Read Your Meter

Fourth Grade
Activity: 13
Time: 1-3 Class Periods

General Description
Students will be able to construct and accurately read an electric meter.

Objective
Students will develop the ability to accurately read electric meters and to recognize how they can conserve energy.

Arizona State Standards
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 S1C4 PO1 Communicate verbally or in writing the results of an inquiry
SC04 S4C3 PO3 Analyze the effect that limited resources (e.g., natural gas, minerals) may have on an environment
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)

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.

Teacher Background
Residential electric meters have either four or five dials. The pointers on the dials move either clockwise or counterclockwise; you can tell by the way the numbers are arranged on each dial.

The aluminum disk moves based on how much energy is being used in the home; the more one uses, the faster the disk revolves.

Familiarize yourself with APS' Meter Reading Fact Sheet, Activity Card 4-13a. You may want the students to work in groups. Help the students construct a model meter with four or five dials and movable pointers.

Materials

Tag board
Small paper plates
Brads
Marking pens
Activity Card 4-13a and 4-13b
Graph papers

Procedure/Exploration

1. Share with your students the information on APS' Meter Reading Fact Sheet.
2. Have your students construct a model meter; perhaps have a model already prepared.
3. Have the students brainstorm on ways of conserving energy thereby slowing down the aluminum disk.

Optional Activity

Using Activity Card 4-13b, have students, over a two week period, read their meters at home and devise a plan for saving electricity and share the information by creating a poster.

Meter Reading Fact Sheet

Fourth Grade
Activity: 13
Activity Card: 4-13a

Student's Name: **Date:**

A meter measures electricity. Through your meter's glass enclosure, you can see a revolving aluminum disk and a series of dials and pointers. The amount of electricity you use determines the speed at which the disk moves. The more electricity you use, the faster it turns. Each revolution represents a portion of an electric energy unit called a watt-hour. This watt-hour measurement is transferred from the disk through a series of gears to the digital numbers or pointers on the dials.

What makes your meter disk turn? There are two sets of connections which cause your meter to register:

1. The amount of current flowing into the house
2. The voltage at which the current is flowing

Your meter is basically a small induction motor run by magnetic forces created by electricity in a set of **coils.** The **voltage coil** is a winding of wire connected to the power supply lines. The **current coil** is a winding of wires connected with the household wiring. When current passes through these coils, the disk is forced to run at a speed exactly proportional to the number of watts (amps x volts) of electricity power being used.

Friction inside the meter is all but eliminated with the use of a magnetic suspension system which uses a magnetic field to float the disk and its shaft in the air. To help maintain accuracy provided by magnetic suspension and other design features, the meter is sealed with filters which keep its interior free of dust and other contaminants that can cause inaccurate meter registration. In the illustration below, the figures above each of the dials indicate the number of kilowatt-hours (kwh) registered by the meter during the time the hand on that dial made one complete revolution.
So, when the hand on the right-hand dial has passed from one figure to the next, 1/10 of 10kwh, or 1 kwh has been used.

10,000	1,000	100	10
			
9	0	6	7

During the time that the pointer on any one dial is making a complete revolution from "0" to "0", the pointer on the next dial to the left will pass from one figure to the next. Therefore, although a pointer on one dial may appear to have arrived on a given figure, that figure should not be read unless the pointer on the dial to the right has reached or passed "0". For example, the pointer on the 10,000 dial looks as if it is on the "0" , but you should read that dial as a "9" because the pointer on the 1,000 dial, to the right, has not made a complete revolution to "0". The correct reading is shown under the dials.

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Meter Reading Optional Activity

Fourth Grade
Activity: 13
Activity Card: 4-13b

Student's Name: **Date:**

This activity is designed as a two-week activity involving three meter readings. The teacher may wish to have the meters read each day at the same time for more practice, accuracy and as a means of comparing daily consumptions. (How does a weekday compare to a Sunday? Why?)

A. Read your kilowatt-hour meter at home and record the reading. A._____

B. Read one week later and record the reading. B. _____

C. Subtract B from A to determine kwh used during the first week of your experiment. C._____

During the second week, encourage your family to conserve all the electricity they possible can. Generate a plan to conserve energy.

D. At the end of the second week, again read your meter and record. D._____

E. Subtract D from B to determine kwh used during the second week of your experiment.
E._____

F. Subtract E from C to determine how much electric energy your family saved over the previous week. F. _____

1. Were you successful in saving energy during the second week? Or, did you see more? Why?

2. Why would someone with an electrically-heated or cooled home have to consider the thermostat setting?

3. List all the energy-saving steps your family took and share it with the class.

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