UNIT ONE

Human Issues

Activity 1
Population—More Is Less

Activity Summary

Students calculate what happens to a population that increases (or decreases) exponentially at varying rates. They see what effect population changes have on per capita availability of finite resources. They then consider whether increased population would have a positive or a negative effect on various environmental factors. Finally, they imagine themselves living forty years from now and write a letter to their imaginary grandchild.

Content Standard Alignment

This activity can help students meet the following National Science Education Standards put forth by the National Research Council.

Grades 5–8

Content Standard C: As a result of their activities in grades 5–8, all students should develop an understanding of

Populations and ecosystems

Content Standard F: As a result of their activities in grades 5–8, all students should develop an understanding of

Personal health

Populations, resources, and environments

Risks and benefits

Grades 9–12

Content Standard C: As a result of their activities in grades 9–12, all students should develop an understanding of

Interdependence of organisms

Matter, energy, and organization in living systems

Content Standard E: As a result of their activities in grades 9–12, all students should develop:

Understandings about science and technology

Content Standard F: As a result of their activities in grades 9–12, all students should develop an understanding of

Personal and community health

Population growth

Natural resources

Environmental quality

Natural and human-induced hazards

Science and technology in local, national, and global challenges

Content Standard G: As a result of their activities in grades 9-12, all students should develop an understanding of

Science as a human endeavor

Introduction

The issue of overpopulation is THE overriding environmental issue of our time. As population increases, more stress is put on the Earth's finite resources. As people endeavor to raise their standards of living, even more stress is put on the Earth. An understanding of population dynamics is crucial to understanding our environmental problems and possible solutions.

One aspect of the population issue is the simple magnitude of the numbers involved. As death rates have decreased, the human population has increased exponentially. In some areas, mainly in the more developed countries, this growth has slowed as resources have been depleted, people have learned the importance of slowing or stopping population growth, and birth control methods have become available. In Europe, the population was growing by only 0.3 percent annually in 1990. By 2006, Europe's natural population growth rate (not counting immigration) was actually –0.1 percent (fewer people were being born than were dying.) The 1996 natural growth in the United States was 0.6 percent. In other areas, though, the population has been growing much more rapidly as medical and agricultural advances have combined to reduce death rates and increase fertility. Africa's annual growth rate in 2006 was 2.4 percent, while Latin America's was 1.5 percent. Although those percentages may not seem large, exponential growth results in very large increases in just a few years. Today there are about three births for each death worldwide. Part I of this activity is intended to demonstrate graphically the results of exponential growth in population and the possible results of exponential population reduction.

In Part II of this activity, the students consider the consequences of rapid population growth. Open space, clean water, adequate food supplies, and other characteristics of a desirable and healthy environment become much more difficult to obtain and maintain as the population increases. Generally, increased population results in more pollution, depletion of natural resources, crowding, stress, and other undesirable developments. We need to consider not only the *quantity* of life, but the *quality* of life.

Finally, in Part III, the students consider what the future might be like if population continues to grow at its present rate. At the current rate of growth, the Earth's population will double in less than forty years. Few demographers expect, though, that the Earth will be able to sustain such rapid population growth. The results of such growth are impossible to predict with accuracy, but there certainly will be major changes in all aspects of the human experience.

Grouping

Parts I and II: twelve approximately equal teams

Part III: individuals

Time

Part I: 30–50 minutes

Part II: 20–40 minutes

Part III: 20–40 minutes, or as homework

Anticipated Outcomes

The students will

- Understand the effect of exponential growth on populations
- Increase their understanding of the relationship between population and resources
- Know the meanings of the terms on the vocabulary list
- Consider the effect of increased human population on the environment

Materials

Photocopied student pages:

1.1 Population—More Is Less: Background Information (one per student)

1.2 Population—More Is Less: Instructions, Parts I and II (one per team)

1.2 Population—More Is Less: Instructions, Part III (one per student)

1.3 Population—More Is Less: Questions (one per student)

For each team:

1 red, 1 green, and 1 black pen, pencil, or crayon

1 calculator

Graph paper

13 apples, candy bars, large soft cookies, or other easily cut food

Knife

Overhead transparency of Instructions sheet (1.2), Parts I and II, and graph paper
Colored pens for writing on transparencies
Optional: overhead transparency of Instructor's Data Sheet (1.4)

Vocabulary

birth rate
carrying capacity
death rate
demography
doubling time
emigration
exponential growth
immigration
per capita
population

Teacher Preparation

1. Photocopy the Background Information sheet (1.1), Instructions sheets for Parts I, II, and III (1.2), and Questions sheet (1.3).
2. Obtain the materials.
3. Make overhead transparencies of the Instructions sheets (1.2), Parts I and II, and graph paper.
4. *Optional:* Make a transparency of the Instructor's Data Sheet (1.4).

Procedure

Part I: Exponential Growth

1. Ask the students whether they think that, forty years from now, when they have their own families, they will have a better, worse, or the same lifestyle as they and their parents do now. Discuss the meaning of "better lifestyle."

Safety Consideration

Be careful when cutting the apple at the end of Part I.

2. Ask the students whether they think the world's population is increasing, decreasing, or is stable. Tell them that it is increasing.
3. Ask the students what relationship there might be between population and lifestyle. Discuss finite resources and introduce the term **per capita**.
4. Ask the students how fast they think the world's population is increasing, both as a percentage and as a number per year.
5. Distribute the Background Information sheet (1.1). Have the students read it.
6. Discuss the Background Information sheet with the class.
7. Distribute the Exponential Growth Instructions sheet (1.2), Part I. Discuss the assignment with the students.
   - Be sure they know how to use the calculators and round off numbers to the nearest whole number.
   - If necessary, help them determine how to make their graphs.
8. Assign each of the teams one of the following growth rates:

   0.5% 1.0% 1.5% 2.0% 2.5% 3.0%

   –0.5% –1.0% –1.5% –2.0% –2.5% –3.0%
9. Allow about twenty to thirty minutes for the students to do their calculations and graphs.
10. Make an overhead transparency of the data, project it, and discuss it.
11. Give each team an apple (or soft cookie or candy bar). Cut out (or add) part of it proportional to the population change over the twenty-year time period, depending on the growth rate they calculated. (See the following calculations.) Discuss how the apple represents any finite resource, such as food, water, land, or minerals. Discuss the effect that various population growth rates have on the amount of the resource per capita.

A population starting at 100 and growing at a rate of 0.5 percent for 20 years will have 110 people. One hundred percent of the resource (apple, candy, pie, or ?) divided among 110 people means that each one will only receive 91 percent of what they would have received if the population had remained at 100. (100/110 = .91 = 91 percent). The figures are:

New Allocation Growth Rate (%)	*(% of Original Allocation)*	*New Allocation Growth Rate (%)*	*(% of Original Allocation)*
0.5	91	–0.5	111
1.0	82	–1.0	122
1.5	74	–1.5	135
2.0	67	–2.0	149
2.5	61	–2.5	167
3.0	55	–3.0	185

Part II: Quality or Quantity?

1. Distribute the Instruction sheet 1.2 (Part II: Quality or Quantity?).
2. Explain the assignment to the students.
3. Have the students do the assignment in teams of two to four, possibly the same teams that worked together for Part I.
4. Discuss the results of the activity.

Part III: Dear Grandchild

1. Distribute the Instruction sheet 1.2 (Part III, Dear Grandchild) and explain the writing assignment.
2. After the students have completed the assignment, discuss their realizations and feelings.

Discussion

Part I

1. Were you surprised at how rapidly the population changed with only a small rate of growth?
2. How can a country's *birth rate* decline yet its *population* increase?
3. Distinguish between a reduced rate of population growth and a reduced population.
4. How might population increases in the more developed countries affect your life 10, 20, 30, or 40 years from now?
5. How might population increases in the less developed countries affect your life 10, 20, 30, or 40 years from now?
6. How might population increases in your local area affect the lifestyle there in 10, 20, 30, or 40 years from now?

Part II

1. Did the "good" things (green) tend to increase or decrease with increased population?
2. Did the "bad" things (red) tend to increase or decrease with increased population?

Part III

What were some of your thoughts as you wrote your letter?

Answers to Worksheet 1.3

1. As a population increases exponentially, there is an ever-increasing rate of growth, resulting in a steeper and steeper population growth curve.
2. Generally, increased population results in a decrease of things that we consider desirable and an increase of most undesirable things. Refer to students' activity sheets for examples.
3. It is not possible for the entire world to live as we in the United States do. If 4.3 percent of the population of the world uses 30 percent of the resources, each 1 percent use 30 ÷ 4.3, or about 7 percent of the resources. Thus, for 100 percent of the world to use an equivalent amount, they would use 700 percent of the resources! (Another way to look at this is to point out that each of us in the United States use about seven times as much as the average person on Earth. To be fair, we should cut our resource consumption to about one-sixth or one-seventh of what it currently is. How do the students feel about that?)
4. Answers will vary, but it is very important for population growth to be halted in all areas.
5. Answers will vary.
6. Answers will vary.
7. Generally, an increase in human population will result in:
   a. More extinctions.
   b. Lower quality of air and water, at least until technology catches up with growth (IF it does).
   c. Less space available.
   d. Less food available per capita.
   e. More stress and conflict as competition for resources increases.
   f. Less energy per person.
   g. More competition for jobs and housing.
   h. More chance of spread of contagious disease due to crowding.
   i. Answers will vary, but there will probably be less freedom and fewer resources available.
   j. Answers will vary.
8. Answers will vary. Some nations already do.
9. Answers will vary. Some nations already do.
10. Answers will vary. Students should address both their own family size and their use of resources. (If it is not comfortable for you, it's not necessary to get into a discussion of HOW to control family size. You might discuss why many people feel that they should do so.)

Extensions

(See Activities 7, "Think Globally, Act Locally," and 8, "Do It!" for student project ideas.)

Part I

1. Obtain copies of the latest U.S. or World Population Data Sheet from the Population Reference Bureau, or view it online. They also publish activity guides to go with their data sheets.

   Population Reference Bureau
   1875 Connecticut Avenue, NW, #520
   Washington, DC 20009
   (800) 877-9881
   www.prb.org

2. Have students study the writings of Thomas Malthus, Paul Ehrlich, and other writers on population issues.
3. Have the students graph their prediction of what would happen to resources per person on the same graph as their exponential population change graph.
4. Invite guest speakers on population issues including:

   a. Ways of preventing pregnancy, including abstention

   b. Abortion

   c. Women's rights

   d. Resource distribution

(Some of these topics are controversial. Be sure to check your district's policies regarding controversial issues. Also, be sure to screen speakers carefully. They can sometimes do more harm than good.)

5. Have students make a bulletin board of a graph of the human population through time, including projected population for the next hundred years. It can be illustrated with pictures from magazines, the Internet, or drawn by students.

Part II

1. Discuss the role of technology in the population resources question.
2. Have the students make a bulletin board of the arrows from this activity, illustrated with pictures from the Internet, magazines, or drawn by students.

Part III

1. Have the students write a letter to a friend or grandchild as if it is forty years from now and the world's population is reduced—through peaceful humane means—by 50 percent from today's population. Compare this scenario to that of the letter with doubled population.

2. Have students make a bulletin board depicting the idea that the United States has about 4.3 percent of the world's population but uses about 30 percent of the world's energy and mineral resources and produces about a third of the world's pollution and trash. (That's a pretty big slice of the pie!)

Modifications

Part I

1. Students can reduce or extend their computations and graphing as far as you wish. To correlate with Part III, you might have them carry them out to forty years.
2. Have one team calculate a very high growth rate, such as 7 percent or more.

Part II

Add other factors, both good and harmful.

Part III

Have the students write a letter to a classmate who is currently their friend, imagining that they haven't seen each other for forty years. They should describe the changes in their environment and living conditions.

Internet Connections

Population Connection (formerly Zero Population Growth) has several population education resources available for teachers: www.populationconnection.org

Population Reference Bureau publishes an annual World Population Data Sheet both online and in print format: www.prb.org

References

Brouse, Deborah, and Pamela Wasserman. *For Earth's Sake.* Washington, D.C.: Zero Population Growth, 1989.

EdVentures in Population Education. Washington, D.C.: Zero Population Growth, 1984.

Miller, G. Tyler. *Living in the Environment.* Belmont, Calif.: Thomson, 2007.

Population Reference Bureau. *2007 World Population Data Sheet.* Washington, D.C.: Population Reference Bureau, 2007.

Wasserman, Pamela, and Andrea Doyle. *Earth Matters.* Washington, D.C.: Zero Population Growth, 1991.

Name _____ Class _____ Date _____

1.1
Population—More Is Less: Background Information

What is the most pressing environmental issue of our time? Is it acid rain? Global climate change? Air pollution? Deforestation? While some authorities might answer differently, most would agree that the problem of human **population** growth is of major importance.

To see why this is so, we need to consider two aspects of human population growth: the *quantity* of human life and the *quality* of human life. First, let us consider the quantity of human life.

Population growth occurs when the number of organisms entering a population exceeds the number of organisms leaving it. The population of a city, for example, grows if the people moving into it (**immigration**) plus the number of people born in it is greater than the sum of the number of people moving out (**emigration**) and the number of deaths. When considering the Earth, we need to consider the **birth rate** (number of live births per one thousand people in a year) as compared to the **death rate** (number of deaths per one thousand people per year).

For most of human existence, the death rate nearly equaled the birth rate, and the population grew very slowly. It took millions of years for the human population to reach one billion, about the year 1810. It took only 117 more years to add the second billion (1927), only 33 years to add the third billion (1960), 14 years to add the fourth billion (1974), and only 13 more years to reach five billion in 1987. In 1999, 12 years later, the world's population reached six billion. It is predicted that the Earth's population will reach seven billion people by 2013. Notice that the rate of growth is now slowing, but that the population is still increasing.

The type of growth exhibited for most of the time since about 1810 is called **exponential growth**. Part I of this activity will allow you to investigate exponential growth.

As you do Part I, keep the following growth rates in mind:

The World:	1.2% per year	Africa:	2.4% per year
Latin America:	1.5% per year	Asia:	1.2% per year
United States:	0.6% per year	Europe:	–0.1% per year

Those who study populations, **demographers**, often consider the **doubling time** for a population. We can see that the population of Earth doubled between 1960 and 1999, a doubling time of less than forty years! Compare this to the 117 years that it took to double from one billion in 1810 to two billion in 1927, and the 47 years that it took to double again to four billion.

Any place on Earth can support only a certain number of any type of organism. That is its **carrying capacity**. We do not know what the Earth's carrying capacity for people is. Some demographers feel that we have already exceeded it. Others think that our ability to manipulate our environment will enable us to support even more people. Regardless of how many people can possibly subsist on Earth, how many of us *should* there be? Is our goal to have as many people as possible existing on Earth, or is our goal for people to have happy, healthy, fulfilling lives? The United States has about 4.3 percent of the world's population but uses about 30 percent of the resources that are consumed each year. Is it possible for all people to achieve the standard of living that we in the United States now enjoy?

Name _____ Class _____ Date _____

1.2A
Population—More Is Less: Instructions

Part I: Exponential Growth

Your team will be assigned a population growth rate, stated as a percentage. Note that a negative population growth rate means simply that the population is getting smaller.

Use a calculator to determine the population each year for a population that starts at 100. Round off decimals to the nearest whole number. As you do your calculations, record your data on the table below.

For example, if you were assigned a growth rate of 7 percent, the first part of the table would look like this: [calculations: 100 × 1.07 = 107 107 × 1.07 = 114.49]

Year #	*Population*	*Year #*	*Population*
0	100	11	
1	107	12	
2	114	13	

As you do your calculations, one team member should graph the population change. Before beginning your graph, your team should:

- Decide which axis should represent the year and which should represent the population
- Decide what the units should be on the population axis
- Graph a population growth of 0 percent

Population growth rate assigned: _____

Year #	*Population*	*Year #*	*Population*
0	100	11	
1		12	
2		13	
3		14	
4		15	
5		16	
6		17	
7		18	
8		19	
9		20	
10			

Name _____ Class _____ Date _____

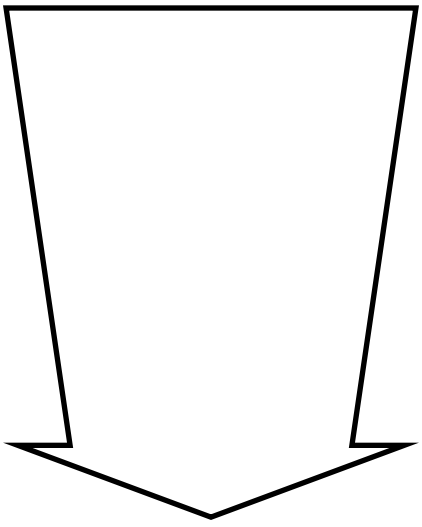
1.2B
Population—More Is Less: Instructions

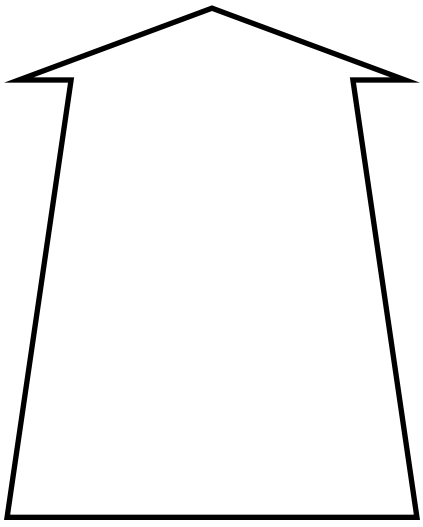
Part II: Quality or Quantity?

