

Kirkwood School District
Kindergarten - Fifth Grade Science/Engineering Curriculum
Proposed Unit Scope and Sequence

Kdg	Forces of Motion: Pushes and Pulls/ Cause and Effect (Physical Science)	Exploring Design: Structure and Function, Physical Properties of Matter (Physical Science)	Weather and Earth's Systems (Earth Science)	Introduction to Plants and Animals (Life Science)
1st	Birds, Beaks, and Babies/ (Life Science)	Seeds, Sprouts, and Sunshine (Life Science)	Sun and Moon/Weather (Earth Science)	Light and Sound (Physical Science)
2nd	Engineering Design/ A Home for a Penguin (Physical Science)	Tools of the Trade (Physical Science)	Helping Seeds Travel (Life Science)	Wind and Water change the Earth (Earth Science)
3rd	Observing Weather Patterns (Earth Science)	How Things Move (Physical Science)	Adapting to Change (Life Science)	Change Over Time (Life Science)
4th	Structure, Function, and Survival (Life Science)	Our Dynamic Earth (Earth Science)	Transfer of Energy And Information (Physical Science)	What Energy Does (Physical Science)
5th	Matter, Energy, Life, and the Earth (Life Science)	Using Our Resources (Earth Science)	Our Place in the Universe (Earth Science)	What's Consistent About Matter (Physical Science)

Course: Kindergarten Science and Engineering

Course Description: In kindergarten science, students learn to observe and describe natural phenomena to look for patterns. Students study how designers create and test solutions. They begin to develop an understanding of structure and function in the built environment and the natural world.

Unit 1 Kindergarten	Exploring Design - Structure and Function, Physical Properties of Matter (Physical Science)
Big Ideas	• Structure and Properties of Matter • Engineering design • Developing Possible Solutions
Guiding & Essential Questions	1. How can you describe an object? (color, mass, size, shape, etc....) 2. How does the shape of an object help it function as needed to solve a given problem?
Student Learning Goal(s)	1. I can describe and identify an object by their observable properties - size, shape, color, or mass. 2. I can match objects based on physical properties 3. I can use the design process to make a simple model. 4. I can develop a simple model based on evidence to represent a proposed object or tool 5. I can explain the function and structure of an object
Vocabulary	Size, color, shape, physical properties, function, design process, plan, structure, analyze, data, strength, weakness
Discipline-Affiliated Standards (Source #1)	K.PS1.A.1 - Make qualitative observations of the physical properties of objects (i.e. size, shape, color, mass).
	K.ETS1.A.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.ETS1.B.1 - 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.ETS1.C.1 - Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Unit 2 Kindergarten	Forces of Motion: Pushes and Pulls/Cause and Effect (Physical Science)
Big Ideas	• Motion and Stability: Forces and Interactions • Forces and Motions
Guiding & Essential Questions	1. What happens when you push or pull an object? 2. How can you change the direction that the object goes? The speed that it goes?
Student Learning Goal(s) (Students will be able to....)	1. I can 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 2. I can describe ways to change the motion of an object (i.e., how to cause an object to go slower, go faster, go farther, change direction, stop). 3. I can collect data on the forces of motion they used to understand the cause and effect.
Vocabulary	Push, pull, forces of motion, cause, effect, investigation, speed, strength
Discipline-Affiliated Standards (Source #1)	K.PS2.A.1 - Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
	K.PS2.A.2 - Describe ways to change the motion of an object (i.e. how to cause an object to go slower, go fast, go farther, change direction, stop).

Unit 3 Kindergarten	Weather and Earth's Systems (Earth Science)
Big Ideas	• Energy - definitions of energy, conservation of energy and energy transfer • Earth's Place in the Universe - Earth and the solar system • Earth's Systems - Weather and Climate
Guiding & Essential Questions	1. How does the sun's energy change throughout the day, months, year? 2. What effects does the sun have? 3. What structures can help to reduce the warming area of sunlight on an area? 4. What observations can you make about the weather in Fall, Winter, Spring, Summer? Is the amount of daylight different because of the seasons? 5. What patterns do you notice about the weather over the last week? Month? Season to season? Throughout the day?
Student Learning Goal(s)	1. I can make observations to determine the effect of sunlight on Earth's surface 2. I can identify structures that reduce the warming area and plan and build a structure to reduce the warming area of the sunlight 3. I can make observations during different seasons to relate the amount of daylight to the time of year. 4. I can use observations of local weather conditions to describe patterns over time.
Vocabulary	Sun, energy, effect, warmer, hotter, colder, cooler, brighter, darker, lighter. Patterns, data, temperature, thermometer, design process, plan, experiment, seasons
Discipline-Affiliated Standards (Source #1)	K.PS3.A.1 - Make observations to determine the effect of sunlight on Earth's surface.
	K.PS3.B.1 - With prompting and support, use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area

K.ESS1.B.1 - Make observations during different seasons to relate the amount of daylight to the time of year. [Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.]

