



Solar vs. Wind

Lesson 1: Introduction to Energy

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GRADE LEVELS: 7-8

LESSON DURATION: 1-2 days

SUBJECT AREAS: science, energy, energy transformation, electrical, chemical, nuclear, mechanical, magnetic, sound, kinetic, potential, motion, gravity, light

LESSON OVERVIEW: This lesson will introduce students to each of the different types of energy using PowerPoint slides, partner activities, and hands-on experiences with different kinds of energy including: batteries (chemical), electrical circuits (electrical), motors (motion), speakers (sound), vinegar and baking soda (chemical) and magnets (magnetic). Finally, students will examine how energy can be transformed from one kind to another.

OBJECTIVES:

- Students will be able to name and describe at least 5 kinds of energy
- Students will be able to identify and explain simple energy transformations

NEXT GENERATION SCIENCE STANDARDS:

MS-PS3-3 (Crosscutting Concept)

- The transfer of energy can be tracked as energy flows through a designed or natural system.

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.
- When the motion energy of an object changes, there is inevitably some other change in energy at the same time.
- Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).

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COMMON CORE STANDARDS:

CCSS.ELA-Literacy.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.

STUDENT BACKGROUND: This lesson assumes little to no prior knowledge of energy. While students often have some knowledge of different types of energy, they are often unable to explain how energy is transformed from one kind to another.

EDUCATOR BACKGROUND: It will be helpful if you feel comfortable with the different types of energy. Look over the “Types of Energy and Energy Transformation” PowerPoint to be familiar with the lesson.

KEY VOCABULARY:

- Light energy
- Heat/Thermal energy
- Electrical energy
- Kinetic energy
- Potential energy
- Chemical energy
- Gravitational energy
- Motion energy
- Nuclear energy
- Elastic energy
- Sound energy
- Solar module
- Circuit
- Battery

MATERIALS NEEDED:

- Computer access to show PowerPoint slides
- Student sheet #1: Introduction to Energy (one per student)
- Pack of Energy Transformation Cards (16 cards/pair of students in a Ziploc bag)
- “Transformation Stations” with **two** set-ups for each of the following:
 - **Station #1:** A small 1.5 V light bulb attached to a D-cell or AA battery with wires or alligator clips
 - **Station #2:** A magnet and a pile of paper clips (10 or 20 will work fine)
 - **Station #3:** A small electric motor attached to a battery with alligator clips
 - **Station #4:** A solar module (1 – 3 V size is ideal) attached to a small electric motor (you will need a strong 100 W clamp light shining on the solar module)
 - **Station #5:** Battery charger charging rechargeable batteries (or a cell phone)
 - **Station #6:** A paper cup with marbles and a cardboard tube (set up a cardboard tube from wrapping paper or paper towel on a stack of some books to create a slope. Use tape to keep the ramp in place – it doesn’t need to look good. Make sure there is a stop at the end of the ramp so marbles don’t fly off the table.)
 - **Station #7:** An electric heater plugged in – parabolic heaters are good
 - **Station #8:** An electric radio plugged in – specifically focus on the speaker!

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PREP:

1. Get computer and LCD/In-Focus Projector working to show PowerPoint slide presentation
2. Make copies of “Student Sheet #1: Introduction to Energy”
3. Gather the materials above for the “Transformation Stations” and create two different set-ups of each of station around the room.
4. Cut up “Energy Transformation Cards” cards (there are 16 cards total) and place them in small Ziploc sandwich bags (1 sandwich bag of 16 cards per pair of students)

LESSON 1:

Opening (10 minutes)

- Hand out “Student Sheet #1: Introduction to Energy”
- Think/Write: Ask students to write down as many kinds of energy as they can for Part 1 of “Student Sheet #1: Introduction to Energy”.
- Share: Have students share with their “elbow partner” the list that they came up with and where each energy type can be found.
- Class Share: Call on one person from each group to share at least two kinds of energy and write them on the board.

PowerPoint (10 minutes)

- Show “Types of Energy and Energy Transformation” PowerPoint. Have students fill in Part 2 of their “Student Sheet #1” using the PowerPoint to help them. They should label each of the examples shown with the correct type of energy.

Energy Transformation Cards (7 minutes)

- Hand out Ziploc bags of 16 energy cards to each pair of students
- Have students work in groups of two to match up the energy picture cards with the corresponding text cards to describe how energy is changing (or being transformed from one kind to another) in each of the situations shown. Have students write down their answers in Part 3 of “Student Sheet #1: Introduction to Energy”.
- Class Share (optional): Call on one person from each group to share at least one of their cards with the class and explain the energy transformations present.

Energy Activity (30 – 40 minutes)

- Explain: Share with students that they will rotating in groups of 4 students from station to station in numerical order, but that they will be working in pairs (because each station has two set-ups). Tell them they will be recording simple observations. Then, tell

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students they will be writing the energy transformations (For example, in station #1: Chemical → Light)

- When most students are finished, go over final column as a class so students can “self check” their identifications. If you have students take detailed observations, and then debrief with students, this takes up much of a 45-minute period.

ADDITIONAL RESOURCES:

Energy Transformation Simulation:

http://www.glencoe.com/sites/common_assets/science/virtual_labs/E04/E04.html

Phet Energy Transformation Simulation:

<http://phet.colorado.edu/en/simulation/energy-forms-and-changes>

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