Unit #3: Physical Science 7- Gravity & Kinetic Energy

Content Area: **Science**
Course(s): **Science 7**
Time Period: **Third Marking Period**
Length: **10 Weeks**
Status: **Published**

Unit Overview

Our science education program is intended to create a community of diverse learners who are engaged in active learning, collaborative problem-solving activities, and scientific inquiry. Our students will engage in the "Practices of Science." They will ask questions, develop and use models, plan and carry out investigations, analyze data, use mathematics and computational thinking, construct explanations, engage in argument from evidence, and obtain, evaluate, and communicate information. These will serve as a foundation for successful careers and informed, responsible citizens in an ever-changing world that is increasingly dependent on science, technology, and engineering.

In the Foss Gravity and Kinetic Energy Course, students test motion at various speeds to explore acceleration and to learn about gravity. They use digital video analysis to calculate the acceleration of gravity. They observe patterns of collisions to discern how the variables of mass and speed affect energy, and they develop a model of force and energy transfer within systems based on Newton's three laws of motion.

STAGE 1- DESIRED RESULTS

2020 New Jersey Student Learning Standards- Science

Physical Science

SCI.MS-PS2-3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
SCI.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.
SCI.MS-PS2-2	Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
SCI.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.
SCI.MS-PS2-5	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

SCI.MS-PS2-1	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
SCI.MS-PS2-4	Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
SCI.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.

Science and Engineering Practices

- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information
- Planning and Carrying Out Information
- Using Mathematics and Computational Thinking

Cross Cutting Concepts

- Cause and Effect
- Energy and Matter
- Influence of Engineering, Technology, and Science on Society and the Natural World
- Interdependence of Science, Engineering, and Technology
- Patterns
- Scale, Proportion, and Quantity
- Stability and Change
- Structure and Functions
- Systems and System Models

Disciplinary Core Ideas

Physical Sciences

- PS1A: Structure and Properties of Matter
- PS1B: Chemical Reactions

- PS1C: Nuclear Processes
- PS2A: Forces and Motion
- PS2B: Types of Interaction
- PS3A: Definitions of Energy
- PS3B: Conservation of Energy and Energy Transfer
- PS3C: Relationship Between Energy and Forces
- PS3D: Energy in Chemical Processes and Everyday Life
- PS4A: Wave Properties
- PS4C: Information Technologies and Instrumentation

Life Sciences

- LS1D: Information Processing

Earth and Space Sciences

- ESS3A: Natural Resources
- ESS3C: Human Impacts on Earth Systems

Engineering. Technology. and Applications of Science

- ETS1A: Defining and Delimiting an Engineering Problem
- ETS1B: Developing Possible Solutioins
- ETS1C: Optimizing the Design Solution

Essential Questions

Investigation 1: Acceleration

- What is Speed?
- What do we need to know to measure speed?
- Why might it be important to learn about collisions?
- How can you protect yourself from collisions?
- What are the key elements of a graph?
- What is acceleration?
- How can you calculate how the speed changes?
- What is gravity?
- What is force?

Investigation 2: Force of Gravity

- What is the relationship between mass and weight?
- What tools measure weight and mass?
- What is the difference between constant speed and acceleration?
- How does gravity affect objects on different planets?

Investigation 3: Energy and Collisions

- How is potential energy related to kinetic energy?
- Do you see any evidence of energy? What kind?
- What are variables in an experiment?
- What variables do we need to control?
- Where does energy come from?
- How is energy transferred?
- How does speed affect impact?
- What are Newton's three laws of motion?

Investigation 4: Collision Engineering

- Which properties of physics can help us design protection from a collision?
- What are the criteria that need to be considered in engineering design?
- What are the constraints that need to be considered in engineering design?
- How did Newton's Laws help you solve the engineering challenge?
- What are the big ideas that explain gravity, acceleration, kinetic energy, and collisions?

