

Matter and Energy, Stability and Change

Grade 4

In grade 4, students observe and interpret patterns related to the transfer of energy and matter within physical interactions and Earth's materials. Students also engage in the Engineer and Design Process within the designed world. Students begin with easily observable phenomena to look for signs of energy, create and use representations to talk about their ideas related to energy, and engage in science talks focused on their questions and findings. They observe and analyze natural phenomena through an energy tracking lens. They look for evidence of energy forms, energy transfers and transformations, where the energy came from, and where the energy goes in increasingly complex scenarios.

Grade 4 students build on what they learned about sand and soil in 2nd grade as they explore Earth materials and landscapes that are changed over time by the processes of weathering, erosion, and deposition. They study today's landscapes to look for evidence of past processes and use fossils to help tell the story of Earth's past environments and organisms. Students obtain, evaluate and communicate information about how we use matter and energy as they investigate renewable and non renewable energy sources and evaluate the sustainability of both.

Finally, students will develop and use models and analyze and interpret data to learn how animals' internal and external structures are used to sense the world around them and support life, growth, behavior, and reproduction. Throughout the year, students have the opportunity to work through the engineering design process, focusing on developing solutions humans can engineer by building, testing, and redesigning prototypes to fit a specific purpose. Robotics is a subset of engineering and grade four students have the chance to work within small teams to design & debug both the hardware and software of classroom robots.

Unit 1: Focus on Energy Enduring Understandings/Big Ideas: <i>You cannot observe energy. You can only observe indicators/evidence of the effect of energy on matter.</i> <i>There are different forms of energy.</i> <i>Energy can be transferred and transformed within a system, it is not created or destroyed.</i> Essential Questions: <i>How can we look for evidence</i>	Unit 2: LexRobotics Program Overview Enduring Understandings/Big Ideas: <i>Real world innovation starts with a problem.</i> <i>We can design solutions to problems through a series of creative and reflective steps.</i> Essential Questions: <i>How can the engineering-design process be used to solve a problem?</i> <i>How can we use hardware and</i>	Unit 3: Earth's Materials Enduring Understandings/Big Ideas: <i>There are forces that cause slow and fast changes to Earth's surface and materials.</i> <i>You can observe indicators/evidence of Earth's changing landscape.</i> <i>We depend upon Earth's renewable and nonrenewable materials.</i> Essential Questions: <i>How can we look for evidence of changes to Earth's surface?</i> <i>How can rocks and fossils tell us</i>	Unit 4: Animal Communications Enduring Understandings/Big Ideas: <i>There are forces that cause slow and fast changes to Earth's surface and materials.</i> <i>You can observe indicators/evidence of Earth's changing landscape.</i> <i>We depend upon Earth's renewable and nonrenewable materials.</i> Essential Questions: <i>How can animals sense the world around them?</i> <i>How can animals process and</i>
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<i>of energy in everyday phenomena?</i> <i>How can we look for evidence of energy, energy transfer, and energy transformation within a system?</i>	<i>software to design and program a robot to accomplish different tasks?</i>	<i>about the past?</i> <i>How do we use Earth's materials?</i>	<i>respond to information?</i> <i>How can animals send and receive information to communicate?</i>
Energy 4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object. 4-PS3-2. Make observations to show that energy can be transferred from place to place by sound, light, heat, and electric currents. <i>Evidence of energy being transferred can include vibrations felt a small distance from a source, a solar-powered toy that moves when placed in direct light, warming a metal object on one end and observing the other end getting warm, and a wire carrying electric energy from a battery to light a bulb.</i> 4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide. <i>Changes in energy can include a change in the object's motion, position, and the generation of heat and/or sound.</i> 4-PS3-4. Apply scientific principles of energy and motion	Physical Science 4-PS4-3. Develop and compare multiple ways to transfer information through encoding, sending, receiving, and decoding a pattern. <i>Examples of solutions could include drums sending coded information through sound waves, using a grid of 1s and 0s representing black and white to send information about a picture, and using Morse code to send text.</i> Engineering Design 4.3-5-ETS1-3. Plan and carry out tests of one or more design features of a given model or prototype in which variables are controlled and failure points are considered to identify which features need to be improved. Apply the results of tests to redesign a model or prototype. 4.3-5-ETS1-5(MA). Evaluate relevant design features that must be considered in building a model or prototype of a solution to a given design problem.	Earth's Place in the Universe 4-ESS1-1. Use evidence from a given landscape that includes simple landforms and rock layers to support a claim about the role of erosion or deposition in the formation of the landscape over long periods of time. <i>Examples of evidence and claims could include rock layers with shell fossils above rock layers with plant fossils and no shells, indicating a change from deposition on land to deposition in water over time; and a canyon with rock layers in the walls and a river in the bottom, indicating that a river eroded the rock over time.</i> • <i>Examples of simple landforms can include valleys, hills, mountains, plains, and canyons.</i> Earth's Systems 4-ESS2-1. Make observations and collect data to provide evidence that rocks, soils, and sediments are broken into smaller pieces through mechanical weathering and moved around through erosion. <i>Clarification Statements:</i> • <i>Mechanical weathering processes can include frost wedging, abrasion, and tree root wedging.</i> • <i>Erosion can include movement by</i>	From Molecules to Organisms - Structures and Processes 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. 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. Waves and Their Applications in Technologies for Information Transfer 4-PS4-2: Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen. 4-PS4-3: Generate and compare multiple solutions that use patterns to transfer information. Engineering Design 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.

to test and refine a device that converts kinetic energy to electrical energy or uses stored energy to cause motion or produce light or sound. <i>Sources of stored energy can include water in a bucket or a weight suspended at a height, and a battery.</i>		<i>blowing wind, flowing water, and moving ice.</i> 4-ESS2-2. Analyze and interpret maps of Earth’s mountain ranges, deep ocean trenches, volcanoes, and earthquake epicenters to describe patterns of these features and their locations relative to boundaries between continents and oceans. Earth and Human Activity 4-ESS3-1. Obtain information to describe that energy and fuels humans use are derived from natural resources and that some energy and fuel sources are renewable and some are not. 4-ESS3-2. Evaluate different solutions to reduce the impacts of a natural event such as an earthquake, blizzard, or flood on humans.	
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