARGUMENT FROM EVIDENCE** • Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world. • Support an argument with evidence, data, or a model.
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**SCALE, PROPORTION, AND QUANTITY** • Standard units are used to measure and describe physical quantities such as weight and volume. • Natural objects exist from the very small to the immensely large. **SYSTEMS AND SYSTEM MODELS** • A system can be described in terms of its components and their interactions. **PATTERNS** • Similarities and differences in patterns can be used to sort, classify, communicate, and analyze simple rates of change for natural phenomena. **CAUSE AND EFFECT** • Cause and effect relationships are routinely identified and used to explain change. **CONNECTIONS TO NATURE OF SCIENCE** • Science addresses questions about the Natural and Material World. • Science findings are limited to questions that can be answered with empirical evidence.

FIFTH GRADE: EARTH SCIENCE

EARTH'S SYSTEMS SPACE SYSTEMS: STARS AND THE SOLAR SYSTEM	
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text *(RI.5.1).* • Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently *(RI.5.7).* • Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s) *(RI.5.8).* • Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably *(RI.5.9).* • Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources *(W.5.8).* • Write opinion pieces on topics or texts, supporting a point of view with reasons and information *(W.5.1).* • Draw evidence from literary or informational texts to support analysis, reflection, and research *(W.5.9).* • Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes *(SL.5.5).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10 *(5.NBT.A.2).* • Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation *(5.G.2),(5.G.A.2).*

FIFTH GRADE: LIFE SCIENCE

MATTER AND ENERGY IN ORGANISMS AND ECOSYSTEMS	
PERFORMANCE EXPECTATIONS *Statements of what students at each grade level should be able to do after instruction*	**5-PS3-1 ENERGY** • Use models to describe that energy in animals' food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun. **5-LS1-1 FROM MOLECULES TO ORGANISMS: STRUCTURES AND PROCESSES** • Support an argument that plants get the materials they need for growth chiefly from air and water. **5-LS2-1 ECOSYSTEMS: INTERACTIONS, ENERGY, AND DYNAMICS** • Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
DISCIPLINARY CORE IDEAS *What students should understand about the most essential ideas in science by the end of grades 2, 5, 8, and 12.*	**PS3.D ENERGY IN CHEMICAL PROCESSES AND EVERYDAY LIFE** • The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (*5-PS3-1)* **LS1.C ORGANIZATION FOR MATTER AND ENERGY FLOW IN ORGANISMS** • Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. *(secondary to 5-PS3-1)* • Plants acquire their material for growth chiefly from air and water. *(5-LS1-1)* **LS2.A INTERDEPENDENT RELATIONSHIPS IN ECOSYSTEMS** • The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. *(5-LS2-1)* **LS2.B CYCLES OF MATTER AND ENERGY TRANSFER IN ECOSYSTEMS** • Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. *(5-LS2-1)*
SCIENCE AND ENGINEERING PRACTICES *"Learn Science by Doing Science"*	**DEVELOPING AND USING MODELS** • Modeling in 3-5 builds on K-2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. • Use models to describe phenomena. *(5-PS3-1)* • Develop a model to describe phenomena. *(5-LS2-1)* **ENGAGING IN ARGUMENT FROM EVIDENCE** • Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Construct an argument with evidence, data, and/or a model. *(5-LS1-1)* **CONNECTIONS TO THE NATURE OF SCIENCE** • Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena • Science explanations describe the mechanisms for natural events. *(5-LS2-1)*
CROSSCUTTING CONCEPTS *Concepts that are considered fundamental to understanding the disciplines of science.*	**SYSTEMS AND SYSTEM MODELS** • A system can be described in terms of its components and their interactions. *(5-LS2-1)* **ENERGY AND MATTER** • Matter is transported into, out of, and within systems. *(5-LS1-1)* • Energy can be transferred in various ways and between objects. *(5-PS3-1)*

FIFTH GRADE: LIFE SCIENCE

MATTER AND ENERGY IN ORGANISMS AND ECOSYSTEMS	
COMMON CORE STATE STANDARDS CONNECTIONS	**ENGLISH LANGUAGE ARTS/LITERACY** • Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text *(RI.5.1).* • Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently *(RI.5.7).* • Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably *(RI.5.9).* • Write opinion pieces on topics or texts, supporting a point of view with reasons and information *(W.5.1).* • Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes *(SL.5.5).* **MATHEMATICS** • Reason abstractly and quantitatively *(MP.2).* • Model with mathematics *(MP.4).* • Use appropriate tools strategically *(MP.5).* • Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems *(5.MD.A.1).*