Enduring Understanding

In our Gravity and Kinetic Energy unit, students will be expected to build on their understanding of Newton's Laws of Motion. They will build on concepts taught in elementary school through their motion unit. Students will develop, build, and test models. They will plan and conduct experiments, analyze and interpret data, using mathematical and computational thinking. Students will work to develop explanations, and use these practices to demonstrate understanding of the core ideas. Students will understand how interactions of motion work within systems. Students will apply ideas about gravitational and magnetic forces to explain a variety of phenomena. They will focus on ideas about energy; transformation of energy, the relationship between energy and forces.

Students will know...

Investigation Guide Vocabulary

Investigation 1: Acceleration

Acceleration, air resistance, average speed, constant speed, distance, force, gravity, position, slope, speed

Investigation 2: Force of Gravity

Gram, mass, newton, weight

Investigation 3: Energy and Collisions

Collision, energy, friction, joule, kinetic energy, potential energy, variable

Investigation 4: Collision Engineering

Constraint, criterion, impulse

Science Resource Vocabulary

Investigation 1: Acceleration

Acceleration, air resistance, attraction, average speed, change in position, constant speed, deceleration, delta (D), distance, energy, force, friction, gravitational force, gravity, interval, mass, motion, orbit, position, rest, slope, speed, speedometer, supersonic speed, surface area, terminal velocity, weight

Investigation 2: Force of Gravity

Centripetal force, escape velocity, field, net force, newton (N)

Investigation 3: Energy and Collisions

Collision, infer, joule (j), kinetic energy, light speed, potential energy, theory of special relativity, thermal energy, transfer, variable

Investigation 4: Collision Energy

Concussion, constraint, criterion, crumple zone, engineer, gram (g), impulse

Misconceptions:

- Mass and weight are the same.
- Energy is the same as force.
- Energy is loss in transformation.
- Things "use up" energy.
- An undervalue of safety helmets and protective gear.
- Objects fall at different rates.
- There is no relationship between force and acceleration.

Students will be able to...

Investigation 1: Acceleration

- Analyze line slopes to make claims about an object's speed.
- Construct and analyze data sets to identify patterns and distinguish between speed and acceleration.
- Use digital tools to analyze motion video data and determine the force of gravity on Earth.

Investigation 2: Force of Gravity

- Calculate weight at locations with different gravitational forces.
- Analyze data to construct explanations about proportional relationships between mass, force, and acceleration.

Investigation 3: Energy and Collisions

- Collect and analyze data from collisions to determine the relationships between speed, mass, and kinetic energy.

Investigation 4: Collision Engineering

- Define an engineering problem and design solutions through an iterative process.
- Engage in argument from evidence to evaluate solutions to a design challenge.
- Develop and use a model to describe the iterative process of engineering design.
- Construct explanations and ask questions about physics concepts related to kinetic energy, gravity, and collisions.

STAGE 2- EVIDENCE OF LEARNING

Formative Assessment

- 3- Minute Pause
- A-B-C Summaries
- Analogy Prompt
- Choral Response
- Debriefing
- Exit Card / Ticket
- Hand Signals
- Idea Spinner
- Index Card Summaries
- Inside-Outside Circle Discussion (Fishbowl)
- Journal Entry
- Misconception Check
- Observation
- One Minute Essay
- One Word Summary
- Portfolio Check
- Questions & Answers
- Quiz
- Self-Assessment
- Student Conference
- Think-Pair-Share
- Web or Concept Map

Authentic Assessments

- Follow lab safety procedures throughout the unit.
- Determine the relationship between applied force and work output.
- Use data tables and graphs to interpret data.
- Build and test a series and a parallel circuit.
- Measure, collect data, and apply formulas to calculate work, speed, and power.
- Work in cooperative groups to complete assignments.
- Build, modify, and troubleshoot designs.
- Develop Focus Questions.
- Complete an Engineering Design Challenge using “bean brains”.

Benchmark Assessments

- End-of-investigation assessments.
- I-Checks.
- Focus questions.
- End-of-unit district exam.
- complete a research project.