1. As a team, discuss the items listed below. Decide whether each item is generally "good" for people and the environment or generally "harmful."
   - If it is "good," place a green "+" in the space beside the item.
   - If it is "harmful," place a red "–" in the space.
   - If your team really can't decide, place a black check in the space.

___Clean water	___Energy	___Noise
___Buildings	___Overgrazing	___Hunger
___Material luxuries	___Polluted air	___Minerals
___Space to live	___Cars and roads	___Unemployment
___Soil erosion	___Forests	___Food
___Wildlife	___Acid rain	___Garbage
___Poverty	___Oil spills	___Crowded cities
___Opportunities for solitude	___Endangered species	___Contagious disease
___Traffic congestion	___Available housing	___International conflicts
___Recreational space		

2. Now consider the effect of a significantly increased human population on each item. If increasing the human population would tend to increase the item, write the item inside the arrow pointing upward. If increasing the human population would tend to decrease it, write the item inside the arrow pointing downward.
   - Use a red writing tool for the "harmful" things.
   - Use a green writing tool for the "good" things.





Name _____ Class _____ Date _____

1.2C
Population—More Is Less: Instructions

Part III: Dear Grandchild

If current trends continue, the population of the world will be about twice as large forty years from now. What do you think your life will be like in forty years? Will you have children? Grandchildren? What will their lives be like? What will the environment be like in the area where you now live?

Write a letter to your ten-year-old grandchild. In your letter, discuss:

- What you do for a living
- What you do for recreation
- How the world has changed
- What you eat
- Your energy source
- What you would have done differently
- Your hopes and dreams for your grandchild
- One simple piece of advice for your grandchild

Date: _____

Dear _____,

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(Continue on the back of this paper or on a separate paper.)

Name _____ Class _____ Date _____

1.3
Population—More Is Less: Questions

1. Summarize the effect of exponential growth on a population.

_____

_____

2. In Part II of this activity, you saw some relationships between population and some parts of the environment. What sorts of things tend to increase with population increases? What sorts of things tend to decrease?

_____

_____

_____

3. The United States has about 4.3 percent of the Earth's human population and is responsible for about 30 percent of the annual resource use and pollution. What does this tell us about the lifestyle that is possible for the *world's* population?

_____

_____

_____

_____

4. Which is more important, to halt population growth in rapidly growing, less developed areas such as Africa, or in more slowly growing developed areas such as the United States? Discuss your answer.

_____

_____

_____

5. List some advantages of a reduced human population.

_____

_____

_____

6. Discuss the relative importance of *quantity* of life versus *quality* of life.

_____

_____

_____

7. How does human population growth affect the following?
   a. Extinction of other species

      _____

   b. Quality of air and water

      _____

   c. Space available for recreation

      _____

   d. Food available for people

      _____

   e. Stress and conflict

      _____

   f. Energy resources available per person

      _____

   g. Competition for jobs and housing

      _____

   h. The spread of contagious diseases

      _____

   i. Your lifestyle in the next forty years

      _____

   j. Your descendants' lifestyles

      _____

8. Should governments enact and enforce laws to limit population? Explain your answer.

   _____

   _____

9. Should governments encourage population control through such measures as education, tax incentives for smaller families, and making birth control more available? Explain your answer.

   _____

   _____

10. What can you do, personally, to help with the overpopulation problem?

    _____

    _____

Name _____ Class _____ Date _____

1.4
Population—More Is Less: Instructor's Data Sheet

Changes in a Population Starting at 100, with Various Growth Rates

					Year Number						
	0 (Start)	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	
Growth Rate					*Population*						
–3.0%	100	97	94	91	89	86	83	81	78	76	C
–2.5%	100	98	95	93	90	88	86	84	82	80	0
–2.0%	100	98	96	94	92	90	89	87	85	83	N
–1.5%	100	99	97	96	94	93	91	90	89	87	T
–1.0%	100	99	98	97	96	95	94	93	92	91	I
–0.5%	100	100	99	99	98	98	97	97	96	96	N
0.0%	100	(A growth rate of 0% results in an unchanged population.)								100	U
+0.5%	100	101	101	102	102	103	103	104	104	105	E
+1.0%	100	101	102	103	104	105	106	107	108	109	
+1.5%	100	102	103	105	106	108	109	111	113	114	B
+2.0%	100	102	104	106	108	110	113	115	117	120	E
+2.5%	100	103	105	108	110	113	116	119	122	125	L
+3.0%	100	103	106	109	113	116	119	123	127	130	0
											↙W

					Year Number						
	10	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*
Growth Rate					*Population*						
–3.0%	74	72	69	67	65	63	61	60	58	56	54
–2.5%	78	76	74	72	70	68	67	65	63	62	60
–2.0%	82	80	78	77	75	74	72	71	70	68	67
–1.5%	86	85	83	82	81	80	79	77	76	75	74
–1.0%	90	90	89	88	87	86	85	84	83	83	82
–0.5%	95	95	94	94	93	93	92	92	91	91	90
+0.5%	105	106	106	107	107	108	108	109	109	110	110
+1.0%	110	112	113	114	115	116	117	118	120	121	122
+1.5%	116	118	120	121	123	125	127	129	131	133	135
+2.0%	122	124	127	129	132	135	137	140	143	146	149
+2.5%	128	131	134	138	141	145	148	152	156	160	164
+3.0%	134	138	143	147	151	156	160	165	170	175	181

Activity 2
Food? What Food?

Activity Summary

By participating in a simple relay game, students see that the transfer of materials and energy between organisms in a food chain is not 100 percent efficient. Discussion leads to a better understanding of problems of food and population.

Content Standard Alignment

This activity can help students meet the following National Science Education Standards.

Grades 5–8

Content Standard B: As a result of their activities in grades 5–8, all students should develop an understanding of

Transfer of energy

Content Standard C: As a result of their activities in grades 5–8, all students should develop an understanding of

Populations and ecosystems

Content Standard F: As a result of their activities in grades 5–8, all students should develop an understanding of

Personal health

Populations, resources, and environments

Grades 9–12

Content Standard B: As a result of their activities in grades 9–12, all students should develop an understanding of

Conservation of energy and increase in disorder

Interactions of energy and matter

Content Standard C: As a result of their activities in grades 9–12, all students should develop an understanding of

Interdependence of organisms

Matter, energy, and organization in living systems

Content Standard D: As a result of their activities in grades 9–12, all students should develop an understanding of

Energy in the Earth's system

Content Standard F: As a result of their activities in grades 9–12, all students should develop an understanding of

Personal and community health

Population growth

Natural resources

Environmental quality

Science and technology in local, national, and global challenges

Introduction

It is generally agreed that the typical American diet has too much meat and too little fiber. Nutritionists would encourage most Americans to eat less meat for health reasons.

There are reasons other than health to reduce meat consumption. As the world's population increases, ways to feed more people need to be found. The food that goes to beef cattle, hogs, chickens, and other animals on American farms and ranches could be used to feed people directly. Ecologists estimate that only about 10 percent of the energy contained in a food organism could theoretically become available to the organism that consumes it. Thus, the land that grows corn to support beef cattle that would support "X" people could, theoretically, support about "10 X" people eating corn. In natural systems, though, the actual percentage of energy converted is closer to 1 percent.

Modern agricultural methods often employed in the United States also use a lot of energy, most of it coming from fossil fuels. It is estimated that the American agricultural industry *uses* about ten to fifteen units of fossil fuel energy to put one unit of food energy on the table. Subsistence farmers elsewhere, on the other hand, *produce* about ten units of food for each one they expend.

Other people promote vegetarianism or veganism for humanitarian reasons. They feel that it is immoral to take an animal's life for human food, or they are upset with the animal-treatment practices of industrial meat producers.

Recently, concern about global climate change has revealed another reason to reduce consumption of meat. Methane is an important greenhouse gas, reducing radiation of heat energy into space from the Earth. Beef cattle and other animals produce significant amounts of methane gas.

It is worthwhile for students to consider their eating habits. Many students have poor diets. They may not be *under*nourished, but many are *mal*nourished or *over*nourished. One advantage of meats is that they provide a variety of the amino acids that we need for protein synthesis. With an understanding of nutrition, these amino acids can also be obtained from a properly balanced vegetarian diet.

This activity teaches about food chains and food pyramids, also known as pyramid of numbers or pyramid of biomass.

Strictly speaking, a food chain does not include the physical environment. It is important, though, that students understand that the physical environment provides the basis for all food chains.

Grouping

Teams of five to seven students

Time

One 45- to 55-minute period

Anticipated Outcomes

The students will

- Increase their understanding of food chains and food pyramids
- Increase their understanding of the environmental value of eating lower on the food chain
- Learn more about nutrition
- Increase their willingness to reduce their meat consumption

Materials

Photocopied student pages:

2.1 Food? What Food? Background Information (one per student)

2.2 Food? What Food? Questions (one per student)

Popcorn (about one quart per team for the activity, plus some to eat afterward)

An area, suitable for a relay, about forty by thirty yards (or more) in size

"Cones" or other objects to mark the start and end points for the relay (see a P. E. teacher)

Vocabulary

food chain

malnourished

per capita

undernourished

vegan

vegetarian

Teacher Preparation

1. Photocopy the Background Information sheet (2.1) and Questions sheet (2.2).
2. Obtain materials.

Safety Considerations

1. To reduce the eating of the popcorn by the students during the activity, tell them that popcorn will be provided for eating after the activity.
2. Be sure that the area where the relay will be done is reasonably smooth and free of holes, sprinkler heads, or other hazards.

Procedure

1. If the class has not yet done Activity 27, "Food Chains," then do it now. If they have, review the concept of food chains and energy and materials being passed from one trophic level to another.
2. Form teams of five to seven students each. If the teams are not equal, have some students run twice.
3. Within each team, assign each student a trophic level role, such as plant, herbivore, first carnivore, second carnivore, scavenger, decomposer, and so forth. In each team, the student with the largest hands should represent the sun. Have the students line up in order behind the "sun."
4. Discuss (or have students tell about) each trophic level. Explain that the popcorn represents energy and materials that are to be passed from one level to another.
5. Explain the rules.
   a. The "suns" will be given as much popcorn as they can hold in their two hands. They may not make a pouch out of shirts, skirts, and so forth.
   b. They are to run to the marker, circle it, and return to the next person in the food chain.
   c. The popcorn is passed to the next person in the food chain, who then runs to the marker, circles it, returns, and passes it to the next person.
   d. This is continued until the entire food chain has run the relay, including any who need to run a second time because of uneven numbers in the teams.

e. When the entire team has completed the relay, the last person is to hold the popcorn above his or her head as a signal that the team has completed the relay.

f. Remind them to run quickly but carefully, and not to eat popcorn that has fallen on the ground or that others have handled. Tell them that clean popcorn will be provided for eating later.

g. Discuss the activity. See Discussion topics below.

Discussion

1. What was the limiting factor affecting how much popcorn could be carried? (At the start, students will often think that the student with the largest hands will give his or her team an advantage. In reality, the limiting factor is the student with the *smallest* hands.)
2. Look at the ground. What does the popcorn on the ground represent? (Heat energy and materials lost to the environment.)
3. When did most of the popcorn spill? (At the transfer point, unless there was an accident.) What would happen if there were fewer transfers? (Less energy lost or wasted.)
4. An example of a food (energy) chain might be: sun→corn→beef cow→man. Could more people be supported if the cow step were eliminated and people ate the corn? (Point out that the sun, while not "food," is the basis of all food chains.)
5. What are some advantages and disadvantages of vegetarianism?

Answers to Worksheet 2.2

1. Most of the energy contained in a food is not available to the consuming organism because it is given off as heat, is expended in the food-getting process, or is not extracted from the food and is passed out of the body as waste.
2. Answers may vary. Water, available sunlight, and soil fertility are natural limiting factors. The availability of labor, machinery, and chemicals are limiting factors in human food-growing systems.
3. Starvation increases the death rate and so limits populations. Undernourishment and malnourishment affect the reproductive capacities of men and women, infant mortality rate, and death rate.
4. *Mal*nutrition occurs when the diet does not supply enough of the proper proteins, vitamins, minerals, and other nutrients needed for good health. It also occurs when there is too much of some nutrients, such as fats and sugars. Undernourishment is a condition of not having enough food.

5. Cutting back on meat consumption certainly helps reduce the demand for land, water, and other materials used in growing meat. It can also help reduce fat intake.
6. Answers will vary.
7. Advantages of raising one's own food include such things as being able to control (or eliminate) chemicals, such as pesticides; saving money; and the enjoyment that many derive from gardening. Disadvantages include the time and effort required; space requirements; and environmental limitations, such as soil fertility, climate, and weather.

Extensions

(See Activities 7, "Think Globally, Act Locally," and 8, "Do It!" for student project ideas.)

1. Have the students record the types and amounts of food that they eat for a week or more. Have them record (privately) their weight at the start and the end of the week. Have them design a data-recording table. Discuss parameters and controls for this experiment. Discuss what happened to the food. If they ate twenty pounds of food, why didn't they gain twenty pounds?
2. If you keep animals such as guinea pigs, rats, mice, and so forth in the classroom, have the students keep accurate records of the food and water given to them for a month. Collect and record the weight of wastes cleaned from the cage. Compare food and water consumed to waste collected. How can the differences be explained? (Gases such as CO_2 and water vapor given off, evaporation, wastes absorbed by shavings or papers in the cage, and so on.)
3. Investigate the diets of people in areas where there are chronic food shortages. Compare the percentage of meat and vegetables in their diets to typical diets in the United States, as represented by the students in the class. How can the differences be explained?
4. Have the students explore and report on the pros and cons of vegetarianism.
5. Have a vegetarian meal for the class. Either have the students each prepare a dish, work out something with a home economics teacher, or invite vegetarian restaurants to donate samples of their wares.
6. Have the students try out vegetarian recipes.
7. Have the students prepare vegetarian cookbooks, including only dishes that they have tried.
8. Are vegetarian entrees offered in the school cafeteria? Have students investigate the nutritional requirements of the food services program in your school.

9. Have the students find out about and illustrate food pyramids, pyramids of numbers, or pyramids of (bio)mass. Have them illustrate this concept either with a bulletin board or a three-dimensional model.
10. Research report topics: the green revolution, pest control, organic-sustainable yield agricultural systems, fish farming, food irradiation, seed banks (genetic storage banks), genetically modified foods, or biological magnification of chemicals in foods.

Modifications

1. The activity can be done indoors. Be sure to have a broom or large dust mop for cleanup.
2. Play another round with uneven teams. This will help bring home the idea that more energy and material is lost at each level. (Having the students explain why shorter teams are desirable can be an assessment method.)

Internet Connections

The following organizations promote the eating of less meat products:

www.animalliberation.org.au/vegconf.php

www.vegsocietyofga.org

www.vegetorisme.be

References

Botkin, Daniel B., and Edward A. Keller. *Environmental Science—Earth as a Living Planet.* Hoboken, N.J.: Wiley, 2007.

Miller, G. Tyler. *Living in the Environment.* Belmont, Calif.: Thomson, 2007.

Tourtillot, Leeann. *Conserve and Renew.* Sacramento: California Energy Extension Service, 1990.

Name _____ Class _____ Date _____

2.1
Food? What Food?
Background Information

As the world's population increases, so does the need for food. About one-fourth of the people living today are not adequately fed. Each year, nearly six million children die prematurely because of undernutrition or malnutrition. People need not only enough food, but they need the right kinds of food to be healthy.

Food provides us with the energy and chemicals that we need for life. Growing, harvesting, processing, shipping, and preparing food are extremely important processes and industries. The food industry generates almost 20 percent of the private sector jobs in the United States. The United States has only about 0.3 percent of the world's farm land, but produces about 17 percent of the world's grain. As the world's population increases, it is highly unlikely that we will be able to continue to provide so much of the world's food. Few things are as important as food. Yet, even in the United States, many people are **malnourished** or **undernourished.**

World food production more than doubled between 1950 and 1984, and food prices dropped. Even so, in many areas, the average food production **per capita** has actually dropped by over 20 percent! This drop has been caused by a variety of factors, including population increases, changes in dietary habits to include more meat, decrease in soil fertility, droughts, and other factors.

Generally, at each step in a **food chain** most of the energy stored in an organism is not transferred to the organism that consumes it. A commonly used figure is that 10 percent of the energy is transferred at each step in the food chain. In nature, it is probably closer to 1 percent, but for simplicity, let's see what happens if we use a very high estimate of 10 percent. If hundred calories are stored in corn and the corn is eaten by a human, the human retains about ten calories. The rest is used or lost as heat or in waste products. If that same hundred calories in corn is fed to cattle (or hogs or chickens), the cattle gain about ten calories. If a human then eats the beef, he or she gains only about one calorie.

