

ENERGY USE AND DELIVERY – LESSON PLAN 3.5

Energy Efficiency

This lesson is designed for 3rd – 5th grade students in a variety of school settings (public, private, STEM schools, and home schools) in the seven states served by local power companies and the Tennessee Valley Authority. Community groups (Scouts, 4-H, after school programs, and others) are encouraged to use it as well. This is one lesson from a three-part series designed to give students an age-appropriate, informed view of energy. As their understanding of energy grows, it will enable them to make informed decisions as good citizens or civic leaders.

This lesson plan is suitable for all types of educational settings. Each lesson can be adapted to meet a variety of class sizes, student skill levels, and time requirements.

Setting	Lesson Plan Selections Recommended for Use
Smaller class size, higher student ability, and /or longer class length	<ul style="list-style-type: none"> The “Modeling” Section contains teaching content. While in class, students can do “Guided Practice,” complete the “Recommended Item(s)” and any additional guided practice items the teacher might select from “Other Resources.” NOTE: Some lesson plans do and some do not contain “Other Resources.” At home or on their own in class, students can do “Independent Practice,” complete the “Recommended Item(s)” and any additional independent practice items the teacher selects from “Other Resources” (if provided in the plan).
Average class size, student ability, and class length	<ul style="list-style-type: none"> The “Modeling” Section contains teaching content. While in class, students complete “Recommended Item(s)” from “Guided Practice” section. At home or on their own in class, students complete “Recommended Item(s)” from “Independent Practice” section.
Larger class size, lower student ability, and/or shorter class length	<ul style="list-style-type: none"> The “Modeling” Section contains teaching content. At home or on their own in class, students complete “Recommended Item(s)” from “Independent Practice” section.

Electrical Safety Reminder: Teachers should remind students that electricity is dangerous and that an adult should be present when any recommended activities or worksheets are being completed at home. Always obey instructions on warning labels and ensure one has dry hands when touching electronics or appliances.

Public School System Teaching Standards Covered

Common Core Language Arts/Reading

- AL RL.3.1 3rd
- AL RL.3.1 and 2 3rd
- AL RL.4.1 4th
- AL RI.4.1 and 2 4th
- AL RL.5.1 5th
- AL RI.5.1 and 2 5th
- GA ELA.CC3.RL.1 3rd
- GA ELA.CC3.RI.2 3rd
- GA ELA.CC4.RL.1 4th
- GA ELA.CC4.RI.1, 2, and 8 4th
- GA ELA.CC5.RL.1 5th
- GA ELA.CC5.RI.1, 2, and 8 5th
- KY 3.RL.1 and 2 3rd
- KY 3.RI.1, 2, and 8 3rd
- KY 4.RL.1 and 2 4th
- KY 4.RI.1, 2, and 8 4th
- KY 5.RL.1, 2, and 6 5th
- KY 5.RI.1, 2, and 8 5th
- TN 3.CCRA.R. 1, 2, and 6 3rd
- TN 3.RI.1 and 2 3rd
- TN 4.RI.1, 2, and 8 4th
- TN 4.RL. 1 and 2 4th
- TN 4.CCRA.1.2, and 6 4th
- TN 5.RI. 1, 2, and 8 5th
- VA 3.6 b, d, k 3rd
- VA 3.7 a 3rd
- VA 4.6 a, g, i, j, k 4th
- VA 5.6 a, b, h, j, k 5th

Writing

- AL W.3.1, 4, and 8 3rd
- AL W.4.1, 4, and 8 4th
- AL W.5.1, 4, and 8 5th
- GA ELA.CC3.W.1, 4, and 8 3rd
- GA ELA.CC4.W. 1, 4, and 8 4th
- GA ELA.CC5.W.1, 4, 8, and 9 5th
- KY 3.W.1, 4, and 8 3rd
- KY 4.W.1, 4, and 8 4th
- KY 5.W. 1, 4, and 8 5th
- TN 3.CCRA.W.1, 4, and 9 3rd
- TN 4.W.1, 4, and 9 4th
- TN 4.CCRA.W. 1, 4, and 9 4th
- TN 5.W. 1, 4, 8, and 9 5th
- TN 5.CCRA.W. 1, 4, and 9 5th
- VA 3.9 3rd
- VA 3.11 a, b, c 3rd
- VA SOL.W.3.11 3rd
- VA 4.7 c, d, g 4th
- VA SOL.W.4.11 4th
- VA 5.7 b, c, e 5th
- VA SOL.W.4.11 5th

Performance Objectives

By the end of this lesson, students will be able to:

- List and explain ways to conserve energy.
- Identify the author's purpose, which is to persuade.
- Write to persuade others to be more energy efficient.
- Identify wattage required to operate appliances or electronics, calculate the amount of electricity required to operate said items and determine the annual cost for operating things they use at home.