K.ESS2.D.1 - Use and share observations of local weather conditions to describe patterns over time. [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.]

Unit 4 Kindergarten	Introduction to Plants and Animals (Life Science)
Big Ideas	• From Molecules to Organisms: Structure and Processes - Organization for Matter and Energy Flow in Organisms • Earth's Systems - Biogeology • Earth and Human Activity - Natural Resources and Human Impacts on Earth's System
Guiding & Essential Questions	1. What does an animal need to survive? 2. What does a plant need to survive? 3. How are the plant needs and animal needs the same? Different? 4. How do living things use their environment to meet their needs? 5. How can plants and animals change their environment? 6. How have humans altered the natural environment to meet their needs? How do animals and plants change the environment to meet their needs? 7. How do humans use natural resources daily? How does that impact other living things needs to survive?
Student Learning Goal(s)	1. I can use observations to describe patterns of what plants and animals (including humans) need to survive. 2. I can use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live. 3. I can (With prompting and support) construct an argument using evidence for how plants and animals (including but not limited to humans) can change the environment to meet their needs. 4. I can communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.
Vocabulary	Animal, plants, basic needs, survive, impact, change, reduce, reuse, recycle, classify

Discipline-Affiliated Standards (Source #1)	<i>K.LS1.C.1 - Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]</i>
	<i>K.ESS2.E.1 - With prompting and support, construct an argument using evidence for how plants and animals (including but not limited to humans) can change the environment to meet their needs.</i>
	<i>K.ESS3.A.1 - Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.</i>
	<i>K.ESS3.B.1 - Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.</i>

Course: First Grade Science and Engineering

Course Description: In first grade, students investigate light and sound, including vibration from sound waves and the effect of different materials on the path of a beam of light. Students use their understanding of light from the Light & Sound unit to understand why the sun, moon, and stars are visible. Students will explore the sequential nature of computer programs through hands-on activities both with and without a computer. The final unit focuses on animals and includes exploration of animal life cycles and survival needs. The concept of variation is introduced by learning that young animals are similar to but not exactly like their parents and that the needs of young animals are sometimes different than those of adults. Students will also explore the design concept of biomimicry - in which structures found in nature are used to design solutions to human problems.

Unit 1 First Grade	Animals and Plants: Needs, Offspring and Variation-Biomimicry: Birds, Beaks, and Babies/ Seeds, Sprouts, and Sunshine Students will build upon their understanding of the basic needs of plants and animals developed in Kindergarten. This unit focuses on animals and includes exploration of animal life cycles and survival needs. The concept of variation is introduced by learning that young animals are similar to but not exactly like their parents and that the needs of young animals are sometimes different than those of adults. Students will also explore the design concept of biomimicry - in which structures found in nature are used to design solutions to human problems.
Big Ideas	● Develop further understanding of plants and animals life cycles, relative to basic needs and wants for survival of living things during their different stages of life. ● Explore the concept of biomimicry to engineer solutions to human problems.
Guiding & Essential Questions	1. What do animals need to survive? 2. What do plants need to survive? 3. What body parts do animals need to survive? 4. What are parts of plants that help them survive and grow? 5. How have components of our natural world inspired engineers to solve problems of our world?
Student Learning Goal(s)	1. I can identify parts of a plant. 2. I can identify what animals need to survive.

	3. I can identify what plants need to survive. 4. I can create a solution to a problem, inspired by nature.
Vocabulary	Life Cycle, Stages, Biomimicry, Survival, Needs, Variation, Offspring
Discipline-Affiliated Standards (Source #1)	<i>1.LS3.A.1. Heredity: Inheritance and Variation of Traits, Inheritance of Traits: A: 1: Make observations to construct an evidence based account that young plants and animals are like, but not exactly like, their parents. [Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could 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.]</i>
	<i>1.LS1.A.1. From Molecules to Organisms: Structure and Processes, Structure and Function: A: 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. [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could 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.]</i>