Food provides us with more than energy. We also get various nutrients, including minerals, vitamins, and proteins. Meat is an important source of protein-building amino acids for many Americans. Those amino acids can also be obtained from vegetables, and many people have chosen to be **vegetarians**.

There are many reasons that some people decide not to eat meat. Too much meat is not healthy, principally because of its fat content. Meat is expensive. Some people object to killing animals for food. Animals produce methane gas, which may contribute to global climate change. Some people are concerned about the land, fuels, expertise, money, water, and other resources that are used to grow meat. They point out that those resources could be used to grow plants that would feed many more people than the meat will.

We also need to be aware of the chemicals used in growing and processing many of our foods. Fertilizers, pesticides, and fungicides are used extensively in growing many foods in the United States and in other countries. Preservatives, coloring agents, and other chemicals may be added before we purchase food. Many people are concerned about the safety of these food additives.

For these and other reasons, the study of nutrition is not only interesting, it is vital.

Name _____ Class _____ Date _____

2.2
Food? What Food?
Questions

1. What happens to the approximately 90–99 percent of the energy that is "lost" at each transfer of energy in a food chain?

_____

_____

2. What are some factors that limit how much food can be grown in an area?

_____

_____

3. In what ways is food a limiting factor for human populations?

_____

_____

4. Distinguish between malnourishment and undernourishment.

_____

_____

5. Could reducing one's meat consumption provide some of the benefits of vegetarianism? Discuss the idea of cutting back on meat consumption.

_____

_____

_____

6. Some people have suggested that, in the long run, sending food to famine victims may cause more harm than it helps. Some suggest attaching conditions to aid sent to famine victims. What do you think of this?

_____

_____

_____

7. What are some advantages and disadvantages of growing at least some of one's own food?

_____

_____

_____

_____

Activity 3
We "Auto" Drive Less

Activity Summary

Student teams complete various surveys of transportation habits and choices. They then graph and analyze the data.

Content Standard Alignment

This activity can help students meet the following National Science Education Standards.

Grades 5–8

Content Standard A: As a result of activities in grades 5–8, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

Content Standard B: As a result of their activities in grades 5–8, all students should develop an understanding of

- Motions and forces
- Transfer of energy

Content Standard E: As a result of their activities in grades 5–8, all students should develop

- Understandings about science and technology

Content Standard F: As a result of their activities in grades 5–8, all students should develop an understanding of

- Populations, resources, and environments
- Risks and benefits
- Science and technology in society

Content Standard G: As a result of their activities in grades 5–8, all students should develop an understanding of

- Science as a human endeavor

Grades 9–12

Content Standard A: As a result of activities in grades 9–12, all students should develop

Abilities necessary to do scientific inquiry

Understandings about scientific inquiry

Content Standard B: As a result of their activities in grades 9–12, all students should develop an understanding of

Motions and forces

Conservation of energy and increase in disorder

Interactions of energy and matter

Content Standard D: As a result of their activities in grades 9–12, all students should develop an understanding of

Energy in the Earth's system

Content Standard E: As a result of their activities in grades 9–12, all students should develop

Abilities of technological design

Understandings about science and technology

Content Standard F: As a result of their activities in grades 9–12, all students should develop an understanding of

Personal and community health

Population growth

Natural resources

Environmental quality

Natural and human-induced hazards

Science and technology in local, national, and global challenges

Content Standard G: As a result of their activities in grades 9–12, all students should develop an understanding of

Science as a human endeavor

Introduction

Most Americans are dependent on the private automobile. We use it for about 98 percent of all urban transportation, and 91 percent of all travel to and from work—75 percent of us drive to and from work alone in a private automobile. Americans use about 43 percent of the world's gasoline! The average number of people in a typical passenger vehicle is only 1.2. Only about 15 percent of us carpool, and a mere 5 percent of us ride public transportation to and from work.

As individuals and as a society, we pay a huge price for our addiction to the private automobile. The Background Information sheet (3.1) gives some statistics about our use of the automobile and its effects.

As the streets become more crowded, as oil prices go up, and air pollution increases, mass transit is going to become a more attractive option to many Americans. There are, however, many attitudinal blocks to the acceptance of public transportation in America. By examining their own attitudes and surveying to determine the attitudes of others, students can gain some understanding of what it will take to move Americans out of their private automobiles.

Grouping

Teams of two students

Time

Introducing the activity: 20–30 minutes

Students complete surveys outside class

Graphing and discussing the data: 45–55 minutes

Anticipated Outcomes

The students will

- Increase their understanding of some of the factors that influence transportation choices in the United States
- Increase their willingness to conserve fuel
- Increase their understanding of the effects of private automobile use in the United States
- Increase their ability to graph and analyze data

Materials

Photocopied student pages:

3.1 We "Auto" Drive Less: Background Information (one per student)

3.2 We "Auto" Drive Less: Instructions and Survey Forms (varies)

3.3 We "Auto" Drive Less: Questions (one per student)

Graph paper

Transparencies of the surveys and graph paper with axes drawn

Vocabulary

carpool public transit subsidy

Teacher Preparation

1. Decide which surveys you want to use, how many students should be in a team, and how many teams you want to do each survey.
2. Photocopy the Background Information sheet (3.1), Instructions and Survey forms (3.2), and Questions sheet (3.3). Note that each team does Survey I and one of the others. Some survey form pages need to be cut in half.

Safety Considerations

Caution the students to be careful of traffic and people while doing their surveys. Adult supervision is recommended.

Procedure

1. Introduce the activity by discussing the advantages and disadvantages of the use of the private automobile as the main means of transportation for most Americans today. Be sure to include social costs such as isolation, time wasted, financial costs (both direct costs such as purchase, gasoline, maintenance, and insurance, and indirect costs such as taxes, land costs, medical insurance costs, and the like), accidents, land dedicated to roads, parking, car lots, and so forth. Ask the students about their families' automobile ownership.
2. Discuss the advantages and disadvantages of various alternatives to reliance on the private automobile, including:

Walking	Motorcycle	Bus
Cycling	Carpooling	Train

3. Point out that automobiles are usually fueled by gasoline, a nonrenewable resource. Point out, too, that we currently import between 40 and 50 percent of our oil. Ask what would happen if the supply of petroleum were to be severely disrupted, either because of world economic and political events or simply because the supplies got used up. What would it take to get most people to reduce their gasoline consumption by 25 percent or more?

4. Issue the Background Information sheet (3.1) and the Instructions sheet (3.2). Have the students form survey teams of two or three students and assign them their survey forms (3.2).
5. Discuss the taking of the surveys, as per the Instructions sheet.
6. Assign a due date for the surveys. Assign the number of people to be surveyed.
7. When the students return their survey forms to class, have the teams with the same survey forms compare and combine their data.
8. Discuss how to graph the data, including the selection of axes (which data should go on the vertical axis and which on the horizontal), selection of units, and labeling of axes. Each team should then graph their data. Teams with narrative responses to their questions should make up groups for similar answers.
9. Either have the students show their data and graphs to the class or make overhead transparencies of the data or graphs to use while discussing the data.
10. Discuss the data. (See Discussion questions below.)

Discussion

1. How much of a price increase would it take to get most drivers to reduce their driving significantly? What other ways are there to encourage the use of public transportation?
2. Did age seem to have an effect on the amount of the price increase needed? Why or why not?
3. Which actions considered for reducing gas consumption were preferred by the most people?
4. Did age seem to influence which actions were preferred? Why or why not?
5. What are some of the advantages of riding public transportation? Disadvantages?
6. Did age have an influence on the opinions about public transportation?
7. If the price of gasoline is raised, who will be hurt more, the rich or the poor?
8. If public transportation is made more convenient and affordable, who will be helped more, the rich or the poor?
9. If public transportation were used more, what benefits would result?
10. What could be done to encourage people to use public mass transportation in your area?

Answers to Worksheet 3.3

1. Answers will vary. For most people, a small increase such as twenty cents is not much of a deterrent to driving. Price increases do not affect all groups equally. Those with low incomes are affected disproportionately.
2. Answers will vary. From an environmental perspective, such a plan would be a good idea because the higher price would discourage unnecessary driving and promote fuel efficiency as well as support public transportation.
3. Answers will vary. Some disadvantages are the loss of privacy, inconvenience, and in some cases, increased time for a given trip.
4. Answers will vary. Some advantages include the opportunity to socialize, the convenience of being able to do something other than drive a car, money saved, time saved when one considers the time it takes to maintain and earn the money to pay for a car, and a multitude of environmental advantages ranging from air pollution to land use.
5. Answers will vary.
6. Answers will vary. (There is an interesting activity dealing with this in the *California Class Project* by Olga Clymire.)

Extensions

(See Activities 7, "Think Globally, Act Locally," and 8, "Do It!" for student project ideas.)

1. Combine the data from several classes and compare each class's data to the larger sample.
2. Find out whether sex, occupation, or financial status have an impact on the answers to the survey questions.
3. Visit a workplace that encourages carpooling, vanpooling, or other use of mass transportation. Talk to the person who runs the program.
4. Many students in suburban areas have never ridden public transportation, especially trains. Take a field trip utilizing public transportation.
5. Obtain a detailed map of your community. With the students, devise a plan for determining how much land is dedicated to the private automobile. Be sure to include parking lots, sales, parts and tire stores, repair facilities, roads, and manufacturing plants. Check with city planners to find out how much land mass transit would take.
6. Students can make up other surveys, including students, faculty, and so forth.
7. Have the students calculate how much money actually is spent on the private automobile when the following are included:

Purchase price	Taxes to pay for roads, signals and signs, courts, police
Operation (fuel, oil)	Purchase price of land for driveways and garages
Maintenance (repairs)	Part of the cost of medical insurance
Automobile insurance	Damages not covered by insurance

8. Have student teams devise plans for increasing carpooling in your community. Have the students present their plans to the city council or other appropriate agency.
9. Have student teams make a plan for a city the size of your community that uses a transportation mix that includes walking, cycling, trains, buses, electric trains, and private automobiles.
10. Students can investigate the demise of the public streetcar system in cities in the United States in the 1930s and 1940s, which was partially brought about by General Motors, Firestone Tire, and Standard Oil to increase their sales of motor vehicles and buses.
11. Students can investigate and graph the price of gasoline since 1950.

Modification

Modify the survey forms or make your own as you see fit.

Internet Connections

The following organizations provide information on alternative methods of transportation: www.car-free.org; www.globalstewards.org; www.motherearthnews.com

References

American Automobile Association. *Your Driving Costs.* Retrieved from www.aaaexchange.com on October 4, 2007.

Christensen, John W. *Global Science: Laboratory Manual and Teacher's Guide.* Dubuque, Iowa: Kendall/Hunt, 1991.

Clymire, Olga, and others. *California Class Project.* Costa Mesa, Calif.: Orange County Superintendent of Schools, 1988.

Duany, Andres, and others. *Suburban Nation: The Rise of Sprawl and the Decline of the American Dream.* New York: North Point Press, 2000.

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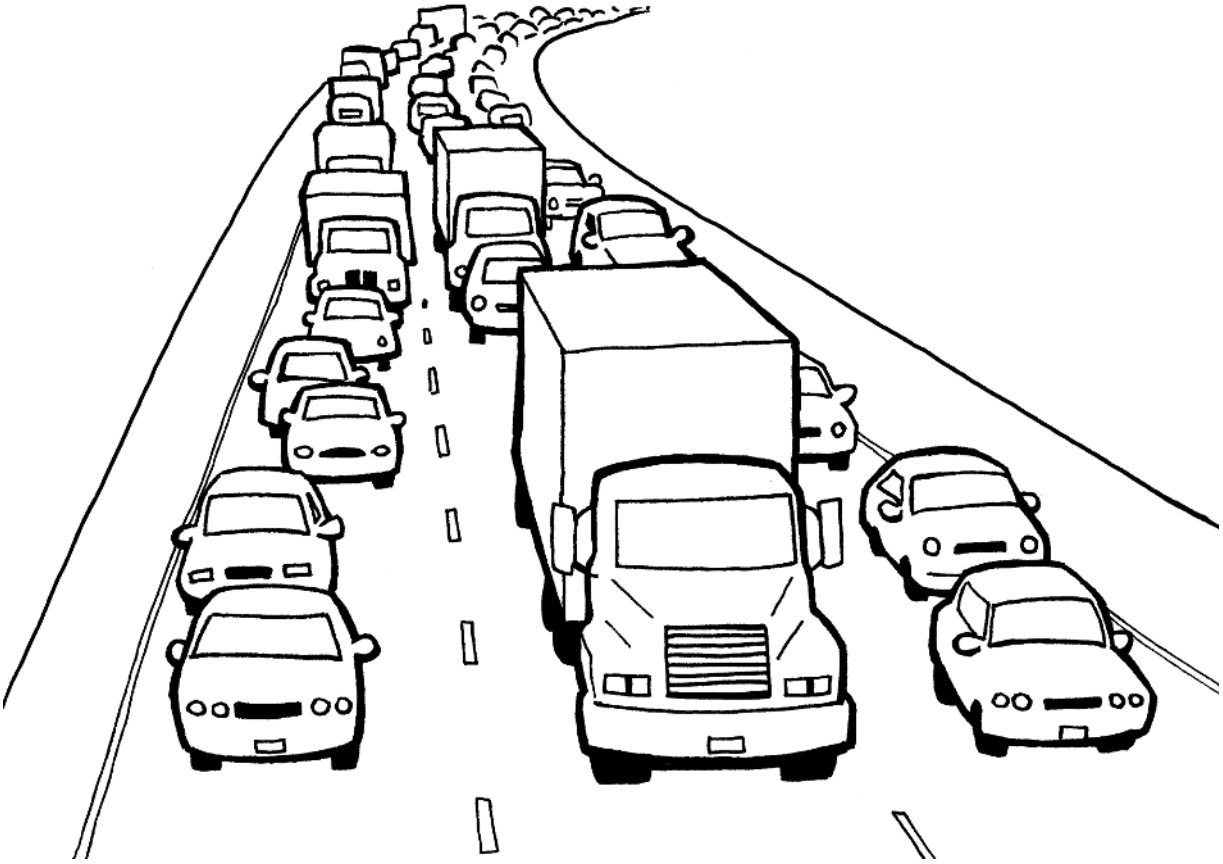
Name _____ Class _____ Date _____

3.1
We "Auto" Drive Less:
Background Information

In the United States, we are addicted to the private automobile. Like many drugs, it gives us the feeling of power and freedom. Also like many drugs, it is habit forming and harmful.

Just how addicted to the automobile are we?

- About 98 percent of our urban travel is done in private automobiles.
- About 85 percent of all travel to and from cities is done in private automobiles.
- About 91 percent of all travel to and from work is done in private automobiles.
- The United States, with less than 5 percent of the world's population, has about one third of the world's automobiles. California alone, with less than 0.01 percent of the world's population, uses about 5 percent of the world's gasoline.
- About one of every six dollars spent in the United States is spent on automobile-related purchases. Owning and operating a car in 2007 cost an average of over fifty cents per mile driven.



Just how harmful are private automobiles?

- In the United States, about 40,000 people are killed in motor vehicle accidents each year, and an additional 300,000 are seriously injured.
- By the late 1980s, about one out of every sixty babies born in the United States would die from an automobile accident by the age of twenty-one.
- By the year 2000, automobile accidents and governmental **subsidies** to support the automobile cost about $5,000 per year for every car and truck in the United States. Had that money been put into mass **(public) transit,** more people would have been employed, transportation would have been safer, and the environmental impact would have been much less.
- At least one third of the average city's land is devoted to roads and parking. In some cities, such as Los Angeles, they take up two-thirds of the total land area!
- Automobiles account for about half of our air pollution.
- Many high school students want their own car so badly that they take jobs so that they can earn the money that a car requires. For many of them, the long hours of work and using the car result in low achievement at school. Unfortunately, many even drop out of school.
- The use of private automobiles accounts for about 14 percent of all the energy used in the United States. Making, selling, and providing parts, materials, and roads for cars constitutes another large portion of our country's energy consumption.

There are many alternatives to the private automobile, but most of us don't use them. Seventy-five percent of us drive alone to and from work, 15 percent of us **carpool,** and only 5 percent take public transportation.

Given the many problems caused by cars, why do we use them so much? Consider your own attitudes toward the use of the private car. What advantages and disadvantages does it have for you? Is our addiction to the private automobile worth all the death, air pollution, energy waste, and money that it costs?

Name _____ Class _____ Date _____

3.2
We "Auto" Drive Less: Instructions

Teams of students from your class will be conducting surveys to determine people's opinions about a number of transportation-related questions. After you collect your data, your team will share its data with that collected by one or more other teams investigating the same question.

After you have shared your data with the other team(s), your combined team will graph the data collected by both (all) teams.

When you ask somebody your survey question, you should first be sure that:

a. You understand the question and how to record answers.

b. The person has not already answered the survey question for another team.

c. The person tells you his or her age.

