



Marietta City Schools

District Unit Planner

Everything on the unit planner must be included on the unit curriculum approval statement.

Science Grade 8

Unit title	<i>Harnessing Human Energy</i>	MYP year	3	Unit duration (hrs)	25 Hours
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Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): *What will students learn?*

GSE Standards

Standards

S8P2. Obtain, evaluate, and communicate information about the law of conservation of energy to develop arguments that energy can transform from one form to another within a system.

- Analyze and interpret data to create graphical displays that illustrate the relationships of kinetic energy to mass and speed, and potential energy to mass and height of an object.
- Plan and carry out an investigation to explain the transformation between kinetic and potential energy within a system (e.g., roller coasters, pendulums, rubber bands, etc.).
- Construct an argument to support a claim about the type of energy transformations within a system [e.g., lighting a match (light to heat), turning on a light (electrical to light)].

S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.

E. Develop models (e.g., atomic-level models, including drawings, and computer representations) by analyzing patterns within the periodic table that illustrate the structure, composition, and characteristics of atoms (protons, neutrons, and electrons) and simple molecules.

Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)

In third grade, students should have mastered the following:

S3P1.a. Ask questions to identify sources of heat energy.

In fourth grade, students should have mastered the following:

S4P2. b. Design and construct a device to communicate across a distance using light (and/or sound).

Concepts/Skills to be Mastered by Students

- Energy
- Energy Transformations

- Kinetic and Potential

Key Vocabulary: (KNOWLEDGE & SKILLS)

Energy, energy transformation, law of conservation of energy, kinetic energy, thermal energy, mechanical energy, electrical energy, magnetic energy, potential energy, chemical potential, gravitational potential, elastic potential, convert, transfer, velocity

Year-Long Anchoring Phenomena: (LEARNING PROCESS)

Human Need for Energy

Unit Phenomena (LEARNING PROCESS)

How do we rely upon energy transformations in our everyday lives?

How can human energy be used to power devices?

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)

- Students will likely have many alternate conceptions about energy. Two common ones are that only living things have energy and that objects can create their own energy.
- Students may not have a full understanding of the Law of Conservation of Energy, which states that:
Energy can neither be created nor destroyed; rather, it can only be transformed or transferred from one form to another.
- Students may need literary devices to help them remember the difference between kinetic and potential energy (root words, analogies, and mnemonics).

Key concept	Related concept(s)	Global context
<p>Systems</p> <p>Systems are sets of interacting or interdependent components. Systems provide structure and order in human, natural and built environments. Systems can be static or dynamic, simple or complex.</p>	<p>Energy (MYP/CCC)</p>	<p>Scientific and technical innovation</p> <p>How the world works: an inquiry into the natural world and its laws; the interaction between the natural world (physical and biological) and human societies; how humans use their understanding of scientific principles; the impact of scientific and technological advances on society and on the environment.</p>
<p>Statement of inquiry</p>		
<p>Scientific and technical advancements have led to the development of multiple systems that facilitate energy transformations.</p>		

Inquiry questions		
<p>Factual What is energy? What forms does energy take? How does kinetic energy differ from potential energy? What does the Law of Conservation of Energy state?</p> <p>Conceptual Why does energy matter to us? How does it play a role in our everyday lives? How do you know if something has energy? How do objects get energy? How do I know whether something has potential or kinetic energy? How does energy change forms?</p> <p>Debatable What is the best way to capture energy from the human body in order to power a device?</p>		
MYP Objectives	Assessment Tasks	
<i>What specific MYP objectives will be addressed during this unit?</i>	<i>Relationship between summative assessment task(s) and statement of inquiry:</i>	<i>List of common formative and summative assessments.</i>
Science: Criterion A: Knowing and Understanding i. describe scientific knowledge ii. apply scientific knowledge to solve problems set in familiar and unfamiliar situations	SOL: Scientific and technical advancements have led to the development of multiple systems that facilitate energy transformations. Throughout this unit, and as part of their unit assessment, students will have multiple opportunities to analyze, evaluate, and create systems that facilitate energy transformations. Students will identify energy forms and demonstrate their understanding of the process of energy transformations in terms of the human need for energy. Through the exploration of scientific inventions and innovations, students will demonstrate their ability to plan and design a system that can be used to make a fan spin/power a light, and use the energy of the human body to power a device.	<p><u>Formative Assessment(s):</u></p> CFA: Forms of Energy + Energy Transformations CFA: PE/KE Variables <p><u>Summative Assessment(s):</u></p> - MYP Harnessing Human Energy Design Project - Unit Assessment Paper I

