Grade Kindergarten

Exploring phenomena or engineering problems

1.1 Asking questions and defining problems 1.1.1 Students will be able to ask questions about aspects of the phenomena they observe, the conclusions they draw from their models or scientific investigations, each other's ideas, and the information they read.

State Benchmark	FOSS Program
Earth and Space Science	
0E.1.1.1.1 Ask questions to obtain information from weather forecasts to prepare for and respond to severe weather. * ^ (P: 1, CC: 7, CI: ESS3, ETS2) *Emphasis is on local forms of severe weather that may arise quickly and should include examples of engineered solutions to severe weather (such as clothing to wear or places to safely shelter).*	**FOSS Next Generation Trees and Weather c2019** **TE**: Investigation 3; Parts 1-3 **SE**: "Up in the Sky" "Weather" **DR:** *Come a Tide; Summer*
0E.1.1.1.2 Ask questions about how a person may reduce the amount of natural resources the individual uses. * ^ (P: 1, CC: 2, CI: ESS3) *Examples of questions may include reusing paper to reduce the number of trees cut down and recycling cans and bottles to reduce the amount of plastic, glass, or metal used*	**FOSS Next Generation Materials and Motion c2018** **TE:** Investigation 1, Part 6; Investigation 2, Parts 4-5; Investigation 3, Parts 2, 5 **SE**: "The Story of a Box" "Land, Air, and Water" "I am Wood" **DR:** *Recycling Center", What is Agriculture? Environmental Health: Reduce, Reuse, and Recycle*

1.2 Planning and carrying out investigations 1.2.1 Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena.

State Benchmark	FOSS Program
Physical Science	
0P.1.2.1.1 Collect and organize observational data to determine the effect of sunlight on Earth's surface. ^ (P: 3, CC: 2, CI: PS3, ETS2) *Examples of Earth's surface may include sand, soil, rocks, and water. Data may be organized in pictographs or bar graphs. Examples of observations may include heating, growth of plants, melting of snow, and shadows.*	**FOSS Next Generation Materials and Motion c2018** **TE**: Investigation 3, Part 6 **FOSS Next Generation Trees and Weather c2019** **TE**: Investigation 3, Part 2 **SE**: *Up in the Sky*

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Grade Kindergarten

State Benchmark	FOSS Program
Life Science	
0L.1.2.1.2 Make observations of plants and animals to compare the diversity of life in different habitats. (P: 3, CC: 1, CI: LS4) *Emphasis is on the diversity of living things in a variety of different habitats and patterns across those habitats.*	**FOSS Next Generation Trees and Weather c2019** **TE:** Investigation 1, Part 5 **SE:** *"Where Do Trees Grow?"* **DR:** *Who Lives Here?* **FOSS Next Generation Animals Two by Two c2018** **TE**: Investigation 1, Parts 4, 5; Investigation 3, Part 4; Investigation 4, Part 4; **SE**: "Fish Live in Many Places" "Birds Outdoors" "Water and Land Snails" "Worms in Soil" "Isopods" "Animals All Around Us" **DR**: *Seashore Surprises* This standard is further supported by: **FOSS Next Generation Plants and Animals c2019** **TE:** Investigation 3, Part 3 **SE:** "Plants and Animals around the World" **DR:** *How Plants Live in Different Places, Habitat Sort, Sorting Animals by Structures*

Looking at data and empirical evidence to understand phenomena or solve problems

2.1 Analyzing and interpreting data 2.1.1 Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables.

State Benchmark	FOSS Program
Physical Science	
0P.2.1.1.1 Sort objects in terms of natural/human-made, color, size, shape, and texture, then communicate the reasoning for the sorting system. (P: 4, CC: 2, CI: PS1) *Emphasis is on using observations to describe patterns and/or relationships in the natural and designed world in order to order to answer scientific questions and solve problems.*	**FOSS Next Generation Trees and Weather c2019** **TE:** Investigation 1, Parts 1, 5; Investigation 2, Parts 1-5; Investigation 4, Parts 2, 8 **SE:** "Where Do Trees Grow?" Book: *How Do We Learn?* **DR:** *Leaf Sorting* **FOSS Next Generation Materials and Motion c2018** **TE**: Investigation 1, Parts 1-3; Investigation 2, Parts 1-3; Investigation 3, Part 1 **SE:** "How Are Fabrics Used?" **DR:** *Where is Wood?* **FOSS Next Generation Animals Two by Two c2018** **TE**: Investigation 2, Part 2 This standard is further supported by: **FOSS Next Generation Solids and Liquids**

Grade Kindergarten

State Benchmark	FOSS Program
Earth and Space Science	
0E.2.1.1.2 Make daily and seasonal observations of local weather conditions to describe patterns over time. ** ^ (P: 4, CC: 1, CI: ESS2) *Examples of qualitative observations may include descriptions of the weather (such as sunny, cloudy, rainy, and warm). Examples of quantitative observations may include numbers of sunny, windy, and rainy days in a month. Examples of patterns may include that it is usually cooler in the morning than in the afternoon and that different months have different numbers of sunny days versus cloudy days in different months.*	**FOSS Next Generation Trees and Weather c2019** **TE**: Investigation 3, Parts 2 **SE**: "Up in the Sky" "Weather" "My Apple Tree" "Orange Trees" "Maple Trees" **DR**: *Once There Was A Tree, Come a Tide, Summer*
Life Science	
0L.2.1.1.3 Record and use observations to describe patterns of what plants and animals (including humans) need to survive. ** ^ (P: 4, CC: 1, CI: LS1) Examples *of patterns may include that animals need to take in food, but plants do not; different animals need different kinds of food; plants require light; and that all living things need water.*	**FOSS Next Generation Trees and Weather c2019** **TE**: Investigation 1, Parts 1, 5, 6; Investigation 4, Part 2 **SE**: "Where Do Trees Grow?" "What Do Plants Need?" "My Apple Tree" **DR**: *Once There Was A Tree*, *Summer* **FOSS Next Generation Animals Two by Two c2018** **TE**: Investigation 1, Parts 2, 5; Investigation 2, Parts 1,3; Investigation 3, Parts 2, 3; Investigation 4, Parts 1, 4; **SE**: "Fish Live in Many Places" "Birds Outdoors" "Water and Land Snails" "Worms in Soil" "Isopods" "Animals All Around Us" "Living and Nonliving" **DR**: *Seashore Surprises*

2.2 Using mathematics and computational thinking. 2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.

State Benchmark	FOSS Program
Physical Science	
0P.2.2.1.1 Identify and describe patterns that emerge from the effects of different strengths or different directions of pushes and pulls on the motion of an object. ** ^ (P: 5, CC: 2, CI: PS2) *Emphasis is on different relative strengths or different directions, but not both at the same time. Examples of pushes or pulls may include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.*	**FOSS Next Generation Materials and Motion c2018** **TE: Investigation 4** **SE:** "Pushes and Pulls" "Collisions" **DR:** *Roller Coaster Builder*

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Grade Kindergarten

Developing possible explanations of phenomena or designing solutions to engineering problems

3.1 Developing and using models 3.1.1 Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others.

State Benchmark	FOSS Program
Life Science	
0L.3.1.1.1 Develop a simple model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. ^ (P: 2, CC: 4, CI: LS2) *Examples of relationships may include that deer eat buds and leaves, therefore, they usually live in forested areas; and grasses need sunlight, so they often grow in meadows. Examples of models may include food chains, collages, and/or sorting activities.*	**FOSS Next Generation Trees and Weather c2019** **TE**: Investigation 1, Parts 5-6; Investigation 3; Part 3 **SE**: "Where Do Trees Grow" "What Do Plants Need?" "Up in the Sky" "Weather" "My Apple Tree" "Orange Trees" "Maple Trees" **DR**: *Once There Was A Tree, Summer, Who Lives Here?* **FOSS Next Generation Animals Two by Two c2018** **TE**: Investigation 1, Parts 4, 5; Investigation 3, Part 4; Investigation 4, Part 4; **SE**: "Fish Live in Many Places" "Birds Outdoors" "Water and Land Snails" "Worms in Soil" "Isopods" "Animals All Around Us" "Living and Nonliving" **DR**: *Seashore Surprise, Is This a House for a Hermit Crab?* This standard is further supported by: **FOSS Next Generation Plants and Animals c2019**

3.2 Constructing explanations and designing solutions 3.2.2 Students will be able to use their understanding of scientific principles and the engineering design process to design solutions that meet established criteria and constraints. *

State Benchmark	FOSS Program
Physical Science	
0P.3.2.2.1 Design and build a structure to reduce the warming effect of sunlight on Earth's surface. * ^ (P: 6, CC: 2, CI: PS3, ETS1) *Emphasis of the practice is on choosing appropriate materials and tools to solve a problem. Emphasis of the core idea is on understanding the heating effects of sunlight. Examples of structures may include umbrellas, canopies, and tents.*	**FOSS Next Generation Materials and Motion c2018** **TE**: Investigation 3, part 6 **SE:** "Are You an Engineer?"