Unit 2 First Grade	Patterns in the Sky: (Earth Science) This unit begins with a two week introduction to the sun, moon, and stars at the end of first quarter. Students use their understanding of light from the Light & Sound unit to understand why the sun, moon, and stars are visible. Students will be introduced to websites and/or apps that can be used to track the position of the sun, moon, and stars and a way to record data. After this two week introduction, recording data about the position of objects in the sky will become a weekly event. In the second part of the third quarter students will examine their data to look for patterns. They will also engage in activities that will help them understand how the motion of the sun, moon, Earth and stars create patterns they have observed.
Big Ideas	• Develop a model and use it to explain a pattern in the sky
Guiding & Essential Questions	1. How is the motion of the sun, moon and stars observed in a pattern replicated across a year and its seasons? 2. How do the seasonal patterns of the sun affect our lives?
Student Learning Goal(s)	1. I can develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s). 2. I can observe, describe, and predict patterns of the motion of the sun, moon, and stars in the sky and seasonal patterns of sunrise and sunset. 3. I can understand that patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.
Vocabulary	Sun, Moon, Stars, Seasons, Sky, Universe, Sunrise, Sunset, Constellations, Cardinal Directions: North, South, East, West, Pattern, Motion, Predict, Describe, Observe
Discipline-Affiliated Standards (Source #1)	<i>1.ESS1.A.1. Earth's Place in the Universe, The Universe and its Stars: A: 1: Describe the presence of the Sun, Moon, and stars in the sky over time.</i>
	<i>1.ESS1.A.2. Earth's Place in the Universe, The Universe and its Stars: A: 2: Use observations of the sun, moon, and stars to describe patterns that can be predicted. [Clarification Statement: Examples of patterns could 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.]</i>

	<i>K.LS1.C.1. From Molecules to Organisms: Structure and Processes, Organization for Matter and Energy Flow in Organisms: C: 1: Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]</i>
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Unit 3 First Grade	Weather Students will make observations of the weather across time, noting types of weather, precipitation, cloud formations and phenomenons. Seasonal weather patterns will be explored, to create predictions of weather across the year.
Big Ideas	● Gather, organize and explain data about weather
Guiding & Essential Questions	1. How can observations of the Sun define each day? 2. To what extent does the Sun affect the weather of our community during each season?
Student Learning Goal(s)	1. I can record information (observations, thoughts, and ideas). 2. I can use and share pictures, drawings, and/or writings of observations. 3. I can use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems. 4. I can compare predictions (based on prior experiences) to what occurred (observable events).
Vocabulary	Sun, Weather, Energy, Season (Winter, Spring, Summer, Fall), Temperature, Precipitation (Rain, Sleet, Snow, Fog), Cloud Systems (Cumulus - puffy, Stratus - thick, Cirrus - wispy), <i>Observe, Describe, Predict, Pattern, Graph, Evidence</i>
Discipline-Affiliated Standards (Source #1)	<i>1.PS3.A.1. Energy, Definitions of Energy: A: 1: Identify the source of energy that causes an increase in the temperature of an object (e.g., Sun, stove, flame, light bulb).</i>

Unit 4	Light & Sound:
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First Grade	(Physical Science) Students investigate light and sound, including vibration from sound waves and the effect of different materials on the path of a beam of light. After students develop understandings of light and sound, they are challenged to design a model to solve a design problem. Students use the design process to sketch, build, test, and reflect on a device that uses light or sound to communicate over a distance.
Big Ideas	Plan and conduct an investigation into the relationship between sound and vibration
Guiding & Essential Questions	- How do different types of matter produce sound and/or vibrations? - To what extent are devices used to communicate across a distance?
Student Learning Goal(s)	- I can plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. - I can define a simple problem that can be solved through the development of a new or improved object or tool. - I can conduct simple tests that can be designed to gather evidence to support or refute student ideas about causes. - I can notice events that have causes that generate observable patterns.
Vocabulary	Engineer, Design Process, Problem, Solution, Light, Sound, Reflection, Vibration, Matter, Force, Data
Discipline-Affiliated Standards (Source #1)	1.PS4.A.1. Waves and Their Applications in technologies for Information Transfer , Wave Properties: A: 1: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]
	2.PS4.A.1. Waves and Their Applications in Technologies for Information Transfer, Wave Properties: A: 1: Plan and conduct investigations to provide evidence that changes in vibration create change in sound.
	1.PS4.C.1. Waves and Their Applications in technologies for Information Transfer, Information Technologies and Instrumentation: C: 1: Use tools and materials to design and build a device

	that uses light or sound to solve the problem of communicating over a distance. [Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string “telephones,” and a pattern of drum beats.]
	1.ETS1.A.1. Engineering Design, Defining and Delimiting Engineering Problem 6-8: A: 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.
	1.ETS1.B.1. Engineering Design, Developing Possible Solutions: B: 1: 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.
	1.PS4.A.1. Waves and Their Applications in technologies for Information Transfer , Wave Properties: A: 1: Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

Course Description: In second grade, students will build upon their understanding of the basic needs of plants and animals developed in Kindergarten and First Grade. They will explore materials science and investigate and classify different kinds of materials by their observable properties, including color, texture, and heat conduction. They will explore computer science combining mathematics and computers and investigate numerical relationships while learning about the sequence and structure required in computer programs. Students will learn that in nature, some changes happen slowly and others happen quickly. They will learn about the water cycle and water's effect on the Earth's surface.

