Survey says...

LESSON OVERVIEW

SURVEYS ARE EXCELLENT MEANS FOR PROMPTING REFLECTION, AS WELL AS FOR PRODUCING RESULTS THAT CAN BE GRAPHED AND EVALUATED. IN THIS LESSON STUDENTS WILL COMPLETE A SURVEY ABOUT ENERGY CONSUMPTION AND SAFETY TWO TIMES — ONCE IN CLASS AND THEN ONCE AT HOME WITH THE BENEFIT OF PARENTAL PARTICIPATION AND BEING ABLE TO CHECK THINGS LIKE THERMOSTAT SETTINGS.

STUDENTS WILL THEN ILLUSTRATE THE RESULTS VIA BAR GRAPHS AND/OR PIE CHARTS. THE LESSON ENCOURAGES STUDENTS TO EVALUATE THE RESULTS OF THE SURVEY, PROVIDING COMPARISONS AMONG STUDENT ANSWERS AS WELL AS BETWEEN THE IN-CLASS RESPONSES AND THE AT-HOME RESPONSES. THE INTENDED RESULT IS AN INCREASED RECOGNITION OF THE MANY WAYS IN WHICH STUDENTS USE ENERGY AND HOW TO BE SAFE AROUND IT, AS WELL AS AN UNDERSTANDING OF HOW SIMPLE, EVERYDAY BEHAVIORS CAN BOTH INCREASE AND DECREASE ENERGY CONSUMPTION.

Standards addressed

This lesson plan helps you address multiple Iowa Core standards and Wisconsin Academic Standards. This section identifies the science standards for each state that apply to this lesson plan.

Iowa Core

S.3–5.PS.4

Essential concept and/or skill: Understand and apply knowledge of sound, light, electricity, magnetism and heat.

S.3–5.PS.4

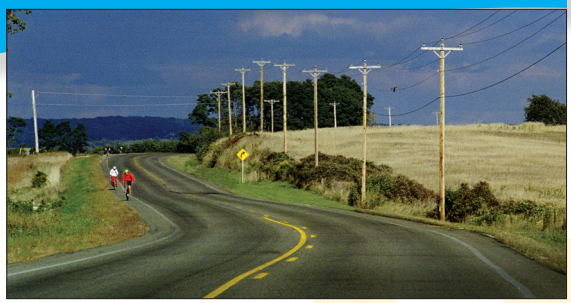
Essential Concept and/or Skill: Understand and apply knowledge of sound, light, electricity, magnetism, and heat.

S.3–5.SI.1

Essential Concept and/or Skill: Identify and generate questions that can be answered through scientific investigations.

S.3–5.SI.3

Essential Concept and/or Skill: Plan and conduct scientific investigations.



S.3–5.SI.4
Essential Concept and/or Skill: Use appropriate tools and techniques to gather, process, and analyze data.

RI.4.IA.1
Employ the full range of research-based comprehension strategies, including making connections, determining importance, questioning, visualizing, making inferences, summarizing, and monitoring for comprehension.

RI.4.3
Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.

RI.4.7
Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

SL.4.5
Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes.

RI.5.IA.1
Employ the full range of research-based comprehension strategies, including making connections, determining importance, questioning, visualizing, making inferences, summarizing, and monitoring for comprehension.

RI.5.3
Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

RI.5.7
Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.

SL.5.5
Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes.

Wisconsin Academic Standards

C.8.1 Identify questions they can investigate using resources and equipment they have available

C.8.2 Identify data and locate sources of information including their own records to answer the questions being investigated

C.8.3 Design and safely conduct investigations that provide reliable quantitative or qualitative data, as appropriate, to answer their questions

C.8.4 Use inferences to help decide possible results of their investigations, use observations to check their inferences

C.8.6 State what they have learned from investigations, relating their inferences to scientific knowledge and to data they have collected

C.8.7 Explain their data and conclusions in ways that allow an audience to understand the questions they selected for investigation and the answers they have developed

