

# Watt's Your Consumption?

## GRADES

6-12

## TIME

1 hour

## MATERIALS

### (per class)

- Appliances (with wall plug-ins)
- *The Home Energy Diet* by Paul Scheckel

## MATERIALS

### (per group)

- Handout 4-a, cut up into cards
- Handout 4-b
- Kill-A-Watt meter
- Calculator
- Pencil

## VOCABULARY

- Carbon Dioxide
- Carbon Footprint
- Carbon Neutral
- Chlorofluorocarbons
- Conservation
- Consumption
- Current
- Efficiency
- Electricity
- Energy Audit
- Emissions
- Energy Star
- Greenhouse Gases
- Kill-a-Watt Meter
- Kilowatt
- Kilowatt-hour
- Load
- Methane
- Nitrous Oxide
- Ohm's Law
- Phantom Load
- Power
- Watt

## OVERVIEW

Students use Kill-a-Watt meters to measure electricity usage of appliances in the classroom and in their homes and determine energy consumption and the efficiency of appliances.

## LEARNING OUTCOMES

1. Students predict which appliances use more electricity and which use less.
2. Students measure electricity use of various appliances through use of a Kill-a-Watt meter.
3. Students compute yearly amounts of electricity used and of CO<sub>2</sub> produced for each appliance.
4. Students discover how their appliances compare to efficient models.
5. Students determine what changes can be made to reduce their consumption of electricity.
6. Students assess what appliances are necessary in their lives.

## ENGAGE

Divide students into groups and provide each group with a collection of appliance cards from Handout 4-a. The cards include the names of appliances they will be testing as well as the category headings "Efficiency Champ," "Energy Average," and "Energy Hog." Allow groups time to discuss and separate their appliance cards into the categories to which they predict appliances belong. Ask the class which appliances they predict use the most energy in a year? Which appliances use very little energy? Explain to students that they are going to use a Kill-a-Watt meter to test these appliances to see which use minimal energy and which truly are energy hogs.

## EXPLORE

1. Divide students into groups and provide each group with a Kill-a-Watt meter, a calculation sheet, and a copy of Handout 4-b.
2. Direct students to plug the Kill-A-Watt meter into the wall.
3. Direct students to plug an appliance into the meter and push the "watt" button.
4. Direct students to read the meter to see the number of watts used by appliance and record the number in column A of Handout 4-b.
5. Repeat with multiple appliances.
6. Provide students with calculators to complete these calculations:
  - \* Kilowatts = watts/1000. Record in column B of Handout 4-b.
  - \* Estimate the average number of hours you use the appliance in a day. Record in column C of Handout 4-b.
  - \* Convert to hours/month that the appliance is used.  
Hours/month = (hours/day) x 30.4. Record in column D of Handout 4-b.

- \* Convert to kilowatt-hours used by the appliance each month.  
 $\text{kWh/month} = \text{kilowatts} \times (\text{hours/month})$ . Record in column E of Handout 4-b.
  - \* Calculate cost per month of appliance.  
 $\text{Cost} = (\text{kWh/month}) \times \$0.1415/\text{kWh}$ . Record in Column F of Handout 4-b.
  - \* Calculate the pounds of  $\text{CO}_2$  used per month.  
 $\text{CO}_2 = (\text{kWh/month}) \times 0.03 \text{ lbs CO}_2/\text{kWh}$  in Vermont. (0.03 is the average  $\text{CO}_2$  released per kWh in VT). Record in Column G of Handout 4-b.
7. Ask groups to circle the three appliances that use the most energy and produce the most  $\text{CO}_2$ .
  8. Ask groups draw a star by the three appliances use and produce the least.

### EXPLAIN

Ask students to compare results with the class predictions of which appliances would use the most energy and which would use the least energy. Provide students with current information to see if the appliances they tested are efficient for their kind (Energy Star or other efficient models). *The Home Energy Diet* by Paul Scheckel contains a wealth of information about this, as does the Energy Star website.

### FURTHER DISCUSSION

1. What can we do in the classroom to decrease energy consumption?
2. What changes might you make now that you are aware of how much energy appliances use?
3. What appliances would you be willing to live without?
4. What appliances could you not possibly live without?
5. Discuss the concept of being carbon neutral. What can we do to offset our carbon footprint for the emissions released by those appliances which we are not willing to live without?
6. How can we make sure our appliances are working efficiently?
7. How does our electricity consumption affect the three corners of the Green Triangle (Environment, Health, and Savings)? (decreased natural resources, climate change, increased energy bills, less money to spend elsewhere, often more sedentary lifestyles)
8. What conservation steps can we take to reduce our consumption of electricity?

### EXTENSIONS

Have students take their total kWh value and calculate equal emissions production scenarios in the EPA's Greenhouse Gas Equivalency Calculator (<http://www.epa.gov/cleanenergy/energy-resources/calculator.html>).

Have students test appliances at home and perform calculations. Compare data to find the range in efficiencies for refrigerators, clothes washers, hair dryers, and other appliances. If any of your students live off of the grid, provide an alternative location for them to assess, such as a school's office, cafeteria, or library.

Challenge students to decrease their family's electrical bill for the upcoming month by turning off and unplugging appliances when not in use. If any of your students live off of the grid, provide an alternative challenge.

## Appliance Cards

<b>ENERGY EFFICIENCY CHAMP</b>		
<b>ENERGY AVERAGE</b>		
<b>ENERGY HOG</b>		
Fridge	Computer	Laptop
Microwave	Lamp compact fluorescent	Radio
TV	Toaster	Coffee Pot
Hair Dryer	Lamp incandescent bulb	Clock
Air Conditioner	Phone	Clothes Dryer
Clothes Washer	Dehumidifier	Fan
Swimming Pool	Electric Water Heater	Electric Oven

