

# Does That About Cover It?

**Fourth Grade**  
**Activity: 9**  
**Time: 1 Class Period**

## General Description

After reviewing energy uses, students will collect data on temperatures inside and outside during the day around various windows. Students will collate and graph data to look for patterns and variables affecting passive solar heat absorption and radiation. Students will share the information with adults that can make changes to reduce waste.

## Objectives

Students collect and analyze temperature data around various types of window treatments.

## Arizona State Standards

SC04 S1C2 PO1 Demonstrate safe behavior and appropriate procedures (e.g., use and care of technology, materials, and organisms) in all science inquiry

SC04 S1C2 PO2 Plan a simple investigation that identifies the variables to be controlled

SC04 S1C2 PO3 Conduct controlled investigations (e.g., related to erosion, plant life cycles, weather, magnetism) in life, physical, and Earth and space sciences

SC04 S1C2 PO4 Measure using appropriate tools (e.g., ruler, scale, balance) and units of measure (i.e., metric, U.S. customary)

SC04 S1C2 PO5 Record data in an organized and appropriate format (e.g., t-chart, table, list, written log)

SC04 S1C3 PO1 Analyze data obtained in a scientific investigation to identify trends

SC04 S1C3 PO2 Formulate conclusions based upon identified trends in data

SC04 S1C4 PO1 Communicate verbally or in writing the results of an inquiry

SC04 S1C4 PO2 Choose an appropriate graphic representation for collected data:

- bar graph
- line graph
- Venn diagram
- model

SC04 S1C4 PO3 Communicate with other groups or individuals to compare the results of a common investigation

SC04 S4C3 PO4 Describe ways in which resources can be conserved (e.g., by reducing, reusing, recycling, finding substitutes)

W04 S1C1 PO1 Generate ideas through a variety of activities (e.g. brainstorming, graphic organizers, drawing, writer's notebook, group discussion, printed material)

W04 S3C2 PO1 Record information (e.g. observation, notes, lists, charts, map labels, and legends) related to the topic

W04 S3C4 PO1 Write persuasive text (e.g. advertisements, paragraph) that attempts to influence the reader

M04 S2C1 PO3 Interpret graphical representations and data displays including single-bar/circle graphs, two-set Venn diagrams, and line graphs that display continuous data

M04 S4C4 PO1 Identify the appropriate measure of accuracy for the area of an object (e.g., sq. feet or sq. miles)

M04 S4C4 PO3 Select an appropriate tool to use in a particular measurement situation

LS E1 Prepare and deliver an organized speech and effectively convey the message through verbal and nonverbal communications with a specific audience

LS E2 Prepare and deliver an oral report in a content area and effectively convey the information through verbal and nonverbal communications with a specific audience

LS E3 Interpret and respond to questions and evaluate responses both as interviewer and interviewee

### **Teacher Information**

In hot climates, a typical three-foot by four-foot window can add \$24.00/year in air conditioning costs. 10-25% of a typical American homes air conditioning or heated air leaves through the windows. According to the U.S. Department of Housing & Urban Development, any method that stops the sun before it gets through the glass is seven times as effective at keeping you cool as blinds or curtains on the inside. Window treatments such as sun screens, awnings, shade trees in front of windows, dual pane or glazed panes can help increase passive solar energy efficiency.

### **Materials**

Activity Card 4-9

### **Procedures/Exploration**

1. Teacher introduces lesson: .We have been looking at some energy use inside a building.
2. Are there factors which affect the energy we use? Teacher may want to draw a pie graph of Home Energy Use with the following: Heating and cooling: The largest amount of home energy is used for heating and cooling. What can we do to use heating and cooling more wisely? Appliances: Home appliances use about 1/4 of home energy. How can we be more energy efficient when we use appliances at home? Hot Water Use: A water heater can use almost as much energy as all other appliances. What can we do to use hot water more wisely at home? Lighting: Lighting uses the least amount of energy at home. How can we use lights more wisely at home?
3. Teacher charts student responses to the questions. What have we learned so far?
4. Teacher asks, .For what is the largest part of our energy at home used?
5. I understand that up to one fourth of our heating and cooling energy can be lost through windows. How could we find out more about the temperature around different kinds of windows?
6. Help students generate ideas and a plan for collecting data. (i.e.: Record type and location of windows and window treatments and record temperature inside and outside of window at regular intervals of time.)
7. Design data collection sheets.
8. Students record data and report findings to the group. Collate class data.
9. Look for patterns. Make recommendations.

# Using Energy

Fourth Grade

Activity: 9

Activity Card: 4-9

Student's Name:

Date:

- In hot climates, a typical three-foot by four-foot windows can add \$24/year in air-conditioning costs.
- 10-25% of a typical American home's space conditioning energy leaves through the windows.
- According the U.S. Department of Housing and Urban Development, "Any method that stops the sun before it gets through the glass is seven times as effective at keeping you cool as blinds or curtains on the inside".
- Sun screens, a variety of which are available on the market, stop the sun's heat and glare before entering the window. They are almost like having a shade tree in front of every window on your home.
- Sun screens reflect, absorb and dissipate a large portion of the sun's heat and glare before it reaches and penetrates the glass surface. Sun screens can block up to 70 percent of the heat and glare common to the Arizona summertime.
- Sun screens block the sun, not the view; can be installed in place of regular insect screens; work with windows open or closed; and reduce glare and improve daytime privacy.
- APS recommends the use of sun screens in the cooling season as an affordable way to block the sun's radiant heat. Sun screens will reduce your energy consumption which may lower your electric bill.
- Sun screens should be removed in the winter to allow for passive solar heat gain to warm your house interior.
- Dual-pane windows and insulated or gas-filled windows, act as an insulation shield against heat loss in winter and conduction heat gain in summer.
- Traditional, single-glazed windows have an R-value of 1.0 while current window technologies can attain R-values of 4.0 or higher. (In other words, state-of-the art window technologies are at least four-times as efficient at stopping heat transfer as are single-pane windows.)
- Dual-pane or multipane windows are a little more energy-efficient than storm windows because they create an insulated air vacuum between the panes which reduces conductive heat transfer.
- A thin transparent metallic coating bonded to the glass between the panes increase the efficiency of dual pane glass by reducing the flow of radiant heat between the panes.
- Low-E, or low emissivity, window treatments act to reflect unwanted heat from passing through your windows. They keep heat outside during the hot summer months.
- Low-E window films, applied on the inside of your south-, east- or west-facing windows and glass doors, reflect infrared and ultraviolet light while allowing most of the visible light (daylight) to enter. These films can reduce solar energy gain by 50% during the summer. Using the currently available home window technologies could save the United States four million barrels worth of oil and gas per day, at costs of several dollars per barrel (42 gallons) saved.