

Fall 2022 Lesson Plan

Subject: Science

Topic: Energy

Umbrella Unit - Physical Science 4th Grade

District Power Goal:

NGSS Science Standards	Union Power Goal	I Can Statement
Energy	Applies scientific ideas to solve design problems. Uses evidence to construct an explanation. Obtains and combines information from books and other reliable media to explain phenomena. Asks questions that can be investigated and predicts reasonable outcomes based on patterns such as cause and effect relationships. Makes observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or to test a design solution.	*I can apply scientific ideas to solve design problems. *I can use evidence to construct an explanation. *I can obtain and combine information from books and other reliable media to explain phenomena. *I can ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. *I can make observations to produce data to serve as evidence to support my reasoning.

NGSS Standard: 4.PS3.4 -

Students who demonstrate understanding can:

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Constructing Explanations and Designing Solutions</p> <p>Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.</p> <ul style="list-style-type: none"> Apply scientific ideas to solve design problems. 	<p>PS3.B: Conservation of Energy and Energy Transfer</p> <ul style="list-style-type: none"> 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. <p>PS3.D: Energy in Chemical Processes and Everyday Life</p> <ul style="list-style-type: none"> The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use. <p>ETS1.A: Defining Engineering Problems</p> <ul style="list-style-type: none"> Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (secondary) 	<p>Energy and Matter</p> <ul style="list-style-type: none"> Energy can be transferred in various ways and between objects. <p>-----</p> <p>Connections to Engineering, Technology, and Applications of Science</p> <p>Influence of Engineering, Technology, and Science on Society and the Natural World</p> <ul style="list-style-type: none"> Engineers improve existing technologies or develop new ones. <p>-----</p> <p>Connections to Nature of Science</p> <p>Science is a Human Endeavor</p> <ul style="list-style-type: none"> Most scientists and engineers work in teams. Science affects everyday life.
<p>Connections to other DCIs in fourth grade: N/A</p> <p>Articulation of DCIs across grade-levels: K.ETS1.A ; 2.ETS1.B ; 5.PS3.D ; 5.LS1.C ; MS.PS3.A ; MS.PS3.B ; MS.ETS1.B ; MS.ETS1.C</p> <p>Common Core State Standards Connections:</p> <p><i>ELA/Literacy -</i></p> <p>W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-4)</p> <p>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. (4-PS3-4)</p> <p><i>Mathematics -</i></p> <p>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. (4-PS3-4)</p>		

* The performance expectations marked with an asterisk integrate traditional science content with engineering through a Practice or Disciplinary Core Idea.

The section entitled “Disciplinary Core Ideas” is reproduced verbatim from *A Framework for K-12 Science Education: Practices, Cross-Cutting Concepts, and Core Ideas*. Integrated and reprinted with permission from the National Academy of Sciences.

Above image is directly from www.nextgenscience.org

Classroom Profile:

In this class there are 12 students. There is a wide variety of socioeconomic backgrounds. Things to consider as part of lesson design are ADHD, ODD, Dyslexia, and other students who are reading below grade level.

Universal Accommodations: We often work around the room using clipboards and cushions for flexible seating. We take frequent movement breaks which include activities that cross the midline to encourage emotional regulation. Students will be offered a variety of sources of information to differentiate for reading and comprehension levels.

Levels of Inquiry - The levels of inquiry within the lesson will range from guided inquiry to semi-independent inquiry. This is due to the range of academic levels within the class as well as the experience of the students. These levels will be noted within the lesson layout.

Expected Outcomes:

	Does Not Meet	Approaching	Meets	Exceeds
I can apply scientific ideas to solve design problems.	Missing 2 or more steps in the learning process	Missing only 1 step in the learning process	Uses all steps in the learning process	Uses the learning process and engages in project redesign through in depth reflection
I can use evidence to construct an explanation.	Does not include explanation	Gives examples but not demonstration	shows examples of the four types of energy discussed	Describes all of 4 as well as how they apply in real world applications
I can obtain and combine information from books and other reliable media to explain phenomena.	Does not use sources	Uses 1 sources for information	Uses multiple types of sources for information	N/A
I can ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.	Does not develop essential question for their research	Has a essential question that is answered simply	Has essential question that leads to understanding of energy types	All of 3 and can explain their use in real world context
I can make observations to	Does not collect data	Collects insufficient data	Collects and organizes data	N/A

produce data to serve as evidence to support my reasoning.		to support reasoning	as well as using it to explain examples of energy from personal experiences	
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Brief Description of the project: I will introduce energy with a conversation as well as a group participation demonstration. This will lead students into a project based inquiry into what energy is and how it works in our every day lives. In the end students will give brief demonstrations of their observations, research and demonstrate their knowledge to our class before moving into other physical science topics.

Stage of Lesson	Description of this stage	Accommodations
Engage	<ul style="list-style-type: none"> - Before the lesson I will have students play with slinkies to see how they work and how to make them climb down stairs. I will also give students pop it toys that you turn inside out and set them down to see when they “pop” up. This will be a Discovery Learning exercise leading into the lesson. <p>What is Energy?</p> <ul style="list-style-type: none"> - Here I will ask this questions of students and have them share their thoughts and possibly misconceptions or incomplete knowledge of what energy is. ● Guided Inquiry 	<ul style="list-style-type: none"> - Flexible seating - Optional response
Explore	<p>I will give a brief demonstration of energy by throwing a kush ball to a student, spinning a fidget spinner and showing a slinky going down stairs made by our classroom place value cubes.</p> <ul style="list-style-type: none"> ● Guided Inquiry 	<ul style="list-style-type: none"> - Students can verbally process material - We will use the kush ball as a talking tool for clear expectations - A movement break will be included

		before the next section
Explain	<p>We will gather and read through the Energy types on the CK-12 website together</p> <ul style="list-style-type: none"> ● Teacher Directed Learning 	<ul style="list-style-type: none"> - Flexible seating - Guided notes pages - Material will be available for future access from Google Classroom
Elaborate	<p>Students will work independently or in groups, depending on skill level and other needs, to create a demonstration to the class of the four types of energy we discussed in the material on CK-12. They will also be asked to include how they have seen this in their own experiences (every student).</p> <ul style="list-style-type: none"> ● Guided Inquiry 	<ul style="list-style-type: none"> - Mixed ability grouping - Teacher check ins
Evaluate	<p>Student demonstrations will be followed up by a brief quiz done on booklet before moving onto the next topic.</p>	

Name _____ Lesson Title _____ Date _____

Lesson Objectives:

1.
2.
3.

Lesson Vocabulary

Key Term	Meaning	Example

Example Problem(s):

What I Learned:

Questions I Still Have:



What is Energy?

Have you ever wondered how a slingshot works or how the electric wires outside can cause the light bulbs in your house to light up? It all starts with Energy. In our explorations you will answer the following questions and report back to the class on what you have learned about energy.

- **What question could help you learn the most about energy?**
- **What different kinds of energy are you learning about and why are they important?**
- **Where could you learn more about energy?**
- **Can you give examples of the different kinds of energy?**
- **Can you demonstrate the different kinds of energy?**

Once you have answered these questions put your information to work by creating a demonstration with your team to teach the class what you have learned.

You will be asked to give a brief (5-15 minuet) presentation showcasing your work including the sources you used to find this information.