

Unit 2: Forces

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Department of Curriculum and Instruction



Belleville Public Schools

Curriculum Guide

Unit 2: Forces

Grade 3

Belleville Board of Education

102 Passaic Avenue

Belleville, NJ 07109

Prepared by: Carly O'Mara

Dr. Richard Tomko, Ph.D., M.J., Superintendent of Schools

Dr. Giovanni Cusmano, Director of Elementary Education K -8

Mr. George Droste, Director of Secondary Education

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Unit Overview

Unit 2: Forces

In this unit, students will...

- explore how forces work
- discover different types of forces
- learn about forces that act from a distance

Vocabulary:

- balanced forces
- electricity
- force
- gravity
- magnet
- net force
- static electricity
- unbalanced forces

Enduring Understanding

- A force is a push or a pull
- A force can be weak or strong
- The strength of any force can be changed
- The direction of a force is applied matters as much as how strong the force is
- When you push something you use force to move it away from you
- When you pull you use force to move it toward you
- Forces change the speed of an object, the direction of an object, or both
- A simple machine changes the strength or direction of a force
- You apply a contact force if you push or pull an object by touching it
- Pairs of forces are either balanced or unbalanced
- Balanced forces are the same size and strength but act in opposite directions, so there is no motion
- Unbalanced forces are when one force is stronger than the other and the forces act in different directions
- Net force is the sum of all the forces that push or pull an object
- Friction is a force that opposes motion between objects that are touching
- Gravity is the force that pulls things down toward the center of the Earth
- A magnet is an object that attracts things made from certain metals
- Electricity is a form of energy

Essential Questions

- What are forces?
- What are some types of forces?
- What forces act from distance?
- What are balanced and unbalanced forces?
- What forces can cause a given object to move?

Exit Skills

By the end of Grade 3, Science Unit 2, the student should be able to:

- Demonstrate how the strength and direction of a force can change the motions of an object
- Plan and conduct an investigation about balanced and unbalanced forces
- Ask and answer questions about forces between objects that are not in contact with each other
- Evaluate cause and effect relationships between forces and objects
- Recognize the cause-and-effect relationships between forces and motion
- Define a simple design problem that can be solved by applying scientific ideas about magnets

New Jersey Student Learning Standards (NJSLS-S)

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-PS2-3	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.
3-PS2-4.1.1	Define a simple problem that can be solved through the development of a new or improved object or tool.
3-PS2-3.1.1	Ask questions that can be investigated based on patterns such as cause and effect relationships.
3-PS2-1.2.1	Cause and effect relationships are routinely identified.
3-PS2-3.2.1	students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause and effect relationship.
3-PS2-1.3.1	Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
3-PS2-1.PS2.A.1	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-PS2-4.PS2.B.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-PS2-1.PS2.B.1	Objects in contact exert forces on each other.
3-PS2-3.PS2.B.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.

Interdisciplinary Connections

MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.5	Use appropriate tools strategically.
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.

MA.3.OA.D.8	Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
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.
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.
MA.3.NF.A.3	Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.
MA.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.
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.

Learning Objectives

Students will demonstrate ability to:

- Evaluate cause-and-effect relationships between forces and objects
 - Recognize force as a push or a pull and demonstrate how its strength and direction can be changed
 - Identify the cause-and-effect relationship between the speed and direction of an object and the strength and direction of the force applied to it
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- Explore net force as well as balanced and unbalanced forces
 - Understand how contact forces, including friction, and non-contact forces, such as gravity, act on object, and that objects often have multiple forces acting on them
 - Determine that balanced forces result in zero net force and no motion change by planning and carrying out an investigation
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- Gather and analyze evidence that forces such as magnetism and electricity can act on objects without touching them
 - identify magnetism and static electricity as forces that can act on object without touching them

Suggested Activities & Best Practices

HMH Science Dimensions, Unit 2 - Lesson 1:

- **Engage:** "Can You Solve It?" lesson
- **Explore/Explain:** "Forces Everywhere", "Strong Enough", "Which Way?" lessons and hands-on activity (Exploration 1, 2, 3)
- **Elaborate:** Take It Further - Simple Machines extension activity
- **Evaluate:** "Lesson Check" and "Lesson Roundup" assessments (formative/summative)

HMH Science Dimensions, Unit 2 - Lesson 2:

- **Engage:** "Can You Solve It?" lesson
- **Explore/Explain:** "Touchy Touchy", "What Are Everyday Forces?" lessons and hands-on activity (Exploration 1, 2,)
- **Elaborate:** Take it Further - People in Engineering extension activity
- **Evaluate:** "Lesson Check" and "Lesson Roundup" assessments (formative/summative)

HMH Science Dimensions, Unit 2 - Lesson 3:

- **Engage:** "Can You Solve It?" lesson and hands-on activity
- **Explore/Explain:** "Magnets Everywhere", "Electricity" lessons and hands-on activity (Exploration 1, 2,)
- **Elaborate:** Take it Further - Electrician extension activity
- **Evaluate:** "Lesson Check" and "Lesson Roundup" assessments (formative/summative)

HMH Science Dimensions, Unit 2 - Performance Task (Moved Without Touching):

- Identify the Problem
- Research
- Brainstorm
- Make a Plan
- Design, Build, and Experiment
- Evaluate and Redesign

HMH Science Dimensions, Unit 2 - Unit Project (Balanced Forces):

- Research and Plan
- Analyze Results
- Restate Question
- Claims, Evidence, and Reasoning

Evidence of Student Learning - Checking for Understanding (CFU)

- Admit Tickets
- Anticipation Guide
- Common benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit tests

Primary Resources & Materials

HMH Science Dimensions Grade 3, 2018 - pages 65 - 134

Ancillary Resources

- Scholastic News
- Science Weekly
- National Geographic Kids

- Bill Nye the Science Guy and appropriate educational videos
- TeacherTube/Youtube

Technology Infusion

- HMH Online Resources
- Brainpop
- SMARTboard
- PowerPoint
- Social Media
- Relevant YouTube/TeacherTube videos
- HMH Science Dimensions Digital Components
- Laptops
- Kahoot
- Quia

Alignment to 21st Century Skills & Technology

CAEP.9.2.4.A.1	Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.
CAEP.9.2.4.A.2	Identify various life roles and civic and work - related activities in the school, home, and community.
CAEP.9.2.4.A.3	Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
CAEP.9.2.4.A.4	Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

21st Century Skills/Interdisciplinary Themes

- Communication and Collaboration
- Creativity and Innovation

- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

Intervention Strategies

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to

reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.

- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Special Education Learning

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multiple test sessions
- multi-sensory presentation
- preferential seating
- preview of content, concepts, and vocabulary
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet

- Use open book, study guides, test prototypes

English Language Learning (ELL)

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarify
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

Sample Lesson

Using the template below, please develop a **Sample Lesson** for the first unit only.

Unit Name:

NJSLS:

Interdisciplinary Connection:

Statement of Objective:

Anticipatory Set/Do Now:

Learning Activity:

Student Assessment/CFU's:

Materials:

21st Century Themes and Skills:

Differentiation/Modifications:

Integration of Technology: