



Title: Energy Efficiency – Choosing the Best Light Bulb for the Environment

Grades: 4

Subjects: Science, Math, Language Arts

Time: 50 minutes

Objective

- Identify and describe how an individual's action in regards to using energy efficiently is a form of waste management and can affect change and improve the environment.
- Add, subtract, multiply and divide whole numbers.
- Organize, interpret and analyze data using a variety of graphic representations, and draw logical conclusions.

Standards

Technology Standard 3: Understand the relationship among science, technology, society and the individual.

- Benchmark # 1: Know that technologies often have costs as well as benefits (e.g., as new technologies are developed, man's need for energy increases, resources are used and more pollution/waste is created) and this can have an enormous effect on people and other living things.
- Benchmark # 4: Know that new inventions reflect people's needs and wants, and when these change, technology changes to reflect the new needs and wants (e.g., upgrades to new energy using devices require more and more energy usage).
- Benchmark # 5: Understand that technology may affect the environment both negatively and positively (e.g., renewable energy, such as wind and waterpower, create cleaner energy, but may effect wildlife populations in areas where they are used).

Science Standard 9: Understand the sources and properties of energy.

- Benchmark #1: Know that heat is often produced when one form of energy is converted to another form.

Mathematics Standard 3: Uses basic and advanced procedures while performing the processes of computation.

- Benchmark # 1: Multiply and divide whole numbers.
- Benchmark # 5: Solve real world problems involving number operations.

Language Arts Standard 8: Use listening and speaking strategies for different purposes.

- Benchmark # 3: Respond to questions and comments (e.g., gives reasons in support of opinions).
Benchmark # 5: Use strategies to convey a clear main point when speaking (e.g., express ideas in a logical manner, use specific vocabulary to present information).

Materials

- 2 Lamps
- Compact fluorescent light bulb
- Incandescent light bulb
- Paper and pencils
- Copy of the book: "Why Should I Save Energy?" by Jen Green

Overview: Demand for energy has increased considerably in the past hundred years. Energy is used to power our electrical devices, to heat our homes and businesses and to fuel most forms of transportation. In using energy we consume valuable natural resources and create waste products that have an affect on the environment. Since it is highly unlikely the need for energy will decrease in the future, it is vitally



important that we learn to use energy wisely, reducing not only the amount we consume, but also the amount of solid waste we create from its consumption.

While energy conservation is an important concept for students to understand, energy efficiency is also a factor that needs to be addressed. Energy efficiency is the use of technology that requires less energy to perform the same function. For example, a compact fluorescent light bulb uses less energy than an incandescent bulb to produce the same amount of light.

Kid's Speak: We use more and more energy each and every day. We use it to make electricity, heat and fuel. It powers our laptops and TVs, gives us hot water and warm, comfy spaces, and helps transport us from place to place. It is very important that we learn not to waste the energy we use in our everyday lives, and to use it in an efficient manner.

Eco-Fact: Compact fluorescent light bulbs not only last longer, they are more energy efficient than incandescent bulbs.

Procedures:

Before Conducting the Lesson:

- Read the story, "Why Should I Save Energy?" by Jen Green aloud to students.
- Review the concept of Energy Conservation. Energy conservation is any behavior that results in the use of less energy.
- Introduce the concept of energy efficiency. Energy efficiency is the use of technology that requires less energy to perform the same function. A compact fluorescent light bulb that uses less energy than an incandescent bulb to produce the same amount of light is an example of energy efficiency. Replacing an incandescent light bulb with a compact fluorescent is an act of energy conservation.
- Display both lamps, one with an incandescent bulb and the other with the compact fluorescent light bulb. Turn on the lamps and compare the light quality of the two bulbs. Label each lamp with type of light bulb it is using. Compare incandescent light bulbs to compact fluorescent light bulbs.
- Create a list of ways CFLs are different from incandescent light bulbs. Include the following facts. CFLs:
 - Minimize the amount of waste produced, and are cost effective because they last five to eight times longer
 - Use 25% less energy than incandescent bulbs
 - Produce less heat, which reduces the need for cooling costs
 - Reach high energy efficiency standards
 - Range in cost from \$4.00 to \$15.00 per bulb
 - Contain small amounts of mercury
 - Do not function well in hot or wet environments
 - Do not produce light instantly
 - Need to be properly recycled and should not be thrown in the trash
- Have students take an inventory of their homes, counting the number of each kind of light bulb they have.

Conducting the Lesson:

- Introduce the students to the chart provided. Explain to students that this chart shows the number of hours that each type of light bulb is expected to burn.

Type of Bulb	Hours of Light
Incandescent	1,000
CFL	10,000

- Ask the students to use the information provided in the chart to determine how many days you could operate the lamp using an incandescent light bulb if the lamp was on for eight hours a day. Then find out how many times a year they would need to change the light bulb if they wanted to use the lamp every day. Using their home inventory of light bulbs have them find how many light bulbs they would need each year if they wanted to operate each light source eight hours a day.
- Then have students find the same information for a CFL bulb. Compare the results for the two bulbs.
- Have students use the information from their home inventory of light bulbs to find how many hours of light they currently have with the light bulbs in place and how that would differ if they were to change to all CFL bulbs. For students that currently have all CFL bulbs in place at home, have them find difference if they had only incandescent bulbs.
- Based on their findings, ask the students which light bulb they would choose if they were trying to conserve energy and waste. Students should be able to justify their response based on the comparison on the two types of bulbs.

After Conducting the Lesson:

- Have students review the list of differences between CFL bulbs and incandescent bulbs. Have students use the information provided in the list to create a T chart identifying the pros and cons of using CFL bulbs.
- Have students develop a position statement on their preference in light bulbs and justify this position used the information from the lessons activity and the T chart.

Adaptations: The teacher could model the above activity using a personal inventory of light bulbs.

Extensions:

- Students can research the Centennial Light Bulb, the oldest operating light bulb in the United States. The centennial light bulb has been burning consistently for 108 years, 24 hours a day in a firehouse.
- Students can research how and where to recycle CFL light bulbs in their community.