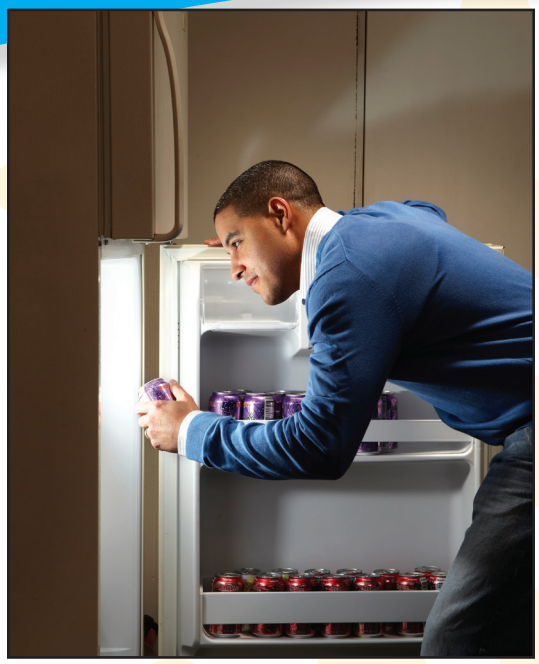
D.8.8 Describe and investigate the properties of light, heat, gravity, radio waves, magnetic fields, electrical fields, and sound waves as they interact with material objects in common situations

H.8.3 Understand the consequences of decisions affecting personal health and safety

This lesson addresses the following Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects:

Reading Standards for Informational Text K–5

- 4.RSIT.7 Integration of Knowledge and Ideas: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on web pages) and explain how the information contributes to an understanding of the text in which it appears.
- 5.RSIT.7 Integration of Knowledge and Ideas: Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.



Desired outcomes

By completing this lesson, students will be able to:

- Better understand the many ways that they consume energy on a daily basis
- Better understand rules for safety around electricity and natural gas
- Practice graphing and analyzing data
- Reflect on ways in which they can reduce their energy use

Reproducibles

- *Surveys* for each student [pages 11–13]
- *Survey data tally sheet* [pages 14–15]

Background

Gathering and working with real-world data is an important skill for students to learn. Plus, when data is real-world, it is often more interesting for students because it tends to be more tangible to them. This lesson has the benefit of students' generating their own data, graphing it and then evaluating that data.

The goal of the survey, and subsequent evaluation, is to enable students to better understand how their everyday activities use energy and power from various energy sources, as well as how to be safe around energy sources. During the data evaluation portion of the lesson you may need to help students make the connection between some of the surveyed behaviors, such as thermostat settings and hot showers, and energy consumption.

Time required

75 - 100 minutes, divided over two days, plus 15 minutes prep time

Materials needed

- *The Energy Zone* magazine
- *Surveys* for each student [page 11–13]
- *Survey data tally sheet* for each student [page 14–15]
- Whiteboard or chart paper

Important terms

- **energy:** the ability to organize or change matter (to do work)
- **energy conservation:** the act of using less energy or saving energy
- **energy efficiency:** products and actions that use less energy due to advanced technology and equipment

Lesson steps

Preliminary steps

1. This lesson is designed to be used either before or after students have read the *Know what? no, what?* section of *The Energy Zone*. Based on how much prior knowledge about energy consumption you think your students have, decide how much of the magazine you would like your students to read (if any) prior to this lesson.
2. Since a key aspect of this lesson is the survey, complete the survey yourself! It will give you a baseline measure to compare with your students' answers, but it also gives you something tangible to share with them as you go over their responses.
3. Write an acrostic on the board for the word S-U-R-V-E-Y: Share your opinion; Use the information; Reveal the responses; Variety of answers are provided; Every question is important; You can ask, or you can respond.

Data collection steps

1. After giving students a chance to check out the acrostic, ask for a show of hands of people who have heard of a survey. Then ask for a show of hands of those who have ever participated in a survey, commenting on the number of students who have.
2. As a class, explore the concept of the survey, referring to some of the phrases within the acrostic when appropriate. Your discussion could get into the fact that surveys can be formal or informal. For example, when you asked how many were familiar with surveys or had taken surveys, you informally surveyed them. Make sure to hit on the key points that surveys help get opinions and information from a wide variety of people, all of whom answer the same (or similar) questions. Close the discussion by asking again how many students have ever participated in a survey. (This time everyone should raise their hands!)