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Grade Kindergarten

Communicating reasons, arguments and ideas to others

4.1 Engaging in Arguing from evidence 4.1.1 Students will be able to engage in argument from evidence for the explanations the students construct, defend and revise their interpretations when presented with new evidence, critically evaluate the scientific arguments of others, and present counter arguments.

State Benchmark	FOSS Program
Physical Science	
0P.4.1.1.1 Construct an argument supported by evidence for whether a design solution works as intended to change the speed or direction of an object with a push or a pull. * ^ (P: 7, CC: 2, CI: PS2, ETS1) Examples *of problems requiring a solution may include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions may include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.*	**FOSS Next Generation Materials and Motion c2018** **TE: I**nvestigation 4, Parts 2, 4 **SE**: "Pushes and Pulls" "Are You an Engineer?" "Collisions" **DR**: *Roller Coaster Builder*

4.2 Obtaining, evaluating and communicating information 4.2.1 Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats.

State Benchmark	FOSS Program
Physical Science	
0P.4.2.2.1 Communicate design ideas for a structure that reduces the warming effect of sunlight on Earth's surface. * ^ (P: 8, CC: 2, CI: PS3, ETS1) *Examples of written designs include models, drawings, writing, or numbers.*	**FOSS Next Generation Materials and Motion c2018** **TE**: Investigation 3, part 6 **SE**: "Are You an Engineer?"

Grade One

Exploring phenomena or engineering problems

1.1 Asking questions and defining problems 1.1.1 Students will be able to ask questions about aspects of the phenomena they observe, the conclusions they draw from their models or scientific investigations, each other's ideas, and the information they read.

State Benchmark	FOSS Program
Life Science	
1L.1.1.1.1 Ask questions based on observations about the similarities and differences between young plants and animals and their parents. ^ (P: 1, CC: 2, CI: LS3) *Examples of observations may include leaves from the same kind of plant are the same shape but can differ in size; and a particular breed of dog looks like its parents but is not exactly the same.*	**FOSS Next Generation Plants and Animals c2019** **TE**: Investigation 4, Parts 2, 3 **SE**: "Animals and Their Young" **DR:** *Animal Offspring and Caring for Animals*; *How Plants Grow,* "Find the Parent" "Watch it Grow"

1.2 Planning and carrying out investigations 1.2.1 Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena.

State Benchmark	FOSS Program
Physical Science	
1P.1.2.1.1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. ^ (P: 3, CC: 2, CI: PS4) *Examples of vibrating materials that make sound may include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate may include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.*	**FOSS Next Generation Sound and Light c2019** **TE**: Investigation 1, Parts 1-3; Investigation 2, Parts 1-3 **SE**: "Vibrations and Sound" "Strings in Motion" "More Musical Instruments" **DR:** *Guitar String Pitch*, *All about Sound*

Looking at data and empirical evidence to understand phenomena or solve problems

2.1 Analyzing and interpreting data 2.1.1 Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables.

State Benchmark	FOSS Program
Physical Science	
1P.2.1.1.1 Identify and describe patterns obtained from testing different materials and determine which materials have the properties that are best suited for producing and/or transmitting sound. * (P: 4, CC: 1, CI: PS1, ETS1) *Examples of materials may be wood, paper, string, plastics, cloth, etc.*	**FOSS Next Generation Sound and Light c2019** **TE**: Investigation 1, Parts 1-3; Investigation 2, Parts 1-3 **SE**: "Vibrations and Sound" "Strings in Motion" "More Musical Instruments" **DR:** *Sorting Sounds*, *Guitar String Pitch*, *All about Sound*

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Grade One

2.2 Using mathematics and computational thinking. 2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.

State Benchmark	FOSS Program
Earth and Space Science	
1E.2.2.1.1 Use quantitative data to identify and describe patterns in the amount of time it takes for Earth processes to occur and determine whether they occur quickly or slowly. (P: 5, CC: 7, CI: ESS1) *Emphasis of the core idea is that some Earth processes happen quickly (like tornadoes and thunderstorms) and some slowly (like the erosion of soil). Examples of data may include firsthand observations data from books, videos, pictures, or historical photos.*	**FOSS Next Generation Air and Weather c2019** **TE**: Investigation 2, Part 1 **SE**: "What is the Weather Today?" "Understanding the Weather" This standard is further supported by: **FOSS Next Generation Pebbles, Sand, and Silt c2019** **TE:** Investigation 1, Part 1; Investigation 2, Part 4; Investigation 4, Part 4 **SE:** "Erosion" **DR:** *All About Landforms, All about Soil*

Developing possible explanations of phenomena or designing solutions to engineering problems

3.1 Developing and using models 3.1.1 Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others.

State Benchmark	FOSS Program
Life Science	
1L.3.1.1.1 Develop a simple model based on evidence to represent how plants or animals use their external parts to help them survive, grow, and meet their needs. ^ (P: 2, CC: 6, CI: LS1) *Examples of external parts may include acorn shells, plant roots, thorns on branches, turtle shells, animal scales, animal tails, and animal quills.*	**FOSS Next Generation Plants and Animals c2019** **TE**: Investigation 1, Parts 1, 3, 4; Investigation 2, Parts 1, 3; Investigation 3, Parts 1, 2, 3; Investigation 4, Part 3 **SE**: "What Do Plants Need?" "What Do Animals Need?" "Plants and Animals around the World" "Learning From Nature" **DR:** *How Plants Grow*, *Animal Growth, Sorting Animals by Structure*

3.2 Constructing explanations and designing solutions 3.2.2 Students will be able to use their understanding of scientific principles and the engineering design process to design solutions that meet established criteria and constraints. *

State Benchmark	FOSS Program
Physical Science	
1P.3.2.2.1 Design and build a device that uses light or sound to solve the problem of communicating over a distance * ^ (P: 6, CC: 6, CI: PS4, ETS1, ETS2.) *Examples of devices may include paper cup and string "telephones" and a pattern of drum beats.*	**FOSS Next Generation Sound and Light c2019** **TE**: Investigation 2, Part 4; Investigation 4, Part 4 **SE**: "Vibrations and Sound" "Strings in Motion" "More Musical Instruments" "Seeing the Light" Communicating with Light" **DR:** *Guitar String Pitch*, *All about Sound*

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Grade One

State Benchmark	FOSS Program
Life Science	
1L.3.2.2.2 Plan and 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. * ^ (P: 6, CC: 6, CI: LS1, ETS2) *Examples of human problems that can be solved by mimicking plant or animal solutions may include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills, and detecting intruders by mimicking eyes and ears.*	**FOSS Next Generation Plants and Animals c2019** **TE**: Investigation 3, Part 4 **SE**: "Learning from Nature"

Communicating reasons, arguments and ideas to others

4.1 Engaging in Arguing from evidence 4.1.1 Students will be able to engage in argument from evidence for the explanations the students construct, defend and revise their interpretations when presented with new evidence, critically evaluate the scientific arguments of others, and present counter arguments.