I. Anticipatory Set (Attention Grabber)

Essential Question

How can we conserve energy?

Interactive

Show class the interactive pictures from this website:

http://www.valuesmoneyandme.co.uk/activities/cost_earth/cost_earth_sittingroom.html

What is wrong in the pictures? Are these people conserving energy or wasting energy? Find and click on wasteful energy examples on the website.

II. Modeling (Concepts to Teach)

Ways to Conserve Energy in Your Home

<http://www.motherearthnews.com/renewable-energy/save-money-on-energy.aspx#axzz35iDH8oN9>

1. **Do not heat or cool rooms that are not in use.**
2. **Turn down the heating/cooling by 1 degree Fahrenheit.** It's hard to notice the difference, and it uses much less energy.
3. **Turn down the hot water heater.** According to the Department of Energy (DOE), a water thermostat setting of 120 degrees is sufficient for most uses.



4. **Install a programmable thermostat.** This allows the use of only the energy needed to heat or cool a house when people are at home by programming different temperatures for different time periods.
5. **Dry clothes outside on a clothes line.**
6. **Do full loads of laundry** or use “express wash” so only the amount of hot water actually needed is used.
7. **Take a shower rather than a bath.** Showers typically use less hot water than baths.
8. **Prevent heat loss in the winter and heat gain in the summer by increasing insulation, filling cracks and crevices and closing window coverings during sunny days in the summer.** The Energy Star program (a government-backed program that helps protect the environment through superior energy efficiency) estimates that more than 50 percent of a home’s energy use goes toward heating and cooling. Increasing the insulation in attics, walls, floors and ceilings slows the flow of air between inside and outside, making it easier to control the temperature.
9. **Unplug appliances when not in use.** The term “phantom load” (also called “vampire electronics”) refers to the energy that an appliance or electronic device consumes when it is not actually turned on. According to the U.S. Department of Energy (DOE), “In the average home, 75 percent of the electricity used to power home electronics is consumed while the products are turned off.”
10. **Turn off lights when not in use.**
11. **Replace incandescent light bulbs with CFLs or LEDs.** According to Energy Star, one of its qualified compact fluorescent light bulbs (CFL), which costs just a few dollars, “will save about \$30 over its lifetime and pay for itself in about six months. It uses 75% less energy and lasts about 10 times longer than an incandescent bulb.”
12. **Use energy efficient appliances.** Energy Star appliances use between 10% and 50% less energy and water than their conventional counterparts.

Modeling to Cover Reading/Language Arts Standards:

Read the book *Why Should I Save Energy?* by Jen Green. (To find a copy in the online library, visit: <http://www.worldcat.org/title/why-should-i-save-energy/oclc/300399188>)

- Ask “What was the **author’s purpose** for writing this book?” (Answer: To convince or persuade us to use energy more efficiently by explaining reasons we should conserve.)
- “What was the author’s main idea? What was she trying to persuade us to do?”
- “What were the reasons or details she gave to support her main idea in this persuasive book?”
- “These are all good reasons to persuade us to use energy more efficiently. Now let’s learn **how**. Let’s think together and brainstorm ways we can use energy more efficiently.”

- Ways to Conserve Energy KWL chart: Teachers ask students to make a KWL chart of “Ways to Use Energy More Efficiently” on a sheet of paper (a table with columns for what you Know, Want, and Learned). Or teachers can pass out copies of KWL chart found here: <http://notebookingfairy.com/pixiedust/all-purpose/KWL-graphic-organizer-notebooking-page.pdf>
 - Fill in the “K” from their brainstormed list.
 - Wonder about other ways; fill in the “W” of KWL Chart.

