Fourth Grade FOSS Pacing Guide 2017-2018

Quarter 1	Quarter 2	Quarter 3	Quarter 4
Unit 1: Soil, Rocks, & Landforms **Aug. 21 - Nov. 3** (approx. 49 days) Investigation 1: Soils and Weathering (approx. 15 days) Investigation 2: Landforms (approx. 12 days) Investigation 3: Mapping Earth's Surface (approx. 10 days) Investigation 4: Natural Resources (approx 9 days)			
	Unit 2: Energy **Nov. 6 - March 9** (approx. 64 days) Investigation 1: Energy and Circuits (approx. 13 days) Investigation 2: The Force of Magnetism (approx. 12 days) Investigation 3: Electromagnets (approx. 10 days) Investigation 4: Energy Transfer (approx. 12 days) Investigation 5: Waves (approx. 14 days)		
		**Unit 3 Environments** **March 12 - May 25** (approx. 45 days) Investigation 1: Environmental Factors (approx. 12 days) Investigation 2: Ecosystems (approx. 12 days) Investigation 3: Brine Shrimp Hatching (approx. 11 days) Investigation 4: Range of Tolerance (approx. 14 days)	

Unit Title: Soil, Rocks, & Landforms Quarter 1/2	
Approximate Teaching Dates	**Aug. 21 - Nov. 3** (approx. 49 days)
Domain(s)	Earth and Space Science (ESS), Engineering, Technology, and Applications of Science (ETS)
Performance Expectations	**4-ESS1-1** (Investigation 2) **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.] [Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.] **4-ESS2-1** (Investigation 1, 2) **Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.** [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.] **4-ESS2-2** (Investigation 2, 3) **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.] **4-ESS3-2** (Investigation 3, 4) **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.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.] **3-5-ETS1-1** (Investigation 4) **Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.**
Science and Engineering Practices	• Asking questions (Investigation 1, 2) • Developing and using models (Investigation 1, 2, 3) • Planning and carrying out investigations (Investigation 1, 2, 3, 4) • Analyzing and interpreting data (Investigation 1, 2, 3) • Constructing explanations and designing solutions (Investigation 1, 2, 3, 4) • Engaging in argument from evidence (Investigation 1, 3, 4) • Obtaining, evaluating, and communicating information (Investigation 1, 2, 3, 4)

Disciplinary Core Ideas	**ESS1.C: The history of planet Earth** (Investigation 2, 3) ● Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1) **ESS2.A: Earth materials and systems** (Investigation 1, 2, 3) ● Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) **ESS2.B: Plate tectonics and large-scale system interactions** (Investigation 2, 3) ● The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2) **ESS2.E: Biogeology** (Investigation 1) ● Living things affect the physical characteristics of their regions. (4-ESS2-1) **ESS3.B: Natural hazards** (Investigation 3, 4) ● A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) **ETS1.A: Defining and delimiting engineering problems** (Investigation 4) ● Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1) **ETS1.B: Developing possible solutions** (Investigation 3) ● Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)
Cross Cutting Concepts	**Patterns** (Investigation 1, 2, 3) ● Patterns can be used as evidence to support an explanation. **Cause and effect** (Investigation 1, 2, 3, 4) ● Cause and effect relationships are routinely identified, tested, and used to explain change
Required Investigations	Investigation 1: Soils and Weathering (approx. 15 days) Investigation 2: Landforms (approx. 12 days) Investigation 3: Mapping Earth's Surface (approx. 10 days) Investigation 4: Natural Resources (approx 9 days)
Required Summative Assessment(s)	**Science and Engineering Practices** ● Performance Assessment- Investigation 1: part 3 ● Performance Assessment- Investigation 2: part 2 ● Performance Assessment- Investigation 3: part 3 ● Performance Assessment- Investigation 4: part 3 **Performance Expectations (conceptual understanding)** ● Investigation 1 I-Check ● Investigation 2 I-Check ● Investigation 3 I-Check

	• PostTest (After investigation 4)

Unit Title: Energy Quarter 2/3	
Approximate Teaching Dates	**Nov. 6 - March 9** (approx. 64 days)
Domain(s)	Physical Science (PS), Engineering, Technology, and Applications of Science (ETS)
Performance Expectations	**3-PS2-3** (Investigation 2) **Ask questions to determine cause and effect relationships 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 paperclips, 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.] [Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.] **4-PS3-1** (Investigation 4) **Use evidence to construct an explanation relating the speed of an object to the energy of that object.** [Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.] **4-PS3-2** (Investigation 1,3,4,5) **Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.** [Assessment Boundary: Assessment does not include quantitative measurements of energy.] **4-PS3-3** (Investigation 4) **Ask questions and predict outcomes about the changes in energy that occur when objects collide.** [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.] **4-PS3-4** (Investigation 1,2,3,5) **Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.*** [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.] **4-PS4-1** (Investigation 3,5) **Develop a model of waves to describe patterns in terms of amplitude and 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.] [Assessment Boundary: Assessment does not include interference

	effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.] **4-PS4-2** (Investigation 3,5) **Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.** [Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.] **4-PS4-3** (Investigation 3) **Generate and compare multiple solutions that use patterns to transfer information.*** [Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.] **3–5-ETS1-1** (Investigation 1,3,5) **Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.** **3–5-ETS1-2** (Investigation 1,3,5) **Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.** **3–5-ETS1-3** (Investigation 1,3,5) **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.**
Science and Engineering Practices	• Asking questions and defining problems (Investigation 1, 4) • Developing and using models (Investigation 1, 3) • Planning and carrying out investigations (Investigation 1, 2, 3, 4) • Constructing explanations and designing solutions (Investigation 1, 2, 3, 4)
Disciplinary Core Ideas	**PS2.B: Types of interactions (Investigation 2, 3)** • Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (Extended from grade 3) **PS3.A: Definitions of energy (Investigation 1, 4)** • The faster a given object is moving, the more energy it possesses.(4-PS3-1) • Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2),(4-PS3-3) **PS3.B: Conservation of energy and energy transfer (Investigation 1, 2, 3, 4, 5)** • Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2),(4-PS3-3) • Light also transfers energy from place to place. (4-PS3-2) • Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2),(4-PS3-4) **PS3.C: Relationship between energy and forces (Investigation 4)** • When objects collide, the contact forces transfer energy so as to change the objects' motions. **PS3.D: Energy in chemical processes and everyday life (Investigation 1, 2, 3, 4, 5)**

	• The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. **PS4.A: Wave properties (Investigation 5)** • Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. • Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). **PS4.B: Electromagnetic radiation (Investigation 5)** • An object can be seen when light reflected from its surface enters the eyes. **PS4.C: Information technologies and instrumentation (Investigation 3)** • Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. **ETS1.A: Defining and delimiting engineering problems (Investigation 1, 5)** • Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. **ETS1.B: Developing possible solutions (Investigation 1, 5)** • Testing a solution involves investigating how well it performs under a range of likely conditions. **ETS1.C: Optimizing the design solution (Investigation 1, 3, 5)** • Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.
Cross Cutting Concepts	**Cause and effect** (Investigation 1, 2, 3, 4) • Cause and effect relationships are routinely identified and used to explain change. **Energy and matter** (Investigation 1, 2, 3, 4) • Energy can be transferred in various ways and between objects **Patterns** (Investigation 2, 3, 4) • Similarities and differences in patterns can be used to sort and classify natural phenomena. • Similarities and differences in patterns can be used to sort and classify designed products.
Required Investigations	Investigation 1: Energy and Circuits (approx. 13 days) Investigation 2: The Force of Magnetism (approx. 12 days) Investigation 3: Electromagnets (approx. 10 days) Investigation 4: Energy Transfer (approx. 12 days) Investigation 5: Waves (approx. 14 days)
Required Summative Assessment(s)	**Science and Engineering Practices** • Performance Assessment- Investigation 1: part 4 • Performance Assessment- Investigation 2: part 3 • Performance Assessment- Investigation 3: part 2 • Performance Assessment- Investigation 4: part 1 • Performance Assessment- Investigation 5: part 3 **Performance Expectations (conceptual understanding)** • Investigation 1 I-Check

	• Investigation 2 I-Check • Investigation 3 I-Check • Investigation 4 I-Check • Posttest (After Investigation 5)

Unit Title: Environments Quarter 3/4	
Approximate Teaching Dates	**March 12 - May 25** (approx. 45 days)
Domain(s)	Life Science (LS), Earth Science (ESS)
Performance Expectations	**4-LS1-1.** (Investigation 1,2,3,4) **Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.** [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.] **4-LS1-2.** (Investigation 1,2) **Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.** [Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.] **4-ESS3-1.** (Investigation 3) **Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.** [Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.]
Science and Engineering Practices	• Developing and using models (Investigation 1, 2, 3) • Planning and carrying out investigations (Investigation 3) • Constructing explanations (Investigation 3) • Engaging in argument from evidence (Investigation 1, 2, 3, 4) • Obtaining, evaluating, and communicating information (Investigation 3)
Disciplinary Core Ideas	**LS1.A: Structure and function (Investigation 1, 2, 3, 4)** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. **LS1.D: Information processing (Investigation 1, 2)** Different sense receptors are specialized for particular kinds of information, which may then be processed by an animal's brain. Animals are able to use their perceptions and memories to guide their actions. **LS2.C: Ecosystem dynamics, functioning, and resilience (Investigation 1, 2, 3, 4)** When the environment changes in ways that affect a place's physical characteristics,

	temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (Extended from grade 3) **LS4.D: Biodiversity and humans (Investigation 1, 2, 3, 4)** Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (Extended from grade 3) **LS4.B: Natural selection (Investigation 3, 4)** Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (Extended from grade 3) **ESS3.A: Natural resources (Investigation 3)** Energy and fuels that humans use are derived from natural sources and their use affects the environment in multiple ways **LS4.A: Evidence of common ancestry and diversity (Investigation 4)** Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (Extended from grade 3)
Cross Cutting Concepts	**Cause and effect** (Investigation 1, 3, 4) ● Cause-and-effect relationships are routinely identified and used to explain change. **Systems and system models** (Investigation 1, 2, 3) ● A system can be described in terms of its components and their interactions.
Required Investigations	Investigation 1: Environmental Factors (approx. 12 days) Investigation 2: Ecosystems (approx. 12 days) Investigation 3: Brine Shrimp Hatching (approx. 11 days) Investigation 4: Range of Tolerance (approx. 14 days)
Required Summative Assessment(s)	**Science and Engineering Practices** ● Performance Assessment- Investigation 1: part 2 ● Performance Assessment- Investigation 3: part 1 ● Performance Assessment- Investigation 4: part 1 **Performance Expectations (conceptual understanding)** ● Investigation 1 I-Check ● Investigation 2 I-Check ● Investigation 3 I-Check ● Posttest (After Investigation 4)