State Benchmark	FOSS Program
Earth and Space Science	
1E.4.1.1.1 Construct an argument based on observational evidence for how plants and animals (including humans) can change the non-living aspects of the environment to meet their needs. (P: 7, CC: 4, CI: ESS2) *Examples of plants and animals changing their environment may include a squirrel digging in the ground to hide its food and tree roots breaking concrete.*	**FOSS Next Generation Plants and Animals c2019** **TE:** Investigation 3, Parts 3, 4 **SE**: "What Do Animals Need?" "Plants and Animals around the World" "Learning from Nature" **DR:** *Habitat Sort, How Plants Live in Different Places,* This standard is supported by: **FOSS Next Generation Animals Two by Two c2018** **SE**: "Worms in Soil" **FOSS Next Generation Trees and Weather c2019** **TE**: Investigation 1, Parts 1 **DR**: *Once There Was A Tree* **FOSS Next Generation Pebbles, Sand, and Silt c2019** **TE:** Investigation 4, Part 1

4.1 Engaging in Arguing from evidence 4.1.2 Students will be able to argue from evidence to justify the best solution to a problem or to compare and evaluate competing designs, ideas, or methods.*

State Benchmark	FOSS Program
Earth and Space Science	
1E.4.1.2.1 Construct an argument with evidence to evaluate multiple solutions designed to slow or prevent wind or water from changing the shape of the land. * (P: 7, CC: 7, CI: ESS2, ETS2) *Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water; and different designs for using shrubs, grass, and trees to hold back the land.*	**FOSS Next Generation Pebbles, Sand, and Silt c2019** **TE:** Investigation 4, Part 4 **SE:** "Erosion"

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Grade One

4.2 Obtaining, evaluating and communicating information 4.2.1 Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats

State Benchmark	FOSS Program
Earth and Space Science	
1E.4.2.1.1 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment. * (P: 8, CC: 4, CI: ESS3) *Examples of human actions that impact the land may include cutting trees to produce paper, using resources to produce bottles, and using water for bathing and brushing teeth. Examples of solutions may include reusing paper and recycling cans and bottles.*	**FOSS Next Generation Materials and Motion c2018** **TE:** Investigation 1, Part 6; Investigation 2, Parts 4-5; Investigation 3, Parts 2, 5 **SE**: "The Story of a Box" "Land, Air, and Water" "I am Wood" **DR:** *Recycling Center, What is Agriculture?, Environmental Health: Reduce, Reuse, and Recycle* **FOSS Next Generation Pebbles, Sand, and Silt c2019** **TE:** Investigation 4, Part 4 **SE:** "Natural Resources" **DR:** *All About Soil*
State Benchmark	**FOSS Program**
Life Science	
1L.4.2.1.2 Obtain information using various features of texts and other media to determine patterns in the behavior of parents and offspring that help offspring survive. ^ (P: 8, CC: 1, CI: LS1) *Examples of text features include headings, glossaries, electronic menus, pictures, illustrations, icons, etc. Examples of behavior patterns may include the signals that offspring make (such as crying, chirping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).*	**FOSS Next Generation Plants and Animals c2019** **TE**: Investigation 4, Parts 2, 3 **SE**: "Animals and Their Young" **DR:** *Animal Offspring and Caring for Animals*, *Find the Parent*, *Watch it Grow*

4.2 Obtaining, evaluating and communicating information 4.2.2 Students will be able to gather information about and communicate the methods that are used by various cultures, especially those of Minnesota American Indian Tribes and communities, to develop explanations of phenomena and design solutions to problems.

State Benchmark	FOSS Program
Physical Science	
1P.4.2.2.1 Communicate solutions that use materials to provide shelter, food, or warmth needs for communities including Minnesota American Indian tribes and communities. * * ** (P: 8, CC: 2, CI: PS1, ETS2) *Examples of cultures may include those within the local context of the learning community and within the context of Minnesota. Examples of solutions may include past and current building practices that incorporate natural building materials and other green practices as used in sweat lodges, green roofs, moss used for insulation, or sustainable food production and tools used for ricing (harvesting and finishing).*	**FOSS Next Generation Materials and Motion c2018** **TE:** Investigation 1, Parts 2, 6; Investigation 3, Parts 3, 5, 6 **SE**: "I am Wood" "How are Fabrics Used?" **DR:** *Clothing and Building Materials, What is Agriculture?* Local resources may be available through: *** The Minnesota Department of Natural Resources Young Naturalists Curriculum https://www.dnr.state.mn.us/mcvmagazine/young-naturalists.html *** The University of Minnesota Culture-Based Arts Integration Curriculum https://intersectingart.umn.edu/?lesson/64

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Grade Two

Exploring phenomena or engineering problems

1.1 Asking questions and defining problems 1.1.1 Students will be able to ask questions about aspects of the phenomena they observe, the conclusions they draw from their models or scientific investigations, each other's ideas, and the information they read.

State Benchmark	FOSS Program
Physical Science	
2P.1.1.1.1 Ask questions about an object's motion based on observation that can be answered by an investigation. (P: 1, CC: 1, CI: PS2) *Examples of questions may include what is causing the motion, what type of motion (circular, bouncing, etc.) and what changes are happening in the motion.*	**FOSS Next Generation Motion and Matter c2018** **TE**: Investigation 1, Parts 1-3; Investigation 2, Parts 1-3; Investigation 3, Part 3 **SE**: "Magnetism and Gravity" "What Scientists Do" "Change of Motion" "Patterns of Motion" "What Goes Around" "Patterns of Motion" "What Goes Around" **DR:** *All about Motion and Balance, All about Magnets, Roller Coaster Builder*

1.2 Planning and carrying out investigations 1.2.1 Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena.

State Benchmark	FOSS Program
Physical Science	
2P.1.2.1.1 Plan and conduct an investigation to describe how heating and cooling affects different kinds of materials based upon their observable properties. (P: 3, CC: 1, CI: PS1) *Examples of materials may include metals, cloth, plastics, Styrofoam, wood and glass.*	**FOSS Next Generation Solids and Liquids c2018** **TE**: Investigation 4, Part 4 **SE**: "Heating and Cooling" "Is Change Reversible?" **DR:** *Solids and Liquids, Change It!*

Looking at data and empirical evidence to understand phenomena or solve problems

2.1 Analyzing and interpreting data 2.1.1 Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables.

State Benchmark	FOSS Program
Earth and Space Science	
2E.2.1.1.1 Represent data to describe typical weather conditions expected during a particular season. (P: 4, CC: 1, CI: ESS2) *Examples of data may include temperature, precipitation, and wind direction. Data displays can include pictographs and bar graphs.*	**FOSS Next Generation Air and Weather c2019** **TE**: Investigation 4, Parts 1-3 **SE**: "What' is the Weather Today?" Understanding the Weather" "Seasons" "Getting through the Winter" This standard is further supported by: **FOSS Next Generation Water and Climate c2018** **TE**: Investigation 3, Part 1; Investigation 4, Part 1 **SE**: "Studying Weather" **DR:** *All about Climate and Seasons, All about Meteorology, Weather Grapher, National Weather Service, The Weather Channel, The Weather Underground*

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Grade Two

Earth and Space Science	
2E.2.1.1.2 Analyze data from tests of objects designed to reduce the impacts of weather-related hazards and compare the strengths and weaknesses of how each performs. * (P: 4, CC: 2, CI: ESS3, ETS1) *Emphasis is on data from tests of student-designed objects. Examples of design solutions to weather-related hazards may include barriers to prevent flooding or snow drifting, structures for sun shading, materials for clothing, and orientation of bus shelters.*	**FOSS Next Generation Water and Climate c2018** **TE**: Investigation 4, Part 3 (Extend Step 19) **SE**: "Wetlands for Flood Control" "Conserving Water during Droughts" **DR:** *Come a Tide; Floods*

2.2 Using mathematics and computational thinking. 2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.

State Benchmark	FOSS Program
Physical Science	
2P.2.2.1.1 Identify and predict quantitative patterns of the effects of balanced and unbalanced forces on the motion of an object. ** (P: 5, CC: F412, CI: PS2) *Examples may include an unbalanced force on one side of a ball can make it start moving; and balanced forces pushing on a box from both sides will not produce any motion at all. Data displays may include pictographs and bar graphs.*	**FOSS Next Generation Motion and Matter c2018** **TE**: Investigation 1, Parts 1-3; Investigation 2, Part 1 **SE**: "Change of Motion" **DR:** *All about Motion and Balance*

