Grade 6: Energy

Stage 1 Desired Results

ESTABLISHED GOALS:

Competencies:

- **Scale, Proportion and Quantity-** Students will apply reasoning and modeling to determine the proportional relationships in observable and non-observable phenomena in terms of relative scale and quantity.
- **Systems and System Models-** Students will investigate and analyze a natural or human designed system in order to develop and justify a model that accurately represents the system or aspects of the system (e.g., boundaries, inputs, outputs, interactions, and behaviors).
- **Energy and Matter in Systems-** Students will analyze evidence (e.g., investigations, models, theories, scenarios) to predict and track changes in the cycling of matter and flow of energy within and between systems in order to identify their possibilities and limitations.
- Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials.
- Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences.
- Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style.

Content Standards:

- MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
- MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.
- MS-PS3-3. Apply scientific principles to design,

Transfer

Students will be able to independently use their learning to ***apply the concepts of energy and its various forms to real-life situations and everyday phenomena.***

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes.
- models can be used to represent systems and their interactions – such as inputs, processes, and outputs – and energy and matter flows within systems.
- energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).
- the transfer of energy can be tracked as energy flows through a designed or natural system.

ESSENTIAL QUESTIONS

- How can we use our knowledge of energy to improve the world around us?

construct, and test a device that either minimizes or maximizes thermal energy transfer - MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. - MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	***Acquisition***	
	Students will know… - that motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. - that a system of objects may also contain stored (potential) energy, depending on their relative positions. - that temperature is a measure of the average kinetic energy of particles of matter. - that the relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present. - that when the motion energy of an object changes, there is inevitably some other change in energy at the same time. - that the amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment. - that energy is spontaneously transferred out of hotter regions or objects and into colder ones. - that when two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. <u>*vocabulary:*</u> kinetic energy, potential energy, temperature, thermal energy, heat, conductor, insulator, conduction, convection, radiation	*Students will be skilled at…* - constructing and interpreting graphical displays of data to describe the relationships. - developing models. - applying scientific principles to design, construct, and test a device. - planning investigations. - constructing, using, and presenting arguments to support a claim.

Content Area Literacy Standards	***21st Century Skills***
RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*. RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually. RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text. WHST.6-8.1 Write arguments focused on *discipline-specific content*. WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. WHST.6-8.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. WHST.6-8.5 With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. WHST.6-8.6 Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently. WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research.	• *access information* • *implement innovations* • *think creatively* • *make judgments and decisions* • *manage goals and time*

Stage 2 - Evidence

Evaluative Criteria	*Assessment Evidence*
	PERFORMANCE TASK(S):
	OTHER EVIDENCE:

Stage 3 – Learning Plan

Summary of Key Learning Events and Instruction

Science and Engineering Practices	*Mathematics Integration*
• S&EP 2. Developing and using Models • SE&P 4. Analyzing and interpreting data • S&EP 8. Obtaining, evaluating, and communicating information	• MP.2 Reason abstractly and quantitatively. • 6.RP.A.1 Understand the concept of ratio and use ratio language to describe a ratio relationship between two quantities. • 6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. • 7.RP.A.2 Recognize and represent proportional relationships between quantities. • 8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. • 8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square • roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. • 8.F.A.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. • 6.SP.B.5 Summarize numerical data sets in relation to their context.
Technology Integration	***District Materials***