



Energy Efficiency Team Activity Book Teacher's Guide

This activity book can be used as a follow-up to or in conjunction with a lesson about energy conservation. The goal of the activity book is to teach students in grades 2 - 5 simple ways to conserve energy and to be energy efficient. It can be utilized in a classroom, with small groups of students or by students individually.

ACTIVITY BOOK OBJECTIVES

- Students will learn the difference between compact fluorescent light bulbs and incandescent light bulbs.
- Students will understand that electricity is made from many different sources.
- Students will learn about the process of delivering electricity from a power plant to homes.
- Students will learn simple, kid-friendly ways to conserve energy and be energy efficient.

REQUIRED MATERIALS

- Crayons, markers, or colored pencils, pencil or pen

ACTIVITY BOOK CONTACT

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ACTIVITY BOOK SECTIONS

SECTION 1: COMPACT FLOURESCENT LIGHT (CFL) BULBS VS. INCANDESCENT BULBS (PAGES 1 - 2)

PAGE 1: INTRODUCTION TO THE TEAM

Background Information

The PUCN's resident team of superheroes, Super Light, Kilowatt and Natalie Gas, otherwise known as the Energy Efficiency Team, will teach Nevada's kids how to be energy efficient and conserve energy through 16 pages of crossword puzzles, word finds and other fun activities.

Main Ideas/Student Work

- Ask the students to read the text and thought bubbles on page 1 and to color the superheroes. Instruct the students to pay attention while completing the activity book so that Energy Burner, the team's arch enemy, doesn't lead kids astray with his wasteful ways!

PAGE 2: INCANDESCENT VS. CFL BULBS

Background Information

The basic design of incandescent light bulbs has not changed much since they were invented by Thomas Edison in 1879. Incandescent bulbs create light by passing electricity through a metal wire, called a filament, until it becomes so hot that it glows. These bulbs are very inefficient, converting only 10% of the electricity consumed into visible light. The remaining 90% of the electricity is actually released as heat!

Compact fluorescent light bulbs can create the same amount of light as incandescent bulbs using only one-quarter of the energy and heat. CFLs use different technology to produce light. In a CFL, instead of electricity running through a simple wire (as in incandescent bulbs), electricity passes through a glass coated tube. The current excites gases inside the tubing, causing a reaction that produces light.

(Source: U.S. DOE, "Energy Star Qualified Light Bulbs, 2009 Partner Resource Guide." http://www.energystar.gov/ia/products/downloads/CFL_PRG.pdf?a108-2924)

Main Ideas/Student Work

- Incandescent light bulbs waste a lot of energy based on the way they utilize electricity to produce light. CFLs are a better choice because they use less energy and last longer than incandescent bulbs. Ask the students to read the text and to complete the connect-the-dot drawing. Ask the students why a CFL is more efficient than an incandescent bulb. Are they able to identify reasons listed on page 2?

SECTION 2: WHAT ELECTRICITY IS MADE FROM, HOW IT IS DELIVERED FROM THE POWER PLANT TO OUR HOMES, AND HOW IT IS MEASURED (PAGES 3 - 7)

PAGES 3 - 5: HOW ELECTRICITY GETS TO OUR HOMES

Background Information

Electricity is made at a power plant. Power plants use a fuel source (biomass, geothermal, coal, oil, natural gas, nuclear, hydro, wind, or solar) to heat water into steam, which turns the blades of a turbine. The turbine spins magnets inside a generator, producing electricity.

Electricity travels through a grid of wires, including transmission lines (which carry high-voltage electricity over long distances) and distribution lines (which carry lower-voltage electricity for use in homes and businesses). Distribution lines run overhead or underground. Transformers change electricity's voltage and are found in substations, on power poles, or in large metal boxes on the ground, called pad-mounted transformers. From distribution lines, electricity enters buildings and flows through wires in the walls that lead to lights and electrical outlets.

(Source: NV Energy, "Stay Safe Around Electricity Teacher Guide." http://www.e-smartonline.net/nvenergy/teachers/pdfs/Stay_Safe_elec_T_Guide.pdf.)



The Public Utilities Commission of Nevada ("PUCN") is a state agency that regulates public utilities engaged in electric, natural gas, telephone, water and wastewater services; geothermal facilities; gas and electric "master meter" service at mobile home parks; and some propane systems. The PUCN also inspects Nevada's railways for safety and monitors gas pipelines across the state.