Developing possible explanations of phenomena or designing solutions to engineering problems

3.1 Developing and using models 3.1.1 Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others.

State Benchmark	FOSS Program
Physical Science	
2P.3.1.1.1 Develop a simple diagram or physical model to illustrate how some changes caused by heating or cooling can be reversed and some cannot. ** ^ (P: 2, CC: 2, CI: PS3) *Examples of reversible changes may include materials such as water and butter at different temperatures. Examples of irreversible changes may include cooking an egg, freezing a plant leaf, and heating paper. Examples of diagrams may include a flow chart.*	**FOSS Next Generation Solids and Liquids c2018** **TE**: Investigation 4, Part 4 **SE**: "Heating and Cooling" "Is Change Reversible?" **DR:** *Solids and Liquids, Change It!*

Grade Two

3.2 Constructing explanations and designing solutions 3.2.2 Students will be able to use their understanding of scientific principles and the engineering design process to design solutions that meet established criteria and constraints. *

State Benchmark	FOSS Program
Life Science	
2L.3.2.2.1 Engineer a device that mimics the structures and functions of plants or animals in seed dispersal. * ^ (P: 6, CC: 6, CI: LS2, ETS1) *Emphasis is on how specific structures have particular functions. Examples of seed dispersal by animals may include feeding and subsequent elimination of seeds, or attachment of seeds/pollen to animal structures. Examples of seed dispersal by plants may include various wind-catching designs (as in dandelions or maple trees) or colors and smells that attract pollinators.*	**FOSS Next Generation Insects and Plants c2018** **TE**: Investigation 2, Part 4 *Add engineering extension for seed dispersal **SE**: "How Seeds Travel" **DR:** *How Seeds Get Here … and There* This standard is further supported by: **FOSS Next Generation Structures of Life c2018** **TE**: Investigation 1, Part 4 **SE**: "Nature Journal – How Seeds Travel" **DR:** *How Seeds Get Here … and There*

Communicating reasons, arguments and ideas to others

4.1 Engaging in Arguing from evidence 4.1.1 Students will be able to engage in argument from evidence for the explanations the students construct, defend and revise their interpretations when presented with new evidence, critically evaluate the scientific arguments of others, and present counter arguments.

State Benchmark	FOSS Program
Life Science	
2L.4.1.1.1 Construct an argument with evidence that evaluates how in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. *** (P: 7, CC: 2, CI: LS4, ETS2) *Emphasis is on the interdependence of parts of a system (organisms and their habitat). Examples of habitats should include those found in Minnesota, such as a wetland, prairie, or garden. Examples of evidence may include needs and characteristics of the organisms and habitats involved.*	**FOSS Next Generation Insects and Plants c2018** **TE**: Investigation 1, Part 2; **SE**: "Animals and Plants in Their Habitats" **DR:** *Habitat Gallery, What Doesn't Belong? Where Does it Live? All about Water Ecosystems, Habitat Havoc*

4.2 Obtaining, evaluating and communicating information 4.2.1 Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats

State Benchmark	FOSS Program
Earth and Space Science	
2E.4.2.1.1 Obtain and use information from multiple sources to identify where water is found on Earth. ^ (P: 8, CC: 1, CI: ESS2) *Emphasis of the practice is on learning how to use texts and maps to integrate and evaluate content. Examples may include liquid water in oceans, lakes, rivers, and ponds; and solid water in glaciers and polar ice caps*	**FOSS Next Generation Pebbles, Sand, and Silt c2018** **TE**: Investigation 4, Part 3 **SE**: "Where is Water Found?" This standard is further supported by: **FOSS Next Generation Water and Climate c2018** **TE**: Investigation 1, Part 4 **SE**: "A Report from the Blue Planet" "Water Everywhere" "Ice is Everywhere"

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Grade Two

Earth and Space Science	
2E.4.2.1.2 Obtain and use information from multiple sources, including electronic sources, to describe climates in different regions of the world. ** (P: 8, CC: 1, CI: ESS2) *Emphasis of the practice is on learning how to use electronic sources to integrate and evaluate content. Examples of information may include data on an area's typical weather conditions and how these patterns are considered climate.*	**FOSS Next Generation Water and Climate c2018** **TE**: Investigation 4, Part 2 **SE**: "Climate Regions" **DR:** *All about Climate and Seasons, Describing Climate*

4.2 Obtaining, evaluating and communicating information 4.2.2 Students will be able to gather information about and communicate the methods that are used by various cultures, especially those of Minnesota American Indian Tribes and communities, to develop explanations of phenomena and design solutions to problems.

State Benchmark	FOSS Program
Physical Science	
2P.4.2.2.1 Obtain information and communicate how Minnesota American Indian Tribes and communities and other cultures apply knowledge of the natural world in determining which materials have the properties that are best suited for an intended purpose. * * ^** (P: 8, CC: 2, CI: PS1, ETS1) *Examples of cultures may include those within the local context of the learning community and within the context of Minnesota. Emphasis of the practice is on obtaining, interpreting, and communicating information related to how various cultures have built materials suited for intended purposes according to their properties. Examples of materials may include instruments (Cedar for knockers and Black Spruce for poles) for ricing, birch bark for baskets or other containers for carrying water, and sinew for connecting parts of tools.*	**FOSS Next Generation Solids and Liquids c** **TE**: Investigation 1, Part 4 **SE**: "Solid Objects and Materials" **DR:** *Clothing and Building Materials, Properties of Materials* Local resources may be available through: *** The Minnesota Department of Natural Resources Young Naturalists Curriculum https://www.dnr.state.mn.us/mcvmagazine/young-naturalists.html *** The University of Minnesota Culture-Based Arts Integration Curriculum https://intersectingart.umn.edu/?lesson/64

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Grade Three

Exploring phenomena or engineering problems

1.1 Asking questions and defining problems 1.1.1 Students will be able to ask questions about aspects of the phenomena they observe, the conclusions they draw from their models or scientific investigations, each other's ideas, and the information they read.

State Benchmark	FOSS Program
Physical Science	
3P.1.1.1.1 Ask questions based on observations about why objects in darkness can be seen only when illuminated. (P: 1, CC: 2, CI: PS4) *Emphasis should be on addressing the misconception that people can see in the dark if they wait long enough and on the way eyes receive light. Examples of observations may include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight.*	**FOSS Next Generation Sound and Light c2019** **TE**: Investigation 4, Part 3 **SE**: "Seeing the Light" **DR:** *Light and Darkness* This standard is further supported by: **FOSS Next Generation Energy c2018** **TE**: Investigation 5, Part 2 **SE**: "Light Interactions" "Throw a Little Light on Sight" **DR:** *All about Light*

1.2 Planning and carrying out investigations 1.2.1 Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena.

State Benchmark	FOSS Program
Physical Science	
3P.1.2.1 1 Plan and conduct a controlled investigation to determine the effect of placing objects made with different materials in the path of a beam of light. (P: 3, CC: 2, CI: PS4) *Emphasis is on conducting fair tests by controlling variables. Examples of materials may include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).*	**FOSS Next Generation Sound and Light c2019** **TE**: Investigation 3, Part 3 **SE**: "Light and Materials" **DR:** *All about Light, My Shadow*
Life Science	
3L.1.2.1.2 Plan and conduct an investigation to determine how amounts of sunlight and water impact the growth of a plant. (P: 3, CC:2, CI: LS2) *Emphasis of the practice is on conducting fair tests and using data to support explanations. Examples of investigations may include simple experiments with fast-growing plants.*	**FOSS Next Generation Insects and Plants c2018** **TE**: Investigation 2, Part 2 **SE**: "Flowers and Seeds" **DR:** *How Plants Grow, Watch It Grow!* **FOSS Next Generation Structures of Life c2018** **TE**: Investigation 1, Part 2 **SE**: "The Most Important Seed" **DR:** *Plant Basic Needs* This standard is further supported by: **FOSS Next Generation Environments c2019** **TE**: Investigation 4, Part 1