When you record the responses, be careful to record them in the correct column.

After someone answers your question, be sure to thank the person.

Some survey questions may require you to summarize the response in a few words. If so, be sure that they accurately reflect the response of the person interviewed. After you write their response, read it back to them to confirm its accuracy.

Survey I: People Per Car (to Be Done by *All* Teams)

Select a safe place along a busy street, preferably at "rush hour." Observe the automobiles that pass, noting the number of people in each car, including the driver. Tally your information below. Count the people in the first one hundred cars that pass. Do not count commercial vehicles such as delivery trucks, buses, taxis, and so forth. (If there is very little traffic, count the people in the first twenty-five or fifty cars that pass.) One team member can call out the number in the car while the other tallies the data.

Location surveyed: _____ date: _____ time: _____ A.M. P.M.

Number of People in the Car, Including the Driver					
1	2	3	4	5	more than 5

Survey II: How Much to Change?

Be sure to record the response of the person in the appropriate age column. Ask at least twelve people, including three from each age group.

Question: How much of a reduction in the amount you drive would the following increases in the price of a gallon of gasoline cause you?

	Age Group											
	16–20			*21–30*			*31–40*			*41+*		
Price Increase	*Reduction*			*Reduction*			*Reduction*			*Reduction*		
	No	*Some*	*Major*	*No*	*Some*	*Major*	*No*	*Some*	*Major*	*No*	*Some*	*Major*
$ .20/gal.												
$ .50/gal.												
$1.00/gal.												
$1.50/gal.												
$2.00/gal.												

Survey III: The Lone Driver!

Be sure to record the response of the person in the appropriate age column. Ask at least twelve people, including three from each age group.

Question: When you drive to work or school, do you usually drive alone?

Ages	*Yes*	*No*
16–20		
21–30		
31–40		
41+		

Survey IV: Difficult Choices

Be sure to record the response of the person in the appropriate age column. Ask at least twelve people, including three from each age group.

Question: If gasoline consumption in the United States absolutely had to be reduced by 25 percent, which of the following measures would you support?

Action	*Age Group*							
	16–20		*21–30*		*31–40*		*41+*	
	Agree	*Disagree*	*Agree*	*Disagree*	*Agree*	*Disagree*	*Agree*	*Disagree*
1. Triple the price of gas and use the money to develop alternative energy sources.								
2. Ration gasoline. Issue coupons. Unused coupons could be sold, traded, or given away.								
3. Increase the minimum age for a driver's license to 21 years.								
4. Lower air pollution standards so more coal and less oil would be burned by industry.								
5. Ban students from driving to school if a bus is available.								
6. Ban the driving of cars with even-numbered licenses two days a week and ban odd-numbered cars two other days.								
7. Use military action to obtain oil from other countries.								
8. Require that all new cars get 30% more miles per gallon.								
9. Other:								

Survey V: Public Transit Users

Be sure to record the age of the person in the age column. Ask at least twelve people, including three from each of the following age groups: 16–20, 21–30, 31–40, and 41+.

Ask this question of people who frequently use public transportation such as a bus, rapid transit system, or train.

Question: What is the main advantage of using public transportation?

Age	*Response—Main Advantage*	*Age*	*Response—Main Advantage*

Survey VI: Public Transit—If Only . . .

Be sure to record the age of the person in the age column. Ask at least twelve people, including three from each of these age groups: 16–20, 21–30, 31–40, and 41+.

Ask this question of people who seldom or never utilize public transportation.

Question: What would make public transportation attractive enough for you to utilize it?

Age	*Response*	*Age*	*Response*

Name _____ Class _____ Date _____

3.3
We "Auto" Drive Less:
Questions

1. In your survey, was raising the price of gas a small amount a very effective way to discourage private automobile use? Was the effect equal in all groups? Discuss.

_____

_____

_____

2. In Europe, gasoline costs about two to three times as much as it does here. Would it be a good idea to triple the price of gas and use the extra money to build or promote an effective public transit system? Discuss.

_____

_____

_____

3. What are the disadvantages of public transit systems?

_____

_____

_____

4. What are the advantages of public transit systems?

_____

_____

_____

5. What are your personal attitudes about public transit?

_____

_____

_____

_____

6. How could cities be built to encourage, rather than discourage, public transit?

_____

_____

_____

_____

Activity 4
Toxics in the Home

Activity Summary

Students practice reading product warning labels and then survey their homes for common (and uncommon) toxic materials. After identifying the toxic materials, students identify less toxic alternatives and learn how to dispose of hazardous household materials.

Content Standard Alignment

This activity can help students meet the following National Science Education Standards.

Grades 5–8

Content Standard B: As a result of their activities in grades 5–8, all students should develop an understanding of

Properties and changes of properties in matter

Content Standard E: As a result of their activities in grades 5–8, all students should develop

Understandings about science and technology

Content Standard F: As a result of their activities in grades 5–8, all students should develop an understanding of

Personal health

Risks and benefits

Science and technology in society

Grades 9–12

Content Standard B: As a result of their activities in grades 9–12, all students should develop an understanding of

Chemical reactions

Content Standard E: As a result of their activities in grades 9–12, all students should develop

Understandings about science and technology

Content Standard F: As a result of their activities in grades 9–12, all students should develop an understanding of

Personal and community health

Environmental quality

Natural and human-induced hazards

Science and technology in local, national, and global challenges

Content Standard G: As a result of their activities in grades 9–12, all students should develop an understanding of

Science as a human endeavor

Introduction

When most of us hear the term "toxic waste," we think of nuclear waste, medical waste washing up on beaches, or severe air or water pollution. Most of us, though, have a number of hazardous substances in our homes. These include paints, stains, solvents, many cleaning agents, pesticides and fertilizers, various automotive chemicals ranging from oil to battery acid, shoe polish, medicines and drugs, mothballs, disinfectants, deodorants, insect repellents, alcohol, tobacco, and a great variety of other substances.

Many of these substances are relatively safe if used properly. Unfortunately, many of them are frequently used or stored improperly. People ignore or fail to read the warnings on the labels. Toxic chemicals are often stored within reach of small children, too close to heat sources, where they can get knocked off a shelf, or where they can mix with other substances. Substances are often mixed improperly, either with chemicals with which they are incompatible or in concentrations that are too strong. These and many other situations result in hundreds of deaths and thousands of injuries every year.

Additionally, when the containers are discarded, they usually contain unused or residual chemicals. These can spill or mix while in transit to the landfill. Once at the landfill, they often are carried away by water that seeps into the site. This leachate pollutes the surrounding land and can enter groundwater and streams and be carried far downstream.

For these and many other reasons, it is important that students (and their parents) become educated about hazardous wastes found in the home. They need to know what is there, how to store, use, and dispose of it properly, and what alternatives are available. It is also important that they know what to do in case of a spill or accidental poisoning. This activity is primarily a survey of chemicals in the home. It is highly recommended that you invite guest speakers from agencies that dispose of hazardous household products and from hospital emergency rooms to visit your class.

Grouping

Whole class, teams of three to five, or individuals

Time

Two 45- to 55-minute periods plus time at home

Anticipated Outcomes

The students will

- Survey their homes for hazardous substances
- Examine labels of household products for warnings
- List alternatives for hazardous substances
- Identify proper means of disposing of hazardous substances
- Increase their awareness of toxics in the home

Materials

Clean, empty containers from a variety of household products with warning labels

Photocopied student pages:

4.1 Toxics in the Home: Background Information (one per student)

4.2 Toxics in the Home: Instructions and Data (one per student)

4.3 Toxics in the Home: Questions (one per student)

Overhead transparencies of product warning labels

Optional, recommended: literature, brochures, stickers from local poison control or hazardous waste agencies

Vocabulary

caustic	flammable	leachate	volatile
corrosive	ingest	toxic	

Teacher Preparation

1. Photocopy the Background Information sheet (4.1), Instructions and Data (4.2), and Questions sheet (4.3).
2. Obtain samples of common household products that have warning labels on them.
3. Photocopy labels with different warnings on them. Use the photocopies to make overhead transparencies.
4. Make transparencies of the Data Table (4.2).

Safety Considerations

1. Do not allow students to bring containers of hazardous materials to school.
2. Be sure to follow the warning labels when you use any of the products in the classroom. Set a good example. Seek to use safer alternatives.
3. Do not store hazardous chemicals in your classroom.
4. Thoroughly clean any empty containers that you bring to the classroom as samples.

Procedure

NOTE: SEVERAL OF THE SUGGESTED EXTENSIONS CAN BE VERY VALUABLE.

1. Show examples of clean empty containers of several common household products that have warnings on their labels. Allow teams of three to five students to examine the containers and read the labels aloud to the class.
2. Discuss product-labeling requirements and the meanings of the terms on the labels. Use transparencies that show one or more warning labels. Point out the liability disclaimer if there is one.
3. Give the students the Instructions and Data sheet (4.2).
4. Have the students survey their homes for toxic materials and bring their data to class.
5. Use a transparency of the Data Table (4.2) to compile data from the whole class. Have the students raise their hands while you or a student use tally marks on the transparency to record which types of hazardous substances are most common. If a student did not record a material type on his or her own data table but knows that he or she has the material at home, include the student in the tally.
6. Distribute and discuss the Background Information sheet (4.1), including the Household Hazardous Materials Chart. Discuss the alternatives suggested. BE SURE TO POINT OUT THAT THIS CHART SHOWS ONLY A VERY SMALL PORTION OF THE HAZARDOUS MATERIALS FOUND IN THE AVERAGE HOME!
7. *Optional but strongly recommended:* Invite a guest speaker from whatever agency is responsible for disposal of hazardous household materials in your community. That might be the fire department, public works department, county solid waste commission, a private waste disposal company, or other agency. As part of the speaker's presentation, find out how he or she recommends disposing of hazardous household materials and containers.

8. *Optional but strongly recommended:* Invite a guest speaker from a local poison control center or emergency room to discuss treatment of injuries and poisonings resulting from improper use of household materials including medicines. See Extension 2.

Discussion

1. Were you aware that you had toxic materials in your home?
2. Do the warning labels provide enough information?
3. What would you do if you thought that your little brother had swallowed some harmful substance?
4. Why is it important to dispose of containers properly? What is leachate?
5. Are you willing to reduce your use of toxic materials? Why or why not? If so, how?

Answers to Worksheet 4.3

1. Answers will vary. You might remind the students that alcoholic beverages and tobacco are toxic.
2. All the materials listed are hazardous except baking soda.
3. a. Check breathing; use CPR if needed; call 911, ambulance, poison control, emergency room
   b. Ambulance, 911, drug line, poison control center, emergency room
   c. County health department, fire department, waste disposal company
   d. Fire department, 911, county sheriff, state highway patrol
   e. Poison control, physician, health department
   f. Read labels carefully, discuss safe use and storage with all family members, store in locked cabinet, encourage switching to alternates, dispose of containers properly.
   g. Find out about local electronics disposal sites. If the computer is still working, find out about a school or nonprofit agency that might be able to use it. Some stores will accept used ink and toner cartridges; they may even provide some sort of discount or reward.
4. Know about safe use, storage, and alternates. Educate family and friends. Read labels carefully; store and use properly.

Extensions

(See Activities 7, "Think Globally, Act Locally," and 8, "Do It!" for student project ideas.)

1. See Procedure steps 7 and 8. (Arrange for guest speakers from waste disposal agency and hospital or poison control center.)

2. Have students design an emergency phone number list. Duplicate and distribute the list. The list should include or provide space for:

   Emergency response number (911?)

   Police, fire department, ambulance

   Poison control center

   Family doctor

   Nearest hospital emergency room

   Nearest relative

   Two neighbors or other responsible adults

   Parents' work phone numbers

3. Use a computer to make labels with emergency telephone numbers. Duplicate these for attachment to telephones. Such labels might be available from fire departments or other agencies.
4. Have students prepare a home hazardous substances presentation to give to younger students.
5. Invite the Red Cross or other agency to train the students on first aid for poisoning (and other first-aid procedures such as CPR).
6. Have the students make posters telling about home hazards and disposal of wastes. Have them arrange to have the posters displayed in local hardware, grocery, garden supply, and other stores.
7. Visit a local landfill to see how household trash and other materials are disposed of. Find out about monitoring of the site for leaks and illegal dumping of toxics.
8. Collect newspaper and other articles about toxic spills.
9. Have the students work with local agencies on a poison prevention educational program for younger students. Have your students get local businesses or service agencies to sponsor the program by purchasing commercially available educational materials.
10. Have the students test the alternatives suggested on the Hazardous Household Materials Chart and compare them to the usual toxic alternatives.
11. Have the students bring in warning labels from containers, newspaper articles, and pictures to make a hazardous materials bulletin board. (NOTE: Do NOT have the students bring containers, as they usually contain residue.)
12. The students can investigate "toxic home syndrome."
13. The students can investigate radon in homes. Some science supply companies sell test kits.

14. Many communities have "household toxic waste" collection days. Have students find out if yours does. If so, have students publicize not only the date but also why people should dispose of waste properly. If your community does not have one, have students find out why not and, possibly, advocate for such a program.
15. The Project Learning Tree Secondary Environmental Education Program's publication *Exploring Environmental Issues: Focus on Risk*, by Louis Iozzi and Frank Gallagher, includes several activities that may be useful.

Modification

You might want to send a letter home to explain the home survey to the parents.

Internet Connections

Numerous Internet sites provide information on toxics. Some may be too technical for students. The following sites provide information that may be useful to teachers and students.

Toxtown is an online activity in which students explore sources of toxins in their community. It's sponsored by the Natinal Library of Medicine of the National Institutes of Health. http://toxtown.nlm.nih.gov

Another online tour, this one of a home, can be found at www.groundwork.org.za/resources/household_toxic_tour.htm.

The National Resources Defense Conuncil has several fact sheets on toxics. www.nrdc.org/health

A household toxins lesson plan developed at Stanford University can be found at http://cwmi.css.cornell.edu/TrashGoesToSchool/household.html.

http://consumerlawpage.com/article/household_chemicals.html

References

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Name _____ Class _____ Date _____

4.1
Toxics in the Home: Background Information

Toxic materials are those that are dangerous or that can be dangerous if not used correctly. Many common household materials can be dangerous, even fatal, if not used properly. Hundreds of people, mostly children, die every year from misuse of ordinary household substances such as paints, cleaners, and pesticides. Do you know what hazards your home contains? What do terms like **caustic, volatile, corrosive,** and **flammable** mean? What happens to the container of a hazardous substance once the contents have been used?

In the United States, if a product contains certain toxic materials in certain amounts, it is supposed to bear a warning label. If the amount of the toxic chemical is low enough, though, the label isn't generally required. Labels may be absent, incomplete, or misleading. Some estimates indicate that as much as 85 percent of the warning labels are incorrect or misleading! So, even if a product doesn't have a warning label, it is wise to treat it carefully and use good judgment.

What kinds of household substances are likely to be hazardous? The most common hazardous household substances include:

- Garden supplies (pesticides, poisons, fertilizers, plant foods)
- Cleaners (drain, oven, spot removers, polishers, bleach, liquid cleaners)
- Automotive chemicals (motor oil, battery acid, antifreeze, gas treatments)
- Paints, lacquers, varnishes, thinner, stains, wood preservatives
- Glues, adhesives, solvents
- Dry-cell (household) batteries
- Medicines, disinfectants, alcohol
- Tobacco

For many toxic substances, there are less hazardous alternatives. Some of these are listed on the Household Hazardous Materials Chart.

An important thing to remember about toxic household products is that the container they came in usually contains some residue. If the used or partly used container is put into the trash, a number of problems may occur. When the trash is in the trash can, some relatively nontoxic materials may mix with others and form more dangerous chemicals. The trash collectors are exposed to these toxic chemicals. When the trash is taken to the landfill, water will eventually reach the trash and may dissolve and carry the toxics away from the landfill into the aquifer, nearby streams, or other areas. This water, which has dissolved chemicals, is called **leachate.** Modern landfills are designed to contain the leachate, but not all landfills are built and operated in such a way that the containment efforts always work. Even if they work well today, can we guarantee that the leachate will be contained for dozens or even hundreds of years?

Many modern electronic devices such as computers, printers, and monitors contain toxic chemicals, such as heavy metals that must be kept out of landfills. Printer and toner cartridges also contain toxic chemicals.

What, then, should one do with hazardous household waste? Your teacher may arrange for a speaker on the topic. What should you do if somebody **ingests** some poisonous substance?

