Unit 6-Physical Science-How Will It Move?

Content Area: **Science**
Course(s):
Time Period: **Full Year**
Length: **7 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

Science and engineering—significant parts of human culture that represent some of the pinnacles of human achievement—are not only major intellectual enterprises but also can improve people's lives in fundamental ways. Although the intrinsic beauty of science and a fascination with how the world works have driven exploration and discovery for centuries, many of the challenges that face humanity now and in the future—related, for example, to the environment, energy, and health—require social, political, and economic solutions that must be informed deeply by knowledge of the underlying science and engineering.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

CONTENT AREA STANDARDS

6-8.MS-ESS1-2	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
6-8.MS-ESS1-3	Analyze and interpret data to determine scale properties of objects in the solar system.
6-8.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.
6-8.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.
6-8.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.
6-8.MS-PS2-1	Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
6-8.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.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.

LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.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).
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.6-8.7	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.SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

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1. Every two objects that touch apply a contact force to each other.
2. All forces always come in pairs, in opposite directions.
3. The beginning of motion is always caused by forces.
4. An object's motion is influenced only by the forces that are applied to it, not by the forces it applies to others.
5. Forces that are applied to an object in opposite directions counteract each other.
6. Forces that are applied to an object in the same direction reinforce one another.
7. For every force, there is an equal and opposite force.
8. Dynamic friction always acts on an object against the direction in which the object moves.
9. The start and end of motion is always caused by forces.
10. Slowing down is caused by unbalanced forces acting against the direction of motion.
11. Speeding up is caused by unbalanced forces acting in the direction of motion.
12. Changing direction of motion is caused by unbalanced forces acting sideways.
13. An object will continue to remain at rest or move at a constant speed and in a straight line unless it is subjected to unbalanced forces.

Procedural Knowledge

Students will be able to:

1. Develop a model to describe the role of gravity in the motions within galaxies and the solar system.
2. Use a model to describe the role of gravity in the motions within galaxies and the solar system.
3. Analyze data to determine scale properties of objects in the solar system.
4. Interpret data to determine scale properties of objects in the solar system.
5. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
6. 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.
7. Construct arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
8. Present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.
9. 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.
10. Construct arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
11. Use arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
12. Present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

EVIDENCE OF LEARNING

Formative Assessments

PS1-6: Activity 8.1: Thermal Energy in Chemical Reactions, Activity 8.2: The Paper Cup, Activity 8.3: How Much Chemical Energy Is There?

PS2-1: Reading 1.2: Newton's Cradle, Activity 4.2: Measuring Forces with Force Probes and Newton's Third Law, Activity 4.3: Revisiting Familiar Apparatuses, Activity 6.1: Graphs That Show When a Ball Moves

PS2-2: Activity 2.1: Analyzing Apparatuses, Activity 2.2: Systems and Contact Forces, Homework 2.2: The World's Greatest Sandwich, Reading 2.3: Balance and Force, Activity 2.4: Putting Things Together, Activity 3.1: Objects That Begin Moving, Activity 3.2: More Objects That Begin Moving, Homework 3.2: Heavy Duty Shopping, Activity 3.3: Complex Systems that Begin Moving, Reading 3.3: Why Does an Object Start Moving?, Activity 4.1: Measuring Forces, Reading 4.3: What Keeps Things from Moving?, Reading 4.4: Who Will Win a Tug-of-War?, Activity 5.1: A Book That Stops Moving, Homework 5.1: Hard and Soft Landings, Activity 5.2: Recoil in the Magnetic Cannon, Reading 5.2: What Affects How Quickly Something Stops Moving?, Homework 6.1: Rat Race, Activity 6.2: Graphs That Show How a Ball Moves, Homework 6.2: Rat Race Part 2, Activity 6.3: Motion Graphs for the Magnetic Cannon, Activity 7.1: Changing Speed, Homework

7.1: Forces and Motions, Activity 7.2: Changing Direction, Activity 7.3: Newton's First Law, Activity 8.1: Revisiting and Summarizing the Scientific Principles, Homework 8.1: Motion Graph, Activity 8.2: Can We Explain the Behavior of the Magnetic Cannon?, Activity 8.3: Concluding the Activity

PS2-5: Activity 2.3: Forces That Act at a Distance

PS3-2: Activity 2.1: Analyzing Apparatuses, Activity 2.2: Systems and Contact Forces, Homework 2.2: The World's Greatest Sandwich, Reading 2.3: Balance and Force, Activity 2.4: Putting Things Together, Activity 3.1: Objects That Begin Moving, Activity 3.2: More Objects That Begin Moving, Homework 3.2: Heavy Duty Shopping, Activity 3.3: Complex Systems that Begin Moving, Reading 3.3: Why Does an Object Start Moving?, Activity 4.1: Measuring Forces, Reading 4.3: What Keeps Things from Moving?, Reading 4.4: Who Will Win a Tug-of-War?, Activity 5.1: A Book That Stops Moving, Homework 5.1: Hard and Soft Landings, Activity 5.2: Recoil in the Magnetic Cannon, Reading 5.2: What Affects How Quickly Something Stops Moving?, Homework 6.1: Rat Race, Activity 6.2: Graphs That Show How a Ball Moves, Homework 6.2: Rat Race Part 2, Activity 6.3: Motion Graphs for the Magnetic Cannon, Activity 7.1: Changing Speed, Homework 7.1: Forces and Motions, Activity 7.2: Changing Direction, Activity 7.3: Newton's First Law, Activity 8.1: Revisiting and Summarizing the Scientific Principles, Homework 8.1: Motion Graph, Activity 8.2: Can We Explain the Behavior of the Magnetic Cannon?, Activity 8.3: Concluding the Activity

PS3-5: Activity 1.1: Anchoring Activity, Activity 1.2: Driving Question Board

Ess1-2: Reading 7.2: Planetary Motion

Summative Assessments

- Benchmark Assessments
  - Multiple Choice Assessment administered at the end of each marking period.

Alternative Assessments

- Oral Presentations
- Questions for Comprehension
- Performance Tasks
- Scientific Journals/Notebooks
- Self-Assessment
- WebQuests

RESOURCES (Instructional, Supplemental, Intervention Materials)

IQWST Unit Materials fo Physical Science 3 Learning Sets

A Framework For K-12 Science Education

Onlne Resources provided by IQWST not included in the program (to be used as support/reinforcement/enrichment): https://docs.google.com/spreadsheets/d/1VpyFCL4_50_-1w2NhcGpdNNZ2jj6aJJegcIUNCy_uzQ/pubhtml

INTERDISCIPLINARY CONNECTIONS

Collaboration with Math and Language Arts teachers is an essential part of the IQWST curriculum.

Information Writing

Current Events

Data collection/analysis

Computations

Statistics

Enginereering

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.

IQWST provides audio recording for all readings in student workbook-available through teacher portal online

Reading differentiation strategies are embedded in the IQWST program and all students prepare for reading through a 'Getting Reading' section which begins each reading.

The sections are desgined to engage students, generate interest, activate prior knowledge and provide a purpose for reading. Teachers use advance organizers for desired readings and to encourage students to plan and annote the passages.

A word wall is developed through vocabulary aquisition in the program. Students develop the word wall as words are learned in context and through experience in class. This helps to build meaning and understanding which support students when reading text.

Students are encouraged to ask questions and post them to the Driving Question Board. This DQB helps students develp a greater level of understanding and encourages students to work together to solve problems

in and outside of class.

Supoort will be provided to students when writing in the student manual and use of teh computer, printing, and pasting into the manual is acceptable if there is a present need.