Unit 2 Second Grade	Engineering and Design - Defining and Delimiting Engineering Problems 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. <i>How can we design, test and improve our prototype of a penguin habitat?</i>
• Big Ideas	• Analyze data from tests of two objects designed to solve the same problem to compare the strength and weaknesses of how each performs. • 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.
Guiding & Essential Questions	1. What is the problem we are trying to solve? 2. What are some solutions? 3. What is the design process? 4. How does this work? 5. What can we change? 6. How can we make it better?
Student Learning Goal(s)	1. I can define a simple problem that can be solved through the development of a new or improved object or tool. 2. I can communicate information or design ideas and/or solutions with others in drawings, writing, or numbers that provide detail about scientific ideas, practices, and/or design ideas.

	3. I can evaluate the different products developed in order to identify how it helps to solve the problem.
Vocabulary	Design, habitat, problem, criteria, brainstorm, data, hypothesis, conclusion, engineer, prototype, disassemble, reassemble
Discipline-Affiliated Standards (Source #1)	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.

Unit 2 Second Grade	Matter and Its Interactions, Structure and Properties of Matter Tools of the trade) (Physical Science)
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Big Ideas	• Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. • Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. • Analyze data to determine how the motion of an object changed by an applied force or the mass of an object.
Guiding & Essential Questions	1. How would you classify or categorize these materials? 2. How does the material help this item function? 3. Can you analyze data from tests of an object or tool to determine if it works as intended?
Student Learning Goal(s)	1. I can develop an investigation to classify different kinds of materials (e.g., metals, rocks, wood, soil, powders). 2. I can identify how properties of materials will be determined and classified. 3. I can collect and record data on the properties of the materials. 4. I can draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. 5. I can solve simple put-together, take-apart, and compare problems using information presented in a bar graph. 6. I can describe how pushes and pulls can have different strengths and directions. 7. I can explain that pushing or pulling on an object can change the speed or direction of its motion and can start or stop the object.
Vocabulary	Matter, solid, liquid, freeze, melt, reversible, experiment, temperature, volume
Discipline-Affiliated Standards (Source #1)	<i>2. PS1.A.1. Matter and Its Interactions, Structure and Properties of Matter: A: 1: Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]</i>
	<i>2.PS1.A.2. Matter and Its Interactions, Structure and Properties of Matter: A: 2: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.]</i>

	<i>2.PS2.A.1. Motion and Stability: Forces and Interactions, Forces and Motion: A: 1: Analyze data to determine how the motion of an object changed by an applied force or the mass of an object.:</i>
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Unit 3 Second Grade	Helping Seeds Travel (Life Science)
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Big Ideas	- Plants depend on animals for pollination or to move their seeds around. - Understand the importance of animals in their specialized role of pollination or seed dispersal. - Identify that animals have different structures that perform specific functions for dispersing seeds or pollinating plants (e.g., chipmunk's cheeks for carrying seeds; a hummingbird's long beak for drinking nectar; animal fur for seeds to cling to). - Identify basic plant needs. - Know that plants depend on water and light to grow. - Develop a simple model based on evidence to represent a proposed object or tool. - Develop a simple model to explain the phenomenon of pollination and dispersal of seeds.
Guiding & Essential Questions	- What do plants need to grow? - How many types of living things live in a place? - How can seeds travel? - How does pollination work (basics)?
Student Learning Goal(s)	- I can plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. - I can determine the types of materials needed for the investigation. - I can determine the parameters for growing conditions.
Vocabulary	Plants, pollination, dispersal, ecosystem, food chain, roots, stem, flower, leaf, pollinator,
Discipline-Affiliated Standards (Source #1)	<i>2.LS2.A.1. Ecosystems: Interactions, Energy, and Dynamics , Interdependent Relationships in Ecosystems: A: 1: Plan and conduct investigations on the growth of plants when growing conditions are altered (e.g., dark vs. light, water vs. no water).:</i>
	<i>2.LS2.A.2. Ecosystems: Interactions, Energy, and Dynamics , Interdependent Relationships in Ecosystems: A: 2: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.:</i>
	<i>1.ETS1.A.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.</i>

