Unit 1: Physical Science- Motion and Matter

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

Summary

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 2026

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

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. Required investigations as follows:
    - All of Investigations 1, 2, and 3
- 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

Optional Engineering Design Challenge (Lesson plan provided in "Materials" section

Assessment

Science is designed to promote skill attainment. Student progression and pace through which they proceed through the performance tasks is based on their affinity for and ability to reach skill attainment. The teacher will determine formative and summative skill attainment; alternative assessments will be incorporated for each student based on their strengths and challenges.

Formative: Teacher observation, student responses during lessons

Summative: FOSS investigation checklist, science notebook (response to focus questions)

Benchmark: I-Check Assessments, science notebook

Alternative: Oral presentation, student produces projects

- Investigation 1.1 FQ: What happens when magnets interact with other magnets and with paper clips?
- Investigation 1.2 FQ: How is the magnetic field affected when more magnets are added?
- Investigation 1.3 FQ: What causes change in motion?
- Investigation 2.1 FQ: How can we change the motion of wheel-and-axle systems rolling down ramps?
- Investigation 2.2 FQ: What rules help predict where a rolling cup will end up?
- Investigation 2.3 FQ: What happens to the motion of a twirly bird when the design changes?
- Investigation 2.4 FQ: What is the best design for a top?
- Investigation 3.1 FQ: What are some important features of a cart that will roll from here to there?

- Investigation 3.2 FQ: How can you improve the design of your cart?
- Investigation 3.3 FQ: How does start position affect how far a cart rolls?
- Investigation 3.4 FQ: How can you use magnets to do cart tricks?
- Investigation 4.1 FQ: What happens when you mix two materials?
- Investigation 4.2 FQ: What happens when you mix two materials?
- Investigation 4.3 FQ: What is the importance of accurate measurements for a metric field day? (optional)

Standards

9.1.2.CR	Civic Responsibility
P.1	Act as a responsible and contributing community members and employee.
9.2.5.CAP	Career Awareness and Planning
P.1	Act as a responsible and contributing community members and employee.
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.
	There are actions an individual can take to help make this world a better place.
9.2.5.CAP.1	Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
9.1.2.CR.1	Recognize ways to volunteer in the classroom, school and community.
P.4	Demonstrate creativity and innovation.
9.1.2.CR.2	List ways to give back, including making donations, volunteering, and starting a business.
P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
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.
P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
	Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion.
P.9	Work productively in teams while using cultural/global competence.
	Objects in contact exert forces on each other.
L.RF.3.4.A	Read grade-level text with purpose and understanding.
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.
	Planning and Carrying Out Investigations
9.1.2.RM	Risk Management and Insurance
	There are ways to keep the things we value safely at home and other places.

	The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it.
	Patterns of change can be used to make predictions.
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.
	Asking Questions and Defining Problems
	Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.
3-PS2-4	Define a simple design problem that can be solved by applying scientific ideas about magnets.
	Asking Questions and Defining Problems
L.VL.3.2	Determine or clarify the meaning of unknown and multiple-meaning academic and domain-specific words and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.
	Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.
3.M.A	Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects
RI.IT.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.
3.DL.A	Understand data-based questions and data collection.
3.DL.B	Represent and interpret data
W.IW.3.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
SL.PE.3.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.
SL.PE.3.1.B	Follow agreed-upon norms for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
SL.PE.3.1.C	Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.
SL.PE.3.1.D	Explain their own ideas and understanding in light of the discussion.
SL.ES.3.3	Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.
SL.PI.3.4	Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

Materials

Core Book List

FOSS Kit: Motion and Matter

Brainpop

Discovery Education

Scholastic News

Science notebook for assessment and journaling

Mystery Science

Optional Culminating Engineering Design Challenge

Integrated Accommodations and Modifications, Special Education students, English Language Learners, At-Risk students, Gifted and Talented students, Career Education, and those with 504's

https://docs.google.com/spreadsheets/d/1w0B8sCtjfBURvexoZZCu72mg1AVOoSSEYP4l516ID6c/edit?gid=180469151#gid=180469151