

Comparing Light Bulbs

Grades: K-4, 5-8

Topic: Energy Efficiency and Conservation

Owner: U.S. Environmental Protection Agency



Comparing Light Bulbs

This activity is based on the “Comparing Light Bulbs” activity produced by the National Energy Education Development (NEED) Project. For information about NEED’s materials, go to www.NEED.org.

Grade Levels: K-5

Brief Description:

Too many greenhouse gas emissions are collecting in our earth’s atmosphere and are causing our climate to change. People at any age can help by using less energy. In this exercise, students will use a light to demonstrate the difference between being energy-efficient and energy-wasteful, and learn what energy efficiency means. After the lesson, they should be able to discuss the following:

- How does using less energy help our environment?
- Do compact fluorescent light bulbs and standard light bulbs create the same amount of light?
- How do you know if one light bulb is more efficient than another light bulb?
- What is one way we can save energy at home?
- Brainstorm: What are other ways we can save energy?

Background:

We have all heard about global climate change and know that it is a challenge facing our world. Most people don’t know that the average home is responsible for twice as many greenhouse gas emissions as the average car. Most of the electricity we use at home comes from burning fossil fuels like coal and oil, which releases greenhouse gas emissions into our earth’s atmosphere. What this means is that we can each play a role in reducing these emissions by using energy more efficiently.

One of the easiest ways to learn about energy efficiency and put it into practice at home is through the light bulb. The most common light bulb today is the incandescent light bulb invented by Thomas Edison 125 years ago. However, new compact fluorescent light bulbs (CFLs) use 1/3 the energy and last as much as 10 times longer. In fact, only 10% of the electricity used by an incandescent bulb is used for light, and the other 90% escapes as heat. CFLs create the same amount of light, but generate a lot less heat – about 70 percent less. CFLs are more energy-efficient than incandescent lights because fluorescent technology does not use a metal filament to create light, but instead use gases that require less electricity to create the same amount of light. Every CFL can prevent nearly 500 pounds of greenhouse gas emissions over its lifetime. To save the most energy and do the most good for the environment, it is best to use CFLs in frequently used areas of the home.

Possible Hypotheses:

- Incandescent and CFL bulbs do/do not produce the same amount of heat.
- Incandescent and CFL bulbs do/do not produce the same amount of light.
- One bulb is/is not more energy efficient than the other.

Materials:

- One incandescent and one CFL bulb that produce equivalent lumens (light levels). For example, a 60 watt incandescent bulb and a 13 watt CFL will generally produce equivalent light levels. Choose an ENERGY STAR qualified CFL.
- Thermometer
- Lamp, or watt meter comparator (if available)



Procedure:

1. Have an adult place the CFL bulb in the lamp and turn it on. Observe the light that is produced. (Or, place the CFL bulb and incandescent in a watt meter comparator, in order to switch back and forth between the bulbs and show the meter speed up and slow down).
2. Hold a thermometer six inches above the bulb for one minute and record the temperature. Turn off the lamp and let the bulb cool.
3. Have an adult remove the CFL bulb, place the incandescent bulb in the lamp and turn it on. Observe the light that is produced.
4. Hold a thermometer six inches above the bulb for one minute and record the temperature.

Analysis and Conclusion:

- Could you tell any difference in how much light the two bulbs produced?
- Did one bulb produce more heat than the other?
- Which bulb is more energy efficient?
- Which bulb will prevent more greenhouse gas emissions in our air?

Extension Activities:

Using Math

Demonstrate to the class how to compute the actual electricity consumption of the two bulbs for varying time periods of use; have the students approximate how long they leave lights on (i.e. one hour of use, how many times a week, how much over the year). Compare the amount of electricity used for the two bulbs for similar amounts of time (have students do this if this is appropriate). Compare the cost of the two bulbs based on the electricity consumed. Compare the amount of greenhouse gases produced based on the electricity consumed.

Electricity used (kWh) = hours of use x (wattage of bulb divided by 1000)

Cost = kWh x electric rate

Greenhouse Gas Emissions (pounds of pollution) = kWh x 1.58 pounds/kWh

Using Language Arts

Have the students discuss the benefits of using more energy efficient bulbs (i.e. saves money, saves time replacing bulbs, helps protect the environment by reducing fossil fuel emissions). Brainstorm about why it is important for them to do their part in helping to improve the environment. Talk about how energy is used in their homes and schools and help them identify other ways that energy is being wasted. Have the students draw a picture or write a short story about the importance of individuals in bringing about larger social changes and illustrate the difference that something as simple as changing a light can make when we all do our part.