March Gr. 3: Unit 2:Forces and Motion

Content Area: **Science**
Course(s):
Time Period: **March**
Length: **5weeks**
Status: **Published**

Unit Overview

In this unit, students learn about forces, balanced and unbalanced, predict patterns of motion, and learn about magnetic and electric forces.

Enduring Understandings

Force can be balanced or unbalances when creating motion.

We can predict patterns of motiion.

Magnetic and electric forces also create patterns of motion.

Essential Questions

What is motion and what creates it?

How do forces interact with one another?

How can we predict the motion of an object by understanding patterns?

How does magnets and electric forces create motion?

Instructional Strategies & Learning Activities

TEACHERS: These units are linked directly to TCI Science Alive! NGSS teaching materials.

What Do Forces Do?

Students observe images and videos of moving objects, describing their position and motion. Then they identify the forces acting on the object and how these forces change the object's motion.

Reading Further: Fair Forces

- 2

What Happens When Forces Are Balanced or Unbalanced?

Students observe balanced and unbalanced forces through videos, a simulation, and an experimental set-up using spring scales and a pulley system.

Reading Further: "5, 4, 3, 2, 1 Lift Off!"

- 3

How Can You Predict Patterns of Motion?

Students work in groups to observe and measure patterns of motion. They use the patterns they observe to make predictions about future motion.

Reading Further: 'Round and 'Round They Go

- 4

What Can Magnetic Forces Do?

Students make electromagnets and investigate magnetic forces. Then they read and interpret a letter to identify engineering criteria and constraints and design a magnetic latch.

Reading Further: Floating Trains

- 5

What Can Electric Forces Do?

Students build electroscopes and then use them to investigate static electricity.

Reading Further: Electricity in Nature

Integration of Career Exploration, 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.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
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.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology and Design Integration

Students will interact with the SmartBoards, Chromebooks, and Document Camera.

	The technology developed for the human designed world can have unintended consequences for the environment. Technology must be continually developed and made more efficient to reduce the need for non-renewable resources.
8.2.5.ETW.1	Describe how resources such as material, energy, information, time, tools, people, and capital are used in products or systems.
8.2.5.ETW.4	Explain the impact that resources, such as energy and materials used to develop technology, have on the environment.
TECH.8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
TECH.8.1.5.A.2	Format a document using a word processing application to enhance text and include graphics, symbols and/or pictures.
TECH.8.1.5.A.4	Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data.
TECH.8.1.5.A.CS1	Understand and use technology systems
TECH.8.1.5.A.CS2	Select and use applications effectively and productively.
TECH.8.1.5.D.1	Understand the need for and use of copyrights.

TECH.8.1.5.D.CS1	Advocate and practice safe, legal, and responsible use of information and technology.
TECH.8.1.5.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.5.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.2.5.B.CS2	The effects of technology on the environment.
TECH.8.2.5.C.2	Explain how specifications and limitations can be used to direct a product's development.

Interdisciplinary Connections

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.RI.3.2	Determine the main idea of a text; recount the key details and explain how they support the main idea.
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.3.4	Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.
LA.RI.3.5	Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.
LA.RI.3.6	Distinguish their own point of view from that of the author of a text.
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.
LA.RI.3.9	Compare, contrast and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) the most important points and key details presented in two texts on the same topic.
LA.RI.3.10	By the end of the year, read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
LA.RF.3.3	Know and apply grade-level phonics and word analysis skills in decoding and encoding words.
LA.RF.3.4	Read with sufficient accuracy and fluency to support comprehension.
LA.W.3.1	Write opinion pieces on topics or texts, supporting a point of view with reasons.
LA.W.3.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
LA.W.3.4	With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
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.
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.L.3.1	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
LA.L.3.2	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
LA.L.3.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.

Differentiation

- Understand that gifted students, just like all students, come to school to learn and be challenged.
- Pre-assess your students. Find out their areas of strength as well as those areas you may need to address before students move on.
- Consider grouping gifted students together for at least part of the school day.
- Plan for differentiation. Consider pre-assessments, extension activities, and compacting the curriculum.
- Use phrases like "You've shown you don't need more practice" or "You need more practice" instead of words like "qualify" or "eligible" when referring to extension work.
- Encourage high-ability students to take on challenges. Because they're often used to getting good grades, gifted students may be risk averse.

- **Definitions of Differentiation Components**:

    - Content – the specific information that is to be taught in the lesson/unit/course of instruction.
    - Process – how the student will acquire the content information.
    - Product – how the student will demonstrate understanding of the content.
    - Learning Environment – the environment where learning is taking place including physical location and/or student grouping

Differentiation occurring in this unit:

Utilize differentiation suggestions in the TCI Science Alive! program for enrichment and support.

Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

Utilize 504 and IEP accommodations where required.

Formative Assessments

- Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

  Formative Assessments used in this unit:

- TCI worksheets, quizzes
- Questioning and Discussion
- Teacher observation
- Labs and Hands on activities
- Whiteboard Response
- Think-Pair Share
- Workbook pages
- Writing/Performance rubrics included in lesson

Summative Assessments

Summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Summative assessments for this unit:

Unit assessments in the TCI program

Performance Task

Instructional Materials

Materials for labs indicated in TCI program

Standards

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. Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all. Qualitative and conceptual, but not quantitative addition of forces, are used at this level. Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down. Planning and Carrying Out Investigations Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. 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.
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.)
3-5-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.
PS2.B	Types of Interactions Objects in contact exert forces on each other. Cause and Effect Cause and effect relationships are routinely identified.
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. Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw. Assessment does not include technical terms such as period and frequency. Planning and Carrying Out Investigations
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.

	Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
	Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.
PS2.A	Forces and Motion
	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.)
	Patterns
	Patterns of change can be used to make predictions.
PS2.B	Types of Interactions
	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.
	Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.
	Asking Questions and Defining Problems
	Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships.
	Define a simple problem that can be solved through the development of a new or improved object or tool.
PS2.B	Types of Interactions
	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.
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.
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-PS2-3	Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.