Unit 4 Second Grade	Wind and Water change the Earth (Earth Science)
Big Ideas	• Earth's place in the universe • The history of the planet • Earth's materials and systems • Bodies of water and the role of water.
Guiding & Essential Questions	1. What are the bodies of water on the Earth? 2. What events can change the Earth quickly/slowly? 3. How has Earth changed?
Student Learning Goal(s)	1. I can obtain information to identify where water is found on Earth and that it can be solid or liquid. 2. I can develop a model to represent the shapes and kinds of land and bodies of water in an area. 3. I can compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. 4. I can use information from several sources to provide evidence that Earth events can occur quickly or slowly.
Vocabulary	Continent, globe, graph, land, ice, liquid, ocean, solid, water cycle, surface, body of water, lake, pond, river, sea, stream, glacier, canyon, hill, landform, map, model, mountain, plain, plateau, valley, soil, erosion, cave, flood, weathering, century, decade, eon, volcano, earthquake
Discipline-Affiliated Standards (Source #1)	<i>2.ESS2.A.1. Earth's System, Earth Materials and System: A: 1: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land. [Clarification Statement: 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.]</i>
	<i>2.ESS2.B.1. Earth's System, Plate Tectonics and Large-Scale System: B: 1: Develop a model to represent the shapes and kinds of land and bodies of water in an area.:</i>
	<i>2.ESS2.C.1. Earth's System, The Role of Water in Earth's Surface Processes: C: 1: Obtain information to identify where water is found on Earth and that it can be solid or liquid.:</i>

Course: Third Grade Science and Engineering

Course Description: In third grade, students will learn that 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. Students will analyze data to determine how the motion of an object is changed by an applied force or the mass of an object. Starting with computer-free activities and progressing to programming in a blocks-based language on a tablet, students learn how to think computationally about a problem. Students make observations of plants and animals to compare the diversity of life in different habitats.

Unit 1 Third Grade	Observing Weather Patterns (Earth Science)
Big Ideas	• Describe the climates in different regions of the world. • Produce tables and graphs to describe weather data that has been collected.
Guiding & Essential Questions	1. What is weather? 2. What is climate? 3. How can weather data be presented in an organized way?
Student Learning Goal(s)	1. I can collect weather data. 2. I can create graphs based on data collected. (bar, picto or pie graph) 3. I can describe weather conditions of the seasons using information such as temperature, precipitation, and wind. 4. I can describe different world climate zones. 5. I can understand that humans cannot eliminate hazards but they can take steps to reduce their impact.
Vocabulary	Weather, climate, prediction, freeze, melt, evaporation, condensation, temperature, humidity, temperate/ tropical/ polar climate zones
Discipline-Affiliated Standards (Source #1)	<i>3.ESS2.D.1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season. [Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.]</i>

	3.ESS2.D.2 <i>Obtain and combine information to describe climates in different regions of the world.</i>
	3.ESS3.B.1 <i>Make a claim about the merit of an existing design solution (e.g. levies, tornado shelters, sea walls, etc.) that reduces the impacts of a weather-related hazard. [Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.]</i>
	3.PS1.A.1 <i>Predict and investigate that water can change from a liquid to a solid (freeze), and back again (melt), or from a liquid to a gas (evaporation), and back again (condensation) as the result of temperature changes.</i>
	3.PS1.B.1 <i>Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.</i>

Unit 2 Third Grade	How Things Move (Physical Science)
Big Ideas	• There is a connection between force and motion. • Forces do not have to touch to create an effect.
Guiding & Essential Questions	1. How can forces that are not touching interact?
Student Learning Goal(s)	1. I can plan and conduct an investigation to determine the cause and effect relationship of electric or magnetic interactions between two objects not in contact with each other.
Vocabulary	Magnetism, predict, force, motion, cause, effect, constraints, criteria
Discipline-Affiliated Standards (Source #1)	3.PS2.B.1 <i>Plan and conduct investigations to determine the cause and effect relationship of electric or magnetic interactions between two objects not in contact with each other. [Clarification Statement: Examples of an electric force could 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 could 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 could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.]</i>
	3.ETS1.A.1 <i>Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.</i>
	3.ETS1.B.1 <i>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.</i>

