June 6D. Gr.8: Friction

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

Unit Overview

Friction is the force that can produce heat and keep objects from sliding around. In this concept, you will learn about friction.

Enduring Understandings

Lesson Objectives

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

- Define friction and explain how it relates to kinetic energy and the transfer of energy between objects that are in contact with each other.
- Describe how friction can affect the motion of an object.

Essential Questions

- **Overarching Question**
    - How is energy transferred and conserved?
- **Focus Questions**
    - What is meant by “conservation of energy”?
    - How is energy transferred between objects or systems?
- **Lesson Questions**
    - How does friction relate to kinetic energy and the transfer of energy between objects that are in contact with each other?
    - How can friction affect the motion of an object?
- **Can You Explain?**

- What is a frictional force, and how does it affect the motion of an object?

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 phenomenon of friction as it relates to bicycle riders. Students begin to formulate ideas around the Can You Explain? (CYE) question.

- Explore (90 minutes)

  Students investigate questions about friction, its relationship to energy transfer, and how it affects the motion of an object. Students complete a Hands-On Activity to investigate kinetic friction.

- Explain (45–90 minutes)

  Students construct scientific explanations to the CYE question by including evidence of how friction affects the motion of an object.

- Elaborate with STEM (45–135 minutes)

  Students apply their understanding of friction as they learn about heat shields on rockets ships, model a thought experiment proposed by Galileo, and investigate various surfaces' friction levels.

- 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.

TECH.9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries. An individual's strengths, lifestyle goals, choices, and interests affect employment and income. Gathering and evaluating knowledge and information from a variety of sources, including

	global perspectives, fosters creativity and innovative thinking.
	Multiple solutions often exist to solve a problem.
WRK.9.2.8.CAP.3	Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
TECH.9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
TECH.9.4.8.CI	Creativity and Innovation
TECH.9.4.8.CT	Critical Thinking and Problem-solving
TECH.9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
	Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
WRK.9.2.8.CAP.2	Develop a plan that includes information about career areas of interest.
TECH.9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
WRK.9.2.8.CAP	Career Awareness and Planning

Technology and Design Integration

Technology is fully integrated using Discovery Techbook.

CS.6-8.8.1.8.DA.1	Organize and transform data collected using computational tools to make it usable for a specific purpose.
	People use digital devices and tools to automate the collection, use, and transformation of data. The manner in which data is collected and transformed is influenced by the type of digital device(s) available and the intended use of the data.

Interdisciplinary Connections

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.
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.W.8.1	Write arguments to support claims with clear reasons and relevant evidence.
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.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.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.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.

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.
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.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.8.F.A.3	Interpret the equation □ = □□ + □ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
MA.6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

Differentiation

Struggling Students

1. As students work through the concept, have them keep a list of examples of friction. For each example, help students identify the objects or materials that are rubbing together. Point out examples of friction that are helpful, such as the friction between tires and pavement.

ELL

1. Allow students to read the Spanish version of the Reading Passage "Tires on the Road." Students can then read the English version to enhance their understanding of the key vocabulary and terms in this concept.

Accelerated Students

1. Encourage students to explain why family cars have grooves in their tires and racecar tires are smooth and flat.
2. Challenge students to describe the effects of friction with air on racecar performance.

Additional Lesson Resources

- Computer Use by Students (PDF)
- Strategies for Teaching Students with Special Needs (PDF)
- Strategies for Teaching English Language Learners (PDF)
- Note-Taking Strategies for Students (PDF)
- Directed Inquiry vs Guided Inquiry (PDF)

- More Actions

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Live Chat

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.

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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:

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:

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

SCI.MS.PS3.B	Conservation of Energy and Energy Transfer
SCI.MS-PS3-5	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
SCI.MS.PS3.B	Conservation of Energy and Energy Transfer
	When the motion energy of an object changes, there is inevitably some other change in energy at the same time.
	Energy is spontaneously transferred out of hotter regions or objects and into colder ones.
SCI.MS-PS3-4	Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
6-8.MS-PS3-4.PS3.B	Conservation of Energy and Energy Transfer
6-8.MS-PS3-4.PS3.B.1	The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment.
6-8.MS-PS3-5	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.