Teach these points:

- Electricity is helpful, but it’s important to use only as much as needed. Becoming more *energy efficient* can help make power plants work more smoothly, reduce costs, and more importantly, use less of the planet’s resources.
- Two very easy things: People can turn off lights when leaving a room. People can turn off and unplug appliances when they are finished using them.
- Some appliances such as refrigerators need to be plugged in all the time in order to work. However, other items such as laptops or cell phone chargers do not always need to be plugged in. When they are plugged in, they use electricity even when turned off or not charging. These types of devices are called Vampire Electronics because they suck up energy! Share: <https://www.dosomething.org/tipsandtools/top-5-energy-sucking-vampire-appliances>
- Another thing people can do is use dishwashers, washing machines, and dryers only when they are full. Teachers ask students to explain why this energy tip is important.
- Teachers ask students about how they got to school that day. How could they have saved some gasoline? (Ex. Carpooling, riding the bus, riding a bike)
- More easy tips for using energy more efficiently: <http://www.fplsafetyworld.com/?ver=kkblue&utilid=fplforkids&id=16160>
- Teachers ask students to add all these ways that were learned to use energy more efficiently to the KWL Chart.

III. Checking for Understanding

Teachers can ask students these questions to determine understanding of concepts.

REMEMBER	List reasons of why it is important to use energy efficiently. How did the author Jen Green convince us of this? (Class discussion).
UNDERSTAND	Fold a piece of paper in half, vertically (hot-dog bun style). On one half, list reasons WHY it’s important to use energy efficiently; on the other half, list the WAYS we use energy efficiently and the actions we take to use energy efficiently. (Assessment)
APPLY AND ANALYZE	Using the lists just made, what the author Jen Green had to say, and also what was learned on the KWL chart, write a persuasive essay hoping to convince others to use energy efficiently. (Teachers ask students to write essay on a sheet of paper).
EVALUATE	What are the most important points to include when trying to convince others to use energy efficiently? (Teachers ask students to use a highlighter to highlight at least three points from each side of their list to include in their persuasive essay).



IV. Guided Practice Ideas

Recommended Items

Your Planet Needs You Game; You Can Make Big Changes

Games

- Your Planet Needs You Game: http://www.energystar.gov/index.cfm?c=kids.kids_index
- You Can Make Big Changes: http://www.energystar.gov/index.cfm?c=kids.kids_index
- The Energy Stars Stories: http://www.energystar.gov/index.cfm?c=kids.kids_index

Video

- You Have the Power Video: <https://www.youtube.com/watch?v=XTtb0khsVuM>

V. Independent Practice Ideas

Recommended Items

At-Home Checklist: 10 Simple Ways to Use Energy Wisely (Worksheet Provided) (see below);

Parent or Guardian Interview: What Could We Do To Use Energy Efficiently? (Interview Guide Provided) (see below)

Other Resources

Personal Practice

- Writing Activity: Teachers write the following question on the board and ask students to copy and answer it on a sheet of paper: What if we all used our energy more efficiently?
- Calculate Cost to Making Things Work Worksheet and Answer Key provided

Practice That May Involve Parents or Guardians

- At-home Checklist: 10 Simple Ways to Use Energy Wisely (USDE) Worksheet Provided
- Parent or Guardian Interview: What Could We Do To Use Energy Efficiently? Interview Guide Provided
- At-home Activity: Complete Energy Survey and Checklist:
<http://www.fplsafetyworld.com/?ver=kkblue&utilid=fplforkids&id=16228>

Reading/Language Arts Activities:

- Writing Activity: Persuasive Essay: Follow instructions in Section III Checking for Understanding. Write a persuasive essay convincing others to use energy efficiently. This paper must also include some simple ways to accomplish the goal of using energy efficiently.



VI. Assessment

These items provide a check for understanding so teachers can easily determine whether concepts need to be reinforced. These items can be graded, if grades are desired.

- Writing Activity: Persuasive Essay (if completed in Section III Checking for Understanding or Section V Independent Practice as shown above)
- Folded paper: List of WHY and WAYS to Use Energy Efficiently (if completed in Section III Checking for Understanding)
- At-Home Checklist: 10 Simple Ways to Use Energy Wisely Worksheet provided (if completed in Section V Independent Practice as shown above)
- Parent or Guardian Interview: What Could We Do To Use Energy Efficiently? Interview Guide Provided (if completed in Section V Independent Practice as shown above)

VII. Materials Needed

The following materials are needed for the “Recommended Items” in Guided Practice & Independent Practice sections.