Household Hazardous Materials Chart			
Substance	*Problem*	*Proper Disposal*	*Alternatives*
Abrasive cleaners, scouring powder	CORROSIVE; TOXIC	Use it all up. Rinse container.	Use baking soda or borax, lemon juice, toothpaste for small stains.
Ammonia-based cleaners	CORROSIVE; TOXIC	Use it all up. Contact waste disposal company.	Use white vinegar diluted with water, elbow grease. NOTE: DON'T MIX AMMONIA-BASED CLEANERS WITH BLEACH!
Chlorine or bleach-based cleaners	CORROSIVE; TOXIC	Use it all up. Contact waste disposal company.	Use dry bleach, white vinegar, baking soda, or borax. NOTE: NEVER MIX BLEACH OR CHLORINE WITH AMMONIA!
Drain openers and cleaners	CORROSIVE; TOXIC	Use it all up. Contact waste disposal company.	Pour boiling water down drains, use plunger or "snake."
Oven cleaners	CORROSIVE; TOXIC	Use it all up. Contact waste disposal company.	Clean oven as you use it. Use oven liner to catch drips. Use baking soda for scouring.
Spot cleaners	FLAMMABLE; TOXIC	Use it all up. Contact waste disposal company.	Use club soda, lemon juice, cornmeal and water paste, dry clean.
Antifreeze	TOXIC	Recycle.	None
Engine degreasers, cleaners, solvents	FLAMMABLE; TOXIC	Recycle. Contact waste disposal company.	Scrub with a brush, catch spills on a rag, fix leaky gaskets.
Motor oil	FLAMMABLE; TOXIC	Recycle.	None. Fix leaky gaskets.
Enamel or oil-based paints	FLAMMABLE; TOXIC	Use it up or donate it. Contact waste disposal company.	Use latex or water-based paints.
Latex or water-based paints	TOXIC	See above. Allow "empty" can and painted item to dry outdoors.	Use limestone-based whitewash or cassein-based paints.
Thinners, solvents	FLAMMABLE; TOXIC	Use it all up. Recycle. Contact waste disposal company.	Keep used solvent in closed jar until sludge settles, pour off and save the reusable solvent.
Aerosol spray cans	FLAMMABLE	Use it all up. Contact waste disposal company.	Use equivalent products without aerosols; use atomizers.
Drugs and medicines	TOXIC	Use per directions. Contact waste disposal company.	Unknown.
Pesticides, poisons, insecticides	TOXIC	Contact waste disposal company.	See any of the numerous books on "organic" pest control.

Name _____ Class _____ Date _____

4.2
Toxics in the Home: Instructions and Data

After obtaining your parents' permission to do so, survey your home for products that may contain hazardous substances. Record your findings on the data table below. As you do so, note any containers that are leaking, labels that are falling off or difficult to read, or chemicals that have passed their expiration date. (Don't touch any leaking containers!) Report these to your parents and recommend that the problem be fixed or the expired chemical properly disposed of. There are many types of toxic chemicals in most homes, but be sure to look for these:

Paints, solvents, cleaners, medicines, pesticides, glues, automotive chemicals

Also note what chemicals the products contain, any warnings on the label, the condition of the container and label, and whether it is stored safely.

Area of House	*Product(s) Found*	*Contents Chemicals*	*Warnings on Label*	*Condition of Container and Label; Stored Safely? Notes*
Kitchen				
Bathroom				
Garage				
Other				

Name _____ Class _____ Date _____

4.3
Toxics in the Home: Questions

1. What were the most common hazardous chemicals in your home and class?

_____

2. Circle the hazardous or toxic chemicals you found:

Drain cleaner	Laundry detergent	Furniture polish
Paint	Baking soda	Hair spray
Air fresheners	Ant spray or stakes	Alcoholic beverages
Aspirin	Cold capsules	Tobacco products
Bleach	Floor polish	Snail bait

3. Tell what you would do in the following situations:

a. A small child has swallowed several aspirin.

_____

_____

b. A friend is sick from a drug overdose.

_____

_____

c. You have a container of a hazardous chemical that you want to dispose of.

_____

_____

d. Some unknown powder has spilled from a truck driving down your street.

_____

_____

e. You have been using a chemical and you feel ill.

_____

_____

f. Your parents have some toxic chemicals that they want to keep at home.

_____

_____

g. You have an old computer, monitor, and some printer cartridges to dispose of.

_____

_____

4. What can you do to reduce the hazards of toxics in your home and to the environment?

_____

_____

Activity 5
Wants and Needs

Activity Summary

Students brainstorm to develop a list of things they have (or might have) in their homes. They then interview senior citizens to find out how they lived when they were the students' age. From this, the students develop the distinction between things they want and things they need. This enables them to realize that they have alternatives and choices and that their values help to determine the choices they make.

Content Standard Alignment

This activity can help students meet the following National Science Education Standards.

Grades 5–8

Content Standard E: As a result of their activities in grades 5–8, all students should develop

Understandings about science and technology

Content Standard F: As a result of their activities in grades 5–8, all students should develop an understanding of

Personal health

Populations, resources, and environments

Risks and benefits

Science and technology in society

Content Standard G: As a result of their activities in grades 5–8, all students should develop an understanding of

Science as a human endeavor

History of science

Grades 9–12

Content Standard E: As a result of their activities in grades 9–12, all students should develop

Understandings about science and technology

Content Standard F: As a result of their activities in grades 9–12, all students should develop an understanding of

Personal and community health

Population growth

Natural resources

Environmental quality

Natural and human-induced hazards

Science and technology in local, national, and global challenges

Content Standard G: As a result of their activities in grades 9–12, all students should develop an understanding of

Science as a human endeavor

Nature of scientific knowledge

Historical perspectives

Introduction

Most of us, child and adult alike, tend to get caught up in the materialism of our society. We equate happiness with "things." We come to think of things as necessities rather than as conveniences or luxuries. What did people do before the invention of television, plastic bags, computers, electronic games, and disposable beverage containers?

It is important to realize that most of our "things" fulfill wants rather than needs. When we realize that we can live without televisions, hair dryers, and gasoline-powered lawn mowers and leaf blowers, we then can exercise our power to choose. It is important to make informed choices. Too often we make choices without considering the real price paid for our material goods. For example, consider the following questions:

- How does watching hours of television impact our social interaction skills?
- Have our children learned how to interact with one another at a party without alcohol or other drugs?
- How many hours do we work to pay for our "labor-saving" devices?
- What are the environmental costs of our labor-saving devices and the things we buy for convenience or because they are currently popular?

It is an interesting paradox that several studies have shown that people in "primitive" cultures tend to have more time for relaxation and socializing than do many of us in our industrialized society. Other studies have shown that homemakers in the 1930s and 1940s actually spent less time doing housework than many homemakers do now. Many of us consider a great vacation one in which we get away from our things and go camping or backpacking.

Many people don't realize that we do have alternatives. People met their needs in different ways in earlier times. Our students need to realize that many things they perceive as necessities are actually wants rather than needs. Once they understand that, they can begin to take the power and responsibility for making informed choices.

Grouping

Whole class and groups of two to four

Time

Brainstorming list: 30–45 minutes

Preparing for interview: 30–45 minutes

Doing interview: 15–30 minutes or more

Discussing interview and implications: 30–55 minutes

Anticipated Outcomes

The students will

- Increase their understanding of the difference between "wants" and "needs"
- Better understand the lifestyles, both past and present, of older people
- Better understand the options we have and their advantages and disadvantages
- Become more willing to simplify their lifestyles and reduce their material desires

Materials

Photocopied student pages:

5.1 Wants and Needs: Background Information (one per student)

5.2 Wants and Needs: Instructions and Data (one per team)

5.3 Wants and Needs: Questions (one per student)

Optional: tape recorder or videotape recorder

Vocabulary

None

Teacher Preparation

1. Photocopy the Background Information sheet (5.1) and Questions sheet (5.3).
2. Arrange for senior citizens to visit the class:
   a. Contact retired teachers, friends, relatives.
   b. You might try local senior citizen centers or retirement communities.
   c. Meet with the senior(s) and discuss the activity.
   d. Arrange for transportation or any other assistance that may be needed.
3. Photocopy the Instructions and Data sheets (5.2) after discussing the interview with the students and adding to the Data table.
4. *Optional:* Arrange for a tape recorder or videotape recorder.

Safety Consideration

Arrange for safe transportation for the senior citizen guest(s).

Procedure

1. Introduce the concept of "wants versus needs" as follows:
   a. On the board or overhead, list the following:
      - Television
      - Refrigerator
      - MP3 player
      - Electric lights
      - Aluminum cans
      - Paper towels
      - Plastic wrap
      - Automobile
      - Computer
      - DVD player

      (Delete some or add others if you wish.)
   b. For each of the above, have the students rate them as an absolute necessity, an unnecessary luxury that some people want, or somewhere in

between. Do this by having the students line up in a continuum as you name the item. For example, have those who think that television is an absolute need line up on the left, those who think it is an unnecessary luxury line up on the right, and the others distribute themselves in between according to the value they give to the item. (This is called a "values continuum.")

c. Discuss the students' choices. Try to avoid making judgments lest students get defensive.

2. Have the students brainstorm a list of common activities and appliances and other items that are commonly found or done in and around the home. Use this list to add to the Data table (5.2).
3. Have the students discuss what alternatives people might have utilized fifty, sixty, or one hundred years ago. How did people get along without it? What did they do or use instead?
4. Introduce the idea of interviewing a senior citizen (at least two generations older than the students) about life when he or she was a teenager.
5. Discuss how to interview an older person. (See the Instructions sheet, 5.2.)
6. Ask the students if they know of somebody who might be willing to come to class and be interviewed. Decide whether to have a small team of students interview the senior(s) in front of the class or for several teams to interview several seniors.
7. Arrange for the interview(s). Consider videotaping it or making an audiotape.
8. Conduct the interview(s).
9. Have the students write letters of appreciation.
10. Discuss the results of the interview. Relate their discussion to the values continuum done at the start of the lesson.

Discussion

1. What are the basic human needs? Do these differ for different people? In different places?
2. What is the difference between a want and a need?
3. What influences our wants?
4. Do most of the things you have fulfill wants or real needs?
5. How do our wants often conflict with our needs?
6. Discuss the statement that "Conservation isn't doing without. It is doing better with less."

Answers to Worksheet 5.3

1. True needs are universal—everybody in every culture shares the same needs, such as food, shelter, and water. Different people, however, have different wants.
2. Our basic physical needs are food, water, air, and shelter. Beyond our physical needs, we need feelings of friendship, affection, security, a feeling of being valued, and some others to be emotionally healthy.
3. a. Materials to build it; air and water pollution; electricity; social costs such as isolation; negative influences; reduced development of personal interaction skills; lack of exercise (physical and mental)
   b. Materials to build it; air and water pollution; fuel costs; large quantities of space devoted to parking and roads; isolation; loss of time (mass transit allows for other uses of the time while one rides the bus or train); injuries and loss of life
   c. Materials; air and water pollution; noise; lack of exercise
   d. Materials, including oil; air and water pollution; litter; hazards to wildlife
   e. Materials; energy; air and water pollution; litter; broken glass
   f. Materials; electricity
   g. Materials; air and water pollution; time; possible ozone depletion; energy
   h. Materials; air and water pollution; effects on wildlife; possibility of accidents; poisons farm workers; possible health risks to consumers
4. Answers will vary. Students will often claim that they need hair spray, hair dryers, televisions, and the like.
5. Answers will vary. Point out how nice it would be to have a three-day work week and be able to have time to relax, do hobbies, enjoy one's family, and so forth.
6. Answers will vary.

Extensions

(See Activities 7, "Think Globally, Act Locally," and 8, "Do It!" for student project ideas.)

1. Interview other seniors, especially those who may have moved from different regions.
2. Obtain magazines and newspapers from forty, fifty, or more years ago. Compare them to today's publications, especially with regard to the types of events reported and the articles advertised.

3. Have the students do an oral history project. The video or audiotape made as part of the interview can be the basis for this project. See the *Foxfire* book series by Eliot Wigginton.
4. Have the students commit to doing without (television, automobiles, plastic bags, aluminum cans, hair spray, or ???) for some period of time. Emphasize that what they are really doing is doing something else instead of watching television. Discuss their alternatives before doing the project and their realizations afterwards.
5. Work with social studies and English teachers to make this an interdisciplinary project. Industrial arts, art, home economics and other departments might also be interested.
6. Compare life in the United States fifty to one hundred years ago to life today in less developed regions of the world.
7. Show the film *The Lorax,* which is based on the Dr. Seuss book of the same title. Discuss the meaning of the film. Point out that it isn't a condemnation of all technology or resources. It is intended to point out the absurdity of waste and a culture of ever-expanding desire for the newest unnecessary gizmo. It also offers a message of hope based on the ability of one person to make a difference. It is available for purchase or rent from various sources.
8. Discuss what the world will be like fifty or one hundred years from now if we keep using up our resources.

Modification

The students can visit the seniors where they live and conduct the interviews there. This should be done in small teams so as to reduce the intrusiveness.

Internet Connections

Many Internet sites offer suggestions for simplifying lifestyles. One good one is: www.simpleliving.net.

Information on the Foxfire organization, philosophy, and resources can be obtained at: www.foxfire.org.

References

Geisel, Theodor Seuss. *The Lorax.* New York: Random House, 1971.

Tourtillot, Leeann. *Conserve and Renew.* Sacramento: California Energy Extension Service, 1990.

Wigginton, Eliot. *The Foxfire Book.* New York: Anchor Books, 1972.

Name _____ Class _____ Date _____

5.1
Wants and Needs: Background Information

Have you ever wondered what it was like "in the good old days"? What about the not-so-good old days? How have times changed, and how have they stayed the same? How did people survive without our modern conveniences?

For most of human history, people have lived quite differently than we do today in the industrialized nations. As people developed different sources of energy and invented various machines, their lives changed. Today, in our country, most of us don't have to find firewood or carry water from a stream to cook a simple meal. Most of us have electricity and electrical appliances. We have cars, telephones, computers, televisions, hair dryers, and microwave ovens. We use and discard paper napkins, aluminum cans, and plastic bottles and bags without thinking about it.

But are these appliances and other objects really needed, or are they conveniences that many of us want? What are our real needs?

Our physical needs include food, water, space, and shelter. We also have needs such as love, friendship, and a feeling of value and importance.

Many of the things that we take for granted or consider necessities have become common only in recent years. Many were invented only in the last forty years or so. If these things are such recent inventions, they must not really be necessities. Rather, they are things to which we have become accustomed, and that eventually come to seem as if we need them. It is important to keep these "needs" in perspective. What are our alternatives? What would we do without them? What prices do we pay for them, including the price that our environment pays for their production and use? What did people do before television? Before hair dryers? Were they all bored, unattractive social misfits?

Does it make sense to work twenty hours to pay for an appliance that will save us some work, and then pay more money and spend more time to exercise at a gym? Making and using electrical appliances takes energy and materials and generates air and water pollution. Our labor-saving devices cost us money, for which we labor. We work for money with which to buy them, operate them, and repair them. Are they worth it?

Do we buy things because they are really important, needed, or useful? Or do we buy things because the advertising agencies and manufacturers sell them to us? Are we healthier or happier because of our "things"?

It is interesting to think about the fact that many people leave their home and their "things" when they have a chance for a vacation. Many even go camping or backpacking and really leave the "modern conveniences" behind. They work fifty weeks a year so that they can get away from their things for two weeks!

Maybe we should all think carefully about what we really want out of our lives and what we really need. Which is more valuable to you, some time to relax with friends or the latest gadget or fashions? Which do you need more, clean air and water, or more manufacturing plants, trucks, and oil wells? Are roads and shopping malls more important than open spaces and wilderness?

Name _____ Class _____ Date _____

5.2
Wants and Needs: Instructions and Data

When you interview a senior citizen, here are some things to keep in mind:

1. Have your interview planned thoroughly. Don't waste the person's time (and yours). Know who is going to do and say what, but don't get so tied to a plan that you don't allow the person being interviewed to talk freely.
2. Talk directly to the person whom you are interviewing.
3. Speak clearly. Be aware of any hearing difficulty.
4. If you can have a tape recorder or a VCR available, it will make it easier to remember what was said and relieve you of the task of taking notes.
5. Allow the person to tell stories and just talk about his or her experiences.
6. As the person talks, look for questions that build on what he or she says.
7. Except for when completing the Data table, try to avoid short-answer, yes-or-no type questions. Try to ask "open-ended" questions that allow and encourage the person to tell his or her story.

For example:

Rather than: "Did you like living here when you were a child?" (closed . . . yes or no answer)

Ask: "What was it like to be a child living here?" (open-ended . . . will tell you much more)

Rather than: "Did you have a television when you were a teenager?"

Ask: "What did you do for entertainment when you were a teenager?"

As part of your interview, but not the whole thing, you should find out whether the person had the things listed on the Data table. If not, what was used instead?

Also find out if the person did the things listed. If not, what did he or she do that was similar or filled the same want or need?

Be sure to assure the person that you aren't trying to pry into his or her personal life. You are just trying to find out what it was like when the person was your age. If he or she seems at all touchy about a question, move on to another one.

Person interviewed: _____ Age:_____ Year born:_____

Where did the person live as a teenager? _____

Was it a city or country area? (describe) _____

Did He or She Have the Following Appliances or Objects?		
	Yes or No?	*If Not, What Was Used Instead?*
Automobile		
Television		
VCR		
Radio		
Space heater		
Air conditioning		
Refrigerator		
Freezer		
Electric lights		
Food processor		
Microwave oven		
Clothes dryer		
Hair dryer		
Dishwasher		
Paper towels		
Paper napkins		
Paper plates		
Disposable razors		
Aluminum cans		
Hair spray		
Computer		

Did He or She Do the Following Things?
Have the Person Describe His or Her Activities.