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Grade Three

Looking at data and empirical evidence to understand phenomena or solve problems

2.1 Analyzing and interpreting data 2.1.1 Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables.

State Benchmark	FOSS Program
Earth and Space Science	
3E.2.1.1.1 Record observations of the sun, moon, and stars and use them to describe patterns that can be predicted. ** (P: 4, CC: 1, CI: ESS1) *Examples of patterns may include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.*	**FOSS Next Generation Air and Weather c2019** **TE**: Investigation 2, Part 4 **SE**: "Changes in the Sky" This standard is further supported by: **FOSS Next Generation Earth and Sun c2019** **TE:** Investigation 1, Parts 2, 3; Investigation 2, Parts 1, 3, 5; **SE:** "Changing Shadows" "Sunrise and Sunset" "The Night Sky" "Changing Moon" "Lunar Cycle" "Stargazing" **DR:** *Tutorial: Sun Tracking, Shadow Tracker, Seasons, All about the Moon, Lunar Calendar, All about Stars, Star Maps, Stellar Motions*

2.2 Using mathematics and computational thinking. 2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.

State Benchmark	FOSS Program
Earth and Space Science	
3E.2.2.1.1 Organize and electronically present collected data to identify and describe patterns in the amount of daylight in the different times of the year. ** (P: 5, CC: 1, CI: ESS1) *Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall*	**FOSS Next Generation Air and Weather c2019** **TE**: Investigation 1, Part 3 **SE**: "Changes in the Sky" "Seasons" This standard is further supported by: **FOSS Next Generation Earth and Sun c2019** **TE:** Investigation 1, Part 3 **SE:** "Sunrise and Sunset" "The Night Sky" **DR:** *Seasons*

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Grade Three

Developing possible explanations of phenomena or designing solutions to engineering problems

3.1 Developing and using models 3.1.1 Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others.

State Benchmark	FOSS Program
Physical Science	
3P.3.1.1.1 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. (P: 2, CC: 2, CI: PS4) *Examples of models may include diagrams, drawings, physical models, or computer programs.*	**FOSS Next Generation Sound and Light c2019** **TE**: Investigation 4, Part 2 **SE**: "Reflections" "Seeing the Light" **DR:** *All about Light, Light and Shadows, Light and Darkness* This standard is further supported by: **FOSS Next Generation Energy c2018** **TE**: Investigation 5, Part 2 **SE**: "Light Interactions" "Throw a Little Light on Sight" "More Light on the Subject" **DR:** *All about Light, Tutorial: Reflection*
Life Science	
3L.3.1.1.2 Develop multiple models to describe how organisms have unique and diverse life cycles but all have birth, growth, reproduction, and death in common. ^ (P: 2, CC: 4, CI: LS1) *Emphasis is on the pattern of changes organisms go through during their life. Examples of models may include diagrams, drawings, physical models, or computer programs.*	**FOSS Next Generation Insects and Plants c2018** **TE**: Investigation 1, Part 3; Investigation 2, Parts 2, 3; Investigation 3, Part 3; Investigation 4, Parts 1, 3; Investigation 5, Part 1-3 **SE**: "Flowers and Seeds" "Insect Life Cycles" "Life Goes Around" **DR:** *How Plants Grow, Watch It Grow* **FOSS Next Generation Structures of Life c2018** **TE**: Investigation 2, Part 2 **SE**: "Life Cycles" **DR:** *Tutorial: Structure and Function of Plants, All about Animal Life cycles, Life Cycles*

3.2 Constructing explanations and designing solutions 3.2.1 Students will be able to apply scientific principles and empirical evidence (primary or secondary) to explain the causes of phenomena or identify weaknesses in explanations developed by the students or others.

State Benchmark	FOSS Program
Life Science	
3L.3.2.1.1 Construct an explanation using evidence from various sources for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. ^ (P: 6, CC: 2. CI: LS4) *Examples of cause and effect relationships may include how individual plants of the same species with different length thorns may be more or less likely to be eaten by predators; or animals that have better camouflage coloration than others of their species may be more likely to survive and therefore more likely to leave offspring.*	**FOSS Next Generation Structures of Life c2018** **TE**: Investigation 3, Part 2 (Meet the Crayfish, alternative: Meet the Hissing Cockroach) **DR:** *Walking Stick Survival, All about Animal Adaptations,* This standard is further supported by: **FOSS Next Generation Environments c2019** **TE**: Investigation 3, Part 4 **SE**: "Variation and Selection" "Animal Sensory Systems"

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Grade Three

Communicating reasons, arguments and ideas to others

4.1 Engaging in Arguing from evidence 4.1.1 Students will be able to engage in argument from evidence for the explanations the students construct, defend and revise their interpretations when presented with new evidence, critically evaluate the scientific arguments of others, and present counter arguments.

State Benchmark	FOSS Program
Life Science	
3L.4.1.1.1 Construct an argument about strategies animals use to survive. * ^** (P: 7, CC: 2, CI: LS2) *Emphasis is on group behavior and how being part of a group helps animals obtain food, defend themselves, and cope with changes. Examples of animals should include wolves or other animals that live in Minnesota.*	**FOSS Next Generation Structures of Life c2018** **TE**: Investigation 3, Parts 3, 5 **SE**: "Food Chains" Local resources may be available through the Minnesota Department of Natural Resources Young Naturalists Curriculum https://www.dnr.state.mn.us/mcvmagazine/young-naturalists.html

4.2 Obtaining, evaluating and communicating information 4.2.1 Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats

State Benchmark	FOSS Program
Life Science	
3L.4.2.1.1 Obtain information from various types of media to support an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. ** (P: 8, CC: 4, CI: LS1) *Examples of structures may include thorns, stems, roots, colored petals, heart, stomach, lungs, brain, and skin. Examples of media may include electronic sources.*	**FOSS Next Generation Structures of Life c2018** **TE**: Investigation 1, Parts 1, 3; Investigation 2, Parts 1, 3, Investigation 3, Parts 1, 2, 4; Investigation 4, Parts 1-3 **SE**: "The Reason for Fruit" "Crayfish" "Adaptations" "Inside a Snail's Shell" "The Human Skeleton" "Skeletons on the Outside" "Crayfish, Snails, and Humans" "Your Amazing Opposable Thumbs" "Joints and Muscles" **DR:** *How Plants Get Good; Tutorial: Structure and Function of Plants* This standard is further supported by: **FOSS Next Generation Environments c2019** **TE**: Investigation 1, Parts 1, 3; Investigation 2, Parts 1, 2, 4; Investigation 4, Part 3 **SE**: "Two Terrestrial Environments" "Isopods" "Variation and Selection" "Animal Sensory Systems" **DR:** *All About the Senses, All About Plant Adaptations, Image Galleries*

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Grade Three

4.2 Obtaining, evaluating and communicating information 4.2.2 Students will be able to gather information about and communicate the methods that are used by various cultures, especially those of Minnesota American Indian Tribes and communities, to develop explanations of phenomena and design solutions to problems.

State Benchmark	FOSS Program
Earth and Space Science	
3E.4.2.2.1 Gather information and communicate how Minnesota American Indian Tribes and communities and other cultures use patterns in stars to make predictions and plans. *** (P 8, CC: 1, CI: ESS1) *Examples of cultures may include those within the local context of the learning community and within the context of Minnesota. Examples may include using star maps to predict seasons, star patterns to inform navigation, and using star stories to identify numeric patterns that guide behavior.*	**FOSS Next Generation Earth and Sun c2019** **TE:** Investigation 2, Part 5 **SE:** Stargazing" "Our Galaxy" **DR:** *All about Stars, Star Maps, Stellar Motions* Local resources may be available at: *** University of Minnesota Culture-Based Arts Integration Curriculum **https://intersectingart.umn.edu/?lesson/64**

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Grade Four

Exploring phenomena or engineering problems

1.1 Asking questions and defining problems 1.1.1 Students will be able to ask questions about aspects of the phenomena they observe, the conclusions they draw from their models or scientific investigations, each other's ideas, and the information they read.