STAGE 3- LEARNING PLAN

Instructional Map

Investigation 1 – Acceleration (12 Sessions)

Part 1: (4 Sessions) Speed Tracks

Students see an unprotected "bean brain" fall to the floor and start to think about speed, acceleration, energy transfer, and collisions. They walk along two interval tracks to collect data about speed. After graphing their results, they conclude that a slope of a graph for distance versus time is related to the speed.

Part 2: (3 Sessions) Acceleration Track

Students walk along an interval track and discover that the speed required is not constant. They graph their results to learn about acceleration.

Part 3: (6 sessions) Acceleration of Gravity

Students observe a ball dropping and complete a detailed analysis of its motion. They determine that the ball is not falling at a constant speed but accelerating. They calculate the rate and compare it to the acceleration of gravity, to develop a working definition of gravity.

Investigation 2: Force of Gravity (8 Sessions)

Part 1: (2 Sessions) Mass and Weight

Students use spring scales to learn about the difference between mass and weight.

Part 2: (6 Sessions) How Heavy?

Students compare mass and weight on different planets, then refine their definition of gravity. They learn about Newton's second law, which describes the relationship between mass, force, and acceleration.

Investigation 3: Energy and Collisions (10 Sessions)

Part 1: (4 Sessions) Potential and Kinetic Energy

Students roll marbles down a ramp system to collide with plastic cubes. They gather data about the cubes' motion to make inferences about kinetic and potential energy. Next, they use spring scales to further explore potential and kinetic energy and read an article to help pull it all together.

Part 2: (2 Sessions) Stop or Crash

Students engage in an activity which they review data from different collision scenarios. They analyze the data in two different ways to draw conclusions about the effect of mass and speed on collisions.

Part 3: (4 Sessions) Marble Collisions

Students experiment with horizontal collisions, then learn more about Newton's laws and consider the implications in various situations.

Investigation 4: Collision Engineering (7 Sessions)

Part 1: (4 Sessions) Helmet Design Challenge

Students view a video that introduces the physics concept of impulse. They learn that increasing the time it takes for an object to change speed in a collision results in less for applied to the object. Using this principle, students design a protective helmet for a model head. After several interactive designs, they share results as a class and discuss the engineering design process.

Part 2: (3 Sessions) Big Ideas

Students review big ideas from the course and create a list of remaining physics questions. Students work together to answer questions and prepare for the post test.

Modification/Differentiation of Instruction

Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content
- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials

- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas

Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content

- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials

- Strategy and flexible groups based on formative assessment

504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
- extended time on tests and assignments
- reduced homework or classwork
- verbal, visual, or technology aids
- modified textbooks or audio-video materials
- behavior management support
- adjusted class schedules or grading
- verbal testing
- excused lateness, absence, or missed classwork
- pre-approved nurse's office visits and accompaniment to visits
- occupational or physical therapy

Modification Strategies

- Cooperative Grouping
- Extended Time
- Frequent Breaks
- Highlighted Text
- Interactive Notebook
- Modified Test
- Oral Directions

- Peer Tutoring
- Preferential Seating
- Re-direct
- Repeated Drill and Practice
- Shortened Assisgnment
- Teacher Notes
- Tutorials
- Use of Additional Reference Materials
- Use of Audio Resources

Differentiation Strategies

High Preparation

- Alternative Assessments
- Choice Boards
- Games and Tournaments
- Group Investigations
- Guided Reading
- Independent Research / Project
- Interest Groups
- Learning Contracts
- Leveled Rubrics
- Literature Circles
- Multiple Intelligence Options
- Multiple Texts
- Personal Agendas
- Project Based Learning (PBL)
- Stations / Centers
- Think-Tac-Toe
- Tiered Activities / Assignments
- Varying Graphic Organizers

Low Preparation

- Choice of Book / Activity

- Cubing Activities
- Exploration by Interest (using interest inventories)
- Flexible Grouping
- Goal Setting With Student
- Homework Options
- Jigsaw
- Mini Workshops to Re-teach or Extend Skills
- Open-ended Activities
- Think-Pair-Share by Readiness, Interest, or Learning Style
- Use of Collaboration
- Use of Reading Buddies
- Varied Journal Prompts
- Varied Product Choice
- Varied Supplemental Materials
- Work Alone / Together

Horizontal Intergration- Interdisciplinary Connections

New Jersey Student Learning Standards for Mathematics

Grade 7

7.RP.A. Analyze proportional relationships and use them to solve real worls mathematical problems.