- Worksheet (provided)
- Interview Guide (provided)

VIII. Closing the Lesson

In addition to the Essential Question shown below, teachers can reference the Performance Objectives at the top of the Lesson Plan.

Essential Question

How can we use energy efficiently?



WORKSHEET FOR ENERGY EFFICIENCY LESSON 3.5

NAME: _____

Ten Ways to Use Energy Wisely

Objective: Students will be able to understand how to minimize energy.

Take-Home Assignment: Check at least 5 boxes Show What You Are Already Doing to be Energy Efficient

1. Turn off the lights.
2. Use energy-saving light bulbs.
3. Shut off computers.
4. Use "smart" power strips.
5. Turn off devices when not in use (TV, game systems, etc.).
6. Use natural light, natural heating and/or natural cooling.
7. Unplug phone chargers when not in use.
8. Ask who pays the electric bill; talk with her/him about ENERGY STAR[®] appliances.
9. Talk with your family about programmable digital thermostats.
10. Talk about home improvements, such as windows, doors, etc.



INTERVIEW GUIDE FOR ENERGY EFFICIENCY LESSON 3.5

NAME: _____

What Can We Do to Use Energy Efficiently?

Instructions: Students interview a parent or guardian.

1. What are some things we do regularly to use energy efficiently?

2. Are there ways we can be better about using energy efficiently?

3. What are some of your favorite ways to use energy efficiently? (Ex. Hang out clothes to dry; open windows; plant shady trees)

