



Title: School and Home Energy Audits

Adapted from the *Alaska Sea Week Curriculum Series, Volume VII*.

Theme: There are many opportunities to conserve energy at home and school.

Objectives:

- Students will understand how daily routines can use significant amounts of energy and have important environmental and economic effects.
- Students will analyze data to identify ways to conserve energy in the home and school.

Duration: 90 minutes (divided into 2 class periods)

Age Range: 4th-8th Grade

Materials:

- Energy Hog Worksheet
- Pencil
- Sticks or old pencils
- Tape
- Scratch Paper
- Computers with internet access (optional)
- Clipboards
- Thermometers
- Watt Meters
- School Energy Audit Data Sheet
- Paper
- Envelopes
- Stamps
- Energy Audit Presentation Rubric

Background:

An energy audit is an excellent way for students to learn about the multitude of ways we use energy in our daily lives. Beyond an academic experience, conserving energy helps students, families, and schools to save money and promotes a healthier environment by cutting down on the amount of oil and natural gas that have to be drilled, transported, and burned for heat and electricity.

Preparation:

Make copies of the Energy Hog Worksheet included in the curriculum for each student or make prints of the energy hog scavenger hunt available at: <http://energyhog.org/pdf/ScavengerHunt.pdf>.

Make copies of the School Energy Audit data sheet.

Watt meters can usually be checked out from the local library or an energy cooperative or company.

Introduction:

Ask students where energy comes from. Brainstorm a list of ways we use energy in our homes and schools. Have students prioritize their top 3 energy needs. What energy uses are important to them, and which ones are less important?

Activities & Procedures:

Introduce the Energy Hog Worksheet and review it with students. Help students to set up a draft-o-meter by taping a 2 inch long, ½ inch wide piece of paper so it hangs vertical off a small stick or pencil. Practice using the draft-o-meter in the classroom and identify an area with a draft (indicated by the paper being blown into a horizontal or diagonal position). Send students home to complete the Energy Hog Worksheet and use the draft-o-meter near doors and windows in their home. Have them complete the scavenger hunt and make a list of drafty areas.

The next day in school, review the Energy Hog Worksheet. Without “naming names” use a scatterplot to graph the scores of the class. Have each student identify an area in which their home scored low and think of a way to change that score. What areas were the draftiest? How can that be changed?

Next, perform a school energy audit. Divide students into teams and provide them with the School Energy Audit data sheet. Have students look for thermostats and energy star appliances in each room. (The whole school heating/cooling system may be controlled by one central thermostat). Check to see whether lights, appliances, and electronics are off when not in use. Students should record the temperature and use the draft-o-meter in each room. Use the watt-meter to measure the energy draw of frequently-used electronics and appliances.

Provide the groups with copies of the Energy Audit Presentation Rubric. Have each student team analyze their data to identify an area of energy waste and present informally to the class. Discuss the different areas of energy waste.

Have each group work together to develop a way to minimize energy waste and prepare a formal presentation. Invite the school principal to the classroom and have students present their solutions.

Wrap-Up:

Now that students have addressed energy waste in the school, ask them to make a switch in their home. Have each student write a letter to themselves with a promise to make at least one simple, inexpensive change to conserve energy in their home or other part of their life. Students should fold the letters, place them in self-addressed envelopes, and give them to the teachers. Mail the letters 2 weeks later to students to remind them of their promises.

Evaluation:

Use the Energy Audit Presentation Rubric to evaluate the student energy solutions, group work, and presentations. Assess student data sheets and analysis for completeness, neatness, and accurate work. Because the characteristics of each home and school will vary, use common sense and your own observations to evaluate answers on the data sheet. Observe student cooperation and participation during group work.

ENERGY HOG OR ENERGY EXPERT

(Reprinted from the Alaska Sea Week Curriculum Series, Volume VII)

Read and mark the answers that best describe what you do to save or use energy. Then total up your points: 70 points or more and you're an energy expert; 30 to 69 points you're not too bad; 29 to -29 need some improvement; and -30 points or less and you're an energy hog!

