

How Green Are We?



Target Grade Levels

Fifth - Twelfth

Time

Two class sessions and one week to conduct the audit

Materials

- paper
- pencil
- chalk
- chalkboard
- guest presenters: *air quality professionals, economists, ecologists, conservationists*

Knowledge and Skills (TEKS)

- Science:
 - Collecting data, observing, drawing conclusions, making oral presentations;
 - Demonstrate safe, environmentally appropriate, and ethical practices;
 - Learn to use and conserve, dispose and recycle resources;
 - Record changes in matter caused by heat and conduct tests, compare data, and draw on conclusions about physical properties of matter-states, conduction, density, and buoyancy; and
 - Identify and observe effects of events that require time for change to become noticeable.

Overview

This activity enables students to audit their homes, their school, and their community to evaluate steps being taken to prevent or reduce air pollution.

Background Information

Air pollution is a major problem in many areas of the United States. Even though some of this pollution comes from natural sources, such as volcanoes, forest fires, and other natural occurrences, much of it can be traced to manmade sources. Air pollution from human sources is the result of our increasing use of fuel to produce electricity and to power automobiles, trucks, and other vehicles.

Many of these air pollutants come from burning coal, oil, wood, and other fuels used to run factories, cars, and the power plants that generate heat and light for our homes. Many air pollutants are not only harmful, but also tend to be concentrated in urban areas where industrial activity is greatest and energy use by the community is highest. There are things that individuals and families, schools, and communities can do to become more energy-efficient.

Individuals and families can play a role in reducing pollution by cutting electrical and fuel consumption. Electricity consumption costs can be reduced by using fluorescent or compact fluorescent bulbs in the home, adjusting the setting of the thermostat appropriately during the summer and winter, turning off appliances when they are not in use, and using alternative sources for accomplishing tasks that traditionally use electricity, such as drying clothes outdoors instead of using a clothes dryer.

Other measures can be taken, such as using sunlight instead of electricity for warmth and light, buying appliances with low wattages and favorable efficiency ratings, and keeping filters clean on furnaces, air conditioners, and refrigerators. Fuel consumption can be reduced by proper car maintenance, walking or bicycling instead of using the car, or by combining errands so that only one trip needs to be made to accomplish many tasks.

Schools also can cut down on electrical and fuel consumption by taking similar measures to those taken in the home. Turning off lights at night, using solar energy to help heat the building, and keeping the temperatures at 68°F (20°C) in the winter and 78°F (25.56°C) in the summer are just a few measures they can take to conserve energy. In addition, they can alter bus routes to accommodate more students so that fewer buses are on the road and encourage their employees to use public transportation, walk, bike, or carpool to get to work, implement SchoolPool and Walking School Bus programs, institute anti-idling policies, or adjust the start and end dates of the school.

Communities can help reduce air pollution by participating in the “Green Lights” program, which is a clean air effort sponsored by EPA. The program works with business and industry to help them reduce electricity usage and save money. The program focuses on upgrading lighting systems and encourages the use of fluorescent and compact fluorescent light bulbs, which last ten times as long as traditional incandescent bulbs and emit more light per watt. The direct result is improved lighting and cost savings for participating schools, as well as a reduction in air pollution. Communities also can reduce air pollution by promoting use of public transportation, designating High-Occupancy Vehicle lanes on major roads during rush hour, improving bus routes to reach more citizens, and designating bike routes to encourage use of bikes instead of cars. This could reduce harmful emissions from cars, as well as heavy congestion on major roads.

The focus of this exercise is to learn about energy conservation practices in the home and to have students investigate how energy efficient their families are. To do this, the students will compile an audit. This audit will be conducted by filling out the student worksheet on conservation practices in the home. It is important to emphasize that the point of the audit is to discover ways in which we can all take action to improve air quality, rather than to criticize anyone’s home energy usage or transportation choices.

Suggested Reading

- Gutfeld, Greg, Linda Rao, and Maureen Sangiorgio. “Pollution-Fighting Plants.” *Prevention*, 44 (September 1992) p. 10.
- Javna, John, et al. *50 Simple Things Kids Can Do To Save the Earth*. Andrews and McMeel (1990).
- “What You Can Do To Reduce Air Pollution.” U.S. *Environmental Protection Agency*. Washington, DC. EPA/450/Kindergarten - 92/002 (1992).
- Willis, Terri, and Wallace B. Black. *Cars: An Environmental Challenge*. Children’s Press (1992).

