

SCHOOL ENERGY MAP

Adapted from the California Energy Commission

Overview: Students make a map of the school, chart the energy users on campus, and discuss energy use and potential ways to save.

Objective: Students will recognize the various energy users at school and infer potential energy saving actions.

Time: 50 minutes

Grouping: Four to six students

Subjects: Geography, Language Arts, Mathematics, Science, Social Studies

Suggested Grade Level: Can be modified for 3 – 5 or 6 – 12

Vocabulary: Budget, conserve, deferred, scale, utility

Materials: Tape measures, graph paper, Energy Users Worksheet

PREPARATION & BACKGROUND

According to the Department of Energy's "Design Guidelines for High Performance Schools," typical schools in the US spend the bulk of their energy dollars on lighting (30%), heating (14%), and cooling (41%). Other energy uses are: hot water (8%), and "other" (6%). Students and staff can have a huge impact on these costs. We often use energy without realizing it. We tend to take lights and copy machines for granted. In this exercise, the students will look carefully at the energy users in their school, and learn about how the school's energy budget is spent. Some schools have monthly electrical bills of thousands of dollars.

You will need to find out what the utility rates are (in cents/kilowatt-hour) and how much the school spends on energy. This information is all in the school utility bills; the administration should be able to provide a copy of gas and electric bills for you. If gas and electric are combined, use the percentages given above to determine what your school spends on energy in each category. (For example: Lighting % x total energy bill = approximate amount spent on lighting for one month. Repeat for heating, cooling, etc.)

When students do the mapping, it is instructive to have access to water heaters, space heaters, and cafeterias. Check with your custodian or building engineer for a tour of the boiler room and to open doors where needed. This activity can be expanded to other buildings in the school district or contracted to individual wings or classrooms.

Some key things to consider in efforts to conserve energy at school are thermostat placement and setting, control of lighting, air vent location, and the number and operation of windows and exterior doors. Thermostats should be located on interior (rather than exterior) walls. They should be set at 68

degrees during the winter and 78 degrees during summer. Unused lighting should be turned off. Furniture arrangement should not block the flow of heated or cooled air from vents. Excessive windows and exterior doors are energy wasters, as are those that are opened too often (while the building is being heated or cooled) or those that are left open. Of course, all unused electrical equipment and appliances should be turned off, but these are minor contributors to school energy bills when compared to heating, cooling, and lighting.

To shorten and simplify the activity, you can make up blank school maps to be filled in. Simple sketches of the school will do also. Or, it might be instructive to use graph paper and discuss drawing to scale. Choose the option best for your class. YOU are the expert in that department!

PROCEDURE

1. Prepare beforehand a transparency made from the teacher sheet "WHICH CLASSROOM IS CONSERVING?" (included). Show the transparency to the students; explain its diagrams. Ask the students the following questions:
 - a. Which classroom do you think is conserving energy? Why? (Classroom 1; thermostat is on inside wall, room has only two windows and heating vent is not blocked)
 - b. Why is the other classroom wasting energy? (too many windows, thermostat on outside wall, and heating vent blocked by desks)
 - c. What can be done to make Classroom 2 more energy-efficient? (cover up some windows, rearrange desks so heating vent is not blocked)
 - d. Can you think of some other ways to conserve energy at school that are not shown on the diagram? (Some possible answers include keeping heating units and filters clean; turning off lights, heating/cooling, and appliances when not needed; setting the thermostats correctly; and so on)
2. Discuss with the students why it is important to conserve energy at school. (Some points to discuss include the expense of energy and the need to stretch our remaining supplies of conventional energy resources.)
3. Divide students into groups of 4 to 6. If you have ready-made maps, the smaller group is more appropriate. Tasks can be divided among the students. One student can translate input from others and draw the map. Another can record energy users, while two students scan the area and report the things they find that are using energy.
4. Assign a portion of the school to each group. If each group works in the same scale, an entire map of the school can be assembled.
5. Students will then tour the school with their paper for mapping. They are to record carefully every energy user they can find, and show on the map where they found each (for ex., lights, refrigerators, heaters, copy machines, etc.). Encourage students to be thorough. For example, have them note how many light fixtures, how many bulbs in each, and what kind of bulbs.
6. Give each student a copy of the student sheet "IS ENERGY CONSERVED OR WASTED IN YOUR SCHOOL?" (included). Discuss the eight items on the worksheet. Tell the students that if they observe energy being conserved in an area listed on the worksheet, they are to write a "1" in the

blank beside “conserved.” If they observe energy being wasted, they are to write a “1” in the blank beside “wasted.” (This is assigning points for energy conservation or waste.)

