Course Name:	Fourth Grade Science		
Credits:	n/a		
Prerequisites:	n/a		
Description:	Students will explore the area of energy, through electricity and magnetism. Students will explore environments and how living organisms depend on them and one another for survival. Students will explore soil, rocks, and landforms to study changes in the Earth's surface.		
Academic Standards:	Next Generation Science Standards		
Units:	**Unit Length:**	**Unit Standards:**	**Unit Outcomes:**
Energy	12 weeks	I can use evidence to construct an explanation relating the speed of an object to the energy of that object. I can make observations to provide evidence that energy can be transferred from place to place by sound, light heat, and electric currents. I can ask questions and predict outcomes about the changes in energy that occur when objects collide. I can apply scientific ideas to design, test, and refine a device that converts energy from one form to another. I can develop model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. I can develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. I can generate and compare multiple solutions that use patterns to transfer information. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	Energy is everywhere, electricity and magnetism are related, energy transfers through waves, repeating patterns of motion, that result in sound and motion.

Environments	12 weeks	I can construct an argument that plants and animals have internal and external structure that function to support survival, growth, behavior, and reproduction. I can 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. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	Organisms have structures and behaviors that serve functions in growth, survival and reproduction and living organisms depend on one another and on their environment for their survival and the survival of populations
Soil, Rocks, and Landforms	12 weeks	I can identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. I can make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. I can analyze and interpret data from maps to describe patterns of Earth's features. I can obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. I can generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	Students will have firsthand experiences with soils and rocks and modeling experiences using tools such as topographic maps and stream tables to study changes to rocks and landforms at Earth's surface.

Unit Name: **Energy**	**Length:** 12 weeks
Standards: I can use evidence to construct an explanation relating the speed of an object to the energy of that object. I can make observations to provide evidence that energy can be transferred from place to place by sound, light heat, and electric currents. I can ask questions and predict outcomes about the changes in energy that occur when objects collide. I can apply scientific ideas to design, test, and refine a device that converts energy from one form to another. I can develop model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. I can develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. I can generate and compare multiple solutions that use patterns to transfer information. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	**Outcomes:** Energy is everywhere, electricity and magnetism are related, energy transfers through waves, repeating patterns of motion, that result in sound and motion.
Topic 1: **Energy and Circuits**	**Length:** 5 days
Essential Questions: 1. What is needed to light a bulb? 2. What is needed to make a complete pathway for current to flow in a circuit? 3. How can you light two bulbs brightly with one D-cell? 4. Which design is better for manufacturing long strings of lights - series or parallel?	**Learning Targets:** Students will understand that an electric circuit is a system that includes a complete pathway through which electric current flows from an energy source to its components. Students will understand that conductors are materials through which electric current can flow: all metals are conductors. Students will understand the difference between a series circuit and a parallel circuit. Students will understand that the energy of two energy sources adds when they are wired in a series, delivering more energy than a single source. Two cells in parallel deliver the same energy as a single cell.
Standard(s): I can make observations to provide evidence that energy can be transferred from place to place by sound, light heat, and electric currents. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	**Academic Vocabulary:** component, energy source, circuit, electric current, terminal, contact points, filament, component, insulators, conductor, insulator, closed circuit, open circuit, switch, parallel circuit, series circuit.
Lesson Frame: Lighting a Bulb	I can make a complete circuit to light a bulb.