3. In order to move to the topic of energy consumption, conduct this brief survey: Ask students to guess what percentage of cold air can escape from a refrigerator each time the door is open; a) 10%, b) 20%, c) 30% or d) 50%. Ask for a show of hands for each answer and count/jot down the numbers. (The correct answer is 30 percent.) Describe how this is related to energy consumption: the more often you open the refrigerator, and the longer you leave it open, the harder it has to work to stay cool and thus, the more power it has to use.
4. Pass out the survey questions. As you pass them out, let students know that they're getting a survey that will help them think about and examine their energy consumption and safety habits on a daily basis. Ask for a volunteer(s) to read the introduction, perhaps dividing it up between two students.
5. Point out that there are two columns for survey answers. The first column is for answering the survey in class. The second column is for answering the survey again at home. After making sure that students are clear on what they are to do, give them around 7 – 8 minutes to answer the questions, encouraging them to do the best they can at estimating some answers when necessary. There are some questions (e.g., those about thermostat settings) for which they may have no idea. There is an answer choice that reflects that.
6. Lead the class in a 5 – 7 minute discussion on their general impression of the survey questions. Are there questions that were difficult to answer? Are they looking forward to going home to get a more definite answer for any of the questions? Are there some questions that made them realize that they could do a better job of conserving energy and being safe? Are there any questions that are not on the survey that they think should be?
7. Close this section of the lesson by giving students the homework assignment of answering the survey questions again at home. This time, they will have the benefit of keeping track of how long they or others shower, for example, or seeing exactly at what temperature their thermostat is set. Emphasize that it's okay if answers change and it's okay if answers stay the same — the important thing is that they try to get as accurate an answer as possible. Students should make sure that they put answers to the at-home survey in the second column.

Analysis & evaluation steps

1. Using the same sheet of paper that the survey questions are on have students spend a few minutes writing down one aspect of redoing the survey at home that surprised them. Give them a few minutes to write down a sentence or two and then ask for a few students to share their responses.
2. Use that brief discussion as a way to transition into comparing the results from the two surveys, as well as simply comparing the results among the class. Ask students for suggestions about how best to display the results and compare them. (If you worry that your students have not done enough graphing to come up with that idea on their own, simply let them know that they're going to tally the results and illustrate them in different ways.) Bar graphs and pie charts are likely to be the best ways to illustrate the responses.
3. Explain that as a class you will now examine the data sets—the answers from in class (Survey 1) and the answers from home (Survey 2). First, tally the responses from the in-class survey by asking for a show of hands for each answer — i.e., "On Question 1, how many of you said, 24 hours? How many said, the whole time you're awake? … Now, on the at-home survey, how many of you said, 24 hours? How many said, the whole time you're awake?" and so on through all questions. Have students record the totals for answers from each survey on the *Survey data tally sheet* while you record them in a place where all students can see them.
4. Demonstrate how to create a bar graph (or pie chart) using the totals from the first question. (You may need to assist students in rounding up and converting totals to percentages for a pie chart if required, however, higher levels students should be able to do this using calculators.) Ideally, put Survey 1 results and Survey 2 results side-by-side for an easy visual comparison. Encourage some reactions to the responses. (But if you worry that the discussion will detract from the graphing exercise, hold off on discussing the responses right now.)

5. Repeat step 4 for the results of questions #2 and #3 from both surveys.
6. After modeling graphs for the first three questions, assign students (individually/in pairs/in small groups) one of the remaining questions for which they should create a graph of the responses. (For students who need assistance, you may wish to provide a bar graph or pie chart template.) Have students put a check mark next to the bar/pie slice that includes their own answers so they can see where their answers fell in the overall responses.

   Below the graphs for each question, have students write a sentence or two that highlights something interesting about the results. Maybe there was dramatic change or very little change between Survey 1 and Survey 2 answers. Maybe there was a wide variety of responses among students on the in-class survey. Maybe people take longer/shorter showers than you'd expect. Essentially, you want students to do some sort of evaluation of the results. Provide students with sufficient time to complete the task, circulating through the room to get a good sense of how long it is taking them (likely 10 – 15 minutes).
7. In the time remaining, give students the opportunity to share their graphs and their insights into the responses. Ask students to identify overall trends in the answers and how that impacts energy safety and energy use in general and by them, specifically. Prompt with additional questions if students are not making the correct connections between the survey questions and energy usage.
8. Close the lesson by exploring ways in which students think that they can decrease their energy consumption and/or increase their energy conservation and safety-related behaviors. How has the survey made them more aware of the ways they use energy?

Academic extensions and modifications

- If you worry that students will struggle to graph results on their own, graph all of the responses as a class.
- If available, use an interactive whiteboard to model the graphs for steps 4 and 5.
- Use an online graphing tool (such as the U.S Department of Education's National Center for Education Statistics (NCES) website at http://nces.ed.gov/nceskids/createagraph/default.aspx) to model how to create a few of the graphs in class.
- A few days after this lesson, give students a writing (or discussion) prompt: After having taken the survey, has your daily energy use changed? If so, what are you doing differently?
- Have students survey five friends and/or extended family members, particularly with the questions around behaviors such as turning off lights, opening the refrigerator, and lengths of showers, and repeat the data graphing and evaluation.
- Give students the opportunity to create additional questions around energy use and safety to add to the survey.

