

Solar Boats

Lesson 2: What is Energy Transfer?

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DESCRIPTION: Students will continue to build an understanding of the fundamentals of energy through observing and describing a variety of energy transformations and build on their foundational vocabulary for identifying and discussing energy concepts. In this stage of the lesson, students will engage more with examples of electrical energy, both stored and kinetic in order to build their understanding of energy fundamentals concepts. This will allow them to gain a stronger sense of unseen forms of energy. At this point, students should be ready to be assessed on their understanding of concepts using the both the informal and formal assessments that are provided at the end of this lesson.

GRADE LEVEL(S): 4, 5, 6

SUBJECT AREA(S): Science, energy, potential energy, kinetic energy, energy sources, renewable energy, circuits, energy transfer, energy transformation

ACTIVITY LENGTH: 2.5 hours

LEARNING GOAL(S):

Students will obtain the foundational knowledge of energy sources and forms of energy. In addition, students will learn that energy can transfer from one form to another. Students will be able to match images of energy transformations to their respected vocabulary.

NEXT GENERATION SCIENCE STANDARDS:

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

STUDENT BACKGROUND:

Students have a basic introduction to energy and energy transfer. This lesson is intended to build from Lesson 1 "What is Energy?"

Materials List (30-person class)

- (30) Energy Transfer Activity Sheets
- (1) "Types of Energy and Energy Transformation II" PowerPoint
- (1) Flashlight with light bulbs

- (1) Crank generator attached to LED
- (1) Motor attached to battery
- (1) Solar Module attached to LED (note: you probably want a 2V module with a red or green LED if you want it to light up in sunlight or with a shop light)
- (1) Battery charger with rechargeable batteries
- (1) Marble
- (1) Cardboard tube
- (1) Electric Heater
- (1) Electric Radio
- (1) Circuit with battery attached to light bulb
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Lesson Details

Prep (30-person class)

1) Print out Energy Transfer Activity Sheets (Last Page can be removed/used as assessment)

2) Set up nine (9) stations for students to experience energy transfer and transformation (~3 people per station, rotating every ~5 minutes)

- **Station 1: Electric & Light Energy** Light bulb in a flashlight. When the flashlight is turned on, this represents a transformation from electric energy to light (and thermal) energy.
- Station 2: Motion & Electric Energy Crank generator attached to LED. When student inputs motion energy (by turning crank), this is transformed into electric energy, which is transformed into light energy.
- Station 3: Electric & Motion Energy Motor attached to battery. When the motor is attached to the battery, the potential electric energy is transformed into electrical kinetic energy and then to kinetic motion of the motor.
- Station 4: Light & Light Energy Solar module attached to LED. Light energy from the sun is transferred to the solar module, which transforms it into electrical energy, which is then transformed into light energy at the LED.
- **Station 5: Electric & Electric Energy** Battery charger charging a battery. Electric kinetic energy is transferred into the battery, being transformed into electric potential energy.
- Station 6: Potential & Kinetic Gravitational Energy Marble rolling down paper tube. Potential energy due to the force of gravity is transformed into kinetic energy as ball rolls down tube.
- **Station 7: Electric & Thermal Energy:** Electric heater plugged in. Kinetic electrical energy is transformed into thermal energy.
- **Station 8: Electric & Sound Energy:** Speaker in electric radio. Kinetic electrical energy is transformed into sound energy at the speaker.

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BONNEVILLE 240 SW 1st Avenue ENVIRONMENTAL Portland 0R 97204 FOUNDATION 503-248-1905 www.b-e-f.org • Station 9: Electric & Light Energy – Circuit with battery attached to light bulb. Same as station 1, but more visible. When the circuit is closed, this represents a transformation from electric energy to light (and thermal) energy.

Activity – Intro and Stations

- Pass out energy transfer activity sheets
- Review focus question from Lesson 1 (Focus Question: **What is Energy?**) Have students fill in Part 1 of handout to assess amount retained from previous lesson.
- Have students quick-write in journals. Focus Question: What is Energy Transformation?
- Show PowerPoint "Types of Energy Transformations II"
- Then, continue with energy transfer activity sheets: Have students rotate through all nine stations, taking notes on sheet provided.
- Once rotations are completed and students have completed the first 3 pages of activity sheet, you may want to assess.
 - Informal Assessment Energy Transformation Card Game
 - Formal Assessment Last page of student activity worksheet

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