Lesson Frame: Conductors and Circuits	I can make a pathway for a current to flow. I can determine which materials can complete the pathway and which cannot.
Lesson Frame: Series and Parallel Circuits	I can light two bulbs with on D-cell.
Lesson Frame: Solving the String-of-Lights Problem	I can decide which type of circuit would be the best design for a string of lights.
Performance Task: Using wires, an energy source and a bulb, light the bulb. Use a switch and motor to make a circuit. Determine which materials can complete a pathway. Devise a series circuit to operate two bulbs. Wire two bulbs in parallel. Analyze a design to light a string of lights. Interactive notebook.	Notes: Student copies of Energy book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment
Topic 2: **The Force of Magnetism**	**Length:** 4 days
Essential Questions: 1. What materials stick to magnets? 2. What happens when two or more magnets interact? 3. What happens when a piece of iron comes close to or touches a permanent magnet?	**Learning Targets:** Students will understand that magnets stick to objects that contain iron. Students will learn that magnets are surrounded by an invisible magnetic field, when an object enters a magnetic field, the object becomes a temporary magnet. All magnets have two poles. Students will learn the magnetic force acting between magnets declines as the distance between them increases. Earth has a magnetic field.
Standard(s): I can make observations to provide evidence that energy can be transferred from place to place by sound, light heat, and electric currents. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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	**Academic Vocabulary:** attract, compass, force, gravity, induced magnetism, interact, iron, magnet, magnetic field, magnetic, North pole, opposite, permanent magnet, pole, repel, South pole, steel, temporary magnet.
Lesson Frame: Magnets and Materials	I can determine what materials stick to magnets.
Lesson Frame: Magnetic Fields	I can understand what happens when two or more magnets interact. I can understand what happens when a piece of iron comes close to or touches a permanent magnet.
Lesson Frame: Magnetic Force	I can understand what happens to the force of attraction between two magnets as the distance between them changes.

Performance Tasks: Students discover that iron-containing objects stick to magnets. Students generate a rule for magnetic interaction with materials. Observe two sides of a magnet are different, that magnetism acts through air, most metals and all nonmetals, bringing a magnet close to a piece of iron induces magnetism, there is an invisible field surrounding every magnet. Using a balance, measure the force of attraction between magnets. Interactive notebook.	Notes: Student copies of Energy book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment
Topic 3: **Electromagnets**	**Length:** 4 days
Essential Questions: How can you turn a steel rivet into a magnet that turns on and off? How does the number of winds of wire around a core affect the strength of the magnetism? How can you reinvent the telegraph using your knowledge of energy and electromagnetism?	**Learning Targets:** Students will understand that a magnetic field surrounds a wire through which electric current is flowing. Students will understand the magnetic field produced by a current carrying wire can induce magnetism in a piece of iron or steel. Students will understand an electromagnet is made by sending electric current through an insulated wire wrapped around an iron core. Students will understand the number of winds of wire affects the strength of the magnetism. Students will understand a telegraphic system is an electromagnet based technology used for long distance communication.
Standard(s): I can make observations to provide evidence that energy can be transferred from place to place by sound, light heat, and electric currents. I can apply scientific ideas to design, test, and refine a device that converts energy from one form to another. I can generate and compare multiple solutions that use patterns to transfer information. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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	**Academic Vocabulary:** code, coil, core, electromagnet, electromagnetism, key, rivet, telegraph
Lesson Frame: Building an Electromagnet	I can turn a steel rivet into a magnet that turns on and off.
Lesson Frame: Changing the Strength	I can determine the number of winds of wire around a core affect the strength of the magnetism.
Lesson Frame: Reinventing the Telegraph	I can reinvent the telegraph using knowledge of energy and electromagnetism.

Performance Tasks: Students discover a steel core becomes a magnet when current flows through an insulated wire around the steel core. Students experiment to find out how the number of winds of wire affects the strength of magnetism. Students apply their knowledge of circuitry and electromagnetism to build a telegraph, they invent a code and send messages to each other, they wire two telegraph units together using long wires.	Notes: Student copies of Energy book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment
Topic 4: **Energy Transfer**	**Length:** 4 days
Essential Questions: 1. What do we observe that provides evidence that energy is present? 2. How does the starting position affect the speed of a ball rolling down a ramp? 3. What happens when objects collide?	**Learning Targets:** Students will understand energy is evident whenever there is motion, electric current, sound, light, or heat. Energy can be transferred from place to place. Students will understand that objects in motion have energy. The faster an object moves, the more kinetic energy it has Students will understand when objects collide, energy transfers between objects, changing their motion Students will understand kinetic energy is energy of motion, potential energy is energy of position. Objects at higher positions have more potential energy than objects at lower positions.
Standard(s): I can use evidence to construct an explanation relating the speed of an object to the energy of that object. I can ask questions and predict outcomes about the changes in energy that occur when objects collide. I can generate and compare multiple solutions that use patterns to transfer information. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	**Academic Vocabulary:** collide, collision, friction, fuel, heat, Kinetic energy, potential energy, sound, stationary, transfer of energy
Lesson Frame: Presence of Energy	I can explore evidence of energy when sound, heat and light are produced and when objects are in motion.
Lesson Frame: Rolling Balls Down Slopes	I can investigate how variables affect the speed of a rolling ball.
Lesson Frame: Collisions	I can test variables of mass and starting position to find out how these variables affect energy transfer.