4. What are the advantages to using energy efficiently?

WORKSHEET FOR ENERGY AT HOME LESSON 3.5

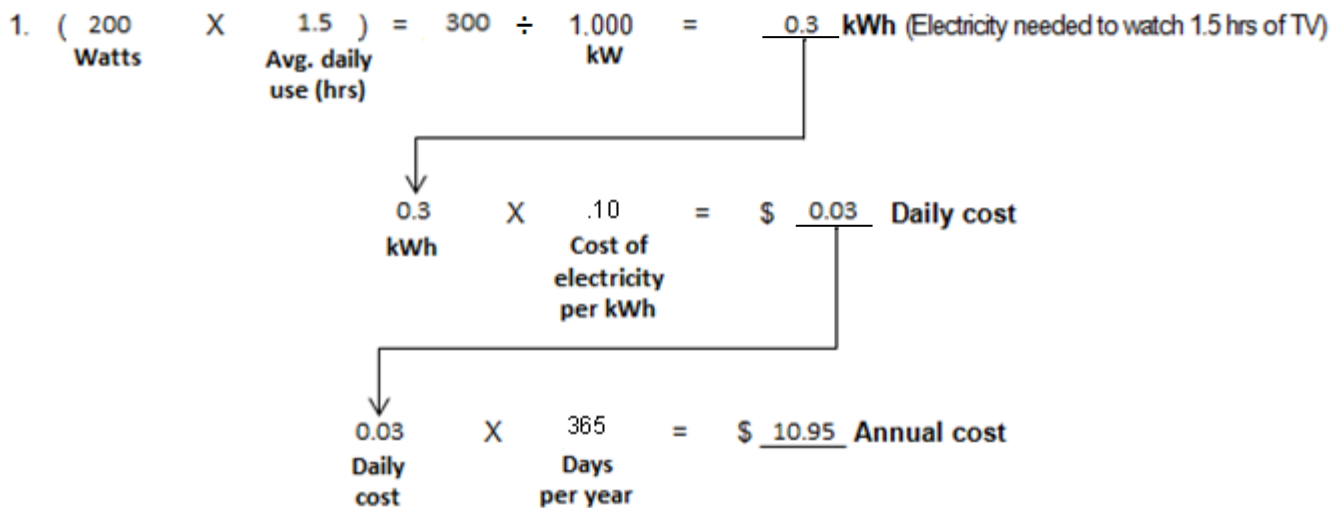
NAME: _____

Calculate Cost to Make Things Work

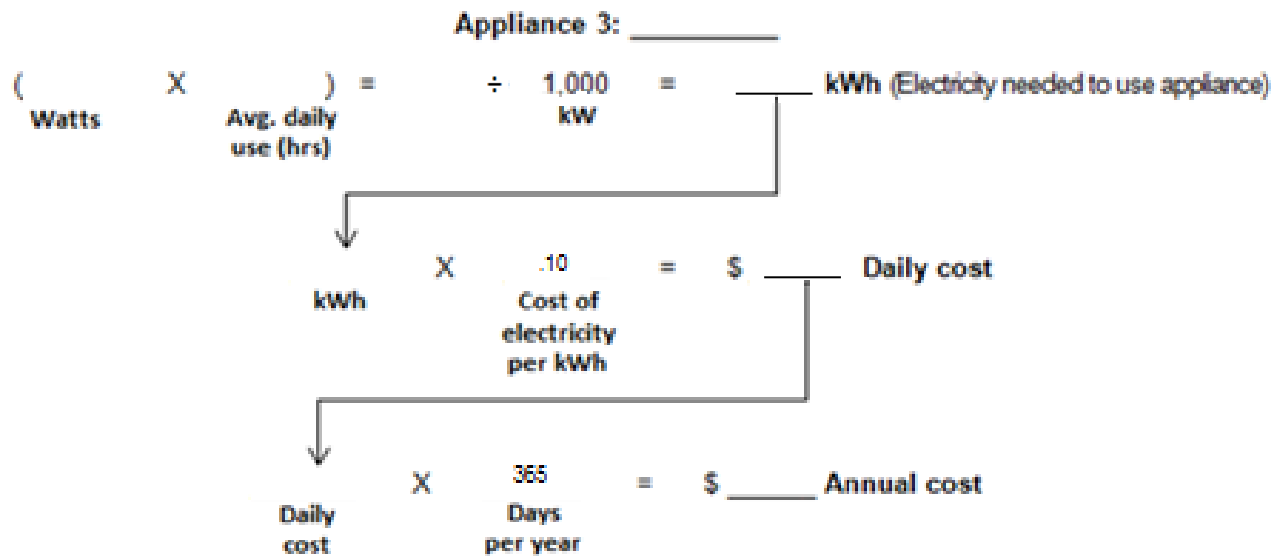
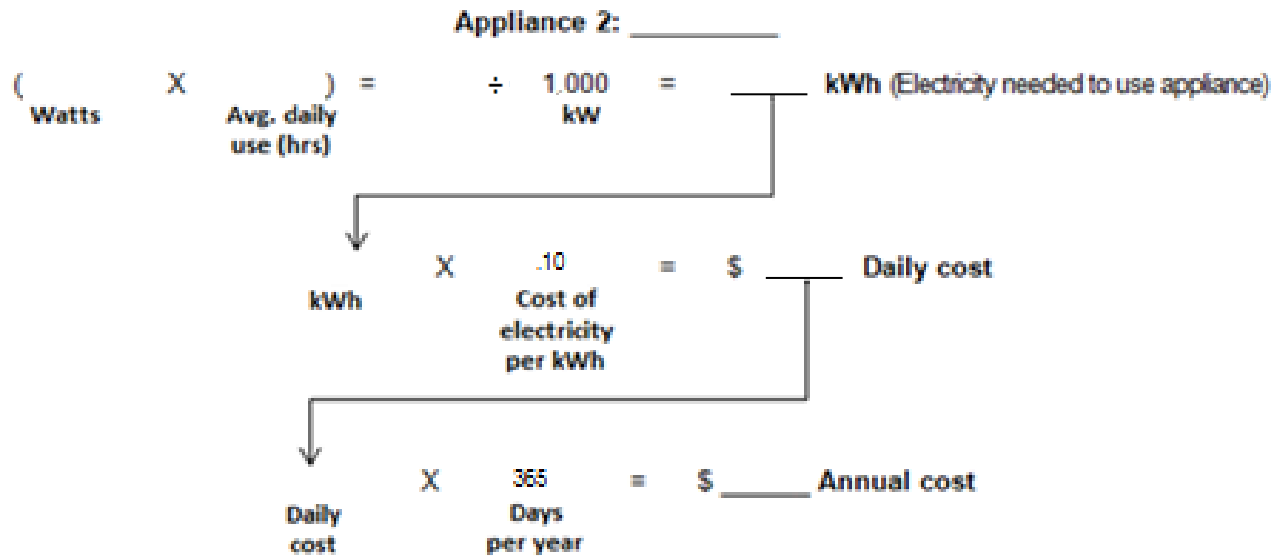
Objective: Students will be able to identify wattage required to operate appliances or electronics, calculate the amount of electricity required to operate said items and determine the annual cost for operating things they use at home.