<p>Criterion D: Reflecting on the Impacts of Science</p> <p>i. describe the ways in which science is applied and used to address a specific problem or issue</p> <p>ii. discuss and analyze the various implications of using science and its application in solving a specific problem or issue</p> <p>iii. apply scientific language effectively</p> <p>Design:</p> <p>Criterion A: Inquiring and Analyzing</p> <p>i. explain and justify the need for a solution to a problem</p> <p>Criterion B: Developing ideas</p> <p>i. develop a design specification which outlines the success criteria for the design of a solution based on the data collected</p> <p>iii. present the chosen design and outline the reasons for its selection</p> <p>iv. Develop accurate planning drawings/diagrams and outline requirements for the creation of the chosen solution</p>	<p>Students will also explore the physics of roller coasters while understanding the PE to KE energy transformations that occur, while developing their own models of a functioning roller coaster.</p>	
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<p>Criterion C: Creating the solution</p> <p>iii. follow the plan to create the solution, which functions as intended</p> <p>Criterion D: Evaluating</p> <p>iii. describe how the solution could be improved</p>		
Approaches to learning (ATL)		
<p>Category: Self-Management</p> <p>Cluster: Organization</p> <p>Skill Indicator: Bring necessary equipment and supplies to class.</p>		

<p style="text-align: center;"><u>Learning Experiences</u></p> <p style="text-align: center;">Add additional rows below as needed.</p>		
Objective or Content		Personalized Learning and Differentiation
<p>S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.</p> <p>E. Develop models (e.g., atomic-level models, including drawings, and computer representations) by analyzing patterns within the periodic table that illustrate the structure, composition, and characteristics of atoms (protons, neutrons, and electrons) and simple molecules.</p>	<ul style="list-style-type: none"> ● Matter, Atoms, and Relationship with Energy Interactive Activity ● Modeling Atoms and their Subatomic Parts 	<ul style="list-style-type: none"> ● Discovery Education Science Techbook ● NGSS Case Studies for Differentiated Learners ● Next Generation Science Standards: “All Standards, All Students” ● Extensions – Enrichment Tasks/Projects <p>All information included by PLC in the differentiation box is the responsibility and ownership of the local school to review and approve per Board Policy IKB.</p> <p>Task-Specific Differentiation</p> <ul style="list-style-type: none"> ● Scaffolding ● Extended Learning ● Sentence Starters ● Leveled Tasks ● Mode/Method of Presentation ● Type of Product
<p>S8P2. Obtain, evaluate, and communicate information about the law of conservation of energy to develop arguments that energy can transform from one form to another within a system.</p> <p>a. Analyze and interpret data to create graphical displays that illustrate the relationships of kinetic energy to mass and speed, and potential energy to mass and height of an object.</p>	<ul style="list-style-type: none"> ● Energy Skate Park PhET ● Ball Drop Exploration ● Analyzing and Interpreting PE/KE Graphs ● A Roller Coaster Design Gallery Walk ● Discovery Ed - Pendulum Lab 	
<p>S8P2. Obtain, evaluate, and communicate information about the law of conservation of energy to develop arguments that energy can transform from one form to another within a system.</p>	<ul style="list-style-type: none"> ● Energy Skate Park PhET ● Ball Drop Exploration ● Analyzing and Interpreting PE/KE Graphs ● A Roller Coaster Design Gallery Walk ● Discovery Ed - Pendulum Lab 	

b. Plan and carry out an investigation to explain the transformation between kinetic and potential energy within a system (e.g., roller coasters, pendulums, rubber bands, etc.).		
S8P2. Obtain, evaluate, and communicate information about the law of conservation of energy to develop arguments that energy can transform from one form to another within a system. c. Construct an argument to support a claim about the type of energy transformations within a system [e.g., lighting a match (light to heat), turning on a light (electrical to light)].	<ul style="list-style-type: none"> ● Energy Forms and Changes PhET ● Energy Transformation CER ● Designing a System to Make a Fan Spin ● MYP Harnessing Human Energy Design Challenge 	
Content Resources		
Georgia Grade 8 Science: Interactions of Matter and Energy Instructional Segment <u>Discovery Education Grade 8 Science Techbook</u> Unit 2: Types of Energy Concept 2.1 Kinetic Energy Concept 2.2 Potential Energy <u>Mosa Mack</u> Energy Transfer Potential & Kinetic Energy <u>PhET:</u> Energy Forms and Changes Energy Skate Park Amplify: Harnessing Human Energy Unit		