

## LESSON PLAN: The Cost of Electricity

### Michigan Curriculum Framework

#### Middle School

- **Benchmark SCI.IV.1.MS.6** – Investigate electrical devices and explain how they work, using instructions and appropriate safety precautions.
- **Benchmark SCI.II.1.MS.3** – Show how common themes of science, mathematics and technology apply in real-world contexts.
- **Benchmark MAT.V.1.MS.4** – Efficiently and accurately apply operations with integers, rational numbers and simple algebraic expressions in solving problems.

#### High School

- **Benchmark SCI.II.1.HS.3**  
Show how common themes of science, mathematics and technology apply in real-world contexts.
- **Standard MAT.V.1.HS** – Students understand and use various types of operations (e.g., addition, subtraction, multiplication, division) to solve problems.

### Lesson Outcome

The student will calculate the energy costs of common household appliances and examine ways to promote energy efficiency.

### Rationale/Purpose for Lesson

Energy plays an important role in our everyday life. However, we often use electronics or appliances without considering the electric costs of running such devices. After understanding how much energy particular appliances require to operate, students can compare the energy use to that of more energy efficient appliances. Using energy wisely helps reduce energy bills and also helps conserve the limited supply of resources used to make energy.

### Resources/Materials Required

- A small electrical appliance such as a microwave, toaster or hair dryer (if desired)
- “Home Energy Use Practice Sheet” worksheet
- Copies of “My Home’s Energy Use” handout

## Introduction

- Prepare to use an electrical appliance to complete a task. Examples include microwaving a bag of popcorn, toasting a piece of bread or using a hair dryer to blow-dry a wet spot on a cotton shirt.
- Describe what appliance you will be using to the class. Ask the students to generate a list of all of the materials needed to complete the task; make sure that “energy” is included in the list.
- Have students consider how much the energy needed to complete the task will cost.

## Procedures

- Ask the students what information would be needed in order to determine the cost of energy used. (Answer: the amount of time the appliance is used, wattage of appliance and the cost per kilowatt-hour used)
- Explain that electrical consumption is stated in kilowatt-hours. Most electrical devices list power consumption in watts. Define kilowatt (kW), kilowatt-hour (kWh), ampere and volt.
  - Kilowatt (kW) - One thousand watts, where a watt is a unit of electrical power calculated as the rate of energy transfer equivalent to one ampere flowing under a pressure of one volt.
  - Kilowatt-hour (kWh) - The standard measure of electricity usage measured as one kilowatt of power supplied to, or taken from, an electric circuit steadily for one hour.
  - Ampere – The basic unit of electric current adapted under the International System of Units (SI)
  - Volt – The unit of electromotive force, the volt measures how much pressure there is in an electric current. The higher the voltage, the more electrical current will flow in the circuit.
- Have a student examine the appliance and locate its power consumption information in watts.
- As a class, use the “Home Energy Use Practice Sheet” to determine the costs of some common household appliances.
- Check results with the students and discuss the comparisons among the energy costs for each activity.

## Closure

Ask students to generate ideas of how to reduce the cost of energy. Introduce the idea of energy efficient appliances. Review <http://www.consumersenergy.com/apps/pdf/More-100-ways-save-on-bill12-06.pdf> and discuss ways to save on energy bills.

## Homework

Have students complete the “My Home’s Energy Use” worksheet, using the formula from the “Home Energy Use Practice Sheet.” (NOTE: Some students may have trouble locating the wattage information on the appliances in their home. It may help to suggest they visit [http://www.eere.energy.gov/consumer/your\\_home/appliances/index.cfm/mytopic=10040](http://www.eere.energy.gov/consumer/your_home/appliances/index.cfm/mytopic=10040) to find a list of common home appliances and the wattage range for each.)

## Extensions

- Have students research and present their findings on energy efficient appliances, using resources such as <http://www.energystar.gov>.
- Compare the energy use and cost between incandescent light bulbs and compact fluorescent light bulbs.
- Have students conduct a home energy audit using [http://www.eere.energy.gov/consumer/your\\_home/](http://www.eere.energy.gov/consumer/your_home/).

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## My Home's Energy Use

This activity will have you locate as many electrical appliances in your home as you can find and ask you to consider how much it costs to run all of these in the course of a year.

1. Locate all appliances used in your home, identify the watts used by each appliance and use the following calculation to estimate how much it costs to run all of these annually. The wattage of most appliances stamped on the bottom or back of the appliance, or on its nameplate. Fill in the table below with this information. Then, add up the annual cost for each item to get a total annual cost. If you have trouble finding the wattage for any of your appliances, visit [http://www.eere.energy.gov/consumer/your\\_home/appliances/index.cfm/mytopic=10040](http://www.eere.energy.gov/consumer/your_home/appliances/index.cfm/mytopic=10040) to see a list of average wattages for a host of appliances.
2. After you calculate the energy costs for your appliances, list at least two ways for each appliance that you could reduce your energy bill. For some helpful advice, visit: <http://www.consumersenergy.com/apps/pdf/More-100-ways-save-on-bill12-06.pdf>.

### Calculation:

$$\left( \frac{\text{_____}}{\text{Watts}} \times \frac{\text{_____}}{\text{Avg daily use (hrs)}} \right) / \frac{1,000}{\text{kWh}} = \text{_____} \text{ kW (Electricity used to run this appliance)}$$

Then,

$$\frac{\text{_____}}{\text{kW}} \times \frac{.10}{\text{cost of electricity per kW}} = \$ \text{_____} \text{ Daily cost}$$

Then,

$$\frac{\text{_____}}{\text{Daily Cost}} \times \frac{365}{\text{days in a year}} = \$ \text{_____} \text{ Annual cost}$$