7. When the maps are done, have students summarize with a list of all the energy users in their area (if not already done).
8. Have the class reassemble and report on what they found.
9. Next, brainstorm with students how the school might save energy. You can list the ideas on the board as they volunteer thoughts like: close doors to keep heat in or out; turn off the lights next to the windows on bright days, weatherstrip the windows and doors; turn off light during recess and after school; and set thermostat to 68 (heating) or 80 (cooling).
10. Ask the class to select one or two ways to save. Ask them to make a plan to involve the whole school with their idea, and launch a school-wide energy efficiency activity.

FOR DISCUSSION

1. Do you think other people in the school realize how much energy they use?
2. Most homes use more energy for heating and cooling. Schools typically use more for lighting. Why do you think there is a difference? (Hint: Lots of bodies in a classroom help keep the room warm!)
3. How can individual students help save energy at school? At home?

FOLLOW UP

- A. Have the students explain to the class what they found in their zones.
- B. Ask the students the following questions:
 1. Do you think our school can conserve more energy? How? (Possible answers include turn off unnecessary lights; keep furniture from blocking heating/cooling vents; keep exterior doors closed in winter; keep heating/air conditioner filters cleaned; remodel the building to add carpet, decrease number of windows, lower ceilings, and place thermostats on inside walls.)
 2. What can you do to help conserve energy at school? (Possible answers include: wear warm clothes in winter and cool clothes in summer; keep windows and doors closed when heat or air-conditioning is on; and keep unnecessary lights turned off.)
- C. Plan and organize an “Energy Week” for your school. Each grade level will be responsible for completing one of the energy conservation activities listed below:
 1. Third Grade: Have the students draw pictures and write short paragraphs on energy conservation for a bulletin board display.
 2. Fourth Grade: Have the students create and present a short skit on energy conservation.
 3. Fifth Grade: Have the students help coordinate Energy Week. Have them “brainstorm” ideas about energy conservation and the compile their ideas into a presentation. Let some of the students visit other classes and do their presentations.

