

Grade 4: Energy

Stage 1 Desired Results		
ESTABLISHED GOALS: <u>Competencies:</u> <u>Nature of Science and Engineering</u> - Students will demonstrate the ability to work collaboratively and individually to generate testable questions or define problems, plan and conduct investigations using a variety of research methods in various settings, analyze and interpret data, reason with evidence to construct explanations in light of existing theory and previous research, and effectively communicate the research processes and conclusions. <u>Cause & Effect</u> - Students will demonstrate the ability to investigate, explain, and evaluate potential causal relationships by using evidence to support claims and predictions about the mechanisms that drive those relationships. <u>Energy and Matter in Systems</u> - Students will demonstrate the ability to analyze evidence from a variety of sources (investigations, models) to predict, connect and/or evaluate the cycling of matter and flow of energy within and between systems in order to understand, describe, or predict possibilities and limitations of systems. <u>Content Standards:</u> 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 provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents. 4-PS3-3. Ask questions and predict outcomes about the changes in energy that occur when objects collide. 4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another. 4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.	Transfer	
	<i>Students will be able to independently use their learning to evaluate the potential of something based upon the amount of energy transferred.</i>	
	Meaning	
	ENDURING UNDERSTANDINGS <i>Students will understand that...</i> - cause and effect relationships are routinely identified and used to explain change. - energy can be transferred or converted in various ways and between objects. - knowledge of relevant scientific concepts and research findings are important in engineering. - over time, people's needs and wants change, as do their demands for new and improved technologies. - engineers improve existing technologies or develop new ones. - most scientists and engineers work in teams. - science affects everyday life.	ESSENTIAL QUESTIONS Can energy be stopped?
Acquisition		
<i>Students will know...</i> - that the faster a given object is moving, or the higher the object is, the more energy it possesses. - that energy can be moved from place to place by moving objects or through sound, light, or electric currents. - that energy is present whenever there are moving objects, sound, light, or heat. - that 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. - that light also transfers energy from place to place. - that energy can also be transferred from place to place by electric currents, which can then be used <i>Students will be skilled at...</i> - asking questions about energy that can be investigated and predicting reasonable outcomes based on patterns (such as, cause and effect). - asking questions and predicting outcomes about the changes in energy that occur when objects collide. - making observations to provide evidence that energy is transferred via sound, light, heat, and electric currents. - obtaining and combining information from sources to explain phenomena. - using evidence (e.g., measurements, observations, patterns) to construct an explanation relating the speed of an object to the energy of that object. - applying scientific ideas to design, test, and refine a		

	<i>locally to produce motion, sound, heat, or light.</i> • <i>that the currents may have been produced to begin with by transforming the energy of motion into electrical energy.</i> • <i>that the expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use.</i> • <i>that energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.</i> • <i>that possible solutions to a problem are limited by available materials and resources (constraints).</i> • <i>that 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.</i> <u><i>vocabulary:</i></u> <i>battery, chain reaction, circuit, coal, collision, conductor, currents, electricity (electrical energy), energy, energy transfer, engineer, experiment, fair test, graph, gravitational energy (height energy), gravity, Hydroelectric energy (water energy), heat energy (thermal energy), heat engine, insulator, invent, lever, light energy, machine, model, motion, natural gas, pollution, renewable resource, resource, solar energy (solar power), solar panel, sound energy, speed, stored energy, trials, wind energy (wind power)</i>	<i>device that converts energy from one form to another.</i>
Content Area Literacy Standards	21st Century Skills	
<i>not applicable</i>	• <i>think creatively</i> • <i>solve problems</i> • <i>access and evaluate information</i>	

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	PERFORMANCE TASK(S):

	OTHER EVIDENCE:
--	-----------------

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction

Language Arts Integration

- RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.
- W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.
- W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.

Technology Integration

Mathematics Integration

- MP.2 Reason abstractly and quantitatively.
- MP.4 Model with mathematics.
- 4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
- 4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

District Materials