The power of a survey

You use and interact with energy every day, probably in ways you don't even realize! In fact, we use energy so often that most people don't even think about it. Only when the power goes out due to a storm or when there has been an accident, do we really think about our energy consumption and safety behaviors. But you know what? Here's a way for you to think about energy without a powerful storm to prompt you! Instead, it's just some simple survey questions.

survey questions	survey 1 in class	survey 2 at home
1. How often do you use energy? a) 24 hours a day (even when I sleep) b) The whole time I'm awake c) About half of the day d) Very little		
2. How many gadgets (such as game players, iPods, cell phones, etc) that you use require frequent recharging? a) None b) 1 c) 2 – 3 d) 4 or more		
3. You could get an electrical shock from... a) Putting anything other than a plug into an outlet b) Flying a kite into a power line c) Using electricity near or in water d) All of the above		
4. How often do you walk or bike somewhere instead of riding in a car? a) Never b) Once a month c) Once a week d) Daily		
5. How many items at home (such as your cable box/ DVR, computer, clock, refrigerator) are always plugged in and operating? a) None b) 1 c) 2 – 3 d) 4 or more		

survey questions	survey 1 in class	survey 2 at home
6. How many times do you open up your refrigerator each day? a) Never b) Once or twice a day c) 3 – 4 times a day d) 5 times or more		
7. A natural gas leak will smell like... a) Nothing b) Peanut butter c) Rotten eggs d) Onions		
8. How good would you say you are about turning off lights when you are the last person to leave a room? a) I rarely or never turn off lights b) Sometimes I turn off lights c) I turn off lights most of the time d) I always turn off lights		
9. On average how long are the showers you and/or other family members take? a) 3 minutes or less b) 4 – 6 minutes c) 7 – 10 minutes d) longer than 10 minutes e) I take only baths		
10. True or False: A power line that has been knocked down by a storm could still have an electric charge. a) True b) False		
11. When the air conditioner is on at home, at what temperature is the thermostat set? a) 76 degrees Fahrenheit or higher b) 71 – 75 degrees Fahrenheit c) 67 – 70 degrees Fahrenheit d) 66 degrees Fahrenheit or lower e) I have no idea		

survey questions	survey 1 in class	survey 2 at home
12. When the heat is on at home, at what temperature is the thermostat set? a) 74 degrees Fahrenheit or higher b) 70 – 73 degrees Fahrenheit c) 66 – 69 degrees Fahrenheit d) 65 degrees Fahrenheit or lower e) I have no idea		
13. How many energy efficient products or appliances do you or your parents have at home? a) None b) 1 c) 2-3 d) 4 or more		
14. How many times a day do you think to yourself, "I'm using energy by doing this"? a) Never b) Once or twice a day c) 3 – 4 times a day d) 5 times or more		

Survey data tally sheet

Record how many people selected each answer for both surveys.

survey questions	survey 1 answers	survey 2 answers
1. How often do you use energy?	a. b. c. d.	a. b. c. d.
2. How many gadgets (such as game players, iPods, cell phones, etc) that you use require frequent recharging?	a. b. c. d.	a. b. c. d.
3. You could get an electrical shock from...	a. b. c. d.	a. b. c. d.
4. How often do you walk or bike somewhere instead of riding in a car?	a. b. c. d.	a. b. c. d.
5. How many items at home (such as your cable box/ DVR, computer, clock, refrigerator) are always plugged in and operating?	a. b. c. d.	a. b. c. d.
6. How many times do you open up your refrigerator each day?	a. b. c. d.	a. b. c. d.
7. A natural gas leak will smell like...	a. b. c. d.	a. b. c. d.
8. How good would you say you are about turning off lights when you are the last person to leave a room?	a. b. c. d.	a. b. c. d.
9. On average how long are the showers you and/or other family members take?	a. b. c. d. e.	a. b. c. d. e.
10. True or False: A power line that has been knocked down by a storm could still have an electric charge.	a. b.	a. b.

survey questions	survey 1 answers	survey 2 answers
11. When the air conditioner is on at home, at what temperature is the thermostat set?	a. b. c. d. e.	a. b. c. d. e.
12. When the heat is on at home, at what temperature is the thermostat set?	a. b. c. d. e.	a. b. c. d. e.
13. How many energy efficient products or appliances do you or your parents have at home?	a. b. c. d.	a. b. c. d.
14. How many times a day do you think to yourself, "I'm using energy by doing this"?	a. b. c. d.	a. b. c. d.