Unit 1 Physical Science - Motion and Matter

Content Area: **Science**
Course(s):
Time Period: **Trimester 1**
Length: **10-12 weeks**
Status: **Published**

Brief Summary of Unit

Introduction: In this unit of study, students determine the effects of balanced and unbalanced forces on the motion of an object and the cause & effect relationships of electrical or magnetic interactions to define a simple design problem that can be solved with magnets. The crosscutting concept of cause and effect, and the interdependence of science, engineering, and technology, and the influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit will be taught utilizing Physical Science: Motion and Matter FOSS Science Kit.

Revision Date: July 2021

SCI.3-5-ETS1	Engineering Design
SCI.3-PS2-1	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
SCI.3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
SCI.3-5.ETS1.A	Defining and Delimiting Engineering Problems
SCI.3.PS2.A	Forces and Motion
SCI.3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
SCI.3.PS2.B	Types of Interactions
SCI.3-5.ETS1.B	Developing Possible Solutions
SCI.3-PS2-2	Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
LA.RI.3.1	Ask and answer questions, and make relevant connections to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
SCI.3-5-ETS1-3	Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
LA.RI.3.3	Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.
SCI.3.PS2.A	Forces and Motion
SCI.3-5.ETS1.B	Developing Possible Solutions
SCI.3-5.ETS1.C	Optimizing the Design Solution
SCI.3-PS2-3	Ask questions to determine cause and effect relationships of electric or magnetic

	interactions between two objects not in contact with each other.
LA.RI.3.7	Use information gained from text features (e.g., illustrations, maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).
LA.RI.3.8	Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence) to support specific points the author makes in a text.
SCI.3.PS2.B	Types of Interactions
SCI.3-PS2-4	Define a simple design problem that can be solved by applying scientific ideas about magnets.
SCI.3.PS2.B	Types of Interactions
LA.W.3.7	Conduct short research projects that build knowledge about a topic.
LA.W.3.8	Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.
CS.3-5.8.1.5.DA.1	Collect, organize, and display data in order to highlight relationships or support a claim.
CS.3-5.8.1.5.DA.3	Organize and present collected data visually to communicate insights gained from different views of the data.
CS.3-5.8.2.5.ED.1	Explain the functions of a system and its subsystems.
CS.3-5.8.2.5.ED.2	Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
CS.3-5.8.2.5.ED.3	Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
CS.3-5.8.2.5.ED.4	Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
CS.3-5.8.2.5.ED.5	Describe how specifications and limitations impact the engineering design process.
CS.3-5.8.2.5.ED.6	Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process.
CS.3-5.8.2.5.NT.1	Troubleshoot a product that has stopped working and brainstorm ideas to correct the problem.
CS.3-5.8.2.5.NT.3	Redesign an existing product for a different purpose in a collaborative team.
CS.3-5.8.2.5.NT.4	Identify how improvement in the understanding of materials science impacts technologies.
CS.3-5.ED	Engineering Design
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.9.2.5.CAP	Career Awareness and Planning
WRK.9.2.5.CAP.1	Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
WRK.9.2.5.CAP.4	Explain the reasons why some jobs and careers require specific training, skills, and certification (e.g., life guards, child care, medicine, education) and examples of these requirements.
WRK.K-12.P.4	Demonstrate creativity and innovation.

WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.6	Model integrity, ethical leadership and effective management.

Essential Questions/ Enduring Understandings

Essential Questions:

- What causes an object to move?
- How do magnets work?
- How can we use our observations of systems to predict motion?
- What causes change of motion?
- How can we use observed patterns of motion to design solutions to engineering problems?
- How can we use tools to measure the mass of materials in mixtures?

Enduring Understandings:

- A force is a push or a pull. The motion of an object is affected by forces.
- There are multiple forces acting on an object at all times. When an object is still, forces are balanced. When an object is in motion, forces are unbalanced.
- Observing patterns of motion can help predict future motion. These predictions can help solve real world problems.

Objectives

Students will know…

- Magnetism and gravity both pull, magnetism can also push.
- Magnets have poles which attract and repel.
- Forces can make objects move even when not in direct contact.
- Change of motion is caused by unbalanced forces.
- When an object is not in motion, forces are balanced.
- Patterns of motion can be used to help predict the motion of an object.
- Patterns of motion can be used to design solutions to engineering problems.
- Different tools can be used to measure the mass of materials in mixtures.

Students will be skilled at…..

- Asking questions and defining problems
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data

- Using mathematics and computational thinking
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating and communicating information

Learning Plan

- Preview essential questions and connect learning through the unit
- Gain students understanding and prior knowledge of motion and forces
- Read literature about motion and matter
- Read literature about magnets
- Read literature about engineering
- Utilize Foss Kit with materials: Motion and Matter
- Introduce Key Vocabulary: Attract, repel, pull, push, balanced, unbalanced, force, gravity, magnet, magnetic field, magnetic force, magnetism, motion, observe, predict, data, pattern, direction, wheel, axle, friction, ramp, shaft, slope, system, standard, variable, twirly bird, axis, rotate, top, bearing, constraint, criterion, engineering, solution, centimeter, meter, metric system, standard unit, conservation, dissolve, mixture, reaction
- Experiment with magnets allowing students to explore how they attract and repel
- Observe how objects can move without direct contact using magnetism
- Explore the change in the magnetic field as you add and take away magnets
- Observe and compare balanced and unbalanced forces
- Discuss the different forces on moving and still objects
- Compare wheel-and-axle systems with different designs
- Discuss how the size of wheels can affect the direction that a wheel-and-axle system will roll
- Challenge students to use observed patterns of motion to predict the direction different wheel-and-axle system will roll
- Explore the variables involved in the interaction of a twirly bird with air and gravity
- Construct and compare different designs of a top
- Discuss which top designs spins the longest and fastest
- Engage in engineering practices by manipulating the design of a cart to meet specific challenges such as speed and distance challenges
- Mix solids with liquids and collect data on changes in mass
- Compare the mass of materials prior to mixing and after mixing
- Observe the way different chemicals react when mixed together
- Watch videos that help explain motion and matter and allow students to make connections
- Maintain observational journals with student note taking and drawings of investigations
- Incorporate literature about motion and matter, make connections to everyday life and environmental factors

Materials

Core Book List

FOSS Kit: Motion and Matter

Brainpop

Discovery Education

Scholastic News

Science notebook for assessment and journaling

Gizmos:

- Magnetism
- Wheel and Axle
- Force and Fan Carts

Integrated Accommodation & Modifications

https://docs.google.com/spreadsheets/d/1w0B8sCtjfBURvexoZZCu72mg1AVOoSSEYP4l516ID6c/edit#gid=1426178898