State Benchmark	FOSS Program
Physical Science	
4P.1.1.1.1 Ask questions to determine cause and effect relationships of electric and magnetic interactions between two objects not in contact with each other. (P: 1, CC: 2, CI: PS2) *Examples of an electric force may include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force may include the force between two permanent magnets, the force between an electromagnet and steel paper clips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships may include how the distance between objects affects the strength of the force and how the orientation of magnets affects the direction of the magnetic force.*	**FOSS Next Generation Motion and Matter c2018** **TE**: Investigation 1, Parts 1, 2 **SE**: "Magnetism and Gravity" "What Scientists Do" **DR:** *Magnetic Poles, All about Magnets* **FOSS Next Generation Energy c2018** **TE**: Investigation 2, Parts 1-3; Investigation 3, Parts 1, 2 **SE**: "When Magnet Meets Magnet" "Magnificent Magnetic Models" "Electricity creates Magnetism" "Using Magnetic Fields" "Electromagnets Everywhere" **DR:** *Virtual Investigation: What Sticks and What Conducts? All about Magnets, Magnetic Poles, Magnetic Fields, Kitchen Magnets, Electromagnets, Virtual Investigations: Electromagnet Experiments*
Earth and Space Science	
4E.1.1.1.2 Ask questions about how water moves through the Earth system and identify the type of question. (P: 1, CC: 5, CI: ESS2) *Emphasis is on the processes of evaporation, condensation, and precipitation. Examples of types of questions may include those that can be tested by an experiment, and questions that may [be] answered from a text.*	**FOSS Next Generation Water and Climate c2018** **TE**: Investigation 1, Part 4; Investigation 3, Parts 2-5 **SE**: "Which Way Does It Go?" "Drying Up" "Condensation" "Water Cycle" "Water: A Vital Resource" **DR:** *Water Cycle, Tutorial: Water Cycle* **FOSS Next Generation Earth and Sun c2019** **TE**: Investigation 3, Part 1; Investigation 5, Parts 1-3 **SE**: "What is Air?" "Condensation" "The Water Cycle" **DR:** *The Water Cycle, Water Cycle Game,*

1.1 Asking questions and defining problems 1.1.2 Students will be able to ask questions about a problem to be solved so they can define constraints and specifications for possible solutions. *

State Benchmark	FOSS Program
Physical Science	
4P.1.1.2.1 Define a simple design problem that can be solved by applying scientific ideas about magnets. * (P: 1, CC: 2, CI: PS2, ETS2) *Examples of problems may include constructing a latch to keep the door shut and creating a device to keep two moving objects from touching each other.*	**FOSS Next Generation Motion and Matter c2018** **TE**: Investigation 3, Part 4 **SE**: "Magnets at Work" **FOSS Next Generation Energy c2018** **TE**: Investigation 2, Part 2 **SE**: "When Magnet Meets Magnet" "Magnificent Magnetic Models" **DR:** "All about Magnets"

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Grade Four

1.2 Planning and carrying out investigations 1.2.1 Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena.

State Benchmark	FOSS Program
Earth and Space Science	
4E.1.2.1.1 Make observations and measurements to provide evidence of the effects of weathering or the rate of erosion by the forces of water, ice, wind, or vegetation. * ^ (P: 3, CC: 2, CI: ESS2) *Emphasis is on predicting the rate of change when variables are changed. Examples of variables to test may include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.*	**FOSS Next Generation Soils, Rocks, and Landforms c2019** **TE**: Investigation 1, Parts 2-4; Investigation 2, Parts 1-3 **SE**: "Weathering" "Erosion and Deposition" "Landforms Photo Album" **DR:** *Freezing Glass Bottle, Weathering and Erosion, Soils, Tutorial: Weathering, Sediments Time-lapse, Stream Table: High Flow vs. Low Flow, Stream Table: High Slope vs. Low Slope, Stream Table: Homogeneous Material vs. Heterogeneous Materials, Tutorial: Stream Tables: Slope and Flood, Virtual Investigation: Stream Tables*
Earth and Space Science	
4E.1.2.1.2 Plan and carry out fair tests in which variables are controlled and failure points are considered to improve a model or prototype to prevent erosion. * (P: 3, CC: 2, CI: ESS2, ETS1; ETS2) *Examples of prototypes to prevent erosion include retaining walls, windbreaks, use of shrubs or other vegetation, and drainage systems.*	**FOSS Next Generation Soils, Rocks, and Landforms c2019** **TE**: Investigation 2, Parts 2, 3 **SE**: "Erosion and Deposition" **DR:** *Stream Table: High Flow vs. Low Flow, Stream Table: High Slope vs. Low Slope, Stream Table: Homogeneous Material vs. Heterogeneous Materials, Tutorial: Stream Tables: Slope and Flood, Virtual Investigation: Stream Tables*

Looking at data and empirical evidence to understand phenomena or solve problems

2.2 Using mathematics and computational thinking. 2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.

State Benchmark	FOSS Program
Earth and Space Science	
4E.2.2.1.1 Interpret charts, maps and/or graphs of the amounts of salt water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth. ** (P: 5, CC: 4, CI: ESS2) *Emphasis is on oceans, lakes, rivers, glaciers, ground water, and polar ice caps.)*	**FOSS Next Generation Water and Climate c2018** **TE**: Investigation 1, Part 1; Investigation 2, Part 4 **SE**: "A Report from the Blue Planet" "Water: A Vital Resource" **FOSS Next Generation Earth and Sun c2019** **TE**: Investigation 5, Part 3 **SE**: "Where is Earth's Water?"

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Grade Four

Developing possible explanations of phenomena or designing solutions to engineering problems

3.1 Developing and using models 3.1.1 Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others.

State Benchmark	FOSS Program
Earth and Space Science	
4E.3.1.1.1 Develop a model based in part on student observations or data to describe ways the geosphere, biosphere, hydrosphere, and atmosphere interact. (P: 2, CC: 4, CI: ESS2) *Emphasis is on how rock, living things, water, and/or air are individual systems that make up the larger Earth system and interact with each other.*	**FOSS Next Generation Living Systems c2019** **TE**: Investigation 1, Part 2; Investigation 3, Part 1, Investigation 4, Part 4 **SE**: "Is Earth a System?" "The Biosphere" "North Atlantic Ocean Ecosystem" **DR:** *Physical Systems, Plant Vascular System, Marine Ecosystems* **FOSS Next Generation Earth and Sun c2019** **TE**: Investigation 5, Parts 3, 4 **SE**: "What is Air?" "Earth's Atmosphere" "The Water Cycle" "Severe Weather" "Earth's Climates" **DR:** *The Water Cycle, Climate and Seasons, Climate regions map*

3.2 Constructing explanations and designing solutions 3.2.1 Students will be able to apply scientific principles and empirical evidence (primary or secondary) to explain the causes of phenomena or identify weaknesses in explanations developed by the students or others.

State Benchmark	FOSS Program
Earth and Space Science	
4E.3.2.1 1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. ^ (P: 6, CC: 1, CI: ESS1) *Examples of evidence from patterns may include rock layers with marine shell fossils above rock layers with plant fossils and no shells, indicating a change from land to water over time; and a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.*	**FOSS Next Generation Soils, Rocks, and Landforms c2019** **TE**: Investigation 2, Part 4; Investigation 3, Part 4 **SE**: "Erosion and Deposition" "Landforms Photo Album" "Fossils Tell a Story" "It Happened So Fast" **DR:** *Weathering and Erosion, Rapid Changes Cards*

3.2 Constructing explanations and designing solutions 3.2.2 Students will be able to use their understanding of scientific principles and the engineering design process to design solutions that meet established criteria and constraints. *

State Benchmark	FOSS Program
Earth and Space Science	
4E.3.2.2.1 Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. * ^ (P: 6, CC: 2, CI: ESS3, ETS1) *Emphasis is on cause and effect relationships to explain change. Examples of solutions may include designing an earthquake resistant building and improving monitoring of volcanic activity.*	**FOSS Next Generation Soils, Rocks, and Landforms c2019** **TE**: Investigation 3, Part 3 **DR:** *Mount St. Helens Impact Video. All about Earthquakes*

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Grade Four

Communicating reasons, arguments and ideas to others

4.1 Engaging in Arguing from evidence 4.1.1 Students will be able to engage in argument from evidence for the explanations the students construct, defend and revise their interpretations when presented with new evidence, critically evaluate the scientific arguments of others, and present counter arguments.