Performance Tasks: Observe and compare the behavior of balls on ramps Design and conduct controlled experiments to find out how collisions affect the transfer of energy	Notes: Student copies of Energy book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment
Topic 5: **Waves**	**Length:** 4 days
Essential Question: 1. How are waves involved in energy transfer? 2. How does light travel? 3. How can you make a motor run faster using solar cells?	**Learning Targets:** Students will understand that waves: are a repeating pattern of motion that transfer energy from place to place, there are sound waves, light waves, radio waves, microwaves, and ocean waves, waves have properties - amplitude, wavelength, and frequency. Students will understand that light travels in a straight line and can reflect off surfaces, an object is seen only when light from that object enters and is detected by an eye, and light can refract when it passes from one transparent material into another Students will understand two energy sources deliver more power than a single source
Standard(s): I can develop model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. I can develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. I can generate and compare multiple solutions that use patterns to transfer information. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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	**Academic Vocabulary:** amplitude, compression cycle, frequency, mirror, peak ray, reflect, reflection, refract, refraction, solar cell trough, wave, wavelength
Lesson Frame: Forms of Waves	I can understand the general properties of waves - amplitude, wavelength, and frequency.
Lesson Frame: Light Travels	I can understand how light travels.
Lesson Frame: Engineering with Solar Cells	I can understand and use alternative energy sources.
Performance Tasks: Experience waves through firsthand experiences using ropes, demonstrations with waves in water, spring toys, and a sound generator Use mirrors to experience reflecting light, students build a conceptual model about how light travels Design series and parallel solar cell circuits and observe the effect on the speed of a motor. Read about alternative energy sources	Notes: Student copies of Energy book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment

Unit Name: **Environments**	**Length:** 12 weeks
Standards: I can construct an argument that plants and animals have internal and external structure that function to support survival, growth, behavior, and reproduction. I can 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. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	**Outcomes:** Organisms have structures and behaviors that serve functions in growth, survival and reproduction and living organisms depend on one another and on their environment for their survival and the survival of populations
Topic 1: **Environmental Factors**	**Length:** 4 days
Essential Questions: 1. How do mealworm structures and behaviors help them grow and survive? 2. What moisture conditions do isopods prefer? 3. What light conditions do isopods prefer? 4. What are the characteristics of animals living in the leaf-litter environment?	**Learning Targets:** Students will describe how an environment is everything living and nonliving that surrounds and influences an organism. Students will describe the relationship between environmental factors and how well organisms grow. Students will describe animal structures and behaviors that function to support survival, growth, and reproduction. Students will demonstrate how by controlling some factors they affect other factors. Students will describe how organisms (specifically isopods) have a preferred set of environmental conditions.
Standard(s): I can construct an argument that plants and animals have internal and external structure that function to support survival, growth, behavior, and reproduction. I can 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. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	**Academic Vocabulary:** adult, antennae, behavior, condition, darkling beetle, environment, environmental factors, function, inference, isopod, larva, life cycle, living, mealworm, molting, nonliving, observation, organism, pillbug, preferred environment, pupa, pupate, sow bug, stage, structure
Lesson Frame: Observing Mealworms	I can use the structure and behavior of mealworms to provide a proper environment for them to survive
Lesson Frame: Designing an Isopod Environment	I can learn how isopods respond to environmental factors of water and light. I can create an isopod environment
Lesson Frame: Leaf-Litter Critters	I can become familiar with small animals living in natural ground litter

