



Marietta City Schools

District Unit Planner

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

Honors Science 8

<b>Unit title</b>	Motion & Newton's Laws	<b>MYP year</b>	3	<b>Unit duration (hrs)</b>	20 Hours
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**Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit):** *What will students learn?*

### GSE Standards

#### Standards

**S8P3: Obtain, evaluate, and communicate information about cause and effect relationships between force, mass, and the motion of objects.**

- Analyze and interpret data to identify patterns in the relationships between speed and distance, and velocity and acceleration. (*Clarification statement:* Students should be able to analyze motion graphs, but students should not be expected to calculate velocity or acceleration.)
- Construct an explanation using Newton's Laws of Motion to describe the effects of balanced and unbalanced forces on the motion of an object.
- Construct an argument from evidence to support the claim that the amount of force needed to accelerate an object is proportional to its mass (inertia).

#### Gifted Standards

- S5B. Recognize and build upon strengths and limitations.
- S5C. Develop and practice critical analysis in judgment of one's actions, feelings and thoughts.
- S6C. Persevere in the face of obstacles.
- S6D. Take initiative to pursue opportunities to share and use abilities.

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

In fourth grade, students are expected to:

**S4P3. Obtain, evaluate, and communicate information about the relationship between balanced and unbalanced forces.**

- Plan and carry out an investigation on the effects of balanced and unbalanced forces on an object and communicate the results.

#### Concepts/Skills to be Mastered by Students

- Energy
- Kinetic and Potential
- Force and Motion

- Speed and Distance
- Speed and Acceleration
- Newton’s Laws of Motion
- Balanced and Unbalanced Forces

**Key Vocabulary: (KNOWLEDGE & SKILLS)**

displacement, distance, direction, velocity, speed, acceleration, proportional, constant, increasing, decreasing, non-zero, force, balanced, unbalanced, mass, inertia, Newton’s 1<sup>st</sup> Law, Newton’s 2<sup>nd</sup> Law, Newton’s 3<sup>rd</sup> Law, stationary, at rest, gravity, spring scale, friction, applied force, normal force

**Year-Long Anchoring Phenomena: (LEARNING PROCESS)**

How does matter and energy interact within our universe?

**Unit Phenomena (LEARNING PROCESS)**

Airplanes have safety features that absorb kinetic energy in collisions.  
How do transportation safety measures relate to Newton’s Laws of Motion (seatbelts, runaway truck ramps)?

**Aviation Phenomena:**

How is flight possible with Newton’s Laws of Motion?  
Aircraft Safety

**CER:** Students answer the phenomenon in a Claim-Evidence-Reasoning constructed response as a formative and summative assessment.

**Capstone Connective Theme:**

Forces in Flight

**UN Sustainable Development Goals:**

**Industry, Innovation and Infrastructure**

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

- Students may confuse distance with displacement.
- Students may have trouble interpreting and using distance vs. time and velocity vs. time graphs to determine an object’s motion, velocity, and/or acceleration.
- Students may not recognize all of the forces acting on an object, which will influence their prediction of the object’s motion.

Key concept	Related concept(s)	Global context
<p><b>Systems and System Models (MYP/CCC)</b></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>Movement (MYP)</p>	<p><b>Scientific and technical innovation</b></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</p>

		and technological advances on society and on the environment.
<b>Statement of inquiry</b>		
Scientific and technical advancements have led to the development of a variety of models that can be used to demonstrate changes in motion of balanced and unbalanced forces on objects.		
<b>Inquiry questions</b>		
<p><b>Factual</b></p> <ul style="list-style-type: none"> <li>• How do I define speed, distance, velocity, and acceleration?</li> <li>• What are Newton’s Laws of Motion?</li> <li>• What are some types of forces?</li> <li>• What are balanced and unbalanced forces?</li> <li>• What is inertia?</li> </ul> <p><b>Conceptual</b></p> <ul style="list-style-type: none"> <li>• How can I view the relationships between speed and distance, and velocity and acceleration using motion graphs?</li> <li>• How are force, mass, and acceleration related?</li> <li>• How can I model the forces acting on an object?</li> <li>• How can I use Newton’s Laws to predict an object’s motion?</li> </ul> <p><b>Debatable</b></p> <ul style="list-style-type: none"> <li>• How can Newton’s Laws be used to improve safety technology in modes of transportation?</li> </ul>		
<b>MYP Objectives</b>	<b>Assessment Tasks</b>	
<i>What specific MYP <b>objectives</b> will be addressed during this unit?</i>	<i><b>Relationship</b> 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	<p>SOI: Scientific and technical advancements have led to the development of a variety of models that can be used to demonstrate changes in motion due to balanced and unbalanced forces on objects.</p> <p>In the unit assessments, students will be required to answer higher-order thinking questions that use data analysis, interpretation, and modeling to demonstrate their understanding of Newton’s Laws. Models will include graphs and diagrams. Students will focus on demonstrating their understanding of the relationships between displacement, velocity, and acceleration; force, mass, and acceleration;</p>	<p><b>Formative Assessment(s):</b></p> <p>Interpreting Motion Graphs CFA</p> <p>Newton’s 1st Law &amp; Free Body Diagram CFA</p>