State Benchmark	FOSS Program
Life Science	
4L.4.1.1.1 Construct or support an argument that traits can be influenced by different environments. (P: 7, CC: 2, CI: LS3) *Emphasis of the practice is on using evidence, data and/or a model to support an argument. Examples of the environment affecting a trait may include the stunted growth of a typically tall plant grown with insufficient water or an animal's weight being influenced by the availability of food.*	**FOSS Next Generation Structures of Life c2018** **TE**: Investigation 3, Parts 1-2 **SE**: "The Most Important Seed" "Crayfish" "Adaptations" **DR:** *All about Animal Adaptations, Walking Stick Survival* **FOSS Next Generation Environments c2019** **TE**: Investigation 4, Part 1 **SE**: "Darkling Beetles" **DR:** *Tutorial: Analyzing Environmental Experiments*

4.2 Obtaining, evaluating and communicating information 4.2.1 Students will be able to read and interpret multiple sources to obtain information, evaluate the merit and validity of claims and design solutions, and communicate information, ideas, and evidence in a variety of formats

State Benchmark	FOSS Program
Earth and Space Science	
4E.4.2.1.1 Read and comprehend grade appropriate complex texts and/or other reliable media to describe that energy and fuels are derived from natural resources and their uses affect the environment. * ^** (P: 8, CC: 2, CI: ESS3, ETS2) *Examples of information about natural resources should include details about those found in Minnesota. Examples of renewable energy resources may include wind, water behind dams, and sunlight; non-renewable energy resources include fossil fuels and fissile materials. Examples of environmental effects may include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution and global warming from burning fossil fuels.*	**FOSS Next Generation Soils, Rocks, and Landforms c2019** **TE**: Investigation 4, Part 1 **DR:** *Natural Resources, Resource ID, Virtual Investigation: Natural Resources* **FOSS Next Generation Energy c2018** **TE**: Investigation 5, Part 3 **SE**: "Alternative Sources of Electricity"
Life Science	
4L.4.2.1.2 Obtain information from various media sources to determine that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. ** (P: 8, CC: 1, CI: LS3) *Emphasis of the practice is to compare and/or combine information across texts and other reliable media. Emphasis is on organisms other than humans and the patterns in traits between offspring and their parents or among siblings.*	**FOSS Next Generation Insects and Plants c2018** **TE**: Investigation 2, Parts 2, 3; Investigation 3, Part 2; Investigation 4, Parts 2, 3 **SE**: "Flowers and Seeds" **FOSS Next Generation Structures of Life c2018** **TE**: Investigation 3, Part 2; Investigation 4, Parts 2, 3 **DR:** *Walking Stick Survival*

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Grade Four

4.2 Obtaining, evaluating and communicating information 4.2.2 Students will be able to gather information about and communicate the methods that are used by various cultures, especially those of Minnesota American Indian Tribes and communities, to develop explanations of phenomena and design solutions to problems.

State Benchmark	FOSS Program
Earth and Space Science	
4E.4.2.2.1 Obtain and combine multiple sources of information about ways individual communities, including Minnesota American Indian Tribes and communities and other cultures use evidence and scientific principles to make decisions about the uses of Earth's resources. * * ** (P: 8, CC: 4, CI: ESS3, ETS1) *Examples of cultures may include those within the local context of the learning community and within the context of Minnesota. Examples may include balancing the water, soil, wildlife, plant, and human needs to support sustainable use of resources.*	Local resources may be available through: *** The Minnesota Department of Natural Resources Young Naturalists Curriculum **https://www.dnr.state.mn.us/mcvmagazine/young-naturalists.html** *** The University of Minnesota Culture-Based Arts Integration Curriculum **https://intersectingart.umn.edu/?lesson/64**

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Grade Five

Exploring phenomena or engineering problems

1.1 Asking questions and defining problems 1.1.1 Students will be able to ask questions about aspects of the phenomena they observe, the conclusions they draw from their models or scientific investigations, each other's ideas, and the information they read.

State Benchmark	FOSS Program
Physical Science	
5P.1.1.1.1 Ask investigatable questions and predict reasonable outcomes about the changes in energy, related to speed, that occur when objects interact. (P: 1, CC: 5, CI: PS3) *Emphasis is on the change in energy due to a change in speed, not on the forces, as objects interact. Example of a question: Where and how do marbles move after a collision?*	**FOSS Next Generation Energy c2018** **TE**: Investigation 4, Part 3 **SE**: "Bowling" "Force and Energy" "Potential and Kinetic Energy at Work" **DR:** *All about the Transfer of Energy, Soccer*

1.2 Planning and carrying out investigations 1.2.1 Students will be able to design and conduct investigations in the classroom, laboratory, and/or field to test students' ideas and questions, and will organize and collect data to provide evidence to support claims the students make about phenomena.

State Benchmark	FOSS Program
Physical Science	
5P.1.2.1.2 Conduct an investigation to determine whether the mixing of two or more substances results in new substances. ^ (P: 3, CC: 2, CI: PS1) *Emphasis is on conducting fair tests by controlling variables.*	**FOSS Next Generation Mixtures and Solutions c2019** **TE**: Investigation 1, Part 1; Investigation 5, Parts 1-3 **SE**: ""Mixtures" "Taking Mixtures Apart" "Science Practices" "When Substances Change" "Ask a Chemist" "When Substances Change" **DR:** *Elements, Compounds, and Mixtures, Chemical Reactions, Tutorial: Mixtures, Tutorial: Solutions, Separating Mixtures, Virtual Investigations: Separating Mixtures, Chemical Reactions, Changes in Properties of Matter, Fizz Quiz, Tutorial: Reaction or Not?"*

Grade Five

Physical Science	
5P.1.2.1.3 Evaluate appropriate methods and tools to identify materials based on their properties prior to investigation. ^ (P: 3, CC: 3, CI: PS1) *Examples of materials to be identified may include baking soda and other powders, metals, minerals, and liquids. Examples of properties may include color, hardness, reflectivity, electrical conductivity, ability to conduct heat, response to magnetic forces, and solubility; density is not intended as an identifiable property.*	**FOSS Next Generation Mixtures and Solutions c2019** **TE**: Investigation 1, Parts 1-3, Investigation 3, Part 3; Investigation 4, Parts 1-3 **SE**: “”Mixtures” “Taking Mixtures Apart” “Science Practices” “When Substances Change” “Ask a Chemist” “A Sweet Solution” “Sour Power” **DR:** *Elements, Compounds, and Mixtures, Tutorial: Mixtures, Tutorial Solutions, Separating Mixtures, Virtual Investigations: Separating Mixtures, Changes in Properties of Matter, Tutorial: Saturation, Virtual Investigation: Solubility* **FOSS Next Generation Energy c2018** **TE**: Investigation 1, Part 2; Investigation 2, Part 1; **SE**: “Energy Sources” **DR:** *Tutorial: Conductors and Insulators, Conductor Detector, Virtual Investigation: What Sticks and What Conducts?”*
Life Science	
5L.1.2.1.4 Plan and conduct an investigation to obtain evidence that plants get the materials they need for growth chiefly from air and water. ^ (P: 3, CC: 5, CI: LS1) *Examples of plants may include aquatic plants that grow without soil. Examples of observational evidence may include growth patterns for plants grown in different environments.*	**FOSS Next Generation Structures of Life c2018** **TE**: Investigation 1, Part 2; Investigation 2, Parts 1, 2 **SE**: “The Most Important Seed” “Germination” **DR:** *Plant Basic Needs, How Plants Get Food* **FOSS Next Generation Living Systems c2019** **TE**: Investigation 2, Part 2; Investigation 3, Part 1 **SE**: “Producers” “Plant Vascular Systems” **DR:** *Plant Structure and Growth, Plant Vascular System*

Looking at data and empirical evidence to understand phenomena or solve problems

2.1 Analyze and Interpret Data 2.1.1 Students will be able to represent observations and data in order to recognize patterns in the data, the meaning of those patterns, and possible relationships between variables.

