

Unit 03: Forces and Interactions

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

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.
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.
3-5-ETS1	Engineering Design
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.
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-PS2-2	Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.
3-PS2-1	Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
3-PS2	Motion and Stability: Forces and Interactions
3-PS2-4	Define a simple design problem that can be solved by applying scientific ideas about magnets.

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
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.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.

Technology / Integration of Computer Science and Design Thinking

TECH.8.2.5	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.5.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.5.A.2	Investigate and present factors that influence the development and function of a product and a system.
TECH.8.2.5.A.3	Investigate and present factors that influence the development and function of products and systems, e.g., resources, criteria and constraints.
TECH.8.2.5.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.5.C.4	Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.
TECH.8.2.5.D	Abilities for a Technological World: The designed world is the product of a design process that provides the means to convert resources into products and systems.
TECH.8.2.5.D.2	Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process to evaluate potential solutions.

Interdisciplinary Connections: NJSLs for ELA, Social Studies, Science and/or Math Section

LA.K-12.NJLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.K-12.NJLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
LA.K-12.NJLSA.R8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
LA.RI.3	Reading Informational Text Key Ideas and Details
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.
LA.K-12.NJLSA.W	Writing Text Types and Purposes
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.K-12.NJLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
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.
LA.K-12.NJSLSA.W8	Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
LA.K-12.NJSLSA.SL	Speaking and Listening Comprehension and Collaboration
LA.K-12.NJSLSA.SL1	Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
LA.K-12.NJSLSA.SL3	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.
LA.W.3.1.B	Provide reasons that support the opinion.
LA.W.3.1.D	Provide a conclusion.
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.
LA.SL.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.
LA.SL.3.3	Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media Literacy **New Section**

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit...

This unit exposes students to introductory forces that will allow them a new understanding of the invisible pushes and pulls that operate in the world around them.

Meaning

Essential Questions

Essential Questions

- How pushes and pulls can accomplish extraordinary things. (3-PS2-1)
- How bridge design directly effects its strength and stability (3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3, Foundational 3-PS2-1)
- How friction interacts with forces and what components reduce/create friction (3-PS2-1 and 3-PS2-2)
- How properties of magnets work both near and at a distance (3-PS2-3 and 3-PS2-4)
- How magnetic attraction and repulsion can be used to solve every day problems (3-PS2-3, 3-PS2-4, 3-5-ETS1-1, 3-5-ETS1-2, 3-5-ETS1-3)

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

- Each force acts on one another and has both strength and direction
- Balanced and unbalanced forces can effect the motion of an object
- Cause and effect relationships exist with electric or magnetic interactions between two objects not in contact with each other
- Simple design problems can be solved by applying scientific ideas about magnets

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know...

- Mystery 1: Pushes and pulls can accomplish extraordinary things
- Mystery 2: Bridge design relies on force for stability and strength
- Mystery 3: Friction is a force and determines movement
- Mystery 4: Properties of magnets
- Mystery 5: Design a solution to a problem using magnets

Skills

Skills

Student will be skilled at ...

- Applying concepts of pushes and pulls to explain movement
- Designing a paper bridge for strength and stability utilizing their understanding of force
- Critiquing various friction material and how they will effect movement
- Analyzing the properties of magnets
- Engineering a solution to a problem using magnets and their properties

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

Mystery Science Online Program (See Attachment)

Mentor Texts:

- Forces and Motion - Sarah Angliss Level M Informational Text
- Push and Pull - Patricia Murphy Level G Informational Text
- Experiments with Forces and Motion with Toys and Everyday Things -Emily Sohn Level P Informational Text
- Move it! Motion, Forces and You - Adrienne Mason Level L Informational Text
- Many Ways to Move: A Look at Motion -Jennifer Boothroyd Level L Informational Text
- Pushing and Pulling -Natalie Hyde Level J Informational Text

- La Gravedad -Robin Nelson Level H Informational Text
- Magnets: Pulling Together and Pushing Apart -Natalie Rosinsky Level Q Informational Text
- A Look At Magnets-Barbara Alpert Level M Informational Text
- What makes a Magnet- Dr. Franklyn Branley Level L Informational Text
- What Can Magnets Do -Allan Fowler Level M Informational Text
- Magnet Max - Monica Hughes Level N Fiction
- Magnets Push, Magnets Pull -David Adler Level L Informational Text
- Mickey's Magnet -Franklyn Branley Level J Fiction

Formative Assessment Strategies

Formative Assessment Strategies

- Analysis of student work
- Strategic questioning
- Think-pair-share
- Teacher observation
- Admit/exit tickets
- Group discussion
- Grand conversations

Learning Activities/Unit of Study

Learning Activities/Unit of Study

Mystery Science Online Program Unit 3 Forces and Interactions

[Mystery 1: Forces](#)

[Mystery 2: Balances of Forces-Engineering](#)

[Mystery 3: Invisible Forces/Friction](#)

[Mystery 4: Magnetic Forces](#)

[Mystery 5: Magnets and Engineering](#)

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, Gifted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.