Go to church _____

_____

Go to parties _____

_____

Drive around in cars _____

_____

Play video games _____

_____

Play board games or card games _____

_____

Read for pleasure _____

_____

Play sports _____

_____

Go to school _____

_____

Do chores _____

_____

Have a job outside the home _____

_____

Date _____

_____

Use public transportation _____

_____

Name _____ Class _____ Date _____

5.3
Wants and Needs: Questions

1. What is the difference between a want and a need?

   _____

2. List the true needs that each of us has.

   _____

3. Besides money, what costs do we incur with the use of each of the following:

   a. Television _____

   b. Automobiles _____

   c. Power lawn mowers _____

   d. Plastic bags _____

   e. Disposable beverage containers _____

   f. Electric hair dryers _____

   g. Aerosol spray cans _____

   h. Pesticides _____

4. What "things" are there at your house without which you could live just as well?

   _____

   _____

   _____

5. Job "A" provides enough money to pay for a large home, many electrical appliances, and expensive clothes. It also requires sixty hours of work per week. Job "B" pays enough money to pay for a modest home, a few basic appliances, and inexpensive clothes. It requires just twenty-four hours per week. Which job would you choose and why?

   _____

   _____

   _____

6. Discuss the idea that conservation means doing more with less.

   _____

   _____

   _____

Activity 6
What's Happening?

Activity Summary

Students study current events by collecting and summarizing articles on environmental issues. They give reports to the class, including actions that they as individuals might take to improve the situation.

Content Standard Alignment

This activity can help students meet the following National Science Education Standards.

Grades 5–8

Content Standard A: As a result of activities in grades 5–8, all students should develop

Understandings about scientific inquiry

Content Standard C: As a result of their activities in grades 5–8, all students should develop understanding of

Populations and ecosystems

Content Standard E: As a result of their activities in grades 5–8, all students should develop

Understandings about science and technology

Content Standard F: As a result of their activities in grades 5–8, all students should develop an understanding of

Personal health

Populations, resources, and environments

Natural hazards

Risks and benefits

Science and technology in society

Content Standard G: As a result of their activities in grades 5–8, all students should develop an understanding of

Science as a human endeavor

Nature of science

Grades 9–12

Content Standard A: As a result of activities in grades 9–12, all students should develop

Understandings about scientific inquiry

Content Standard B: As a result of their activities in grades 9–12, all students should develop an understanding of

Structure and properties of matter

Conservation of energy and increase in disorder

Interactions of energy and matter

Content Standard C: As a result of their activities in grades 9–12, all students should develop an understanding of

Interdependence of organisms

Matter, energy, and organization in living systems

Content Standard D: As a result of their activities in grades 9–12, all students should develop an understanding of:

Energy in the Earth's system

Geochemical cycles

Content Standard E: As a result of their activities in grades 9–12, all students should develop

Understandings about science and technology

Content Standard F: As a result of their activities in grades 9–12, all students should develop an understanding of

Personal and community health

Population growth

Natural resources

Environmental quality

Natural and human-induced hazards

Science and technology in local, national, and global challenges

Content Standard G: As a result of their activities in grades 9–12, all students should develop an understanding of

Science as a human endeavor

Nature of scientific knowledge

Introduction

Environmental issues seldom grab the headlines as they did in the 1970s, but there are still numerous articles on them to be found in popular publications. It is important

that students learn to read articles on environmental issues and that they learn to think about and analyze them. Most important, they need to consider how current environmental events might affect them and how they might improve the situation.

Grouping

Individuals or teams

Time

Introduce the assignment: 10–15 minutes

Students collect articles: 3–6 (or more) weeks

Student oral reports on current events: varies, approximately 20 minutes per week

Anticipated Outcomes

The students will

- Increase their willingness to read articles on environmental issues
- Read articles from environmental journals
- Improve their ability to analyze written articles
- Improve their ability to present information orally
- Learn more about current environmental issues
- Better understand how they can have an impact on environmental issues

Materials

Photocopied student pages:

6.1 What's Happening? Background Information (one per student)

6.2 What's Happening? Instructions and Article Cover Sheet (the number varies)

6.3 What's Happening? Questions (one per student)

Vocabulary

None

Teacher Preparation

1. Photocopy the Background Information sheet (6.1), Instructions and Article Cover Sheet (6.2), and Questions sheet (6.3).

2. Check your school and public libraries for environmental publications. Talk with the librarian about the possibility of starting subscriptions if they don't have many.
3. If you are using the Cover Sheet (6.2), make sure students have enough to fill in one for each article.

Safety Considerations

None

Procedure

1. Check your school and local libraries for environmental publications. Students might do this. If they don't subscribe to enough, talk with the librarian about subscribing to more. (Librarians often want suggestions for magazines that will actually be used.)
2. Check with local environmental or service organizations about the possibility of their donating subscriptions to the school library. Alternatively, they might have members who would donate their publications as they finish with them each month. (Students might make these contacts.)
3. Decide for how long you want the students to keep their current events files, how many articles they are to do each week, and what kinds of articles are to be required. Also decide how you want the oral reports to be done. Duplicate an appropriate number of the Cover Sheet (6.2). Here are some alternative ways to give this assignment:

   a. Each member of the class is to do:

      - Written current event summaries on three newspaper and one magazine article each week for four weeks
      - One short oral report on an article or a topic each week
      - Current events portfolios which are to be submitted for evaluation every two weeks

   b. Divide the class into quarters.

      - One-fourth of the class will be responsible for keeping the class abreast of current environmental events for each quarter of the school year. They are to meet as a team and decide how to do this. Make and post a schedule. Remind the students each week.
      - Each student, whether it is his or her quarter to be the environmental reporter or not, is to keep a current event summary file that the teacher

will collect periodically. The student is to do summaries of three articles each week.

c. Divide the class into teams of three students. Each team is to collect and report on the current environmental events for a week and will do an environmental news report to the class on Monday of the following week. With thirty students in a class, a thirty-week school year allows for each team to do this three times, thus allowing for development of their presentation skills.

d. Different students or teams of students could be responsible for different topics, such as air, water, population, toxics (hazardous substances), energy, wildlife, food, open space, solid waste, oceans, land use, or laws. They would develop files of articles and report to the class periodically. Teams could change topics after two or three weeks.

e. Different teams of students could be responsible for different media types. Once a week, each team could report on the main environmental issues dealt with by their media. After three or four weeks, each team rotates to a different media type. A possible division of responsibilities could be:

- Local newspapers and local television news broadcasts
- Regional newspapers or newspapers with large distributions
- National television news broadcasts
- Television specials and documentary programs
- Popular news-oriented magazines such as *Time* and *Newsweek*
- Environmental, nature, and science magazines such as *National Audubon*, *Sierra*, *National Wildlife,* and *National Geographic*
- Publications of local environmental groups and/or agencies
- Internet sites for environmental organizations (See Appendix II)

4. Be sure to make your expectations clear to the students, including any grading criteria. Students might be involved in developing presentation formats and evaluation criteria. Consider filling in the Instructions sheet (6.2) before duplicating it.

Discussion

1. Were the articles from different sources equally informative? Were some sources biased?
2. Did the media present solutions or just tell about problems? Was the issue presented as an isolated event or was it shown in relation to other events or issues?

3. How does the media affect our views about environmental issues?
4. Why is it important to keep informed about local issues as well as about national or world issues?
5. Is it easier for you to have an influence on local issues or national issues? Does this mean that you should not keep informed about national or worldwide issues?
6. What are some ways that you can have an influence on national or world issues?

Answers to Worksheet 6.3

1. Answers will vary. Any article (or speech or broadcast) will have a bias. General news publications often tend to emphasize the sensational or whatever sentiment is currently "in."
2. Answers will vary. Environmental publications, rightfully, present arguments from an environmental viewpoint. They don't always agree, though, about what is best for the environment.
3. Answers will vary. Solutions that are suggested often are not ones that we as individuals can put into effect in our daily lives.
4. Answers will vary. One approach is to ask, "What is the worst that could happen if this side is wrong? Now, what is the worst that could happen if that side is wrong?" It is also important to learn as much about the subject as possible and think about what seems most logical and simplest. It is also useful to ask what ulterior motives the "experts" on each side might have.
5. Answers will vary. Publications that specialize to some degree, including both books and magazines, are useful.
6. Answers will vary. It is important that understanding be a starting point and foundation for the concern and action.
7. Ostriches employing this defensive technique are called dinner! What you don't know can hurt you. It is vital to know as much as possible about the things in your environment that affect you. It is also useful to simplify your life so that you have more control over the outside influences.
8. If a person attempts to attack global problems without addressing local issues, he or she often feels frustrated and powerless. By dealing with local issues, you can see success. Furthermore, the global (or national) issues are actually made up of lots of local and personal issues. For example, the accumulation of CO_2 in the atmosphere is caused largely by the burning of fossil fuels. Those fossil fuels are burned to produce electricity and products that we as individuals purchase. If we reduce our purchases and save energy, less fossil fuels will be burned.

Extensions

(See Activities 7, "Think Globally, Act Locally," and 8, "Do It!" for student project ideas.)

1. Oral presentations can be videotaped and critiqued, looking for ways to improve them.
2. Students can do bulletin boards as part of their reports.
3. If there is a bulletin board or display case available on the campus, students could use it to publicize environmental information or local environmental issues or events.
4. Students can write letters to the editors of local newspapers.
5. Students can write an environmental column for the school newspaper.
6. Students can produce environmental pieces for local radio or television news programs. Find out about local public access television programming or public service announcements.
7. Students can maintain an environmental library in a portion of the school library. Contact local environmental groups for donations of subscriptions, reference materials, back issues of publications, and other materials.

Modifications

1. Modify the Instructions and Cover Sheet (6.2) to suit your needs.
2. Rather than duplicate the Cover Sheet for each article, give one to each student and have him or her use it as a model.

Internet Connections

Many environmental groups have current events sections on their Web sites.

- See Appendix II for some contact information.
- Students can do Internet searches on environmental topics.
- Have students do an Internet search for "environmental news."

References

Clymire, Olga, and others. *California Class Project.* Costa Mesa, Calif.: Orange County Superintendent of Schools and the National Wildlife Federation, 1988.

Name _____ Class _____ Date _____

6.1
What's Happening?
Background Information

The 1970s were called the "Environmental Decade." Many people were very concerned about environmental issues ranging from air pollution to overpopulation. The concern of the people resulted in legislation intended to address the multitude of environmental problems facing us. Some of the legislation included:

The National Environmental Policy Act

The Clean Air Act

The Endangered Species Act

The Safe Drinking and Water Act

The Toxic Substances Control Act

States established various environmental agencies and offices. The federal government established the Environmental Protection Agency and the Department of Energy. The Atomic Energy Commission was reorganized into the Nuclear Regulation Commission and the Energy Research and Development Administration within the Department of Energy.

In the 1980s, many people, both in and out of government, turned their attention away from environmental issues. Some thought that the measures taken in the 1970s had taken care of the problems. Some became involved in other issues. Others became frustrated because the solutions were not simple or the results didn't come about fast enough. Still others became disenchanted when they found that some measures taken to protect the environment resulted in problems of their own, such as increased costs, less convenience, and even the loss of some jobs.

Now we find that the environmental problems of the 1970s are still unsolved. In fact, many problems, such as overpopulation, are even greater than before. As we have learned about environmental issues, we have found that there are few easy solutions to the problems. Every issue has more than one side. We cannot, however, ignore the problems or leave them to the "experts."

It is imperative that every one of us learn about what is happening in our environment now. Why? Because we are directly affected by our environment. The air we breathe, the water we drink, the food we eat, and the energy we use are all affected by environmental influences. We, in turn, affect our environment, sometimes in harmful ways and sometimes in helpful ways. Only by becoming informed of environmental issues can we make wise choices in our daily lives.

By becoming more informed, most of us also become more concerned about environmental issues. When we become more concerned, many of us want to become involved in working toward improving our environment. As we work toward a better environment, we become even more informed. Thus, learning about environmental issues gives us the exciting opportunity and ability to work toward solutions.

Name _____ Class _____ Date _____

6.2
What's Happening?
Instructions and Article Cover Sheet

Your teacher will tell you how many articles you are to do current events reports about, how frequently they are to be done, and what is expected in the report.

Record the details of your assignment below. Be sure to ask questions if anything is not clear.

1. Due date(s): _____
2. What I am to do: _____

   Type(s) of articles: _____

   _____

   _____

   _____

   Number: _____

   How to do the reports: _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

Name _____ **Class** _____ **Date** _____

Article Cover Sheet

Article title: _____ Topic: _____

Attach this cover sheet to a copy of the article or to the article itself if the publication belongs to you and you want to cut it out. (Don't damage library publications!) If it is about a television or radio program, give the title, channel, network, time, and date of broadcast. If it is from the Internet, print it and be sure to include the URL.

Publication: _____ _____ _____
Name Date Page or URL

Source: ☐ Home ☐ School library ☐ _____ Library ☐ Internet ☐ Other _____

Summary of the article (who, what, when, where, why, and so on): _____

_____

My opinions and reaction to the article: _____

_____

How this affects me; what I can do: _____

_____

Name _____ **Class** _____ **Date** _____

Article Cover Sheet

Article title: _____ Topic: _____

Attach this cover sheet to a copy of the article or to the article itself if the publication belongs to you and you want to cut it out. (Don't damage library publications!) If it is about a television or radio program, give the title, channel, network, time, and date of broadcast. If it is from the Internet, print it and be sure to include the URL.

Publication: _____ _____ _____
Name Date Page or URL

Source: ☐ Home ☐ School library ☐ _____ Library ☐ Internet ☐ Other _____

Summary of the article (who, what, when, where, why, and so on): _____

_____

My opinions and reaction to the article: _____

_____

How this affects me; what I can do: _____

_____

Name _____ Class _____ Date _____

6.3
What's Happening? Questions

1. Are general news publications unbiased in their reporting? Should they be? Discuss.

_____

_____

2. Are environmental organizations' publications unbiased? Should they be? Discuss.

_____

_____

3. Do most of the articles about environmental problems suggest solutions? Should they? Discuss.

_____

_____

4. Even "experts" frequently disagree. If opposite sides of an environmental issue both seem to have good arguments and believable "experts" supporting them, how would you decide on which side to base your actions?

_____

_____

5. Do the general news publications and broadcast media seem to go into depth, or do they just do superficial coverage of environmental issues? If they do superficial coverage, what can one do to find out more?

_____

_____

6. Discuss the idea that understanding leads to concern, which leads to involvement, which leads to more understanding, which leads to more concern, and so on.

_____

_____

7. There is a story that when ostriches see predators approaching, they hide their heads in the sand because they think that if they don't see the predator it won't hurt them. Some people seem to take the attitude that "What I don't know won't hurt me" with regard to environmental issues. What do you think of this?

_____

_____

8. Discuss the idea of "Think globally, act locally."

_____

_____

Activity 7
Think Globally, Act Locally

Activity Summary

Students investigate and report on state, national, or international organizations and agencies that are working on environmental issues. They also investigate and report on nongovernmental groups working on local environmental issues.

A suggested extension includes a list of questions about local environmental issues for students to investigate.

Content Standard Alignment

This activity can help students meet the following National Science Education Standards.

Grades 5–8

Content Standard F: As a result of their activities in grades 5–8, all students should develop an understanding of

Personal health

Populations, resources, and environments

Risks and benefits

Science and technology in society

Content Standard G: As a result of their activities in grades 5–8, all students should develop an understanding of

Science as a human endeavor

Grades 9–12

Content Standard E: As a result of their activities in grades 9–12, all students should develop

Understandings about science and technology

Content Standard F: As a result of their activities in grades 9–12, all students should develop an understanding of

Personal and community health

Population growth

Natural resources

Environmental quality

Natural and human-induced hazards

Science and technology in local, national, and global challenges

Content Standard G: As a result of their activities in grades 9–12, all students should develop an understanding of

Science as a human endeavor

Introduction

When confronted with environmental issues, it is easy to feel overwhelmed and powerless to solve the problems. This is even more true for many who are too young to vote or who have minimal incomes. And yet, many students are still full of "youthful enthusiasm" and want to make a difference. Simple steps taken as a middle school or high school student can lead to lifelong changes in behavior and involvement in working on environmental or other issues.

Each of us, however, has limited resources, including time, energy, and money. We must make choices about how to use our resources. In this activity, students investigate and report on environmental organizations and agencies at all levels—local, state, national, and international. Emphasis is on the potential for change through individual involvement.

Grouping

Individual students or teams of two

Time

Introducing the activity: 15–30 minutes

Students researching organizations: 30–60 minutes

Student reports to the class: 45–60 minutes

Anticipated Outcome

The students will

- Increase their knowledge of the opportunities available to help improve the environment

Materials

Photocopied student pages:

7.1 Think Globally, Act Locally: Background Information (one per student)

7.2 Think Globally, Act Locally: Instructions (one per student)

7.3 Think Globally, Act Locally: Questions (one per student)

Vocabulary

agency boycott non-governmental organization (NGO)

Teacher Preparation

1. Photocopy the Background Information sheet (7.1), Instructions sheet (7.2), and Questions sheet (7.3).
2. Arrange for students to have access to the Internet.
3. Decide on a due date for the assignment.

