

Unit 1: Motion and Stability: Forces and Interactions

Content Area: **Science**
Course(s):
Time Period: **Generic Time Period**
Length: **3 weeks**
Status: **Published**

Disciplinary Core Ideas

PS2.A: Forces and Motion

- 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. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-1)
- 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. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS2-2)

PS2.B: Types of Interactions

- Objects in contact exert forces on each other. (3-PS2-1)
- 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-PS2-3),(3-PS2-4)

CCSS.Math.Content.3.MD.A.2	Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.
3-PS2	Motion and Stability: Forces and Interactions
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.
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.
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.
3-PS2-4	Define a simple design problem that can be solved by applying scientific ideas about magnets.
LA.3.CCSS.ELA-Literacy.W.3.7	Conduct short research projects that build knowledge about a topic.
LA.3.CCSS.ELA-Literacy.SL.3.3	Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.
LA.3.CCSS.ELA-Literacy.RL.3.1	Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
LA.3.CCSS.ELA-Literacy.RI.3.1	Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
LA.3.CCSS.ELA-Literacy.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

LA.3.CCSS.ELA-Literacy.RI.3.8

to time, sequence, and cause/effect.

Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence).

Essential Questions

Essential Unit Question:

-How do unequal and equal forces effect an object?

Guiding Questions:

How can we use our observations to predict the future?

Objectives:

- SWBAT Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object

-SWABT Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion

Concepts that will be Taught:

- Science investigations use a variety of methods, tools, and techniques.
- Cause-and-effect relationships are routinely identified.
- Objects in contact exert forces on each other.
- Each force that acts on a particular object has both strength and a direction.
- An object at rest typically has multiple forces acting on it, but they add to 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.
- Science findings are based on recognizing patterns.
- Patterns of change can be used to make predictions.
- The patterns of an object's motion in various situations can be observed and measured.
- When past motion exhibits a regular pattern, future motion can be predicted from it

Students who Understand the concepts are able to...

SWBAT Make predictions using patterns of change.

Make observations and/or measurements to produce data to serve as the basis of evidence

for an explanation of a phenomenon.

Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion

SWABT Identify cause-and-effect relationships.

Plan and conduct investigations collaboratively to produce data to serve as the basis for evidence.

Use fair tests in which variables are controlled and the number of trials considered.

Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

Activities

1. Students will measure and graph how fast they walk and run (Movement)

2. Students will do an experiment where they will predict how a hanging washer will move or change movement

(Pg. E22-E23 in textbook. W/S page 134)

3. Mystery Science : Invisible Forces (4 weeks)

Mystery #1: In this Mystery, students will see that by learning to think about pushes and pulls — forces — they can accomplish extraordinary things!

Mystery #2: In this Mystery, students will learn about bridge design and use their knowledge of forces to engineer a strong bridge made of paper.

Mystery #3: In this Mystery, students will learn about friction (the force that slows you down on a playground slide) and will investigate what materials slide best.

Mystery #4: In this Mystery, students will explore the surprising properties of magnets and experiment with an invisible force that acts at a distance.

Materials & Resources

www.mysteryscience.com

Stop watch, crayons, graph paper, meter tape, washer, 2 paper clips, goggles, scissors, string, Text Book (Unit E)

Mystery Science Supplies:

Mystery #1: Hopper Popper

- Cereal Boxes
- A ruler
- A pen
- Scissors
- 2 or 3 #16 rubber bands

Mystery #2 Balance of Forces; Engineering

- a [Bridge Challenge](#) handout
- a ruler
- several sheets of typing paper
- a pair of scissors
- two stacks of books
- pennies (We recommend having at least 400 pennies on hand. Some bridges are VERY strong.)
- a [Bridge Designer's notebook](#) sheet where they can show their work
- a pencil

Mystery #3: The Great Slide Challenge

Each group of students needs:

- A piece of stiff cardboard measuring at least 12" by 16" (The lid of a cardboard file storage

box is perfect)

- Tape
- Pennies to use as weights
- A ruler
- A stack of books or blocks that can be used to prop up one end of the slide
- Several materials to test, such as
 - sandpaper (a few 1" squares),
 - craft foam or styrofoam (a few 1" squares),
 - a few big plastic buttons or plastic bottle caps,
 - a few large coins or metal bottle caps
 - cardboard (a few 1" squares).

Each student needs:

- A "Try This!" handout and a "Friction Investigation" worksheet.
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- A pencil

Mystery #4: Magnet Discovery

Each student will need:

- at least two ring magnets, available [here](#)
- a [Magnets Are Weird](#) worksheet
- an [Ideas for Experimenters](#) worksheet
- a pencil
- paperclips
- a piece of thread or string or light ribbon
- a few 3X5 cards

- test items

Assessment

Chapter review (Unit E Page E32-E33)

Chapter Test (Page 49)

Mystery Science

Mystery 1-4 assessment

Summative assessment

Accommodations & Modifications

- Large print textbooks
- Additional time for assignments
- Review of directions
- Have student restate information
- Provision of notes or outlines
- Concrete examples
- Adaptive writing utensils
- Support auditory presentations with visuals
- Weekly home-school communication tools (notebook, daily log, phone calls or email messages)
- Space for movement or breaks
- Extra visual and verbal cues and prompts
- Books on tape

- Graphic organizers
- Quiet corner or room to calm down and relax when anxious
- Preferential seating
- Alteration of the classroom arrangement
- Reduction of distractions
- Answers to be dictated
- Hands-on activities
- Use of Manipulatives
- Follow a routine/schedule
- Alternate quiet and active time
- Teach time management skills
- Rest breaks
- Verbal and visual cues regarding directions and staying on task
- Daily check-in special education teacher
- Visual daily schedule
- Varied reinforcement procedures
- Immediate feedback
- Personalized examples