

How Much Energy Do You Use?



Target Grade Levels

Third - Sixth

Time

15 minutes preparation, one day's homework, 20 minutes class work

Materials

- calculators
- handout
- energy Home Survey worksheet

Knowledge and Skills (TEKS)

- Science:
 - Demonstrate safe, environmentally appropriate, and ethical practices; and
 - Plan and implement investigations, as well-defined questions, formulate hypotheses, select and use equipment, collect, analyze and interpret information, observe and measure, and communicate valid conclusions.
- Math:
 - Problem solving;
 - Collect information, measure, and compare using tools such as a calculator; and
 - Number, operation, and quantitative reasoning.

Overview

Students will observe the items that use energy in their own homes, as well as calculate the energy cost. Then students will compare this cost with others in their class and with the national average.

Background Information

U.S. residents use more energy now than in the past. There are many reasons for this. As more people populate the country, energy needs rise. Technology advances, such as industrial processes, sophisticated machinery and computers, also require increased energy. Our everyday lives are filled with electrical appliances that our grandparents never used.

Why is our energy bill so high? This activity gives your students a chance to work on some real-life math problems. This activity bases its numbers on cost figures from one utility. Energy figures in your area may be different. Your local energy utility can give you figures that show the average expenditure per household in your community.

For more information, visit the City Public Service (CPS) website at www.citypublicservice.com/.

Procedure

1) Vocabulary

- | | |
|----------------|------------------|
| a) energy | d) kilowatt |
| b) electricity | e) kilowatt-hour |
| c) watt | |

2) Activities

- Start by asking your students if they ever heard their parents complain about the cost of energy. Explain that the monthly utility bill is directly related to the amount of energy the household uses, and that this activity will help them find the “energy-eaters” in the house.

- b) Distribute the Energy Home Survey worksheet and assign the homework.
- c) When students have completed the homework assignment, assist them in answering the questions and completing the math.
- d) Ask them if they found appliances in their homes they think they could live without, such as an electric can opener or an electric plate warmer.

3) Review

- a) Have the class work in groups to add and average their numbers into a whole class average. Then open up a discussion as to why students' personal home's numbers might have been higher or lower than the class average.
- b) Students should estimate their usage of each of the appliances and ways they can reduce usage.

4) Evaluation

- a) Students can be quizzed on energy conservation concepts.
- b) Students can be quizzed using math questions related to energy usage.
- c) Students can perform the following extension activities as graded exercises.

5) Extension

- a) A good introduction to this activity is to encourage students to ask a grandparent, or older relative or neighbor about what life was like when they were children. Many grandparents grew up before television, commuter flights and digital clocks.
- b) The student could interview the senior and write a report comparing an aspect of energy use "then" vs. "now."
- c) Students can be assigned particular home appliances on which to do consumer research. Reports should cite information on at least three different brands. Information should include basic appliance capabilities (e.g. for a refrigerator, cubic feet, icemaker, in-door water dispenser), energy usage, Energy Star rating or lack thereof, cost, expected monthly cost due to energy usage, and time it would take for a less expensive, less efficient model to equal and surpass the cost of a more efficient model when both initial cost and monthly energy cost are taken into account.
- d) Students can research home improvements (such as installation of additional insulation, replacement of windows, or replacement of thermostat with electronic thermostat) that improve energy efficiency and write a report including process and cost for improvement and time to recoup initial investment with savings from reduced energy usage.

Adapted from: "How much energy do you use?" *Alliance to Save Energy (ASE)*.
www.ase.org/educators/download.htm.

Credit: The National Wildlife Federation's Animal Tracks Activity Guide for Educators.
Copyright © National Wildlife Federation 1995.

Energy Home Survey

Do this survey twice: once on a weekday before dinner and once on a weekend day. It will help you determine how much energy you use.

Appliance Electrical Appliances	Multiply by	Subtotal	Total per day
Incandescent Lights: Number of lights on =	1 cent per hour		
Fluorescent lights: Number of lights on =	1 cent per every 4 hours		
Television: Number of sets on =	4 cents per hour		
Radio: Number of sets on =	1 cent per hour		
Stereo: Number of sets on =	2 cents per hour		
Microwave oven: Number of ovens on =	15 cents per hour		
Computer: Number of computers on =	1 cent per hour		
Vacuum cleaner: Number on =	9 cent per hour		
Portable heater: Number on =	15 cents per hour		
Air conditioner: Number on =	55 cents per hour		
Total for all subtotal usage			
Total usage in one day			

Add up all the numbers in the Subtotal column. This subtotal is the total cost for these appliances in one hour.

Some of these appliances will be on for more than one hour, some less. Based on what you know about your household, write the total number of hours and the total cost in one day for these appliances in the Total per day columns above.

(Example 1: If two stereos are on for eight hours a day, you multiply 2 (stereos) x 2 cents per hour x 8 hours = 32 cents per day. Example 2: If you vacuum for 1/2 hour, multiply by 9 cents per hour x .5 hours = 4.5 cents per day.)

Periodic Appliances

Some items are not used all the time. They create a cost only when they are used.

Periodic Appliances Appliance and loads per month	Multiply by	Total per month
Dishwasher:		
Loads =	10¢ per load	
Washing machine:		
Loads =	5¢ per load	
Electric clothes dryer:		
Loads =	67¢ per load	
Gas clothes dryer:		
Loads =	16¢ per load	
Total usage for one month		

These answers give you the total cost per month, based on how much your family uses these appliances.

Periodic Appliances: Appliance and average use per month	Total per month
Gas water heater:	\$13.00
Electric water heater:	\$45.00
Refrigerator:	\$16.00
Extra freezer:	\$18.00
Electric heating system:	
Small home:	\$85.00
Large home:	\$250.00
Gas heating system:	
Small home:	\$28.00
Large home:	\$120.00
Total for 1 month	

With your teacher's help, try to figure out your home energy costs for one month. Compare it to the bill that your parents receive each month. How do they compare?

My estimate: _____

My home's bill: _____

Did your estimate come close to the actual cost? If not, why do you think they differ?