



Marietta City Schools

District Unit Planner

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

Honors Science 8

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| Unit title | <i>Energy Forms and Transformations</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.

Gifted Standards

- **MCS.Gifted.S3A.** Develop and apply core critical thinking skills of metacognition, observation, questioning, prediction, analysis, interpretation, inference, summarization, evaluation, synthesis, explanation, and transference.
- **MCS.Gifted.S3C.** Use a variety of strategies for solving authentic, complex, real world problems through evaluative thinking and the engineering design processes.
- **MCS.Gifted.S5A.** Explore personal beliefs, feelings, and understanding of self, regarding one's own unique giftedness.
- **MCS.Gifted.S6A.** Set appropriately high standards for work and behavior.

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 energy forms and transformations impact flight operations?

CER: Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative assessment. Allow students to make edits to their constructed response throughout the unit for a final submission.

Capstone Connective Theme: Energy Transformations & Forms in Aircraft

UN Sustainable Development Goals:

Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all.

Target 7.3 - Progress in energy efficiency needs to speed up to achieve global climate goals, by 2030 double the global rate of improvement in energy efficiency.

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 |
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| Systems 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. | Energy (MYP/CCC) Transformation (MYP) | Scientific and technical innovation 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 |

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| | | and technological advances on society and on the environment. |
| Statement of inquiry | | |
| Scientific and technical advancements have led to the development of multiple systems that facilitate energy transformations. | | |
| 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? What forms of energy are transferred or transformed in aircraft during take off and landing?</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? How are sustainable aviation fuels classified?</p> <p>Debatable How can we sustainably power our planes in the future? How can we create and/or contribute to sustainability in aviation? Can aviation be environmentally sustainable?</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> |

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| <p>Science:</p> <p>Criterion A: Knowing and Understanding</p> <p>i. describe scientific knowledge</p> <p>ii. apply scientific knowledge to solve problems set in familiar and unfamiliar situations</p> <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>SOL: Scientific and technical advancements have led to the development of multiple systems that facilitate energy transformations.</p> <p>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.</p> <p>Students will identify energy forms and demonstrate their understanding of the process of energy transformations in terms of the human need for energy, to include the uses of and role of energy in aviation.</p> <p>Through the exploration of scientific inventions and innovations, students will first demonstrate their ability to plan and design a system that can be used to power a light. They will then use the information they have gathered to design and test various sources of chemical potential energy with the goal of powering a propeller, as they consider how alternative sources of fuel may play a role in aviation.</p> | <p><u>Formative Assessment(s):</u></p> <p>CFA: Forms of Energy + Energy Transformations</p> <p>CFA: PE/KE Variables</p> <p><u>Summative Assessment(s):</u></p> <p>- MYP Aviation Design Project</p> <p>- Energy Forms and Transformations Unit Assessment Paper I and Paper II</p> |
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| <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>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> | | |
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Approaches to learning (ATL)

Category: Self-Management
Cluster: Organization
Skill Indicator: Bring necessary equipment and supplies to class.

Learning Experiences

Add additional rows below as needed.

| Objective or Content | | Personalized Learning and Differentiation |
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| <p>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.</p> | <ul style="list-style-type: none"> ● Matter, Particles (Atoms), and Relationship with Energy Graphic Organizer | <ul style="list-style-type: none"> ● Capstone Connections ● Discovery Education Science Techbook ● NGSS Case Studies for Differentiated Learners ● Next Generation Science Standards: “All Standards, All Students” ● Extensions – Enrichment Tasks/Projects <p>Task-Specific Differentiation</p> |
| <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. 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 Sim ● Ball Drop Lab: Calculating PE and KE ● Analyzing and Interpreting PE/KE Graphs | <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. 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,</p> | <ul style="list-style-type: none"> ● Energy Skate Park PhET Sim ● PE/KE Transfer Demos (roller coaster, pendulum, rubber band) ● Ball Drop Lab: Calculating PE and KE ● Analyzing and Interpreting PE/KE Graphs and Diagrams | <ul style="list-style-type: none"> ● STEM Careers Coalition |

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| etc.). | | |
| <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>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)].</p> | <ul style="list-style-type: none"> ● Energy Forms and Changes PhET Sim ● Energy Transformation CER ● Designing a System to Make a Light Shine + Diagramming Energy Transfers ● Exploring Generators and Motors Nearpod ● MYP Aviation Energy Design Challenge | |

Content Resources

Georgia Grade 8 Science: Interactions of Matter and Energy Instructional Segment

Discovery Education Grade 8 Science Techbook
Unit 2: Types of Energy
Concept 2.1 Kinetic Energy
Concept 2.2 Potential Energy

Discovery Education: Boeing Partnership
Powering Our Skies

PhET:
Energy Forms and Changes
Energy Skate Park

Capstone Connections

- Capstone Kickoff
- Capstone Brainstorming
- Energy Transformation CER
- Analyzing and Interpreting PE/KE Graphs and Diagrams
- **MYP Aviation Energy Design Challenge:** Students will use multiple sources of energy to design a system to make a propeller spin.