

Calculating energy costs

Students calculate the yearly costs of operating energy-efficient appliances and light bulbs and compare them to the costs of using standard appliances and bulbs.

Learning goals

Big idea

Energy-efficient appliances and light bulbs can save money.

Essential questions

- What is energy efficiency?
- Why could it be a good idea to save energy?

Objectives

- Calculate savings from energy-efficient appliances and light bulbs
- Understand ways to save money by saving energy

What students will do

- Calculate and compare the costs of operating energy-efficient appliances and bulbs with standard appliances and bulbs.
- Consider ways to save money by using less energy in their homes.

NOTE

Please remember to consider your students' accommodations and special needs to ensure that all students are able to participate in a meaningful way.

KEY INFORMATION

Building block:

 Executive function

 Financial knowledge and decision-making skills

Grade level: Middle school (6-8)

Age range: 11-14

Topic: Spend (Budgeting, Buying things, Paying bills)

School subject: CTE (Career and technical education), Math, Science

Teaching strategy: Direct instruction, Simulation

Bloom's Taxonomy level: Understand, Evaluate

Activity duration: 45-60 minutes

National Standards for Personal Financial Education, 2021

Spending: 4-1, 4-2, 8-1, 8-2, 8-3, 12-1, 12-2, 12-3, 12-5, 12-9

Saving: 4-2, 4-3, 8-1, 8-2, 12-8, 12-9

These standards are cumulative, and topics are not repeated in each grade level. This activity may include information students need to understand before exploring this topic in more detail.

Preparing for this activity

- While it's not necessary, completing the "Creating a monthly household budget" activity first may make this one more meaningful.
- Print copies of all student materials for each student, or prepare for students to access them electronically.
- You'll need to give students the cost of electricity for their calculations.
If you would like to look up the current cost of electricity in your state, visit the U.S. Energy Information Administration's "Electric Power Monthly" webpage at https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a.
- Make sure students have access to calculators.

What you'll need

THIS TEACHER GUIDE

- Calculating energy costs (guide)
[cfpb_building_block_activities_calculating-energy-costs_guide.pdf](#)

STUDENT MATERIALS

- Calculating energy costs (worksheet)
[cfpb_building_block_activities_calculating-energy-costs_worksheet.pdf](#)
- Calculators

Exploring key financial concepts

Many of the things we use in our homes require electricity, which costs money. We measure electricity in units of power called watts. One watt is a small amount of power. Some devices require only a few watts to operate, and others require larger amounts. A kilowatt is equal to 1,000 watts and is the way we measure energy use for large devices.

Many products in our homes – like refrigerators, dishwashers, clothes washers, clothes dryers, and even light bulbs – use kilowatts to operate. Some new products are energy-efficient, which means using less energy to get the same job done –

TIP

Because products, terms, and laws related to energy change, students should be encouraged to always look for the most up-to-date information.

and in the process, avoiding high energy bills and unnecessary pollution. The U.S. Environmental Protection Agency, which is part of the federal government, rates the energy efficiency of certain appliances. A blue Energy Star label lets you know that a product, home, or building meets certain standards for lower energy use. Buying an Energy Star product could save you money over time because it will use less energy than other products. When you want to buy something that uses electricity, researching more than one product or brand and comparing features, benefits, and costs can help you better understand your options.



Teaching this activity

Whole-class introduction

- Ask students to name some of the appliances they have in their homes.
- Explain that they'll learn about how much it costs to operate some common appliances and light bulbs.
- Read the "Exploring key financial concepts" section to the students.
- Be sure students understand key vocabulary:
 - **Comparison shopping:** The practice of comparing prices, features, benefits, risks, and other characteristics of two or more similar products or services.
 - **Kilowatt (kW):** A kilowatt is 1,000 watts. Power consumption for large devices is measured in kilowatts.
 - **Watt:** Electricity is measured in units of power called watts. One watt is a small amount of power. Some devices require only a few watts to operate, and other devices require larger amounts.

TIP

Visit CFPB's financial education glossary at consumerfinance.gov/financial-education-glossary/.

Individual work

- Distribute the "Calculating energy costs" worksheets.
- Students will work independently to complete the worksheet.
- Students will calculate and compare the costs of operating four energy-efficient appliances and four standard appliances over time.
 - Be sure to tell students the cost of electricity. The cost of electricity is expressed as cents per kilowatt. You can use \$0.13 per kilowatt, which

is the 2019 national residential average, according to the U.S. Energy Information Administration. You also can look up the current cost of electricity in your state by visiting the U.S. Energy Information Administration's "Electric Power Monthly" webpage at https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a.

- Next, students will calculate and compare the costs of operating energy-efficient light bulbs and standard light bulbs.
- Students will then answer the reflection questions.

Wrap-up

- Bring the class back together and ask volunteers to share their calculations.
- Ask volunteers to share their answers to the reflection questions.

Suggested next steps

Consider searching for other CFPB activities that address the topic of spending, including budgeting, buying things, or paying bills. Suggested activities include "Using a buying plan" and "Explaining how inflation works."

Measuring student learning

Students' answers on their worksheets and during discussion can give you a sense of their understanding.

This answer guide provides possible answers for the "Calculating energy costs" worksheet. Note that these answers use \$0.13 per kilowatt as the price of electricity. Answers will vary if you use the current cost of electricity in your state.

Keep in mind that students' answers to the reflection questions may vary, as there may not be only one right answer. The important thing is for students to have reasonable justification for their answers.

Answer guide



Energy Star appliances

Appliance	Kilowatts per year	Average price of electricity	Cost for one year
Television	81	x \$0.13	\$10.53
Refrigerator	488	x \$0.13	\$63.44
Dishwasher	181	x \$0.13	\$23.53
Clothes washer	316	x \$0.13	\$41.08
Clothes dryer	480	x \$0.13	\$62.40
Total	1,546		\$200.98

Standard appliances

Appliance	Kilowatts per year	Average price of electricity	Cost for one year
Television	112	x \$0.13	\$14.56
Refrigerator	538	x \$0.13	\$69.94
Dishwasher	206	x \$0.13	\$26.78
Clothes washer	409	x \$0.13	\$53.17
Clothes dryer	607	x \$0.13	\$78.91
Total	1,872		\$243.36

1. How much money could a household save in one year by using the Energy Star appliances in the table? **$\$243.36 - \$200.98 = \$42.38$**
2. How much money could a household save in 10 years by using the Energy Star appliances in the table? **$\$42.38 \times 10 = \423.80**
3. How much could a household save in one year for each Energy Star light bulb they use? **$\$6.11 - \$1.30 = \$4.81$**
4. The average U.S. household has 40 light bulbs. How much could a household save in one year by using 40 Energy Star light bulbs? **$\$4.81 \times 40 = \192.40**

Reflection questions

Name three other things where you live that use electricity and may cause your power bill to be higher. **Answers will vary but may include responses such as air conditioning, a heater, a stove, a microwave, or a computer.**

What are other ways you can save energy in your home? **Answers will vary but may include responses such as shutting off lights when leaving a room, turning down the air conditioning when no one is home, or turning off the ceiling fan when no one is in the room.**