Unit 2: Energy

Content Area: **Science**
Course(s): **Science - Grade 4**
Time Period: **8 weeks**
Length: **Weeks**
Status: **Published**

Unit Overview

Students design a ramp that will roll a ball a certain distance. Students use straws hanging from a zipline to model collisions. They ask testable questions about the energy of the straws, and then answer them using information from this investigation. Students make observations to identify how energy is transferred through heat, sound, or light. They use their knowledge of energy transfers to come up with solutions to various problems. Students use circuits to investigate how electric current transfers energy. Then they build and solve a puzzle using electric currents. Students act as engineers to design and build a lunchbox alarm. Students act as advisors to research and report on different energy resources for a power plant.

Transfer

Students will be able to independently use their learning to...

- use evidence (e.g., measurements, observations, patterns) to construct an explanation.
- 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.
- ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
- make observations to produce data to serve as the basis for evidence of a phenomenon or test a design solution.
- apply scientific ideas to solve design problems.
- energy can be transferred in various ways and between objects.
- cause and effect relationships are routinely identified and used to explain change.
- obtain and combine information from books and other reliable media to explain phenomena.

Meaning

Understandings

Students will understand that...

- energy and motion are related.
- energy is transferred by colliding objects in various ways.
- energy is transferred by sound, light and heat.
- energy is transferred by electric currents.
- there are various ways to store and use energy.
- people choose energy resources in multiple ways.

Essential Questions

Students will keep considering...

- How are energy and motion related?
- How is energy transferred by colliding objects?
- How is energy transferred by sound, light and heat?
- How is energy transferred by electric currents?
- How is energy stored and used?
- How do people choose energy resources?

Application of Knowledge and Skill

Students will know...

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- energy and motion are related.
- energy is transferred by colliding objects in various ways.
- energy is transferred by sound, light and heat.
- energy is transferred by electric currents.
- there are various ways to store and use energy.
- people choose energy resources in multiple ways.

Students will be skilled at...

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- use evidence (e.g., measurements, observations, patterns) to construct an explanation.
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- make observations to produce data to serve as the basis for evidence of a phenomenon or test a design solution.
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Academic Vocabulary

conserved

energy

transfer

collide

absorb

reflect

vibrate

electric current

electricity

motor

solar cell

efficient

natural resource

nonrenewable

resource

renewable

resource

Learning Goal 1 - Lesson 1

Use evidence to construct an explanation relating the speed of an object to the energy of that object.

- Use evidence to construct an explanation relating the speed of an object to the energy of that object.

SCI.4-PS3-1	Use evidence to construct an explanation relating the speed of an object to the energy of that object.

Target 1 - Lesson 1

Explain that moving objects have energy.

- Explain that moving objects have energy.

Target 2 - Lesson 1

Understand that factors such as weight and speed affect the amount of energy.

- Understand that factors such as weight and speed affect the amount of energy.

Target 3 - Lesson 1

Give evidence of how energy is gained, lost, and transferred.

- Give evidence of how energy is gained, lost, and transferred.

Target 4 - Lesson 1

Describe how an object that is not moving has energy.

- Describe how an object that is not moving has energy.

Target 5 - Lesson 1

Use an understanding of energy to make inferences about how energy is conserved.

- Use an understanding of energy to make inferences about how energy is conserved.

Learning Goal 2 - Lesson 2

Ask questions and predict outcomes about the changes in energy that occur when objects collide.

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SCI.4-PS3-3	Ask questions and predict outcomes about the changes in energy that occur when objects collide.

Target 1 - Lesson 2

Energy can be moved from place to place by moving objects or through sound, light, or electric current.

- Energy can be moved from place to place by moving objects or through sound, light, or electric current.

Target 2 - Lesson 2

When objects collide, energy can be transferred from one object to another, thereby changing their motion.

- When objects collide, energy can be transferred from one object to another, thereby changing their motion.

Target 3 - Lesson 2

Energy can be moved from place to place by moving objects or through sound, light, or electric current.

- Energy can be moved from place to place by moving objects or through sound, light, or electric current.

Target 4 - Lesson 2

Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.

- Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships

Learning Goal 3 - Lessons 3 & 4

Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

- Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

SCI.4-PS3-2	Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

Target 1 - Lessons 3 & 4

Energy can be moved from place to place by moving objects or through sound, light, or electric current.

- Energy can be moved from place to place by moving objects or through sound, light, or electric current.

Target 2 - Lesson 3

Energy is present whenever there are moving objects, sound, light, or heat.

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

Target 4 - Lesson 3

Energy can be transferred in various ways and between objects.

- Energy can be transferred in various ways and between objects.

Target 5 - Lesson 4

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.

- 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.

Target 6 - Lesson 4

Explain how electric currents can be used to produce motion.

- Explain how electric currents can be used to produce motion.

Target 7 - Lesson 4

Explain how electric currents can be used to produce sound, light, and heat.

- Explain how electric currents can be used to produce sound, light, and heat.

Learning Goal 4 - Lesson 5

Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

- Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

SCI.4-PS3-4	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

Target 1 - Lesson 5

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.

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

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

Target 2 - Lesson 5

Electrical energy can be transferred and stored in various ways and between objects.

- Electrical energy can be transferred and stored in various ways and between objects.

Target 3 - Lesson 5

Apply scientific ideas to solve design problems.

- Apply scientific ideas to solve design problems.

Learning Goal 5 - Lesson 6

Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the

environment.

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SCI.4-ESS3-1	Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Target 1 - Lesson 6

Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways.

- Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways.

Target 2 - Lesson 6

Discuss how some resources are renewable over time, and others are not.

- Some resources are renewable over time, and others are not.

Formative Assessment and Performance Opportunities

Interactive Notebook

Lesson Games

Quizzes

Written Assessments (can be modified)

Summative Assessment

Class Participation

Vocabulary Cards

Interactive Tutorial

Cooperative Groups

Centers

Investigations

Accommodations/Modifications

Support the Note Taking

Setup the Investigation Beforehand and Scaffold It

Simplify the Processing

Make the Reading Notes More Concrete

Conduct the First Investigation Together as a Class

Create Zipstraws Before Class

Scaffold the Investigation

Create a Word Wall

Make Connections to Home

Use a Simplified Universal Circuit Notation

Skip the 9V Battery

Support the Reading

Provide Criteria and Constraints

Simplify the Processing Assignment

Annotate the Handouts

Support the Presentations

Assign Energy Resources to Particular Groups

Reduce the Math

Unit Resources

TCI Website

TCI Material Kits

21st Century Life and Careers

CAEP.9.2.4.A.1	Identify reasons why people work, different types of work, and how work can help a person achieve personal and professional goals.
CAEP.9.2.4.A.2	Identify various life roles and civic and work - related activities in the school, home, and community.
CAEP.9.2.4.A.3	Investigate both traditional and nontraditional careers and relate information to personal likes and dislikes.
CAEP.9.2.4.A.4	Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

Interdisciplinary Connections

MA.K-12.2	Reason abstractly and quantitatively.
MA.4.OA.A.1	Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
MA.4.OA.A.3	Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
MA.K-12.4	Model with mathematics.
LA.RI.4.1	Refer to details and examples in a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
LA.RI.4.3	Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.
LA.RI.4.9	Integrate and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) information from two texts on the same topic in order to write or speak about the subject knowledgeably.
LA.W.4.2	Write informative/explanatory texts to examine a topic and convey ideas and information clearly.
LA.W.4.7	Conduct short research projects that build knowledge through investigation of different aspects of a topic.
LA.W.4.8	Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

LA.W.4.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.