Performance Tasks: Observe mealworms, determine what is needed to provide a proper environment for them to survive. Keep the environments at room temperature have one environment at a colder temperature. Conduct two different investigations to find out how isopods respond to factors of water and light Collect, observe, and sort small animals living in natural ground litter. Use a Critter Replicator to become familiar with the anatomical parts of animals they find. Use a concept grid to organize the information they have gathered	Notes: Student copies of Environment book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment
Topic 2: **Ecosystems**	**Length:** 4 days
Essential Questions: 1. What are the environmental factors in an aquatic system? 2. What are the roles of organisms in a food chain? 3. How does food affect a population in its home range? 4. How do animals use their sense of hearing?	**Learning Targets:** Students will explain how aquatic environments include living and nonliving factors. Students will describe how organisms that live in water have structures to meet their needs. Students will explain that an ecosystem is the interaction of organisms with one another and the nonliving environment. Students will explain how organisms have structures that allow them to feed and compete for resources. Students will explain that producers make their own food, which is used by animals (consumers). Students will explain that decomposers eat and recycle the nutrients in the system. Students will explain that animals have different systems for obtaining oxygen. Students will describe how organisms interact in ecosystems. Students will explain that when environments change, plants and animals survive and reproduce, move to new locations, or die. Students will describe how animals communicate to warn others of danger, scare off predators, and locate others of their kind. Students will explain how organisms have sensory systems to gather information about their environment and act on it. Students will describe how animals detect sounds, interpret, and act on them.
Standard(s): I can construct an argument that plants and animals have internal and external structure that function to support survival, growth, behavior, and reproduction. I can 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. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	**Academic Vocabulary:** algae, aquarium, aquatic environment, carnivore, carrying capacity, competition, consumer, decomposer, ecosystem, elodea, energy, food chain, food web, freshwater environment, herbivore, home range, interaction, microorganism, omnivore, phytoplankton, population, predator, prey, producer, zooplankton
Lesson Frame: Designing an Aquarium	I can describe the environmental factors in an aquatic system
Lesson Frame: Food Chains and Food Webs	I can discuss the roles of organisms in a food chain

Lesson Frame: Population Simulation	I can describe how food affects a population
Lesson Frame: Sound Off	I can replicate how animals use their sense of hearing
Performance Tasks:	Notes: Student copies of Environment book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment
Topic 3: **Brine Shrimp Hatching**	**Length:** 4 days
Essential Questions: 1. How can we find out if salinity affects brine shrimp hatching? 2. How does salinity affect the hatching of brine shrimp eggs? 3. Does changing the salt environment allow the brine shrimp eggs to hatch? 4. What are some benefits of having variation within a population?	**Learning Targets:** Students will explain that brine shrimp are crustaceans that live in marine or salt-pond environments. Students will describe how environmental factors (living or nonliving) are one part of an environment. Students will describe the range of tolerance organisms have for environmental factors. Students will explain how there are optimum conditions for reproduction and growth within a range of tolerance. Students will describe how brine shrimp can hatch in a range of salt concentrations. Students will explain that when environments change, plants and animals survive and reproduce, move to new locations, or die. Students will describe how humans impact natural environments. Students will describe how individuals of the same kind differ in characteristics, and sometimes the differences give individuals an advantage in surviving and reproducing.
Standard(s): I can construct an argument that plants and animals have internal and external structure that function to support survival, growth, behavior, and reproduction. I can 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. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	**Academic Vocabulary:** brine, brine shrimp, concentration, controlled experiment, inherited trait, migrate, optimum, range of tolerance, reproduce, salinity, salt lake, survive, thrive, tolerance, variation, viable
Lesson Frame: Setting Up the Environment	I can identify if salinity affects brine shrimp hatching.
Lesson Frame: Determining Range of Tolerance	I can determine how salinity affects the hatching of brine shrimp eggs.
Lesson Frame: Determining Viability	I can determine how changing the salt environment allows the brine shrimp eggs to hatch.