State Benchmark	FOSS Program
Physical Science	
5P.2.1.1.1 Analyze and interpret data to show that energy can be transferred from place to place by sound, light, heat, and electric currents. (P: 4, CC: 5, CI: PS3) *Emphasis of the practice is on analyzing student observations and data to serve as evidence to support a claim.*	**FOSS Next Generation Energy c2018** **TE**: Investigation 1, Parts 1, 2; Investigation 4, Part 1; Investigation 5, Parts 1, 2 **SE**: “Edison Sees the Light” “Energy Sources” “Series and Parallel Circuits” “Engineering a Solar Lighting System” “Energy” “Waves” “More about Sound” “Light Interactions” **DR:** *Lighting a Bulb, Flow of Electricity, Tutorial: Simple Circuits, Turn on the Switch, All about Light, Candle Video, All about the Transfer of Energy, Sound Energy, All about Waves, Waves, Real World Science: Sound, All about Light*

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Grade Five

2.2 Using mathematics and computational thinking. 2.2.1 Students will be able to use mathematics to represent physical variables and their relationships; compare mathematical expressions to the real world; and engage in computational thinking as they use or develop algorithms to describe the natural or designed worlds.

State Benchmark	FOSS Program
Physical Science	
5P.2.2.1.1 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. ^ (P: 5, CC: 3, CI: PS1) *Examples of reactions or changes may include phase changes, dissolving, and mixing to form new substances. Mass and weight are not distinguished.*	**FOSS Next Generation Mixtures and Solutions c2019** **TE**: Investigation 1, Part 2; Investigation 2, Part 3 **SE**: "Mixtures" "Taking Mixtures Apart" "Solid to Liquid" "Liquid and Gas Changes" **DR:** *Changes in Properties of Matter, Tutorial: Solutions, Tutorial: Conservation of Mass*
Earth and Space Science	
5E.2.2.1.2 Use data to describe patterns in the daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. ** ^ (P: 5, CC: 1, CI: ESS1) *Examples of patterns may include the number of daylight hours over the course of a year, selected stars that are visible only in particular months, and the length and direction of shadows over a year.*	**FOSS Next Generation Earth and Sun c2019** **TE**: Investigation 1, Parts 1-3; Investigation 2, Part 5 **SE**: "Changing Shadows" "Sunrise and Sunset" "Stargazing" "Star Scientists" **DR:** *Tutorial: Sun Tracking, Shadow Tracker, Seasons, All about Stars, Star Maps, Stellar Motions*

Developing possible explanations of phenomena or designing solutions to engineering problems

3.1 Developing and using models 3.1.1 Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others.

State Benchmark	FOSS Program
Physical Science	
5P.3.1.1 .1 Develop and refine a model to describe that matter is made of particles too small to be seen. ^ (P: 2, CC: 3, CI: PS1) *Examples of evidence supporting a model may include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.*	**FOSS Next Generation Earth and Sun c2019** **TE**: Investigation 3, Part 1 **SE**: "What is Air?" **DR:** *Ball on a Scale, Fizz Keeper, Soda Can Experiment* **FOSS Next Generation Mixtures and Solutions c2019** **TE**: Investigation 1, Part 1; Investigation 3, Parts 1-3 **SE**: "Solutions Up Close" "Liquid and Gas Changes" "The Air" "Concentrated Solutions" **DR:** *Tutorial: Mixtures, Tutorial: Concentration*
Physical Science	
5P.3.1.1.2 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. ^ (P: 2, CC: 5, CI: PS3) *Examples of models may include diagrams, and flow charts.*	**FOSS Next Generation Living Systems c2019** **TE**: Investigation 1, Parts 2, 3; Investigation 2, Parts 2, 3 **SE**: "The Biosphere" "Monterey Bay National Marine Sanctuary" "Comparing Aquatic and Terrestrial Ecosystems" "Producers" **DR:** *Web of Life: Life in the Sea*

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Grade Five

Life Science	
5L.3.1.1.3 Create an electronic visualization of the movement of matter among plants, animals, decomposers, and the environment. ** ^ (P: 2, CC: 4, CI: LS2) *Emphasis is on the idea that matter that is not food is changed by plants into matter that is food. Examples of systems through which matter cycles may include organisms, ecosystems, and the Earth. Examples of an electronic visualization may include a computer program, simulation, or animation.*	**FOSS Next Generation Living Systems c2019** **TE**: Investigation 1, Parts 3, 4; Investigation 4, Part 4 **SE**: "The Biosphere" "Monterey Bay National Marine Sanctuary' "Comparing Aquatic and Terrestrial Ecosystems" "Nature's Recycling System" "Producers" "North Atlantic Ocean Ecosystem" **DR** *Web of Life: Life in the Sea, Plant Vascular System, Simulation: Food Webs, Food Chains. Marine Ecosystems*

Exploring phenomena or engineering problems

3.2 Constructing explanations and designing solutions 3.2.1 Students will be able to apply scientific principles and empirical evidence (primary or secondary) to explain the causes of phenomena or identify weaknesses in explanations developed by the students or others.

State Benchmark	FOSS Program
Physical Science	
5P.3.2.1.1 Construct an explanation based on evidence relating the speed of an object to the energy of that object. (P: 6, CC: 5, CI: PS3). *The emphasis of the practice is on students identifying the evidence that supports particular points in the explanation. Examples of evidence may include the damage and the height attained when going up a ramp.*	**FOSS Next Generation Energy c2018** **TE**: Investigation 4, Parts 1-3 **DR:** All about the Transfer of Energy (Inv. 4.3, Step 4: Design and record observations of objects moving up ramps) **FOSS Next Generation Motion and Matter c2018** **DR:** Roller Coaster Builder

Developing possible explanations of phenomena or designing solutions to engineering problems

3.2 Constructing explanations and designing solutions 3.2.2 Students will be able to use their understanding of scientific principles and the engineering design process to design solutions that meet established criteria and constraints. *

State Benchmark	FOSS Program
Physical Science	
5P.3.2.2 1 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. * (P: 6, CC: 5, CI: PS3, ETS1, ETS2) *Examples of devices may include electric circuits that convert electrical energy into motion, light, or sound; and a passive solar heater that converts light into heat. Examples of constraints may include the materials, cost, or time to design the device.*	**FOSS Next Generation Energy c2018** **TE**: Investigation 1, Part 3; Investigation 3, Part 3; Investigation 5, Part 3 **SE**: "Science Practices" "Engineering Practices" "Thinking Like an Engineer" "Engineering a Solar Lighting System" "Morse Gets Clicking" "Energy" "Alternative Sources of Energy" **DR:** *All about the Transfer of Energy*

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Grade Five

Communicating reasons, arguments and ideas to others

4.1 Engaging in Arguing from evidence 4.1.1 Students will be able to engage in argument from evidence for the explanations the students construct, defend and revise their interpretations when presented with new evidence, critically evaluate the scientific arguments of others, and present counter arguments.

State Benchmark	FOSS Program
Earth and Space Science	
5E.4.1.1.1 Use evidence to support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth. ^ (P: 7, CC: 3, CI: ESS1) *Evidence may include analogies of light bulbs and distances.*	**FOSS Next Generation Earth and Sun c2019** **TE**: Investigation 2, Part 1 **SE**: "The Night Sky" "Stargazing" **DR:** *All about Stars*

4.1 Engaging in Arguing from evidence 4.1.2 Students will be able to argue from evidence to justify the best solution to a problem or to compare and evaluate competing designs, ideas, or methods. *

State Benchmark	FOSS Program
Life Science	
5L.4.1.2.1 Evaluate the merit of a solution to a problem caused by changes in plant and animal populations as a result of environmental changes. * (P: 7, CC: 4, CI: LS4, ETS1) *Emphasis is on evaluating solutions (based on evidence and design criteria and constraints), not developing new solutions. Examples of environmental changes may include land characteristics, water distribution, temperature, food availability, or the presence of other organisms.*	**FOSS Next Generation Structures of Life c2018** **TE**: Investigation 3, Part 4 **SE**: "A Change in the Environment" **DR:** *Where Does It Live? What Doesn't Belong? Habitat Gallery*