	3.ETS1.C.1
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	<i>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.</i>
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Unit 3 Third Grade	Adapting to Change (Life Science)
Big Ideas	• Different plants and animals have different life cycles. • Describe the characteristics of living things. • Describe adaptations and characteristics.
Guiding & Essential Questions	1. How do plant and animal life cycles differ? 2. What qualifies as a living organism? 3. How are adaptations helpful to survival?
Student Learning Goal(s)	1. I can develop a model to compare and contrast observations of life cycles of different plants and animals. 2. I can construct claims to support that some characteristics of organisms are inherited from parents and some are influence by the environment
Vocabulary	Adaptation, inheritance, reproduction, life cycle
Discipline-Affiliated Standards (Source #1)	3.LS3.A.1 <i>Construct scientific arguments to support claims that some characteristics of organisms are inherited from parents and some are influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]</i>
	3.LS3.B.1 <i>Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving and finding mates. [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]</i>

Course: Fourth Grade Science and Engineering

Course Description: In fourth grade, students identify the conversion of energy between forms and the energy transfer required to move energy from place to place. They will develop a model of waves to describe patterns in terms of amplitude or wavelength and that waves can cause objects to move. Students will identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. In this exploration of how computers work, students are encouraged to make analogies between the parts of the human body and parts that make up a computer. Students are introduced to the structures of plants and animals - with an emphasis on their functions.

Unit 1 Fourth Grade	Plants and Animals: Structure and Function (Life Science)
• Big Ideas	• Plants and Animals: Structure and Functions–Input/Output • Students are introduced to the structures of plants and animals - with an emphasis on their functions. Then, in a more focused world, transmit this information to the brain for processing, and then send out a signal to generate a response.
Guiding & Essential Questions	1. How do a plant's internal and external structures support their survival, growth, behavior, and reproduction? 2. What would happen if plants didn't have the structures? 3. Why do plants and animals have different internal and external structures?
Student Learning Goal(s)	1. I can develop and argument to show that plants and animals have internal and external structures that support survival, growth, behavior, and plant reproduction 2. I can use a model to describe how animals receive information through their senses and process the information in their brains.
Vocabulary	Structures, functions, transmit information to the brain, signals, model to show relationship between variables, analogy, abstract representation, phenomena, internal and external structures, survival, growth, plant reproduction, thorns, stems, roots, colored petals, heart, stomach, lunch, brain, and skin, receive information through senses, process information in brain, respond to information

Discipline-Affiliated Standards (Source #1)	<i>4.LS1.A.1. From Molecules to Organisms: Structure and Processes, Structure and Function: A: 1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and plant reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.]:</i>
	<i>4.LS1.D.1. From Molecules to Organisms: Structure and Processes, Information Processing: D: 1: 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. [Clarification Statement: Emphasis is on System of information transfer.]:</i>

Unit 2 Fourth Grade	Our Dynamic Earth (Earth Science)
Big Ideas	• Earth's Place in the Universe and Earth and Human Activity, • Gather and explain scientific information
Guiding & Essential Questions	1. How can we read the early changes to the planet from the rock formations and fossils? 2. How can we conduct investigations to provide evidence of how natural processes shape the earth? 3. How can we learn the topographics of the earth by interpreting maps?
Student Learning Goal(s)	1. I can generate multiple solutions to reduce the impact of natural Earth processes on humans. 2. I can read maps and other grade-appropriate texts to identify evidence and explanations on why and how the Earth's surface was formed
Vocabulary	Compare, combine, evidence, fossils, landscape, rock formations, canyon, rock layers, weathering, erosion, plate tectonics, topographics, ocean floor, mountains, continental boundaries, volcanoes, earthquakes
Discipline-Affiliated Standards (Source #1)	<i>4.ESS1.C.1. Earth's Place in the Universe , The History of Planet Earth: C: 1: Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. [Clarification Statement: Examples of evidence from patterns could 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.]:</i>
	<i>4.ESS2.A.1. Earth's System, Earth Materials andSystem: A: 1: Plan and conduct scientific investigations or simulations to provide evidence how natural processes (e.g. weathering and erosion) shape Earth's surfaces.:</i>
	<i>4.ESS2.B.1. Earth's System, Plate Tectonics and Large-ScaleSystem: B: 1: Analyze and interpret data from maps to describe patterns of Earth's features. [Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.]:</i>

	<i>4.ESS3.A.1. Earth and Human Activity, Natural Resources: A: 1: Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. [Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.]:</i>
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Unit 3 Fourth Grade	Transfer of Energy and Information (Physical Science)
Big Ideas	• Waves • Patterns
Guiding & Essential Questions	1. What exactly is a wave, and what are the various methods for creating one? 2. How are wave's energy transport phenomena?