Procedure

1) Vocabulary

- a) compact fluorescent
- b) energy-efficiency incandescent
- c) anthropogenic
- d) biogenic
- e) fluorescent

2) Activities

a) Class #1

- i) Discuss with students the causes of air pollution and how air pollution can be reduced through the use of energy efficient appliances and light bulbs and fuel-efficient cars.
- ii) Introduce the exercise by telling the students that they will be conducting an audit. Explain to them that the audit will be a formal examination of each student's home and family practices related to energy use. Data will be collected and observations will be recorded on the student worksheets.
- iii) Hand out "Student Worksheet 1" with specific instructions to answer all of the questions. Explain to the class that data collected from the audit will be used as part of a future in-class discussion to assess the energy efficiency of their homes and to discuss the importance of energy conservation.
- iv) Give the students one week to complete the audit of their home. Be sure to tell them that they should feel free to make additional observations and to collect data related to energy use that is not necessarily on the student worksheets.

b) Class #2

- i) Meet with the class to discuss the data collected from their audits.
- ii) Discuss the importance of energy conservation and how it relates to the reduction of air pollution. Explain to students that there are many measures their families can take to conserve energy, such as purchasing new appliances that have energy efficiency ratings or setting the thermostat to 68°F (20°C) in the winter and 77°F (25°C) in the summer.
- iii) Explain how energy conservation measures not only reduce air pollution, but save money as well.
- iv) Discuss the importance of fuel conservation and how it relates to air pollution.
- v) Discuss how car emissions contribute to air pollution, but that this can be combated by more people using public transportation, carpools, and biking or walking.

3) Review

- a) Have the class tally answers and ascertain the high values, low values, and median values for the class.
- b) Go over each value, encouraging students to discuss why some homes are low and others are high in that value and to postulate what additional energy conservation habits they can practice.

4) Evaluation

- a) Completion of the home energy audit can be a graded exercise.
- b) Class participation can be a graded exercise.
- c) Extension activities can be performed as graded exercises.

5) Extension

- a) For grades 7-9, have students conduct an audit of the school in addition to auditing their homes. Using "Student Worksheet 2," they can answer questions related to energy conservation by the school and its students and personnel.
- b) For grades 10-12, expand the activity to include an audit of the community. Have students use "Student Worksheet 3." This additional activity will require time to do research outside of class and includes an evaluation of energy use by industry and businesses in the community and the efforts that the community takes to encourage energy efficient practices by its citizens.

STUDENT WORKSHEET 1
HOW GREEN ARE WE?
Home Audit

1) How many light bulbs do you have in your home?

2) How many are fluorescent or compact fluorescent bulbs?

3) What is the total wattage of all bulbs in your home?

4) What temperature does your family set your thermostat set at in the winter?

Summer?

5) Is your home properly insulated to help keep the house warm in the winter and cool in the summer?

6) What locations in the house should be insulated the most?

7) Does your family wait until there is a full load of laundry to wash clothes?

8) Do you dry washed clothes outside or use a clothes dryer?

9) How many miles per gallon does your family's car get?

10) How many gallons of gas does your car use in a week?

11) What kind of gas does your family use in their car?

12) How often do you walk, ride your bike, or use public transportation instead of riding in a car per month?

STUDENT WORKSHEET 2
HOW GREEN ARE WE?
School Audit

1) How long do the lights stay on in the school after the students have left for the day?

2) Who is responsible for turning off the lights?

3) Do you ever see the lights turned on in the evening hours?

4) What kinds of light bulbs are used in the lighting fixtures at the school?

5) Are the windows in the school properly insulated? (Hold a tissue next to the windows.)

6) What are ways to fix the windows?

7) Who is responsible for getting this done?

8) How do you and your friends get to school each day?

9) Does the bus reach enough students so that no one has to rely on other transportation?

10) If a parent drives you, do other students ride with you?

11) What other modes of energy-efficient transportation could students use to get to school?

12) Can you make arrangements to pick up a friend or several friends to ride to and from school with you and your parents?

13) How do most teachers and other school personnel (such as the principal, teachers, or your guidance counselor) get to school each day?

14) How else may teachers travel to and from school each day?

15) Do you see parents picking up children from school?

16) If so, do they leave their car running while they wait?

17) What measures could the school take to discourage drivers from doing this?

STUDENT WORKSHEET 3
HOW GREEN ARE WE?
Community Audit

- 1) What industries in your community are major polluters?

- 2) What federal regulations that relate to air pollution affect their business?

- Do they abide by these regulations?

- If not, why?

- 3) What local regulations affect their business?

- 4) What other businesses in your community indirectly contribute to air pollution?

- 5) What measures do these companies take to cut down on air pollution?

- 6) Are there enough buses and subways to help people get around town easily without having to get into their car

- Could the routes be changed to accommodate more people?

- 7) Do major streets have bicycle lanes to make it easier for people to ride bikes as an alternative to driving their car?

- 8) Does the community sponsor a car pool program?

- How many people are participating?

- 9) Do the major roads in your community encourage carpooling by designating High-Occupancy Vehicle (HOV) lanes during rush hour?

- 10) Are traffic signals timed to reduce the amount of time that cars sit at lights?

- 11) Are gas stations required to install special devices on pumps to capture gas fumes that can be released into the atmosphere, causing air pollution?

- 12) Does your community require emissions inspections for all registered vehicles?
How often are these inspections required?