Lesson Frame: Variation in a Population	I can understand some benefits of having variation within a population.
Performance Tasks:	Notes: Student copies of Environment book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment
Topic 4: **Range of Tolerance**	**Length:** 4 days
Essential Question: 1. How much water is needed for early growth of different kinds of plants? 2. What is the salt tolerance of several common farm crops? 3. How does mapping the plants in the schoolyard help us to investigate environmental factors? 4. What are some examples of plant adaptations?	**Learning Targets:** Students will describe the range of tolerance organisms have for factors in its environment. Students will describe the specific requirements for successful growth, development, and reproduction that organisms need. Students will describe the optimum conditions that are most favorable to an organism. Students will explain that adaptations are structures and behaviors of an organism that help it survive and reproduce. Students will explain the relationship that exists between environmental factors and how well organisms grow.
Standard(s): I can construct an argument that plants and animals have internal and external structure that function to support survival, growth, behavior, and reproduction. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	**Academic Vocabulary:** adaptation, dominant plant, drought, irrigate, plant distribution, salt-sensitive, salt-tolerant
Lesson Frame: Water or Salt Tolerance and Plants	I can determine how much water is needed for early growth of different kinds of plants. I can determine the salt tolerance of several common farm crops.
Lesson Frame: Plant Patterns	I can map plants in the schoolyard to investigate environmental factors.
Lesson Frame: Plant Adaptations	I can identify some examples of plant adaptations.
Performance Tasks:	Notes:Student copies of Environment book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment

Unit Name: **Soil, Rocks, and Landforms**	**Length:** 12 weeks
Standards: I can identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. I can make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. I can analyze and interpret data from maps to describe patterns of Earth's features. I can obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. I can generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	**Outcomes:** Students will have firsthand experiences with soils and rocks and modeling experiences using tools such as topographic maps and stream tables to study changes to rocks and landforms at Earth's surface.
Topic 1: **Soils and Weathering**	**Length:** 4 days
Essential Questions: 1. What is soil? 2. What causes big rocks to break down into smaller rocks? 3. How are rocks affected by acid rain? 4. What's in our schoolyard soil?	**Learning Targets:** Students will describe soil by their properties. Students will describe the amounts of earth materials and humus that soil is made of. Students will explain weathering as the breakdown of rocks and minerals at/near the Earth's surface. Students will explain the physical-weathering processes of abrasion and freezing as the breaking of rocks and minerals into smaller pieces. Students will explain that chemical weathering occurs when exposure to water and air changes rocks and minerals into something new.
Standard(s): I can make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	**Academic Vocabulary:** abrasion, acid rain, basalt, calcite, chemical reaction, chemical weathering, clay, conglomerate, earth material, expand, freeze, granite, gravel, humus, limestone, marble, model, pebble, physical weathering, rock, sand, sandstone, silt, soil, system, weathering
Lesson Frame: Soil Composition	I can describe soils by their properties.
Lesson Frame: Physical Weathering	I can understand physical weathering.
Lesson Frame: Chemical Weathering	I can understand chemical weathering.
Lesson Frame: Schoolyard Soils	I can describe schoolyard soils by its properties.

Performance Tasks: Students observe and compare four different soils, they will speculate where each of the four came from: mountain, desert, river delta, or forest. Students tumble rocks and freeze water to see how these two types of physical weathering can break rocks. Students conduct an investigation to test rocks with "acid rain." Students collect and observe different soils from several locations in the schoolyard.	Notes: Student copies of Soils, Rocks, and Landforms book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment
Topic 2: **Landforms**	**Length:** 4 days
Essential Questions: 1. How do weathered rock pieces move from one place to another? 2. How does slope affect erosion and deposition? 3. How do floods affect erosion and deposition? 4. Where are erosion and deposition happening in our schoolyard? 5. How do fossils get in rocks and what can they tell us about the past?	**Learning Targets:** Students will describe how weathered rocks can be reshaped by erosion and deposition. Students will explain that erosion is the transport of weathered rock material by moving water or wind. Students will explain that deposition is the settling of sediments when the speed of moving water or wind declines. Students will explain how the rate and volume of erosion relates to the energy of moving water or wind. Students will explain that the energy of moving water depends on the mass of water in motion and its velocity. Students will describe how fossils provide evidence of organisms that lived long ago and clues to changes in past environments.
Standard(s): I can identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time. I can make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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	**Academic Vocabulary:** alluvial fan, basin, canyon, cast, delta, deposition, erosion, flood, floodplain, fossil, imprint, landform, meander, mold, mountain, petrification, preserved remains, river channel, river mouth, sediment, sedimentary rock, slope, superposition, valley
Lesson Frame: Erosion and Deposition	I can understand how water moves earth's materials from one location to another.
Lesson Frame: Stream-Table Investigations	I can understand how environmental variables can affect erosion and deposition.
Lesson Frame: Schoolyard Erosion and Deposition	I can decide if erosion and deposition are happening in our schoolyard.
Lesson Frame: Fossil Evidence	I can understand how the sedimentation process can result in fossils.
Performance Tasks: Use stream tables to observe that water moves earth materials from one location to another Use stream tables to learn how environmental variables can affect erosion and deposition Look for evidence of erosion in our schoolyard Watch a video, make models, and read to learn about how sedimentation can result in fossils.	Notes: Student copies of Soils, Rocks, and Landforms book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment

Topic 3: **Mapping Earth's Surface**	**Length:** 4 days
Essential Questions: 1. How can we represent the different elevations of landforms? 2. How can we draw the profile of a mountain from a topographic map? 3. How can scientists and engineers help reduce the impacts that events like volcanic eruptions might have on people? 4. What events can change Earth's surface quickly?	**Learning Targets:** Students will demonstrate how topographic maps use contour lines to show the shape and elevation of the land. Students will explain how a change in elevation between two adjacent contour lines is always uniform. Students will describe how contour lines affect slope. Students will describe a profile as a side view or cross-section of a landform. Students will draw a profile map from information given on a topographic map. Students will describe how the surface of the Earth is constantly changing. Students will describe how catastrophic events have the potential to change the Earth's surface. Students will explain how scientists and engineers can do things to reduce the impacts of natural Earth processes on humans.
Standard(s): I can make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. I can analyze and interpret data from maps to describe patterns of Earth's features. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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	**Academic Vocabulary:** contour interval, contour line, crust, earthquake, elevation, landslide, lava, magma, mantle, profile, satellite cone, sea level, topographic map, volcano
Lesson Frame: Making a Topographic Map	I can understand and create a topographic map.
Lesson Frame: Drawing a Profile	I can create a two-dimensional profile.
Lesson Frame: Mount St. Helens Case Study	I can compare two topographic maps.
Lesson Frame: Rapid Changes	I can understand processes that cause rapid changes to Earth's surface.
Performance Tasks: Build a model mountain of MT. Shasta, trace outlines creating a topographic map Use topographic maps to produce two-dimensional profiles Compare two topographic maps. Draw profiles of Mount St. Helens before and after eruption Think about processes that cause rapid changes to Earth's surfaces	Notes: Student copies of Soils, Rocks, and Landforms book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment
Topic 4: **Natural Resources**	**Length:** 4 days

Essential Questions: 1. What are natural resources and what is important to know about them? 2. How are natural resources used to make concrete? 3. How do people use natural resources to make or build things?	**Learning Targets:** Students will explain how natural resources are taken from the environment and used by humans. Students will explain natural resources as renewable or nonrenewable and describe which resources are which. Students will explain alternative sources of energy (solar, wind, and geothermal energy). Students will describe the earth materials that make concrete. Students will explain how natural resources are important for shelter and transportation. Students will explain how scientists and engineers work to improve how people use natural resources.
Standard(s): I can obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment. I can generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans. I can define a simple design problem reflecting a need or a want that includes specific criteria for success and constraints on materials, time, or cost. I can 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 can 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.	**Academic Vocabulary:** aggregate, cement, concrete, fossil fuel, geothermal power, natural resource, nonrenewable resource, renewable resource, solar energy, wind power
Lesson Frame: Introduction to Natural Resources	I can review what I have learned in the module about soils, rocks, and landforms.
Lesson Frame: Making Concrete	I can make a concrete stepping stone.
Lesson Frame: Earth Materials in Use	I can identify what natural resources were used to construct objects.
Performance Tasks: Write a story or draw a concept map to bring ideas together about what they have learned in this module, focusing on renewable and nonrenewable resources Use local natural resources to make a stepping stone Walk around the school searching for materials in use	Notes: Student copies of Soils, Rocks, and Landforms book Materials in FOSS kits Various videos mentioned in FOSS TE Online activities I Check Assessment