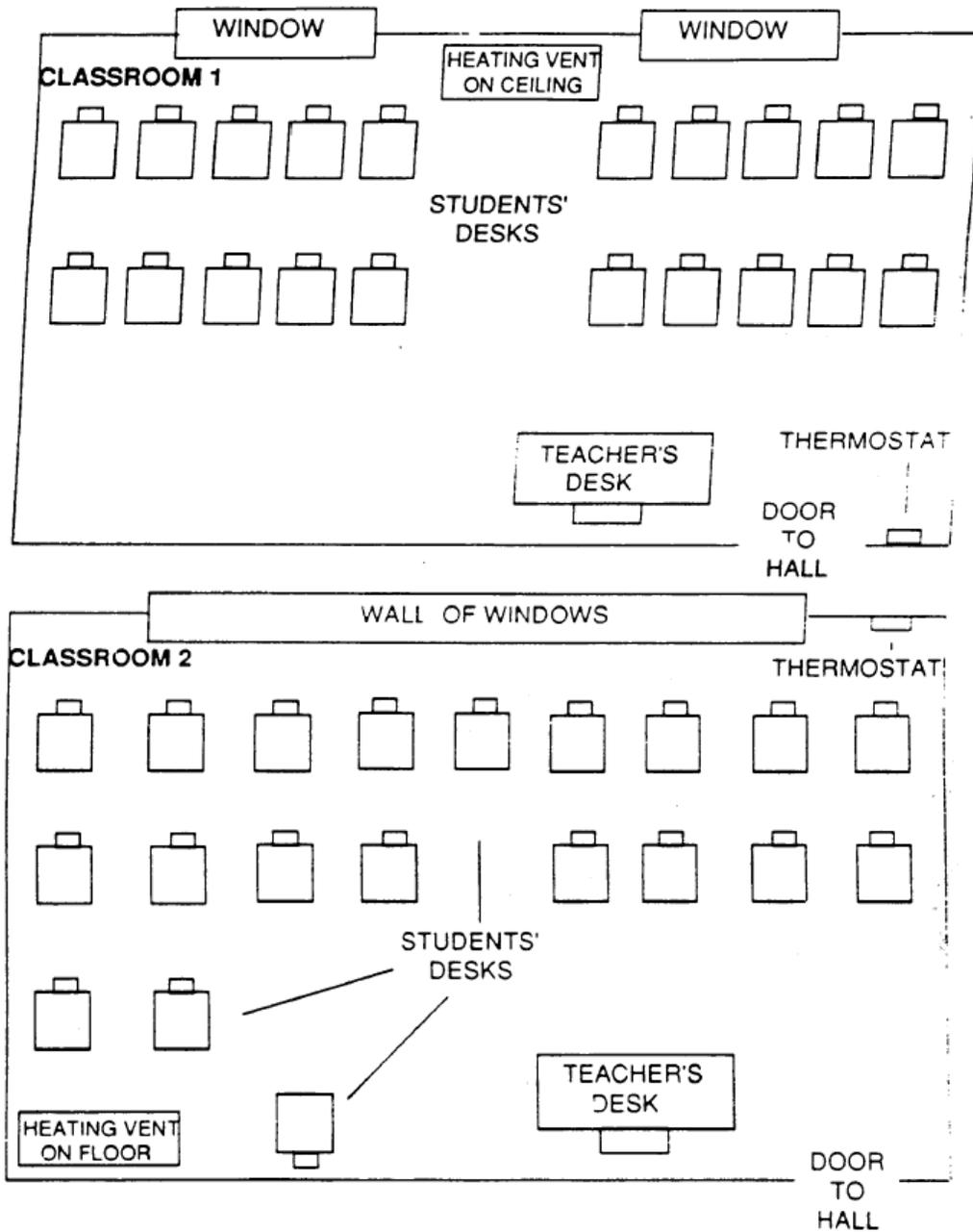
EXTENSIONS

1. Repeat the exercise, only have students do their own homes this time.
2. Have students write an essay about what they think the money saved should be spent on.
3. Students could prepare a pamphlet on simple ways to save energy at school and distribute it to all classes.
4. Have the students start a “Let’s Energize” campaign for the school. Have a school-wide poster contest. Display posters recommending good energy practices for the school.
5. Have the students draw a picture of a building designed to conserve energy. (Some features might be fewer windows on the north side, brick structure, and landscaping such as tall shrubs on the north side of the structure.)
6. Have an assembly program in which the students may share the activities from Energy Week. Activities might also be shared at a parent/teacher organization meeting.

RESOURCES

- The California Energy Commissions’s “Energy Quest” website at http://www.energyquest.ca.gov/saving_energy/index.html.
- The Alliance to Save Energy’s “Save Energy at School” website at <http://www.ase.org/section/audience/educators/edsavsch/>.

WHICH CLASSROOM CONSERVES ENERGY?



Conserving Energy At School

IS ENERGY CONSERVED OR WASTED IN YOUR SCHOOL?

Tour your school building to look for ways energy is conserved or wasted. There are eight things to observe as you walk through the building. If you think energy is being conserved, write the number "1" in the "conserved" blank. If you think energy is being wasted, write "1" in the "wasted" blank. Repeat this process in every room you check. When you finish your tour, count the points for each thing. Does your school save energy or waste energy?

<p style="text-align: center;">Thermostat</p> <p>(Should be located on inside walls and set at 68° in winter and 80° in summer.)</p> <p>Conserved: _____ Wasted: _____</p>	<p style="text-align: center;">Floor Covering</p> <p>(Carpeting helps keep rooms more comfortable.)</p> <p>Conserved: _____ Wasted: _____</p>
<p style="text-align: center;">Ceiling Height</p> <p>(About 8 feet is average. Very high or peaked ceilings waste energy.)</p> <p>Conserved: _____ Wasted: _____</p>	<p style="text-align: center;">Windows</p> <p>(Check for drafts and for numbers of windows.)</p> <p>Conserved: _____ Wasted: _____</p>
<p style="text-align: center;">Classroom Air Vent Filters</p> <p>(Clean filters conserve energy. Dirty filters waste energy.)</p> <p>Conserved: _____ Wasted: _____</p>	<p style="text-align: center;">Lighting</p> <p>(Unnecessary lights should be turned off.)</p> <p>Conserved: _____ Wasted: _____</p>
<p style="text-align: center;">Exterior Doorways</p> <p>(Doors should be kept closed when heat or air conditioning is on. Check doors for air leaks.)</p> <p>Conserved: _____ Wasted: _____</p>	<p style="text-align: center;">Furniture Placement</p> <p>(Furniture should not block heating or cooling vents.)</p> <p>Conserved: _____ Wasted: _____</p>
<p>TOTAL POINTS</p> <p>Conserved: _____ Wasted: _____</p>	