7.NS.A. Apply and extend previous understandings of operations.

7.EE.B. Solve real life and mathematical problems using numerical and algebraic expressions and equations.

Reading in Science

RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

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.6-8.5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

RST.6-8.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

RST.6-8.7.Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

RST.6-8.8.Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.

Writing in Science

LA.WHST.6-8.1 Write arguments focused on discipline-specific content.

LA.WHST.6-8.1.A Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

LA.WHST.6-8.1.B Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

LA.WHST.6-8.1.C Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.

LA.WHST.6-8.1.D Establish and maintain a formal/academic style, approach, and form.

LA.WHST.6-8.1.E Provide a concluding statement or section that follows from and supports the argument presented.

LA.WHST.6-8.10 Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

LA.WHST.6-8.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.

LA.WHST.6-8.2.A Introduce a topic and organize ideas, concepts, and information using text structures (e.g., definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g., headings, graphics, and multimedia) when useful to aiding comprehension.

LA.WHST.6-8.2.B Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

LA.WHST.6-8.2.C Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

LA.WHST.6-8.2.D Use precise language and domain-specific vocabulary to inform about or explain the topic.

LA.WHST.6-8.2.E Establish and maintain a formal/academic style, approach, and form.

LA.WHST.6-8.2.F Provide a concluding statement or section that follows from and supports the information or explanation presented.

LA.WHST.6-8.3 (See note; not applicable as a separate requirement)

LA.WHST.6-8.4 Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience.

LA.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.

LA.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.

LA.WHST.6-8.7 Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.

LA.WHST.6-8.8 Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.

LA.WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research.

2020 New Jersey Student Learning Standards- Computer Science and Design Thinking

Computer Science and Design Thinking Practices

CSDT.K-12.CSDTP1	Fostering an Inclusive Computing and Design Culture
CSDT.K-12.CSDTP2	Collaborating Around Computing and Design
CSDT.K-12.CSDTP3	Recognizing and Defining Computational Problems
CSDT.K-12.CSDTP4	Developing and Using Abstractions
CSDT.K-12.CSDTP5	Creating Computational Artifacts
CSDT.K-12.CSDTP6	Testing and Refining Computational Artifacts
CSDT.K-12.CSDTP7	Communicating About Computing and Design

8.2 Design Thinking

8.2.8.ED.1: Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer. 8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. 8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). 8.2.8.ED.4: Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate, and test options to repair the product in a collaborative team. 8.2.8.ED.5: Explain the need for optimization in a design process. 8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. 8.2.8.ED.7: Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).
8.2.8.ITH.1: Explain how the development and use of technology influences economic, political, social, and cultural issues. 8.2.8.ITH.2: Compare how technologies have influenced society over time. 8.2.8.ITH.3: Evaluate the impact of sustainability on the development of a designed product or system. 8.2.8.ITH.4: Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact. 8.2.8.ITH.5: Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another.
8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem. 8.2.8.NT.2: Analyze an existing technological product that has been repurposed for a different function. 8.2.8.NT.3: Examine a system, consider how each part relates to other parts, and redesign it for another purpose. 8.2.8.NT.4: Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product.
8.2.8.ETW.1: Illustrate how a product is upcycled into a new product and analyze the short- and long-term benefits and costs. 8.2.8.ETW.2: Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people, capital). 8.2.8.ETW.3: Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact. 8.2.8.ETW.4: Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best.
8.2.8.EC.1: Explain ethical issues that may arise from the use of new technologies. 8.2.8.EC.2: Examine the effects of ethical and unethical practices in product design and development.