Student Learning Goal(s)	1. I can develop a model showing how wave energy causes objects to move. 2. I can conduct investigations to observe how sound and light travel.
Vocabulary	Model, analogy, example, abstract representation, waves, transfer, amplitude, wavelength, diagrams, physical model, information transfer, phenomena
Discipline-Affiliated Standards (Source #1)	<i>4.PS4.A.1. Waves and Their Applications in technologies for Information Transfer , Wave Properties: A: 1: Develop a model of waves to describe patterns in terms of amplitude or wavelength and that waves can cause objects to move. [Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.]: (Boundary: The terms amplitude and wavelength should not be assessed.)</i>

Unit 4 Fourth Grade	What Energy Does (Physical Science)
Big Ideas	• Electrical energy travels through a loop to create sound and light. • Devices allow energy to transfer from place to place. • Humans use energy transfer, patterns, and waves to communicate over long distances. • Computer codes are used to communicate with a computer and analyze a code to determine what patterns occur within the code.

Guiding & Essential Questions	1. How can we generate light and sound with electrical energy? 2. How does energy move in a circuit? 3. How can we construct a circuit that transforms energy? 4. How do codes help us communicate with each other? 5. How do codes help us communicate with computers?
Student Learning Goal(s)	1. I can Develop a model to describe the transformation of energy in an electric circuit 2. I can construct a complete electric circuit and describe evidence that the energy is being transferred from battery to bulb. 3. I can gather information about materials that can conduct electricity and those that cannot 4. I can design electric circuits that transform electrical energy into light, heat, and sound. 5. I can explain how and why humans have used patterns, waves, and energy transfer to communicate 6. I can explain how computers and humans communicate with code by writing and testing simple computer programs. 7. I can design a device that uses patterns to transfer information
Vocabulary	electrical energy, light energy, sound energy, chemical energy, electricity, open circuit, conductor, circuit, closed circuit, insulator, electrical current, switch, transfer, transform, motion energy, heat energy, transmitter, code, decode, receiver, program, algorithm
Discipline-Affiliated Standards (Source #1)	<i>4.LS1.A.1. From Molecules to Organisms: Structure and Processes, Structure and Function: A: 1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and plant reproduction. [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.]</i> <i>4.LS1.D.1. From Molecules to Organisms: Structure and Processes, Information Processing: D: 1: 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. [Clarification Statement: Emphasis is on System of information transfer.]</i>

Course: Fifth Grade Science and Engineering

Course Description: In fifth grade, students will take a deeper, more advanced dive into matter, energy, and their relationship with ecosystems and environments. They will study the characteristics and motion of objects in our solar system and examine how relative distance in space impacts light. Students will end their year with a unit on robotics and automation, developing skills needed to build and program an autonomous robot.

Unit 1: Fifth Grade	Matter, Energy, Life, and the Earth (Life Science)
Big Ideas	The Earth is a complex and dynamic set of interconnected systems (e.g. geosphere, hydrosphere, atmosphere, biosphere) that interact over a wide range of temporal and spatial scales.
Guiding & Essential Questions	- How and why is Earth constantly changing? - Where do living things get what they need to move, grow, and reproduce? - What is photosynthesis?
Student Learning Goal(s)	- I can understand and can identify systems that exist on the earth, including ecosystems and simple planet-wide systems - I can understand the interdependence that exists between parts of these systems. - I can describe the flow of matter and energy through these systems. - I can define matter and energy. - I can use a model to explain what plants need to make their own food for growth - I can describe how energy moves through a food chain. - I can describe how living things get the energy and matter they need to grow, move, and survive.
Vocabulary	Ecosystems, food chain, biotic, abiotic, interaction, producers, consumers, omnivores, herbivores, carnivores, energy, community, organism, matter, decomposer, scientific method (process)
Discipline-Affiliated Standards (Source #1)	Matter, Energy, Life, and the Earth: Describe the ways the Earth's spheres interact with each other Develop a model to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact with each other (5.ESS2.A.1)
	Matter, Energy, Life, and the Earth: Provide evidence that plants get the materials they need for growth from air and water Support an argument that plants get the materials (i.e. carbon dioxide, water, sunlight) they need for growth chiefly from air and water (5.LS1.C.1)

	Matter, Energy, Life, and the Earth: Describe the movement of matter among plants, animals, decomposers, and the environment Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment (5.LS.2.B.1)
	Matter, Energy, Life, and the Earth: Compare and contrast the organ systems belonging to different vertebrate classes