Find 2 appliances or electronic devices in your home and identify the amount of watts required to operate each item. Most appliances list their wattage on the back or bottom of the appliance. If wattage is not listed, use the chart below for reference. Fill in the calculation with the wattage information to get the annual cost of electricity needed to operate each item.

EXAMPLE Calculation: "I watch 1 ½ hours of TV each day."



Appliance/Electronic	Watts	Appliance/Electronic	Watts
Dishwasher	2400	Computer	150
Clothes Dryer	2400	Hair Dryer	1500
Microwave Oven	650	Alarm Clock	2
Refrigerator	210	Radiator Heater	1000
Washing Machine	900	Water Heater	4800
Color TV	200	PlayStation 3	107
Video/DVD Recorder	100	Xbox 360	125
Iron	1000	Wii (WiiConnect24 enabled)	550



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Clothes Dryer	2400	Hair Dryer	1500
Microwave Oven	650	Alarm Clock	2
Refrigerator	210	Radiator Heater	1000
Washing Machine	900	Water Heater	4800
Color TV	200	PlayStation 3	107
Video/DVD Recorder	100	Xbox 360	125
Iron	1000	Wii (WiiConnect24 enabled)	550

Answer Key

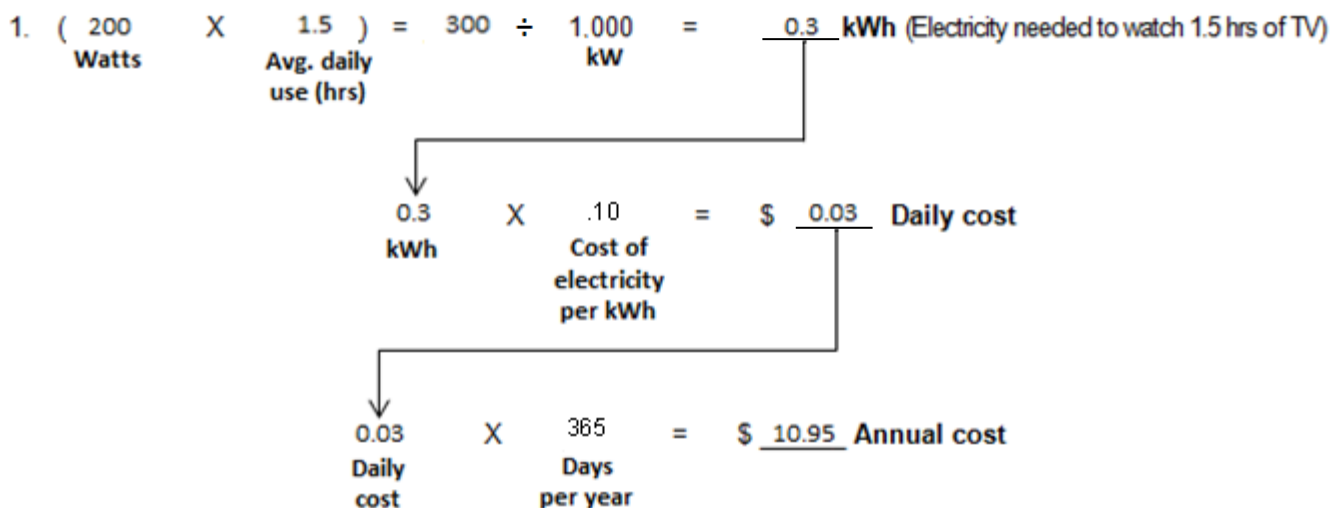
ANSWER KEY FOR CALCULATE COST TO MAKE THINGS WORK

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Color TV	200	PlayStation 3	107
Video/DVD Recorder	100	Xbox 360	125
Iron	1000	Wii (WiiConnect24 enabled)	550

Note: Each calculation will vary based on students' selections of appliances/electronic items and average daily use