Main Ideas/Student Work

- Page 3: Electricity does not occur naturally. It has to be made. Have the students read the text from both Energy Burner and Natalie Gas. Call upon individual students to read the definitions for the the various sources of electricity from the glossary at the back of the book. Ask the students to complete the word find. Ask students to close their activity books. Then ask them to identify sources of electricity (i.e. solar, petroleum, etc). Are they able to name all the sources listed on page 3?
- Page 4: The production of electricity at a power plant and the delivery of electricity to our homes is a process that often spans many miles of transmission and distribution lines. Ask the students to read the text and color in the images on this page.
- Page 5: Ask the students to complete the worksheet. They may use the electricity diagram on page 4 for help completing the worksheet. Go over the answers as a class. Ask the students to describe the process of moving electricity from a plant to a home. Are they able to adequately describe the process?

PAGE 6: HOW ELECTRICITY IS MEASURED

Background Information

An analogy to explain how amps, volts and watts relate to each other is that of the garden hose. The water pressure in the hose is like the voltage, the amp value is like the volume of water flowing through the hose, and the wattage is the total amount of water that comes out of the hose per unit of time.

Electrical consumption is measured in watts, or watt-hours, and this is the basis on which a power company bills a customer for electrical usage. For convenience, power companies measure consumption with a unit called a kilowatt-hour (kWh), which is the equivalent of using 1,000 watts of power for one hour.

(Source: WiseGEEK, "What is the Difference Between an Amp, Volt, and Watt?" <http://www.wisegeek.org/what-is-the-difference-between-an-amp-volt-and-watt.htm>)

The average Southern Nevada household consumes 1,147 kWh of electricity monthly. The current general rate charged for electricity per kWh in Southern Nevada, as of January 1, 2013, is \$0.13, which would lead to a \$149 ($\$0.13 \times 1,147$) energy consumption charge on this household's electricity bill.

The average Northern Nevada household consumes 745 kilowatt hours per month of electricity. The current general rate charged for electricity per kilowatt hour in Northern Nevada, as of July 1, 2009, is \$0.06207, which would lead to a \$46.24 ($\0.06207×745) energy consumption charge on this household's electricity bill.

PAGE 7: ENERGY BURNER MAZE

Main Ideas/Student Work

- This page is a simple, fun activity for the kids.

SECTION 3: ENERGY EFFICIENCY AND CONSERVATION STEPS FOR KIDS (PAGES 8 - 11)

PAGES 8 - 11: ENERGY CONSERVATION & EFFICIENCY

Background Information

All of us use energy every day - for transportation, cooking, heating and cooling rooms, manufacturing, lighting, and entertainment. The choices we make about how we use energy – turning machines off when we're not using them or choosing to buy energy efficient appliances – impact our environment and our lives. The terms energy conservation and energy efficiency have two distinct definitions. There are many things we can do to use less energy (conservation) and use it more wisely (efficiency).

Energy conservation is any behavior that results in the use of less energy. Turning the lights off when you leave the room and recycling aluminum cans are both ways of conserving energy.

Energy efficiency is the use of technology that requires less energy to perform the same function. A CFL light bulb that uses less energy than an incandescent bulb to produce the same amount of light is an example of energy efficiency. However, the decision to replace an incandescent light bulb with a compact fluorescent is an act of energy conservation.

(Source: U.S. Energy Information Administration, Energy Kids: Using and Saving Energy. http://www.eia.gov/kids/energy.cfm?page=about_energy_efficiency-basics)

Main Ideas/Student Work

- Page 8: Simple steps can help conserve energy and lower energy bills. Students will learn simple, kid-friendly energy efficiency and conservation steps by completing the crossword puzzle.
- Page 9: Super Light has a secret message for the kids that will reinforce the importance of being energy efficient and conserving.
- Page 10: To reinforce lessons learned on page 8, ask the students to circle examples of energy waste as depicted in the illustration of a typical home on page 10.
- Page 11: Give the students a few minutes to write down examples of how they can save energy in their homes, or maybe even their schools. Have the students share their ideas with the class. This page could also be used a pre and post test.

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