MP3a-Energy and Motion

Content Area: **Science**
Course(s): **Science 4**
Time Period: **MP3-4**
Length: **MP3-4**
Status: **Published**

Essential Questions

- What are the various forms of energy?
- What is the difference between kinetic and potential energy and how does energy shift from kinetic to potential energy?
- What is the law of conservation of energy and what is force?
- How do they relate?
- How can energy be converted from one form to another?

Big Ideas

- Moving objects contain energy, the faster the object moves, the more energy it has.
- Energy can be moved from place to place by moving objects, or through sound, light, or electrical currents.
- Energy can be converted from one form to another form.
- Energy can be “produced”, “used”, or “released” by converting stored energy.
- When objects collide, contact forces transfer energy so as to change the object’s motion.

Cross-Curriculuar Integration

Integration Area: Math

4.NBT.B.6 Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

Activity:

Students calculate average speed using the algorithm of dividing distance by time.

Science and Engineering Practices

Planning and Carrying Out Investigations:

- 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.
- Make predictions about what would happen if a variable changes.
- Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success.

Science and Society

William Gilbert

Physician who developed and conducted experiments about electricity and magnetism

OpenEdSci

Objective:
Students will investigate how energy is transferred between objects during collisions and how contact forces, such as kicks, affect the motion and speed of objects in sports, while exploring the relationships between energy, motion, and shape changes.
Standards:

- 4-PS3-1
- 4-PS3-3

Activities:
Carry out our investigation of differently sized kicks. Read a book to learn how scientists use data displays to analyze and interpret data. Create graphs to analyze and interpret data from our kick investigation. Explain the changes in an object's motion in terms of energy transfer. Ask questions about collisions and energy. If we kick a ball with more force, the ball has more motion/speed. If we kick a ball with a large force then a large amount of energy is transferred. If we kick a ball with a small force then a small amount of energy is transferred.

CSDT Technology Integration

• 8.1.5.DA.3: Organize and present collected data visually to communicate insights gained from different views of the data.

• 8.1.5.DA.4: Organize and present climate change data visually to highlight relationships or support a claim.

Activity:

Students will complete an organizer where they research one type of energy. Students will work in groups to use their organizer to create a Google slide show about their type of energy. (Multiple students will have the same type of energy, and they can compare notes.) Students will present their slide shows to the class.

Activity:

Students will review forces and motion. Review what we've learned about forces and motion. Show students the Forces & Motion Review Website. Have them use their chromebooks to go on the site and explore forces and motion. Students can work in pairs or independently. Once they are done exploring the site, have students post a comment in Google Classroom about something they learned from this activity. Students can read their classmate's comments and post meaningful comments about their responses.

Enduring Understandings

Definitions of Energy

4-PS3.A The faster a given object is moving, the more energy it possesses.

4-PS3.A Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

Conservation of Energy and Energy Transfer

4-PS3.B Energy is present whenever there are moving objects, sound, light, or heat.

4-PS3.B When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.

4-PS3.B Light also transfers energy from place to place.

4-PS3-2 Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light.

4-PS3-4 The currents may have been produced to begin with by transforming the energy of motion into electrical energy.

Relationship between Energy and Forces

4-PS3.C When objects collide, the contact forces transfer energy so as to change the objects'

motions.

Energy in Chemical Processes and Everyday Life

4-PS3.D The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use.

Focus Areas

Knowledge

- Energy is an objects’ ability to do work.
- Energy can be kinetic or potential, and has many different forms.
- Energy shifts between kinetic and potential.
- Energy is not created or destroyed.
- Energy is transferred among its various forms.
- Force is a way that energy can be transferred.
- Producing energy refers to converting energy from one form to another so that it can be used for practical purposes.

Skills

- Predict how changes in speed affect an object’s energy.

Resources

Primary Resource

Pearson Interactive Science, 2016

- Chapter 1: Energy and Heat
- Chapter 2: Motion

Secondary Resources

Pearson Leveled Readers

- *Energy and Heat*
- *What is Light?*
- *Electricity’s Power*
- *Objects in Motion*
- *Learning About Motion*
- *Isaac Newton and Gravity*

Scientific Inquiry

Core

- Pendulum Lab
- Potential and Kinetic Energy Lab
- Heat Transfer Lab