<p>li. apply scientific knowledge and understanding to solve problems set in familiar and unfamiliar situations</p> <p>iii . analyze information to make scientifically supported judgments</p> <p>Criterion B: Inquiring and Designing</p> <p>I. describe a problem or question to be tested by a scientific investigation</p> <p>Criterion C: Processing and Evaluating</p> <p>I. present collected and transformed data</p> <p>li. interpret data and describe results using scientific reasoning</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>lii. apply scientific language effectively</p>	<p>and action-reaction pairs. Students will also be tasked with completing a claim-evidence-reasoning that answers a question related to an object’s motion given the forces acting on the object.</p> <p>Additionally, students will engage in hands-on investigations requiring the collection and interpretation of data in moving systems to model and evaluate the relationships between force, mass, acceleration, and inertia, as well as balanced and unbalanced forces.</p>	<p><b>Summative Assessment(s):</b></p> <p>Motion &amp; Newton’s Laws Unit Assessment Paper I and Paper II</p> <p>Aviation Safety Project</p>
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**Approaches to learning (ATL)**

**Category:** Research  
**Cluster:** Information Literacy Skill;s  
**Skill Indicator:** Collect and analyze data to identify solutions and/or make informed decisions.



**Learning Experiences**

Add additional rows below as needed.

Objective or Content		Personalized Learning and Differentiation
<p><b>S8P3: Obtain, evaluate, and communicate information about cause and effect relationships between force, mass, and the motion of objects.</b></p> <p>a. Analyze and interpret data to identify patterns in the relationships between speed and distance, and velocity and acceleration. <i>(Clarification statement: Students should be able to analyze motion graphs, but students should not be expected to calculate velocity or acceleration.)</i></p>	<ul style="list-style-type: none"> <li>Analyzing and Interpreting Motion Graphs Station Rotation</li> <li>DE: Boeing Future U: Boeing 360 Experience: Flight Path/Forces of Flight Experience (Science B,C)</li> </ul>	<ul style="list-style-type: none"> <li>Capstone Connections</li> <li>Discovery Education High School Science Techbook</li> <li>NGSS Case Studies for Differentiated Learners</li> <li>Next Generation Science Standards: "All Standards, All Students"</li> <li>Extensions – Enrichment Tasks/Projects</li> </ul> <p>Task-Specific Differentiation</p>
<p><b>S8P3: Obtain, evaluate, and communicate information about cause and effect relationships between force, mass, and the motion of objects.</b></p> <p>b. Construct an explanation using Newton’s Laws of Motion to describe the effects of balanced and unbalanced forces on the motion of an object.</p>	<ul style="list-style-type: none"> <li>PhET: Forces and Motion Basics</li> <li>Using Free Body Diagrams to Model Forces</li> <li>Lab: Using Spring Scales to Measure Force (Science: B,C)</li> <li>Newton’s 3 Laws of Motion Scenarios</li> </ul>	<ul style="list-style-type: none"> <li>Scaffolding</li> <li>Extended Learning</li> <li>Sentence Starters</li> <li>Leveled Tasks</li> <li>Mode/Method of Presentation</li> <li>Type of Product</li> </ul>
<p><b>S8P3: Obtain, evaluate, and communicate information about cause and effect relationships between force, mass, and the motion of objects.</b></p> <p>c. Construct an argument from evidence to support the claim that the amount of force needed to accelerate an object is proportional to its mass (inertia).</p>	<ul style="list-style-type: none"> <li>Lab: Using Spring Scales to Measure Force (Science: B,C)</li> <li>Newton’s 3 Laws of Motion Choice Board</li> <li>Identifying Forces &amp; Motion in Action/Reaction Pairs (Newton’s 3rd Law)</li> </ul>	

## Content Resources

Georgia Grade 8 Science GaDOE Instructional Segment : Motion

-Part One: Runaway Truck Ramps

-Part Two: Vehicular Motion

Discovery Education Grade 8 Science Techbook

-Concept 4.2: Straight Line Motion

-Concept 4.3: Interaction of Force and Mass

Discovery Education Physics Science Techbook

Discovery Education: Boeing Partnership

Future U: Boeing 360 Experience: Flight Path/Forces of Flight Experience

PhET:

-Masses and Springs: Basics

-Forces and Motion: Basics

Flight Simulator: <https://www.geo-fs.com/>

## Capstone Connections

Aviation Safety Project

Capstone Project Work