2020 New Jersey Student Learning Standards- Career Readiness, Life Literacies, and Key Skills

Career Readiness, Life Literacies, and Key Skills Practices

CRP.K-12.CRP1	Act as responsible and contributing community members and employee.
CRP.K-12.CRP2	Attend to financial well-being.
CRP.K-12.CRP3	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP4	Demonstrate creativity and innovation.
CRP.K-12.CRP5	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP6	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP7	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP8	Use technology to enhance productivity, increase collaboration and communicate effectively.
CRP.K-12.CRP9	Work productively in teams while using cultural/global competence.

9.2 Career Awareness and Planning

9.2.8.CAP.1: Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest. 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest. 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income. 9.2.8.CAP.4: Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
9.2.8.CAP.11: Analyze potential career opportunities by considering different types of resources, including occupation databases, and state and national labor market statistics. 9.2.8.CAP.12: Assess personal strengths, talents, values, and interests to appropriate jobs and careers to maximize career potential.

9.4 Life Literacies and Key Skills

9.4.8.CI.1: Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4). 9.4.8.CI.2: Repurpose an existing resource in an innovative way (e.g., 8.2.8.NT.3). 9.4.8.CI.3: Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2). 9.4.8.CI.4: Explore the role of creativity and innovation in career pathways and industries.
9.4.8.CT.1: Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (MS-ETS1-2). 9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1). 9.4.8.CT.3: Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
9.4.8.DC.1: Analyze the resource citations in online materials for proper use. 9.4.8.DC.2: Provide appropriate citation and attribution elements when creating media products (e.g., W.6.8). 9.4.8.DC.3: Describe tradeoffs between allowing information to be public (e.g., within online games) versus keeping information private and secure. 9.4.8.DC.4: Explain how information shared digitally is public and can be searched, copied, and potentially seen by public audiences. 9.4.8.DC.5: Manage digital identity and practice positive online behavior to avoid inappropriate forms of self-disclosure. 9.4.8.DC.6: Analyze online information to distinguish whether it is helpful or harmful to reputation. 9.4.8.DC.7: Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys. 9.4.8.DC.8: Explain how communities use data and technology to develop measures to respond to effects of climate change (e.g., smart cities).
9.4.8.GCA.1: Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a). 9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.1: Critically curate multiple resources to assess the credibility of sources when searching for information. 9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information. 9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b). 9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations. 9.4.8.IML.5: Analyze and interpret local or public data sets to summarize and effectively communicate the data. 9.4.8.IML.6: Identify subtle and overt messages based on the method of communication. 9.4.8.IML.7: Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8). 9.4.8.IML.8: Apply deliberate and thoughtful search strategies to access high-quality information on climate change (e.g., 1.1.8.C1b). 9.4.8.IML.9: Distinguish between ethical and unethical uses of information and media (e.g., 1.5.8.CR3b, 8.2.8.EC.2). 9.4.8.IML.10: Examine the consequences of the uses of media (e.g., RI.8.7). 9.4.8.IML.11: Predict the personal and community impact of online and social media activities. 9.4.8.IML.12: Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience. 9.4.8.IML.13: Identify the impact of the creator on the content, production, and delivery of information (e.g., 8.2.8.ED.1). 9.4.8.IML.14: Analyze the role of media in delivering cultural, political, and other societal messages. 9.4.8.IML.15: Explain ways that individuals may experience the same media message differently.
9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.

9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4). 9.4.8.TL.3: Select appropriate tools to organize and present information digitally. 9.4.8.TL.4: Synthesize and publish information about a local or global issue or event (e.g., MS-LS4-5, 6.1.8.CivicsPI.3). 9.4.8.TL.5: Compare the process and effectiveness of synchronous collaboration and asynchronous collaboration. 9.4.8.TL.6: Collaborate to develop and publish work that provides perspectives on a real-world problem.

Vertical Integration- Discipline Mapping

Grade 4: Energy

Grade 6: Waves

Preparation for high school science courses.

Additional Materials

- Classroom posters display on laws of motion
- Word Wall
- YouTube Videos: motion, design, simple machines
- Bill Nye short videos: Motion, Simple Machines, Energy
- Foss website
- Quizlet
- Kahoot
- PowerPoint Design
- Materials for Engineering Helmet Challenge