



Activity Two: Energy Down the Drain

To fully understand why they're participating in the Junior Energy campaign, students need to understand that compact fluorescent bulbs use less energy than standard bulbs. But younger students are only just beginning to develop an understanding of how energy works. This activity will help them build that understanding by using a simple demonstration to help illustrate the differences between how standard light bulbs and CFLs use energy. You'll also discuss what it means to waste energy, and ways we can save energy.

OBJECTIVES:

After participating in this activity, students will be able to:

- explain that both standard light bulbs and CFLs use electricity to operate
- explain that CFLs use less electricity than standard bulbs
- give examples of ways we can save energy

TIME: One hour

MATERIALS:

Two paper cups

Permanent marker

One copy of "Demonstration Cutouts"

Tape

Two graduated cylinders, about two to three times the size of the paper cups (note: if you don't have access to graduated cylinders, large cups or small pitchers also will work, but you won't be able to measure the liquid)

Dark-colored juice, such as grape juice

Optional: If you'd like, the students can drink the juice you use in the simulation when the activity is done; in that case, you'll need enough juice and paper cups for all the students.



GETTING READY:

This activity involves a simulation that is best conducted over a sink where all the students can see what's happening. If that's not possible in your space, you can also conduct the activity outside in the grass.

Use the tip of a pen or pencil to poke a small hole in the bottom of one of the paper cups. In the other cup, poke four holes that are about the same size as the hole you made in the first cup. Read through the activity to understand how the simulation will work, and test it out once yourself using water to be sure your holes are not too big or too small and that your cylinders are the appropriate size.

THE ACTIVITY :

Set out and turn on a battery-operated toy. Ask the students what's making it work. (If you completed Activity One, "Energy Matching," set out the same battery-operated toy that you used to begin that activity and quickly review that batteries are giving the toy energy to work.)

Ask the students what would happen if you didn't turn the toy off. Explain that batteries are giving the toy the energy it needs to work, but that eventually the batteries will run out of energy and the toy will stop working. Have the students ever had a toy that ran out of batteries? Have they ever been told by their parents or others not to "waste" the batteries by leaving a toy on when they're not playing with it?

Remind the students that there are other ways that the things around us get energy to work, including gasoline and electricity. Ask the students if they can think of ways that we sometimes waste gasoline or electricity. (Help students think of other things that use energy that we sometimes leave on even if we're not using them, such as leaving a car running while we run an errand or leaving a light on when we leave a room.)

These are all ways that we sometimes waste energy by leaving things on when we're not using them. We have to pay for the energy to make them work, even though we're not using them.

But, explain that this isn't the only way that we can waste energy. Sometimes, energy can be wasted because of the way something works. Explain that you'll demonstrate how two similar things can use different amounts of energy using two cups.

Ask the students to imagine that the two cups represent light bulbs. One is a standard light bulb like the ones many of us have around the house. Tape the picture of the standard bulb to the cup with four holes in the bottom. Explain that the other cup represents a newer kind of light bulb, called a compact fluorescent bulb, or CFL. Tape the picture of the CFL to the cup with one hole.

Next, ask the students how most light bulbs around their homes or in the school get energy. (Electricity.) Tell the students that the juice represents electricity. Tape the picture of the cord and outlet to the juice. Then, draw a line around each of the cups representing the light bulbs about



two-thirds of the way up the cups, and explain that the line represents the amount of electricity that's needed to make the light bulb turn on and make light.

Explain that you're going to compare which bulb uses more electricity. Pour equal amounts of juice into each of the graduated cylinders. Note the beginning level of juice in the cylinders on the board.

Ask for four volunteers to help you see what happens when these two bulbs are "turned on" for one minute. (Two volunteers will hold the cups and two will hold the cylinders and pour the juice.) Tell your volunteers that they'll need to pour the juice into the cup up to the line. When the juice reaches the line, the light bulbs can produce light. If the juice falls below the line, they should pour in more juice so that the light bulb will stay "on."

Begin timing and ask the students to keep the light bulbs shining by keeping the juice filled up to the line. When the time is up, have students stop pouring. Ask the students to compare the amount of electricity the two bulbs used by comparing the amount of juice left in the two cylinders. Which one appears to have used more? Find out exactly how much each used by subtracting the amount left in the cylinder from the amount in the cylinder when the simulation began. What are the two numbers? Which used more electricity?

Ask the students why the standard bulb used so much more electricity. Where did all that electricity go? The students probably noticed that a lot of juice was running out of the bottom of the standard-bulb cup so that the cup constantly needed more juice to stay filled up. The CFL cup, on the other hand, didn't lose as much juice.

Explain that standard bulbs and CFLs produce the same amount of light, but they work differently. The way that CFL bulbs work requires much less energy. Standard bulbs, on the other hand, waste a lot of energy because of the way they work.

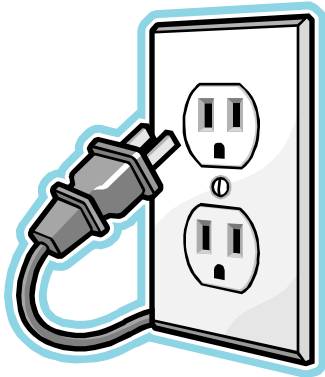
If you like, you can help the students visualize this difference another way. Put out five paper cups and explain that if a CFL bulb needed one cup of juice to light up (pour one cup of juice and set it aside), a standard bulb would need four cups of juice to do the same thing (pour four cups of juice). Again, they produce the same amount of light, but use very different amounts of energy.

Note: More advanced students might be interested to know more about the differences in the ways the two bulbs work, and why the standard bulb uses more electricity. The biggest difference between the bulbs is that standard bulbs get very hot, and heating them up takes energy. In fact, most of the electricity standard bulbs consume is used to make heat, not light.

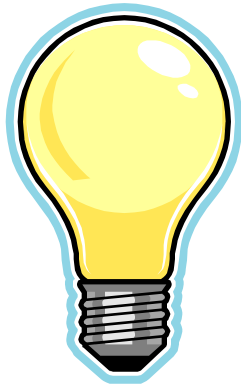
End the activity by asking students to review the different ways that we can waste energy you discussed. Then, ask if they can think of things we can do to help save energy. Guide the discussion so that the students understand that we can do things like being sure to turn things off when we're not using them, and that we can also use things that require less energy to operate. Explain that your school is participating in the Junior Energy campaign to help people switch from standard bulbs to CFLs so they can save energy.



Demonstration Cutouts



Electricity



Standard Bulb



CFL Bulb