May 6E Gr.7: Straight Line Motion

Content Area: **Science**
Course(s):
Time Period: **May**
Length: **1 Weeks**
Status: **Published**

Unit Overview

From a moving car, things appear to move at different speeds than they do from a stationary point. Physicists call this relative motion. This concept will teach you about the basics of straight line motion.

Enduring Understandings

Lesson Objectives

By the end of the lesson, students should be able to:

- Describe the motion of an object in terms of its change in position over time compared to a reference point.
- Explain why motion can only be described in comparison to a reference point.
- Explain and demonstrate that changes in motion are due to unbalanced forces acting on an object.

Essential Questions

- **Overarching Question**
    - How can one explain and predict interactions between objects and within systems of objects?
- **Focus Question**
    - How can one predict an object's continued motion, changes in motion, or stability?
- **Lesson Questions**
    - What is speed?
    - What are velocity and acceleration?
    - When and why does the motion of an object change?
- **Can You Explain?**

- How could a change in straight line motion due to unbalanced forces be predicted from an understanding of inertia?

Instructional Strategies & Learning Activities

- The Five E Instructional Model

  Science Techbook follows the 5E instructional model. As you plan your lesson, the provided Model Lesson includes strategies for each of the 5Es.

- Engage (45–90 minutes)

  Students are presented with the phenomena of a car racing around a track and the forces affecting it. Students begin to formulate ideas around the Can You Explain? (CYE) question.

- Explore (90 minutes)

  Students investigate questions about straight line motion by using evidence from text and media assets. Students complete a Hands-On Activity to measure changes in the motion of a ball.

- Explain (45–90 minutes)

  Students construct scientific explanations to the CYE question by including evidence of how changes in straight line motion due to unbalanced forces can be predicted via an understanding of inertia.

- Elaborate with STEM (45–135 minutes)

  Students apply their understanding of straight line motion as they learn about calculations made by demolition engineers, design a racing event, investigate forces, and examine how parachutes work.

- Evaluate (45–90 minutes)

  Students are evaluated on the state science standards, as well as Standards in ELA/Literacy and Standards in Math standards, using Board Builder and the provided concept summative assessments.

Integration of Career Readiness, Life Literacies and Key Skills

Students will work in small groups or partnerships to conduct investigations, build models or prototypes and present findings.

Students explore different engineering careers.

9.2.8.CAP.1	Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.
9.2.8.CAP.2	Develop a plan that includes information about career areas of interest.
9.2.8.CAP.3	Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
9.2.8.CAP.4	Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
	Multiple solutions often exist to solve a problem.
9.4.8.DC.7	Collaborate within a digital community to create a digital artifact using strategies such as crowdsourcing or digital surveys.
	Digital technology and data can be leveraged by communities to address effects of climate change.
9.4.8.GCA.1	Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
9.4.8.IML.12	Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.
9.4.8.TL.3	Select appropriate tools to organize and present information digitally.

Technology And Design Integration

Technology is fully integrated using Discovery Techbook.

8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
8.2.8.ED.1	Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
8.2.8.ED.2	Identify the steps in the design process that could be used to solve a problem.
8.2.8.ED.3	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).

Interdisciplinary Connections

LA.RST.6-8	Reading Science and Technical Subjects
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RI.8.1	Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the

	text distinct from prior knowledge or opinions.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
LA.RI.8.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.
LA.RST.6-8.5	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
LA.RST.6-8.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
LA.RI.8.7	Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.
LA.RI.8.8	Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.
LA.RI.8.10	By the end of the year read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
MA.7.EE.A.2	Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
LA.W.8.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
MA.7.EE.B	Solve real-life and mathematical problems using numerical and algebraic expressions and equations.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
LA.WHST.6-8.1.A	Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
LA.W.8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
MA.6.EE.A.2	Write, read, and evaluate expressions in which letters stand for numbers.
MA.6.EE.A.2a	Write expressions that record operations with numbers and with letters standing for numbers.
LA.WHST.6-8.4	Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience.
LA.WHST.6-8.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
LA.WHST.6-8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
LA.WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused

	questions that allow for multiple avenues of exploration.
LA.WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.W.8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
LA.SL.8.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
LA.SL.8.4	Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.

Differentiation

Struggling Students

1. Using a three-column chart, ask students to compare and contrast velocity, speed, and acceleration.
2. Set up a table in the classroom with objects and an inclined plane where students can demonstrate motion and discuss the forces at work.

ELL

1. Use a toy car or other small object to have students demonstrate an object moving at a constant velocity, and an object that is accelerating.
2. Encourage students to demonstrate their understanding by drawing concepts. For example, they can create their own drawings of the forces acting on different objects in motion, using arrows in indicate the direction of the force.

Accelerated Students

1. Before they read the Core Interactive Text, have students use their previous knowledge of motion to describe all of the forces acting on a car that is coasting down a hill.
2. Challenge students to create different scenarios of objects that are changing in motion and to quiz their peers about which forces are causing the change.

Differentiation in science can be accomplished in several ways. Once you have given a pre-test to students, you know what information has already been mastered and what they still need to work on. Next, you design activities, discussions, lectures, and so on to teach information to students. The best way is to have two or three groups of students divided by ability level.

While you are instructing one group, the other groups are working on activities to further their knowledge of the concepts. For example, while you are helping one group learn the planet names in order, another group is researching climate, size, and distance from the moon of each planet. Then the groups switch, and you instruct the second group on another objective from the space unit. The first group practices writing the order of the planets and drawing a diagram of them.

Here are some ideas for the classroom when you are using differentiation in science:

- Create a tic-tac-toe board that lists different activities at different ability levels. When students aren't involved in direct instruction with you, they can work on activities from their tic-tac-toe board. These boards have nine squares, like a tic-tac-toe board; and each square lists an activity that corresponds with the science unit. For example, one solar system activity for advanced science students might be to create a power point presentation about eclipses. For beginning students, an activity might be to make a poster for one of the planets and include important data such as size, order from the sun, whether it has moons, and so on.

- Find websites on the current science unit that students can explore on their own.

- Allow students to work in small groups to create a project throughout the entire unit. For example, one group might create a solar system model to scale. Another group might write a play about the solar system. This is an activity these groups can work on while they are not working directly with you.

Differentiation in science gets students excited to learn because it challenges them to expand their knowledge and skills, instead of teaching the whole group concepts they have already mastered

Modifications & Accommodations

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

Modifications and Accommodations used in this unit:

In addition to differentiated instruction, IEP's and 504 accommocations will be utilized.

Benchmark Assessments

Benchmark Assessments are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Schoolwide Benchmark assessments:

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

Additional Benchmarks used in this unit:

Pre and post assessments to measure growth.

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:

Formative assessments as listed in unit.

See assessments located in links above.

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:

Summative assessments as listed in unit.

See assessments located in links above.

Instructional Materials

See materials located in links above.

Discovery Techbook

Teacher made materials

Additional labs are available through NJCTL on-line curriculum

Standards

6-8.MS-PS2-2.PS2.A	Forces and Motion
6-8.MS-PS2-2.PS2.A.2	All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.