1. Do you turn the heat down and use lots of quilts and blankets at night? (7 pts) _____
....an electric blanket? (4 pts) _____
....or just keep the whole house warm? (-2 pts) _____

2. Do you grow some of your own vegetables? (5 pts) _____
....pick berries? (5 pts) _____
....hunt or fish for food? (5 pts) _____
....rely only on food from the Lower 48? (1 pt) _____

3. Do you eat food from the four basic food groups everyday? (5 pts) _____
....sometimes eat from the four basic food groups? (3 pts) _____
....survive on packaged foods like pop, candy and potato chips? (-1 pt) _____

4. In your spare time, do you always have your nose in a book? (5 pts) _____
....bicycle, hike, swim, jog, canoe, sail, or cross country ski? (5 pts) _____
....ride a three wheeler, in a car, motorboat, or on a snowmachine? (-5 pts) _____
....feel that your nose may one day become permanently glued to the tube (TV) (-3 pts) _____

5. Is your house weatherstripped and caulked? (5 pts) _____
....real drafty? (-3 pts) _____
....or does it have holes big enough for voles (Alaskan mice!)
to come in through? (-5 pts) _____
(subtract another 3 pts if the holes are big enough for weasels!)

6. Are your windows single-paned? (1 pt) _____
....visqueened? (1 pt) _____
....double-paned? (5 pts) _____
....triple-paned? (8 pts) _____
....heat mirrored? (10 pts) _____
....argon filled? (10 pts) _____

7. Give yourself a point for each inch of insulation (or equivalent)

- ...in your roof _____
- ...in your floor _____
- ...in your walls _____
- (if you have log walls, figure ½ pt for each inch of thickness)
8. Add 4 pts if your house has a vapor barrier. _____
9. Is the temperature in your house in wintertime*
- ...warm enough for bikinis? (-7 pts) _____
- ...OK for T-shirts and shorts? (-5 pts) _____
- ...cool enough for light sweaters? (3 pts) _____
- ...requires heavy sweaters and wool shirts (5 pts) _____
- *If your house is well insulated, you can still have it warm and be saving lots of energy, but there is such a thing as overheating!
10. Do you have a hot water heater? (-12 pts) _____
- ...add 5 pts if it is insulated _____
- ...add 5 pts if it is set at 120 F or less _____
- ...add 10 pts if it only heats “on demand” rather than having a tank continually filled with hot water _____
11. Do you cook several dishes in the oven at once? (5 pts) _____
- ...use the oven for one large dish? (2 pts) _____
- ...or use it to make toast in the morning? (-1 pt) _____
12. Do you boil water with the lid on the pan? (3 pts) _____
13. After washing clothes, do you hang them up to dry rather than using the electric dryer?
- ...never (-1 pt) _____
- ...in good weather (3 pts) _____
- ...in any weather (5 pts) _____
14. Do you turn off lights when you are not using them?
- ...never (-2 pts) _____
- ...sometimes (3 pts) _____
- ...always (5 pts) _____
15. Do you repair things when they break? (10 pts) _____
- ...or throw them away? (-5 pts) _____
16. Are your clothes
- ...from second-hand stores or hand-me downs? (8 pts) _____
- ...almost always new? (1 pt) _____
- ...only the finest designer specials? (-3 pts) _____
17. Do you recycle or reuse newspapers, cans, bottles, paper? (10 pts) _____

18. Do you shut off the TV, radio, and computers when you're not using them?
....always (5 pts) _____
....sometimes (1 pt) _____
....never (-3 pt) _____

19. Subtract 2 pts for each gas or electric appliance in your house. _____

20. Do you have solar panels, wind generator, geothermal, hydropower, air-to-air heat exchanger, or a heat pump in your house? (15 pts) _____

21. Add 3 pts for each additional way you save energy. Write them here. _____

School Energy Audit

Room: _____

Thermostat Set To: _____ Actual Room Temperature: _____

of EnergyStar Appliances: _____ #of Appliances not EnergyStar: _____

of Unused Appliances Off: _____ # of Unused Appliances Left On: _____

of Lights Turned Off: _____ # of Lights Left On: _____

of Compact Flourescent Bulbs: _____ # of Non-CFL Bulbs in Room: _____

Drafty areas:

Other notes:

Your Energy Efficiency Rating for Room (circle one):

Awful

Bad

Okay

Good

Excellent

Room: _____

Thermostat Set To: _____ Actual Room Temperature: _____

of EnergyStar Appliances: _____ #of Appliances not EnergyStar: _____

of Unused Appliances Off: _____ # of Unused Appliances Left On: _____

of Lights Turned Off: _____ # of Lights Left On: _____

of Compact Flourescent Bulbs: _____ # of Non-CFL Bulbs in Room: _____

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Drafty areas:

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Excellent

School Campaign : Energy Audit

Teacher Name: _____

Student Name: _____

CATEGORY	4	3	2	1
Brainstorming - Solutions	Students identify more than 4 reasonable, insightful possible solutions/strategies to encourage change.	Students identify at least 4 reasonable, insightful possible solutions/strategies to encourage change.	Students identify at least 3 reasonable, insightful possible solutions/strategies to encourage change.	Students identify fewer than 3 reasonable, insightful possible solutions/strategies to encourage change.
Research/Statistical Data	Students include 3 or more high-quality examples, quotations, types of evidence, or data from their energy audit to support their idea.	Students include at least 2 high-quality examples, quotations, types of evidence, or pieces of data from their energy audit to support their idea.	Students include at least 1 example, quotation, type of evidence, or piece of data from their energy audit to support their idea.	Students do not include any examples, quotations, evidence, or data to support their idea.

Campaign/Solution	Students create an original, accurate and interesting solution that adequately addresses the issue.	Students create an accurate solution that adequately addresses the issue.	Students create an accurate solution but it does not adequately address the issue.	The solution is not accurate.
Presentation:Group Content & Comprehension	Show a full understanding of the topic. Students are able to accurately answer almost all questions posed by classmates about the topic.	Shos a good understanding of the topic. Students are able to accurately answer most questions posed by classmates about the topic.	Show a good understanding of parts of the topic. Students are able to accurately answer a few questions posed by classmates about the topic.	Do not seem to understand the topic very well. Students are able to accurately answer a few questions posed by classmates about the topic.
Presentation: Individual Preparedness	Student is completely prepared and has obviously rehearsed. Speaks clearly and distinctly all (100-95%) the time.	Student seems pretty prepared but might have needed a couple more rehearsals. Speaks clearly and distinctly almost all (95-90%) the time.	The student is somewhat prepared, but it is clear that rehearsal was lacking. Speaks clearly and distinctly most (90-80%) of the time.	Student does not seem at all prepared to present. Often mumbles or can not be understood
Group Work	The group functioned exceptionally well. All members listened to, shared with, provided feedback, and supported the efforts of others. The group (all members) was almost always on task!	The group functioned pretty well. Most members listened to, shared with, provided feedback, and supported the efforts of others. The group (all members) was almost always on task!	The group functioned fairly well but was dominated by one or two members. The group (all members) was almost always on task!	Some members of the group were often off task AND/OR were overtly disrespectful to others in the group AND/OR were typically disregarded by other group members.

Home & School Energy Audit

Science As Inquiry and Process: Students develop an understanding of the processes and applications of scientific inquiry.

SA1

Students develop an understanding of the processes of science used to investigate problems, design and conduct repeatable scientific investigations, and defend scientific arguments

The student demonstrates an understanding of the processes of science by:

[3, 4, 5, 6, 7, 8, 9] SA1.1 asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating

[3] SA1.2 observing and describing the student's own world to answer simple questions

[4] SA1.2 observing, measuring, and collecting data from explorations and using this information to classify, predict, and communicate

[5] SA1.2 using quantitative and qualitative observations to create inferences and predictions

[6] SA1.2 collaborating to design and conduct simple repeatable investigations

[7,8] SA1.2 collaborating to design and conduct simple repeatable investigations, in order to record, analyze (i.e., range, mean, median, mode), interpret data, and present findings

Science and Technology: Students develop an understanding of the relationships among science, technology, and society.

SE1 Students develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events.

The student demonstrates an understanding of how to integrate scientific knowledge and technology to address problems by:

[3] SE1.1 identifying local problems and discussing solutions

[4] SE1.1 recognizing that tools (e.g., spear, hammer, hand lens, kayak, computer) and processes (e.g., drying fish, sewing, photography) are an important part of human cultures

[5] SE1.1 identifying a community problem or issue and describing the information needed to develop a scientific solution

[6] SE1.1 recognizing that technology cannot always provide successful solutions for problems or fulfill every human need

SE2 Students develop an understanding that solving problems involves different ways of thinking, perspectives, and curiosity that lead to the exploration of multiple paths that are analyzed using scientific, technological, and social merits.

The student demonstrates an understanding that solving problems involves different ways of thinking by:

[3] SE2.1 identifying local tools and materials used in everyday life

[4] SE2.1 identifying the function of a variety of tools (e.g., spear, hammer, hand lens, kayak, computer)

[6] SE2.1 identifying and designing a solution to a problem

[6, 7] SE2.2 comparing the student's work to the work of peers in order to identify multiple paths that can be used to investigate a question or problem

[8] SE2.2 comparing the student's work to the work of peers in order to identify multiple paths that can be used to investigate and evaluate potential solutions to a question or problem