Safety Considerations

Caution students not to give out personal information on the Internet, including home address, home e-mail, or phone numbers. Any materials to be mailed should be sent to the school address, care of the teacher.

Procedure

1. Call on students to read paragraphs from Background Information (7.1). Discuss each paragraph as it is read. Emphasize the idea that all of the big problems are the result of decisions made by individuals. If enough individuals act to improve the environment, a social issue, or any other problem, the situation can be improved. If individuals don't act, the situation will most likely get worse. Every big problem is caused by many little decisions and actions; solutions to big problems must come from many little decisions and actions.
2. After reading and discussing the Background Information page, go over Instructions (7.2), and give the due date for their research. Be sure to warn the students not to put off investigating their topic, as they may not find an organization that deals with their first choice and they may need to select another topic. To avoid duplication, keep a record of which group or agency the students are investigating.
3. When the research is due, have students give short (one- to three-minute) reports on their findings.

Discussion

Ask the students to tell what the following mean to them:

- Think globally. Act locally.
- Be not merely good . . . Be good for something.
- Nobody can do everything; everybody can do something.
- If not me, who? If not now, when?
- But I'm just one person.

Answers to Worksheet 7.3

Answers will vary.

Extensions

(See Activity 8, "Do It!" for more student project ideas.)

1. Students can attend meetings of local environmental organizations and report back to the class.
2. Students can participate in environmental activities organized by local environmental organizations.
3. After learning about ways to help protect the environment, students can experiment with changes in their own lifestyle. They can start by making a change for a short period of time and then evaluating its impact on their life, possibly reporting to the class. For example, students could commit to one or more of the following for a three-week period:
   a. Taking a reusable cloth bag when shopping
   b. Walking or riding a bike to the store unless there is too much to carry
   c. Turning off all unused lights in the home
   d. Picking up and recycling recyclable containers on the campus
   e. Recycling all recyclable materials at home (or, if they already recycle, at a neighbor's)
   f. Taking a shower of no more than five minutes
   g. Turning off the water when brushing teeth and shaving
4. Students can prepare a Conservation Directory of local NGOs and agencies that deal with environmental issues. The Directory can be distributed to schools and libraries as well as to and by the NGOs and agencies.
5. Students can organize an Earth Day or Earth Week event at which individuals, agencies, and NGOs are invited to share how they help the environment and how people can get involved. Ideas can be obtained at:

   www.earthday.net

   www.earthday.envirolink.org

   www.earthday.gov
6. Students can work with NGOs and agencies to put on an Environmental Education Resource Fair. The fair can include tables for NGOs and agencies, workshops, games, songs, and, possibly, speeches, movies, or other presentations.
7. Students can create a file of information about agencies. It can be kept in the classroom, shared with other teachers, or put into the school or community library.

8. The American Forest Foundation and Project Learning Tree have published a useful book titled *Green Works! Connecting Community Action and Service Learning,* by Rebecca Dobbins and Barb Pitman.
9. Project WILD has published two useful resources titled *Taking Action—An Educator's Guide to Involving Students in Environmental Action Projects* (Darleen Stoner, and others), and *Science and Civics: Sustaining Wildlife* (Theresa Alberici, and others).
10. Students can be investigative reporters. They can investigate local topics such as those listed in Appendix VI and write articles or editorial letters for local newspapers or the school newspaper. Students might make public service programs, school television broadcasts, or "blogs" to share their findings. The topics listed in Appendix VI can also be the subject of written or oral reports.

Modifications

1. Students can write for information.
2. Teach about the steps in dealing with a significant loss such as a death (shock, denial, guilt, hostility, and so forth). Many people go through these same steps when learning about environmental issues.

Internet Connections

Contact information for hundreds of environmental organizations and agencies can be found at:

www.nwf.org/conservationdirectory

www.webdirectory.com

Also see the listings of environmental organizations and agencies in Appendixes I and II.

References

Alberici, Theresa, and others. *Science and Civics: Sustaining Wildlife.* Houston, Tex.: Council for Environmental Education/Project WILD, 2002.

Dobbins, Rebecca, and Barb Pitman. *Green Works! Connecting Community Action and Service Learning.* Washington, D.C.: American Forest Foundation/Project Learning Tree, 2001.

Miller, G. Tyler. *Living in the Environment.* Belmont, Calif.: Thomson, 2007.

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Name _____ Class _____ Date _____

7.1
Think Globally, Act Locally: Background Information

As you learn about environmental issues, you may become concerned and want to do something about them. Good for you! Even the biggest environmental issues, such as global climate change, overpopulation, energy shortages, air and water pollution, and food shortages, are the result of the decisions and actions of individuals. If enough individuals make more appropriate decisions, our environment can improve not only for us, but for our children and future generations. Individual actions can influence what happens in homes; communities; local, state, and national government; and the boardrooms of corporations.

You may wonder how a huge issue such as global climate change or water pollution can be the result of individual decisions. Here's an example: One important component of global climate change is global warming. Some global warming is the result of natural processes about which we can do little or nothing. Most scientists agree, though, that human activities, such as deforestation and the burning of coal to make electricity, have contributed to global warming. If we as individuals use less electricity, less coal will need to be burned. If we simplify our lives and buy fewer products, less coal and oil will be burned to make those products. Simply recycling saves energy, and, therefore, reduces global warming. It is the actions of millions of individuals that create many environmental problems, and those same millions of individuals can help reduce the problems by taking positive steps as individuals.

Many people acting together can have a major impact in a variety of ways. They can work together to elect officials who will work to improve the environment. They can organize consumer actions to either encourage the purchase of environmentally beneficial products or discourage the purchase of or **boycott** environmentally harmful products. They can undertake public awareness campaigns. They can raise funds to purchase and protect land or for other environmental causes. All of these and hundreds of other actions are undertaken by large and small citizen groups and **non-governmental organizations or NGOs.** There are over 30,000 that are concerned with environmental issues in the United States alone, and over 100,000 worldwide.

Elected officials create governmental **agencies** such as the Environmental Protection Agency, the National Park Service, and the Department of Energy. These public agencies and many others are also involved in protecting and improving the environment. Because elected officials create these governmental agencies, working for the election of environmentally aware candidates can help give the agencies direction.

Some people choose to try to help the environment by training for jobs as scientists, park rangers, educators, or for other positions that will enable them to make a living by working for the greater good. Others try to find ways to help the environment in other jobs and in their daily lives.

Some people get frustrated when they try to influence a large agency or national group. They often find that they can have more of an impact by working on a local level. It is certainly easier to influence your local city council than it is to influence the U.S. Congress! And city councils working together can influence county or regional agencies. County and regional agencies can influence state agencies, and the states can influence the national government.

Even large national and international NGOs such as the Sierra Club and Audubon Society often have local groups in which individuals can become involved with working on local, regional, statewide, and national issues.

This much is certain: There are many environmental problems, and unless individuals decide to work toward reducing the problems, they will only get worse. Individuals, including you, especially when working with others, can make a difference.

Notes:

Name _____ Class _____ Date _____

7.2
Think Globally, Act Locally: Instructions

Part I: Think Globally

Over one hundred topics that are of concern to individuals and environmental groups are listed on the next page. Many have groups or agencies that are specifically concerned with them. Others are of concern to groups or agencies that deal with a variety of environmental issues. There are many other topics on which environmental groups and agencies are working.

Part I of this assignment is to find a group that is working toward solutions to an environmental problem or issue that is not limited to your local community. Find a group that works on issues that affect large areas or regions. You can select a topic from this list or come up with another. In either case, check with your teacher so that every student or team of students is investigating a different topic. Then complete the Questions sheet (7.3).

A key to this assignment is finding a topic in which you are really interested, so give some thought to your selection.

Your teacher may provide suggestions for groups or agencies to investigate. Performing an Internet search for a topic will usually yield several groups or agencies that can be helpful.

Part II: Act Locally

Every city and county has environmental issues. There may be concerns about water use, waste disposal, air pollution, pesticides, traffic, land use, wildlife, industry, or hundreds of other topics.

For Part II of this assignment, your task is to identify an environmental topic that is of concern in your community. Fill out Part II of the Questions sheet (7.3). Your teacher might be able to suggest topics of importance in your community.

Following is a partial list of topics that various groups are concerned about and working on:

- Air pollution
- Animals (threatened or endangered)
  - Bat
  - California condor
  - Cheetah
  - Dolphin
  - Elephant
  - Florida panther
  - Grizzly bear
  - Harp seal
  - Horses, mustangs
  - Koala
  - Manatee
  - Monk seal
  - Mountain lion
  - Ocelot
  - Orangutan
  - Orca
  - Peregrine falcon
  - Polar bear
  - Primates
    - Gorilla
    - Bonobo
    - Chimpanzee
    - Monkey
  - Raptors (birds of prey)
  - Rhinoceros
  - Sea otter
  - Sea turtle
  - Tortoise
  - Waterfowl, ducks
  - Wolf
- Arctic National Wildlife Refuge
- Bicycling as transportation
- Biodiversity
- Carbon sequestration
- Caves, cave protection
- Climate change
- Coastal issues
- Composting
- Community-supported agriculture
- Conservation
  - general
  - of electricity
  - of minerals
  - of water
- Coral reefs
- Desertification
- Dune protection
- Electric vehicles
- Electromagnetic radiation (EMF)
- Energy alternatives
- Farm animal treatment
- Farm workers' health
- Farmers' markets
- Farmland preservation
- Feral cats
- Feral dogs
- Fertilizer use, alternatives
- Food radiation
- Forest fire suppression
- Forestry: private lands
- Forestry: public lands
- Genetic modification
  - animals
  - foods
  - trees
- Grazing on public lands
- Green building
- Hazardous waste
- Herbicides
- Invasive species
  - animals
  - plants
- Light pollution
- Marshland protection
- Multiple use of public lands
- Native plants
- Noise pollution
- Nuclear power and waste
- Oil spills
- Organic farming
- Overgrazing
- Overpopulation
- Ozone depletion
- Parks
  - national
  - state
  - county or city
- Pesticides
- Plants
  - Cacti
  - Mangroves
  - Oaks
  - Redwoods
- Prairies
- Radiation (low level)
- Rainforests
  - animals
  - general
  - plants
- Recycling
- River ecosystems
- Seed banks
- Soil erosion
- Solar energy
- Solar vehicles
- Sustainable agriculture
- Sustainable development
- Transportation alternatives
- Trophy hunting
- Urban forestry
- Urban wildlife
- Veal farming
- Veganism, raw food diets
- Vegetarianism and the environment
- Water
  - general
  - pollution and quality
  - supplies
- Wetlands protection
- Wilderness
- Wildlife
  - general
  - pet trade

Name _____ Class _____ Date _____

7.3
Think Globally, Act Locally: Questions

Due date: _____

Part I: Think Globally

1. State, national, or international topic: _____
2. I/we chose this topic because: _____

   _____

   _____
3. One group or agency that we found that is working on this topic is:

   Name: _____

   Address: _____

   E-mail address: _____ Telephone: ( ) _____
4. Briefly describe the group or agency and how it is working on the environmental issue.

   _____

   _____

   _____

   _____

   _____

   _____
5. How can you as an individual get involved with or support this group's work?

   _____

   _____

   _____

   _____

   _____

   _____

   _____

Part II: Act Locally

1. Local environmental issue or topic: _____

2. I/we chose this topic because: _____

   _____

   _____

3. One local group or agency that we found that is working on this topic is:

   Name: _____

   Address: _____

   E-mail address: _____ Telephone: ( ) _____

4. Briefly describe the group or agency and how it is working on the environmental issue.

   _____

   _____

   _____

   _____

   _____

   _____

5. How can you as an individual get involved with or support this group's work?

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

Activity 8
Do It!

Activity Summary

This activity provides a format for student projects, as well as suggestions for these projects. This activity can be used several times throughout the school year.

Content Standard Alignment

This activity can help students meet the following National Science Education Standards.

Grades 5–8

Content Standard A: As a result of activities in grades 5–8, all students should develop

Abilities necessary to do scientific inquiry

Understandings about scientific inquiry

Content Standard C: As a result of their activities in grades 5–8, all students should develop understanding of

Populations and ecosystems

Content Standard E: As a result of their activities in grades 5–8, all students should develop

Abilities of technological design

Understandings about science and technology

Content Standard F: As a result of their activities in grades 5–8, all students should develop an understanding of

Personal health

Populations, resources, and environments

Natural hazards

Risks and benefits

Science and technology in society

Content Standard G: As a result of their activities in grades 5–8, all students should develop an understanding of

Science as a human endeavor

Nature of science

Grades 9–12

Content Standard A: As a result of activities in grades 9–12, all students should develop

Abilities necessary to do scientific inquiry

Understandings about scientific inquiry

Content Standard B: As a result of their activities in grades 9–12, all students should develop an understanding of

Conservation of energy and increase in disorder

Interactions of energy and matter

Content Standard C: As a result of their activities in grades 9–12, all students should develop an understanding of

Interdependence of organisms

Matter, energy, and organization in living systems

Content Standard D: As a result of their activities in grades 9–12, all students should develop an understanding of

Energy in the Earth's system

Geochemical cycles

Content Standard E: As a result of their activities in grades 9–12, all students should develop

Abilities of technological design

Understandings about science and technology

Content Standard F: As a result of their activities in grades 9–12, all students should develop an understanding of

Personal and community health

Population growth

Natural resources

Environmental quality

Natural and human-induced hazards

Science and technology in local, national, and global challenges

Content Standard G: As a result of their activities in grades 9–12, all students should develop an understanding of

Science as a human endeavor

Nature of scientific knowledge

Introduction

Learning about environmental issues can be very frustrating and discouraging for students. As they learn about environmental problems, many will want to become involved in finding solutions, but they often have trouble seeing how they can have an impact. Actually working on environmental projects can help students feel that they can have a positive impact and can help them develop the skills needed to work on any issue. It might even open the door to career possibilities.

It can be very rewarding for students to become physically involved in projects to help the environment. If they can work with others from their community, especially adults, they can benefit from others' knowledge, experience, and skills. Working with others also helps the students feel more optimistic and powerful.

It is easy to feel as if what we do as individuals doesn't count. Students, like most of us, often use this as a rationalization for doing nothing or for doing something that we know we shouldn't do. It is worthwhile to keep the following points in mind and to point them out to students:

- We as individuals and consumers determine what our government and industries do. If enough of us don't buy certain harmful products, especially if we let the manufacturer know why we aren't buying them, they will stop making them. Conversely, if we support environmentally sound industries, they will flourish. As voters, or future voters who can influence those who can vote now, we can influence our government. Legislators do pay attention to their popularity polls, and, especially if we join together with others, we can influence them.
- When it seems as if one person's vote doesn't count, consider the following. People often think that it takes 51 percent of the population to win an election. This is not so, as the following shows:

  1. Only about 71 percent of the population is of voting age.
  2. Of that 71 percent, only about 70 percent are registered to vote. Seventy percent of 71 percent is 50 percent.
  3. Of that 50 percent, only about 50 percent actually vote. Fifty percent of 50 percent is 25 percent.
  4. Therefore, to have a 51 percent majority of the voters in a two-party election, it would take only about 13 percent of the population.
  5. BUT, there are more than two parties, so it actually takes less than 13 percent of the population to win an election. In 2000, George W. Bush was elected President with a little more than 18 percent of the total population voting for him.

- Students know very well that some people are more influential than others. They know who sets the styles on campus, who decides what is "in" and what is "out." They also know that a governor, mayor, or city councilperson has more power than somebody who doesn't participate in the governmental system. Point out that the actions of a few people can affect the population as a whole. They can learn how to be influential. If they go to a city council

meeting and speak intelligently on an issue, they will have more influence than does the 99 percent of the population who never go to a city council meeting. If they write a letter to a legislator, they will have more influence than one thousand people who don't.

- Suggest that they "think globally and act locally." Students' actions in their local communities can have an impact far beyond the local community.
- If we try to help improve the environment, we won't win every battle, but we will win some. If we don't take actions to help the environment, it will certainly get worse.
- Our environmental problems have been accumulating and getting worse for over a hundred years. We aren't going to solve them in a week, a month, or a year. The longer we wait, though, the more difficult the solutions and choices will become.
- Each of us is going to spend the next twenty-four hours (or days, or weeks, or years) doing something. Why not spend at least some of the time doing something good. Be not simply good. Be good for something!

Grouping

Individual or small groups

Time

Introducing the activity: 20–30 minutes

Doing the projects: varies

Anticipated Outcomes

The students will

- Become involved in actively working toward a better environment
- Increase their ability to plan and complete a project outside the school setting

Materials

Photocopied student pages:

8.1 Do It! Background Information (one per student)

8.2 and 8.3 Do It! Instructions and Project Description sheets (one per student or group)

8.4 Do It! Questions (one per student)

8.5 Do It! Project Ideas (one per student, or have students share them)

Vocabulary

None

Teacher Preparation

Photocopy the Background Information sheet (8.1), Instructions and Project Description sheets (8.2 and 8.3), Questions sheet (8.4), and Project Ideas (8.5).

