MYP/3D Science Unit Planner

Marietta City Schools

Grade & Course: Physics	**Topic:** Energy	**Duration:** 5 weeks
Teachers: Physics PLC Teachers		

Georgia Standards and Content:

SP3. Obtain, evaluate, and communicate information about the importance of conservation laws for mechanical energy and linear momentum in predicting the behavior of physical systems.

a. Ask questions to compare and contrast open and closed systems.

b. Use mathematics and computational thinking to analyze, evaluate, and apply the principle of conservation of energy and the Work-Kinetic Energy Theorem.

- Calculate the kinetic energy of an object.
- Calculate the amount of work performed by a force on an object.

c. Plan and carry out an investigation demonstrating conservation and rate of transfer of energy (power) to solve problems involving closed systems.

Narrative / Background Information

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

From 8th grade Physical Science

- Basic algebra
- Differentiate between Kinetic and Potential Energy
- Basic Calculation for Power

Year-Long Anchoring Phenomena: (LEARNING PROCESS)

The laws of physics dictate the interactions of our physical world.

Unit Phenomena (LEARNING PROCESS)

Energy is always conserved, even when the motion is not uniform or friction is involved.

MYP Inquiry Statement:

Energy changing from one form to another can be captured for useful means.

MYP Global Context:

Scientific and Technical Innovation

Approaches to Learning Skills:	**Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)**	**Crosscutting Concepts: (KNOWLEDGE & SKILLS)**
Research Skills Thinking Skills Collaboration Skills Communication Skills	Potential energy Kinetic energy Work Power Conservation of Mechanical energy Work Energy Theorem	Stability & Change (CC & MYP) Matter & Energy (CC) Patterns (CC) **MYP Key and Related Concepts:** Stability & Change (CC & MYP) **Related Concepts:** Movement & Energy Matter & Energy (CC) Patterns (CC)

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)
Gravitational energy exists only on Earth.
Energy can be lost or gained.
Energy cannot be measured.

Key Vocabulary: (KNOWLEDGE & SKILLS)

Kinetic Energy
Potential Energy
Mechanical Energy
Gravitational Energy
Conservation of Energy
Work-Energy Theorem
Work
Power

Inquiry Questions:

Factual

What is the difference between Kinetic and Potential Energy?
What is the Work-Energy Theorem?
What is the difference between an isolated and nonisolated system?

Conceptual

How can you determine Kinetic Energy given mass and velocity?
How can you calculate Gravitational Potential Energy given mass and height?
How can you determine an object's final velocity when given its initial velocity and position?
How can energy be used to do work?

Debatable

Is it possible for a skydiver to survive a fall without a parachute?
Can a baseball have Kinetic Energy and Gravitational Potential Energy at the same time?
Must the lift hill of a roller coaster be the highest?

MYP Objectives	**Summative assessment**	
MYP A MYP B MYP C	Formative Conservation of Energy Lab; MYP B+C Energy Summative test: MYP A	Relationship between summative assessment task(s) and statement of inquiry: The assessments measure students' ability to calculate the amount of energy generated by changes in position and/or motion.

Unit Objectives: 1D Motion Need to Know - https://drive.google.com/open?id=1NfhIX3o-aJzXLa5G_CR3SnV50FiA31-lkXPdO4PtUdg

Learning Activities and Experiences	**Inquiry & Obtain: (LEARNING PROCESS)**	**Evaluate: (LEARNING PROCESS)**	**Communicate: (LEARNING PROCESS)**
Week 1:	Students observe the motion of a skateboarder using a PHET simulation to see the changes in kinetic, potential and total mechanical energy throughout his trip.	Students use the potential energy equation, kinetic energy equation and total mechanical energy equation to determine the final velocity of a cart at a given height. amount of time it	Students create whiteboards showing their own roller coaster and the different types of energy occurring at different points and students will show work to determine the velocity of the cart at a given height.

		will take for a car to travel on the road.	
Week 2:	Students will explore the force required to climb a ramp vertically vs the force required to climb a ramp at an angle.	Students will use the force and displacement variables to calculate and compare the work done vertically vs the work done at an angle.	Students will work in groups and use their observations and calculations to explain the “tradeoffs” simple machines provide to make a task easier.
Week 3:	Students determine the amount of power they are capable of generating by running up a flight of stairs.	Students use their measured vertical displacement, force and time to calculate the amount of power they were able to generate.	Students will present their calculations and average power generated to their group to determine which group member was capable of generating the most power.
Week 4:	Students will debate whether a skydiver can survive a fall without a parachute and then observe a video of it being completed successfully.	Students use the given equation $W = \Delta Ek$ to determine the full equation for the work energy theorem and then will discuss how different landing surfaces would affect the jumper based on the equation above.	Students create whiteboards to brainstorm the derivation of the work energy theorem equation and post their group's conclusions about landing surfaces on a discussion board.
Week 5: Remediation	Students complete a review quiz to diagnose strengths and weaknesses in the content.	Students complete review activities based upon quiz results.	

Resources (hyperlink to model lessons and/or resources): (click here for description)

Discovery Education Science Techbook

Energy Unit in Schoology:
https://marietta.schoology.com/group/1606049999/materials#/group/1606049999/materials?f=63015729

Skateboard PHET Simulation:
https://phet.colorado.edu/en/simulation/energy-skate-park

Reflection: Considering the planning, process and impact of the inquiry

Prior to teaching the unit	During teaching	After teaching the unit
PLC members planned together and shared resources to prepare for teaching the unit as well as creating CFA and CSA materials before the unit is taught.	PLC members discussed strategies that worked and did not work, discussed CFA and CSA results and the questions where students performed below the set goal (70% passing).	Collaborated on updating information From the unit and how we can Improve next year.