4th Grade Science

Instructional Focus:

- Apply process skills by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring and communicating findings.
- Observe, measure and collect data from explorations and using this information to classify, predict and communicate.
- Work collaboratively to carry out investigations (e.g., following a set of written instructions for a scientific investigation)
- Conduct multiple trials to verify results (repeat to ensure accurate measurements, repeated observations, etc.) and control variables.
- Use scientific tools (i.e. measuring tape, meter stick, thermometer, hand lens, balance, droppers, graduated cylinders)
- Record and explain data through charts, graphs, writing and speaking.
- Explain and differentiate evidence from opinion, understanding that scientists do not rely on claims or conclusions unless they are backed by confirmed observations. (e.g., answering "how do you know?" questions with reasonable answers)

Physical Science: Energy

Standard	Objective	Examples
4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.	Students will: • Explain that the faster a given object is moving, the more energy it possesses.	
4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	Students will: • Understand energy is present whenever there are moving objects, sound, light, or heat. • Understand when objects collide, energy can be transferred from one object to another, thereby changing their motion. • Understand when objects collide some energy is also transferred to surrounding air producing heat and sound. • Understand light also transfers energy from place to place. • Understand energy can also be transferred from place to place by electric currents to produce motion, sound, heat, or light. • Understand electric currents can be produced by transforming the energy of motion into electrical energy.	Examples can include a rushing river generates electricity in hydroelectric plant which in turn powers electric lights; solar power lights; fossil fuels; musical instruments
4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide.	Students will: • Predict the change of motion when objects collide. • Understand that transfer of energy causes the change in motion.	Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.	Students will: • Apply knowledge that energy can be transferred from place to place by electric currents, which can then be used to produce motion, sound, heat or light. • Connect the expression "produced energy" refers to the conversion of "stored energy" into a desired form for practical use. • Define engineering problems and propose possible solutions. • Test possible solutions to convert energy. • Understand constraints, such as materials, resources, costs, may limit solution choices (such as materials, resources, and costs, time).	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.
Physical Science: Waves and their Applications in Technologies for Information Transfer		
Cross Cutting: • Patterns, Cause and Effect – {SS-Exon Valdez Oil Spill}		
Standard	**Objective**	**Examples**
4-PS2-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.	Students will • Understand that waves may differ in amplitude and wave lengths and may cause objects to move. • Understand that waves cause objects to move. • Create a model that shows wave movement. • Demonstrate that water moves up and down when waves move across the surface, except when water meets a beach.	Examples of models could include diagrams and physical models. One physical model could be using wire to illustrate wavelength and amplitude of waves. In addition to models analogies can be used to clarify student understanding. An example of an analogy would be electromagnetic waves oscillate like flicking a rope up and down or a ripple in a pond.
4-PS2-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.	Students will: • Model to show an object can been seen when light reflected from its surface enters the eyes.	
4-PS2-3. Generate and compare multiple solutions that use patterns to transfer information.	Students will: • Understand that digitized information can be transmitted over long distances. • Understand high tech devices can receive and decode information- converting digitized information to voice—and vice versa. • Compare different solutions in order to determine which of them best solves the problem, given the criteria and the constraints.	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.

Life Science: From Molecules to Organisms; Structures and Processes		
Cross Cutting: Systems and System Models {SS-Alaska Animals, weak}		
Standard	**Objective**	**Examples**
4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.	Students will: • Demonstrate that animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. • Demonstrate that plants have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. • Cite evidence to support their argument.	Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin. Assessment is limited to macroscopic structures within plant and animal systems.
4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.	Students will: • Demonstrate that different sense receptors are specialized for special kinds of information, which is processed by the animal's brain. • Demonstrate that animals are able to use their perceptions and memories to guide their actions.	Examples can include animal migrations.
Earth Systems: Earth's Place in the Universe		
Cross Cutting: Patterns in Natural Systems {SS-Geography}		
Standard	**Objective**	**Examples**
4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.	Students will: • Understand that rocks are made up of a combination of minerals (quarts, calcite, feldspar, mica, and hornblende). • Classify igneous, sedimentary, and metamorphic rocks by referring to their properties. • Identify how local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. • Recognize the presence and location of certain fossil types indicate the order in which rock layers were formed.	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.

Earth Systems: Earth's Systems		
Cross Cutting: Patterns, Cause and Effect, Measurements {SS-Geography}		
Standard	**Objective**	**Examples**
4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.	Students will: • Observe that some changes in the earth are due to slow processes, such as glaciation, erosion and rainfall, and some are due to rapid processes such as landslides, volcanic eruptions, avalanches, and earthquakes. • Cite evidence that water, ice, wind, living organisms, and gravity breaks rocks and soils, into smaller particles and move them around. (weathering, transport, and deposition) • Understand that living things affect the physical characteristics of their regions.	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.
4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.	Students will: • Use maps to locate the different land and water features of earth. • Understand that the locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. • Understand most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans.	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.
Earth Systems: Earth and Human Activity		
Cross Cutting: {SS- Culture and History}		
Standard	**Objective**	**Examples**
4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.	Students will: • Describe energy and fuels that humans use are derived from natural sources. • Describe that their use affects the environment in multiple ways. • Explain that some resources are renewable over time, and others are not.	Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; nonrenewable 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.
4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.	Students will: • Recognize that a variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). • Recognize that humans cannot eliminate the hazards but can take steps to reduce their impacts. • Develop solutions to reduce impact of natural processes. • Investigate how a solution performs under a range of likely conditions.	Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.

Engineering and Technology Science: Engineering Design		
Cross Cutting: {SS-History, Culture, Geography, Government/Citizenship}		
Standard	**Objective**	**Examples**
3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.	Students will: • Identify a problem based on a need or want. • Identify limiting criteria for said problem.	Examples can include the construction of the Alaska pipeline.
3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	Students will: • Investigate possible solutions to a problem that is limited by available materials and resources (constraints). • Communicate with peers about proposed solutions.	
3-5-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	Students will: • Develop a procedure to test possible solutions. • Test possible solutions to determine which best solves the problem. • Evaluate the success of a solution based on specific criteria.	