Safety Consideration

As you review the students' project proposals, be aware of any hazardous projects. Consider exposure to hazardous chemicals, animals, traffic, and equipment or materials. Discuss safety measures with the students. Transportation can be a safety issue. Projects involving bodies of water such as rivers, lakes, ponds, creeks, or the ocean can be especially hazardous. If necessary, have the students change their projects or find other ones.

Procedure

1. Decide if you want to specify whether you want these to be individual or group projects, or whether students can choose. If groups are assigned or allowed, what will be the size? How will grades be determined for individuals?
2. Decide on a schedule, including the following dates:
   a. Begin assignment—make assignment
   b. Students commit to their projects and submit their Project Description sheet (8.3)
   c. *Optional:* dates for progress reports
   d. Project to be completed; Questions sheet (8.4) due
   e. Written (or oral) report due
3. If these projects are to be graded or evaluated, decide on the criteria and explain them to the students.
4. Introduce the project assignment by using the Background Information sheet (8.1), Instructions and Project Description sheets (8.2 and 8.3), and Project Ideas (8.5).
5. Have the students select a project and submit a Project Description sheet.
6. Read the Description sheets, making any appropriate comments and suggestions.
7. Have the students begin their projects after receiving your approval.
8. Periodically, have the students meet with you to give progress reports. Ask if there are any problems, what has been accomplished so far, what is next, and what the long-term plan is. Consider obtaining this information in writing.

Give the students lots of encouragement and support. Sometimes the most valuable learning comes from problems that the students encounter.

9. At the conclusion of the projects, have the students give short (one- to five-minute) reports to the class.
10. The Questions sheet (8.4) can serve as a project summary report.

Discussion

1. Do you feel that doing this project actually helped to improve the environment?
2. What did you learn about how to do such a project effectively?
3. What did you learn about environmental problems and their solutions?
4. What problems did you encounter? How did you solve them? What did you learn from them?
5. In what ways, if any, has this project had an effect on your daily life or your plans for the future?

Answers to Worksheet 8.4

1. Answers will vary.
2. Answers will vary.
3. Answers will vary. Encourage the students to be specific.
4. Answers will vary. Emphasize that problems and "failures" can be valuable learning experiences. Accomplishing something, or at least trying, is better than doing nothing.
5. Answers will vary. Point out that what they learned from doing this project will help them in the future.
6. Answers will vary.
7. Answers will vary.
   a. Students need to realize that their actions do count. They have lots of energy, ability, influence, and, possibly, money. Also, the habits they develop now will carry over into adulthood.
   b. We are all part of the problem. We all need to be part of the solution, or at least most of us do.
   c. The global problems are actually the result of lots of actions by individuals. Also, we can change our local environment much more easily than we can change the state, nation, or world. If enough individuals and groups work for local improvements, however, the state, nation, and the world will be changed!

d. One who leads a simple self-sufficient life may have little negative impact on the environment, but may also have little positive impact. If the environment is to improve, we need to become involved. Point out, though, that none of us is perfect. If students feel that they must be perfect to help, they will not become involved. Taking a few little actions today may lead to bigger and better actions in the future. One step at a time will get the job done, but we need to keep taking those steps, striving to be "better." Remind them that "The longest journey begins with but a single step" and "None of us can do everything, but each of us can do something."

e. See "d" above.

Extensions

(See Activity 7, "Think Globally, Act Locally," for more student project ideas.)

1. As you discuss the projects, ask the students what might be done to increase the good done by the project, how it could be extended and expanded, and whether they plan to continue.
2. Most of the sources used as references in this book provide suggestions for projects.
3. Some schools have independent study, student assistant, and other courses or other ways in which students could continue and expand their projects and possibly even earn credit.
4. There are several awards programs that recognize student environmental projects. Consider participating in these. They provide recognition and positive reinforcement for the students and your class. Two programs that have simple procedures for participating are:

   President's Environmental Youth Awards (PEYA)

   Different Environmental Protection Agency regions have different contact information. The following Internet site has information not only on the PEYA program, but also links to other EPA educational programs:

   www.epa.gov/enviroed/peya/contacts2.html

   National Energy Education Development Program (NEED)
   8408 Kao Circle
   Manassas, VA 20110
   (703) 257-1117
   www.need.org
5. Many student environmental projects could be suitable for science fair projects.
6. If the students receive any certificates of appreciation, arrange to have them presented at a school board or other public meeting.
7. Contact your school newspaper, local newspapers, radio, or television stations about the projects. Arrange for an awards presentation ceremony. Also invite the school and district administration, PTA, and so forth. Arrange for some positive publicity for your students (and your program).

8. The American Forest Foundation and Project Learning Tree have published a useful book titled *Green Works! Connecting Community Action and Service Learning,* by Rebecca Dobbins and Barb Pitman.
9. Project WILD has published two useful resources titled *Taking Action—An Educator's Guide to Involving Students in Environmental Action Projects* (Darleen Stoner, and others.), and *Science and Civics: Sustaining Wildlife* (Theresa Alberici, and others.).

Modifications

1. Before duplicating the Assignment and Description sheets (8.2 and 8.3), alter them as you see fit.
2. The list of ideas provided (8.5) suggests fifty-five possible projects. There is room to add your own. Do so, especially if there are local projects with which the students can become involved.
3. Assign a relatively simple project early in the year and another more advanced one later in the year. Spend time discussing project planning with the students.
4. Rather than written reports, have the students prepare videotaped reports, PowerPoint presentations, or slide shows.
5. If you are going to assign more than one project per student, require that one be an individual project and one be done with a group of at least two other students.

Internet Connections

See Appendixes I and II for a list of governmental and environmental organizations that may provide ideas for projects.

References

Alberici, Theresa, and others. *Science and Civics: Sustaining Wildlife.* Houston, Tex.: Council for Environmental Education/Project WILD, 2002.

Dobbins, Rebecca, and Barb Pitman. *Green Works! Connecting Community Action and Service Learning.* Washington, D.C.: American Forest Foundation/Project Learning Tree, 2001.

Miller, G. Tyler. *Living in the Environment.* Belmont, Calif.: Thomson, 2007.

Stoner, Darleen, and others. *Taking Action—An Educator's Guide to Involving Students in Environmental Action Projects.* Houston, Tex.: Council for Environmental Education/Project WILD, 1995.

U.S. Bureau of the Census. *Statistical Abstract of the United States*. Retrieved from www.census/gov/compendia/statab/cats/elections.html. Washington, D.C.: U.S. Bureau of the Census, 2008.

Name _____ Class _____ Date _____

8.1
Do It! Background Information

Learning about environmental issues can be very frustrating. There are many problems—air pollution, water pollution, overpopulation, wildlife problems, energy shortages, and myriad other concerns. It is easy to feel overwhelmed and helpless. If we all felt helpless, we'd all give up and the situation would, indeed, be hopeless. Fortunately, we are not helpless and the situation is not hopeless.

In 1960, few communities had recycling programs, cars didn't have air-pollution control devices, hybrid cars were unknown, and few homes had energy-saving devices, such as double-paned windows and adequate insulation. Now, most communities have recycling programs, automobiles must meet air-pollution standards, hybrid cars are gaining in popularity, and new homes usually must meet energy efficiency standards.

If we analyze our environmental problems, we realize that even the biggest problems are actually the combination of lots of "little" choices by individuals. Other choices by those individuals (us) would reduce the problems.

Air pollution is an example. Most air pollution comes from private automobiles, generation of electricity, and factories that make various products that we purchase. If we drove our cars less, walked, bicycled, and used mass transit more, there would be much less air pollution. Living nearer to our jobs, carpooling, and keeping our cars well tuned also would help. If we as individuals save electricity, less coal and oil will be burned to generate electricity. If we demand fewer unnecessary products, purchase well-made things and take care of them, recycle, and reuse materials, industry will make less air pollution. All of these are choices that we as individuals can make.

The role of our government is to protect us and help us to live healthy, happy lives. We sometimes feel that our vote doesn't count. You may feel that you can't influence the government if you aren't old enough to vote. That isn't so. Most people don't become involved in the governmental process. That means that those who do become involved have a disproportionate influence. If you investigate issues and then talk to voters, you will have an influence. Working on local issues may produce faster results than working on national or statewide issues, and both are very important. You can be very influential. One well-written letter from you will have more influence than a hundred people who are old enough to vote but don't, and many don't vote!

There are dozens of projects you can do to help improve the environment right now. Simply picking up litter, recycling, fixing a dripping faucet, donating time or money to an environmental organization, teaching other people about environmental issues, and saving electricity at home are all ways that really will help. Joining environmental organizations can help you stay informed and add to their power.

Sometimes we feel frustrated because we don't immediately see the results of our efforts to help the environment. We need to be patient and know that what we do does help, even if we don't always see it immediately. It has taken us a long time to get ourselves into our current predicament, and we should not expect to solve our problems in a short time. The longer we wait to start working on them, however, the harder they will be to solve. We will make some mistakes as we try to help the environment, but we will also do a lot of good. Why not start now?

Name _____ Class _____ Date _____

8.2
Do It! Instructions

The best way to learn how to work toward a better environment is to actually become involved in a project designed to help the environment. In other words, Do It! The keys to doing a successful project are:

- Find a project that is interesting to you and that you truly want to do.
- Plan your project carefully and realistically.
- Be willing to make commitments and keep them.
- Turn problems into learning experiences, solve them, and continue.
- Keep your mind on your real goal. Be flexible, but keep moving toward your objective. Don't let egos, personalities, and so forth get in the way.

Keep the above ideas in mind as you plan your project. Your teacher will give you the details of this assignment. The planning guide below may help you plan and complete an excellent project. You may want to add other steps, or you might eliminate some.

Project Planning Guide

DATE	*STEPS TO A SUCCESSFUL PROJECT*
_____	Think of ideas. Talk them over. Envision what will be done and what the project will accomplish. What problems will be encountered and how will they be addressed? Find a project that you really want to do.
_____	Fill out and submit the Project Description sheet (8.3).
_____	Begin working on the project. • Find and contact local people who can help or whom you can help. • Consult libraries, the Internet, or people for information. • Gather materials. • If necessary, e-mail, write, or telephone for information. • Get to work! • Seek help if you need it.
_____	First Progress Report due.
_____	Second Progress Report due.
_____	Third Progress Report due.
_____	Actual project to be done.
_____	Write report or plan oral report.
_____	Answer questions on Questions sheet (8.4).
_____	Submit written report, questions, do oral report, or other assignment.

Name _____ **Class** _____ **Date** _____

8.3
Do It! Project Description

Project Title:

1. Goal: What, as exactly as possible, do you hope or expect to accomplish by doing this project? In what way will the environment be helped?

   _____

2. In addition to the good done for the environment, what do you expect to learn?

   _____

   _____

3. Steps to reach the goals: (Be as specific as possible. Include target dates.)

   (1) _____

   (2) _____

   (3) _____

   (4) _____

   (5) _____

   (6) _____

   (7) _____

4. What problems do you anticipate?

   _____

   _____

5. What help will you need?

   _____

6. Where might you get that help? (People, agencies, organizations, and so on.)

   _____

7. Are there any safety issues about which to be concerned?

   _____

8. When do you plan to actually start the project? _____ Finish? _____

   _____

9. How will you evaluate your project? How will you know whether you achieved your goal?

   _____

   _____

Name _____ Class _____ Date _____

8.4
Do It! Questions

1. Briefly describe your project.

   _____

2. What was your main goal in doing this project?

   _____

3. Did you accomplish your main goal? If you did, what were the keys to that success? If not, what prevented you from attaining your goal?

   _____

4. What problems did you encounter? What did you learn from them?

   _____

5. Do you think that your project actually helped to improve the environment? Discuss your answer.

   _____

6. Discuss how this project will affect you in the future, if at all.

   _____

   _____

7. Discuss the following ideas or statements:

   a. I'm only a kid. What I do doesn't matter.

   _____

   b. It's not my job. Let somebody else do it.

   _____

   c. Think globally, act locally.

   _____

   _____

   d. Be not simply good. Be good for something.

   _____

   _____

   e. Nobody can do everything. Everybody can do something.

   _____

   _____

Name _____ Class _____ Date _____

8.5
Do It! Project Ideas

The ideas below can serve as starting points for projects. They should be modified to meet your particular circumstances. Some are most suitable for individual students and others are most suitable for group projects. When you select a project, whether it is from this list or not, be sure that you really want to do it. Then, plan carefully and DO IT!

1. Contact a local environmental organization and participate in one of its projects.
2. Learn how to fix dripping faucets. Check several homes and fix any leaks found.
3. Learn how to weather-strip doors and windows. Check several homes and weather-strip them.
4. Work with the appropriate agencies to plant trees in parks, schools, or other public areas.
5. Study an environmental issue, then prepare and teach lessons to groups of younger students.
6. Make some attractive posters promoting conservation. Be specific. Get them put up in stores.
7. Organize an environmental essay or poster contest for younger students. Have prizes.
8. Arrange to do some public-service announcements on local radio or television.
9. Do a creek cleanup. Recycle any recyclable materials you find.
10. Work with your local waste management company to do a household toxic waste cleanup.
11. Plan and do a recycling campaign in your town or neighborhood.
12. If your town has curbside recycling pick-up, organize a campaign to promote participation.
13. If your town doesn't have curbside recycling pick-up, work to start a curbside program.
14. Plan several vegetarian meals. Prepare them and serve them to friends.
15. Prepare and distribute a handbook of locally available, environmentally friendly products.
16. Organize a litter pick-up program for local roads or parks.
17. Contact environmental groups and bookstores. Establish an environmental library at school.
18. Attend city council meetings. Learn about local environmental issues. Speak out.
19. Write letters to the editor of your local newspaper.
20. Start an environmental column in your school newspaper.

21. Start an environmental club on your campus.
22. Make up a skit, song, or rap about conservation. Perform it in public or at school.
23. Volunteer to help a wildlife rescue organization.
24. Learn to do a simple automotive tune-up. Tune several cars so that they run more efficiently.
25. Find out where to recycle oil. Set up a used oil collection and recycling program.
26. Volunteer to work with recreation, YMCA, or other groups to lead nature hikes for kids.
27. Organize an Earth Day program for your school or other schools.
28. Get local service organizations to subscribe to environmental magazines for school libraries.
29. Work with your local water department to promote water conservation.
30. Arrange for political candidates to discuss environmental issues with social studies classes.
31. Find out about threats to local open spaces and work to protect them.
32. Arrange for environmental action bulletin boards at local bookstores, libraries, and so on.
33. Set up a table at a hardware store. Demonstrate energy- and water-saving devices.
34. Start a neighborhood composting project.
35. Set up a school recycling program for cans, glass, white paper, computer paper, batteries, printer cartridges, and so forth.
36. Help to recycle toys by helping with a Christmas toy drive.
37. Get permission and post signs at local markets indicating environmentally friendly products.
38. Post signs at markets promoting the use of boxes or cloth bags rather than paper or plastic.
39. Talk to local store owners or managers. Arrange for clerks not to automatically use bags and to give a five-cent credit for people who don't use bags from the store.
40. Write letters to governmental officials about environmental issues.
41. Translate a brochure on household hazardous chemicals into another language. Distribute it.
42. Organize a "No TV Week" (or two or three or more) among the students at your school.
43. Set up a display about environmentally friendly careers. Arrange for speakers.
44. Make a certificate, to be signed by graduating students, pledging to consider the environmental and social consequences of any job or career they might consider.

45. Create a board game that teaches about environmental issues and values. Arrange to play it with groups of elementary school children.
46. Meet with the purchasing agent for your school district or a local company to discuss the purchase of recycled products and recycling waste from the district or company.
47. Work with your district's business manager and your local utility company to arrange for an "energy audit" of one or more schools in your district. The audit should include examination of both hardware and behaviors, and should provide cost-saving estimates to various changes that might be made. Try to arrange for some of the money saved to be returned to the school directly.
48. Set up a recycling program at a local retirement community or apartment complex.
49. Arrange for local service stations or auto repair shops to give discounts on tune-ups during Earth Week. Publicize this program.
50. Work with an auto shop teacher to develop an environmental unit, including recycling of oil, fuel economy, and tuning up a car for minimizing air pollution and fuel waste.
51. Work with a home economics teacher to develop a unit on conservation in the home, including avoiding wasteful packaging, reducing waste, recycling, choosing alternatives to toxics, preparing vegetarian meals, and so on.
52. Work with a wood shop teacher to develop a unit on environmentally sound building, including insulation, use of solar energy for space and water heating and lighting, alternative building materials, and so forth.
53. Work with the city or county to organize a tree planting campaign. Be sure to include young children and senior citizens.
54. Volunteer at a local Humane Society or animal shelter.
55. Work with your local water agency or utility company to distribute information on water and energy conservation.