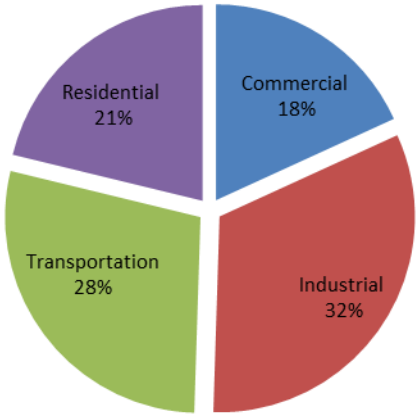
Project: Energy Audit

We all use energy to turn on lights, heat and cool our homes, get to school, and power our electronics. In the United States, a majority of the use of energy is concentrated in three sectors: residential, commercial, and transportation. The residential sector includes energy used in places like houses and apartments. The commercial sector includes energy used in public places like office buildings, schools, and hospitals. Energy used in the transportation sector includes the gasoline and fuel used to drive cars and fly planes

In 2012, energy used in the residential and commercial sectors accounted for almost 40% of the total energy consumption (including electricity) in the United States

Share of total energy consumed by major sectors in USA 2012



Conducting an energy audit will allow you to better understand how much energy is used by the devices in your home and classroom. Based on this information, brainstorm ways to reduce the amount of energy you use.

Experiment: Classroom Energy Audit

Aim

Measure electricity usage by several devices in your classroom and at home.

Materials

- Vernier data-collection interface Surface Temperature Sensor
- Logger Pro or LabQuest App multiple devices that use electricity
- Watts Up Pro

Preliminary Questions

1. List as many devices in your classroom that are using electricity as you can. Do the same for your home

1. What is "phantom" energy? What types of phantom energy use is occurring in your classroom or home right now?

Procedure

Part I Classroom energy audit

1. Perform a general assessment of your classroom by answering the following questions.
   a. How many devices are plugged in?

   b. How many lights are on? What types of light bulbs are in use?

   c. Is temperature controlled directly in the classroom or centrally for the building? What temperature is the thermostat set to?

   d. How high are the ceilings?

   e. What is the source for energy at your school?

2. Use Watts Up to determine how much energy is used by the devices your teacher has provided
3. Use a Surface Temperature Sensor to measure the temperature in various parts of your classroom.

Location	Surface Temperature
Near the door	
Close to the thermostat	
Near the windows	
Close to the ceiling	

Part II Home energy audit

1. Create a plan for conducting a home energy audit. The following questions may help you in your plan.
   - How many rooms are in your home? What is the area? How many people live in your home?
   - How many lights are in the house? What types of light bulbs are in use?
   - What direction do the windows face? Are they single- or double-pane windows?
   - Is temperature controlled in each room or centrally? What temperature is the thermostat set to?
   - How high are the ceilings?
   - What is the source for energy for your home?
   - What is the energy cost for your home on average each month (include electric bill, natural gas bill, etc.)?

1. Use Watts Up to determine how much energy is used by the devices in your home. Create a table modelled after the following example

Device	Energy usage measured by Watts up	Estimated usage/month	Operating cost (usage/month × cost/kWh) (use R1.75 if you don't know) (R)
Refrigerator			
Computer			
TV			

Data Analysis

Part I Classroom energy audit

1. What device used the most energy? The least?

Most Energy used	Least Energy used

2. For three of the devices, calculate how much energy is consumed during the year. How could you conserve energy use for the devices?

3. How does the temperature compare in different places in your classroom? What are ways to reduce energy use for heating or cooling in your classroom?

4. Calculate energy usage/person in your class.

1. What are ways your class could help conserve energy at school?

2. Research to find the carbon emission values for the source of energy that is used to produce the electricity that is used in your classroom (e.g., natural gas or coal). Calculate the carbon footprint for the devices you measured.
3. What are ways can you make your home more energy efficient?

SECTION C

Extension Questions/ Projects

1. Measure energy use over a 24-hour period. How does energy use change during the day? Predict how energy use would change over the entire year due to varying factors such as temperature and amount of daylight.
2. Learn about ways that buildings can reduce energy use through design elements. Some factors to consider include: aspect, green roofs, insulation, vegetation, and paint colour.
3. Write a letter to an administrator at your school to share ideas for how your school can reduce energy consumption and save money.
4. Share your results from this experiment with people living in your home. Work together to come up with a plan for how you can reduce energy use in your home. In a month or two, repeat your measurements and determine if there have been changes in energy consumption patterns
5. Imagine you are responsible for replacing a device in your home that uses electricity, such as a TV, water heater, or light bulb. Do research to find the most energy efficient product you could buy. Is it more expensive than less efficient options? How will you balance cost with energy savings?
6. Learn about how energy use in your country compares to energy use in other parts of the world.
7. You have now spent a lot of time thinking about the importance of energy conservation. Imagine that you are having a conversation with someone who does not think it is important to conserve energy. Explain different reasons that might make them change their mind.
8. Does it take more energy to charge something every day (like a laptop) or to leave it plugged in overnight? Support your answer.