	Compare and contrast the major organs/organ systems, like reproductive, digestive, transport/circulatory, that perform similar functions for animals belonging to different vertebrate classes (5.LS1.A.1)
	Matter, Energy, Life, and the Earth: Apply the scientific method to collect, organize and interpret data to support claims Pose scientific questions, design and conduct investigations to answer them, collect, and organize data (measurements and observations), and use evidence from investigations to support claims (5.ETS1.C.1)

Unit 2 Fifth Grade	Using Our Resources (Earth Science)
Big Ideas	• Resources can be renewable, meaning they are replenished naturally over time. • Resources can also be nonrenewable, meaning they can not be readily replaced over time. The materials we use as sources of energy are natural resources, and can be renewable or nonrenewable. • The hydrosphere, atmosphere, geosphere, and biosphere describe the water, air, land, and life on Earth. • These Earth systems interact with one another. • The ways humans interact with Earth's systems can have positive or negative effects.

Guiding & Essential Questions	1. What are natural resources? 2. What are the components of each Earth system and how do they interact? 3. How does the water cycle involve all of Earth's systems? 4. How do human actions affect Earth's systems?
Student Learning Goal(s)	1. I can distinguish between renewable and non-renewable energy sources. 2. I can explain how and why people choose to use renewable sources of energy. 3. I can identify and describe the main components of the four Earth systems. 4. I can explain the water cycle as a complex set of interactions between the four Earth systems. 5. I can describe how humans can impact Earth's systems including the use of natural resources for energy.
Vocabulary	natural resource, fossil fuel, non-renewable energy, renewable energy, biofuel, atmosphere, biosphere, hydrosphere, geosphere, condensation, water cycle, evaporation, dew, precipitation, fog, groundwater, runoff
Discipline-Affiliated Standards (Source #1)	4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
	5-ESS2-1. (5.ESS2.A.1) Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
	5-ESS2-2. (5.ESS2.C.1) Describe and graph the amounts of saltwater and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.
	5-ESS3-1. (5.ESS3.C.1) Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.
	4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Unit 3 Fifth Grade	Patterns in the Sky (Earth Science)
Big Ideas	• The universe is composed of a variety of different objects, which are organized into systems each of, which develops according to accepted physical processes and laws
Guiding & Essential Questions	1. What is the universe, and what is Earth's place in it? 2. What is a system and what is in our solar system? 3. How do gravitational forces affect the solar system, including Earth? 4. How does Earth's motion cause day, night, and the season? 5. What factors cause the phases of the moon? 6. What makes a star seem bright to us?

Student Learning Goal(s)	1. I can describe and explain patterns in the appearance and apparent motion of the sun, moon, and stars.
Vocabulary	System, pattern, moon, sun, planet, solar system, gravity, rotation, axis, phases, orbit, dim, constellation, scientific method (process)
Discipline-Affiliated Standards (Source #1)	Patterns in Space: Use data to reveal patterns in the sky 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 (5.ESS1.B.1/2)
	(5.ESS1.A.1) Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.

Unit 4 Fifth Grade	Matter: Properties, Changes, and Conservation (Physical Science)
Big Ideas	Matter can be understood in terms of the types of atoms present and the interactions both between and within atoms.
Guiding & Essential Questions	- How can one explain the structure, properties, and interactions of matter? - What is matter? - Can matter be changed? If so, how? - How can we classify materials?

Student Learning Goal(s)	1. I can identify the states of matter 2. I can explain the difference between a physical and chemical change 3. I can explain the difference between a mixture and solution 4. I can understand that matter is made of particles too small to be seen 5. I can understand that materials can be identified and classified according to their properties. 6. I can understand that matter can be changed and mixed in many ways, but in all cases the total mass stays the same.
Vocabulary	solid, liquid, gas, mixtures, solutions, patterns, chemical (changes), physical (changes), properties, conservation, mass, matter, scientific method (process)
Discipline-Affiliated Standards (Source #1)	Matter, Properties, Changes, and Conservation: Describe how matter is made of particles too small to be seen Develop a model to describe that matter is made of particles too small to be seen (5.PS1.A.1)
	Matter, Properties, Changes, and Conservation: Provide evidence that matter is conserved regardless of circumstances Measure and graph quantities to provide evidence that the total weight of matter is conserved regardless of heating, cooling, or missing of substances (5.PS1.A.2)
	Matter, Properties, Changes, and Conservation: Compare the distribution of fresh water to total water on Earth Describe and graph the amounts and percentages of total water and fresh water in various reservoirs to provide evidence of the distribution of water on Earth (5.ESS2.C.1)
	Matter, Properties, Changes, and Conservation: Collect information about ways to protect the Earth's resources and environment Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment (5.ESS3.C.1)