4 What Can We Do About Pollution Issues?

Overview

This final section builds on the knowledge and skills developed earlier in the curriculum. Students have looked at what pollution is, where it comes from, and how it affects them. In the next few activities they will continue to learn how to think about pollution issues, how to recognize and research them, and how to make decisions and choices about them. Using issues in their own communities, students begin to think about action steps and action projects that they can undertake.

Background

Most pollution results from human behavior. Some of its consequences are permanent, and some of its effects can be remedied by other kinds of behavior. To prevent pollution or work to clean up what already exists, people first must understand which types of behavior result in pollution, and which kinds minimize it. By learning how to behave in ways that prevent the air, land, and water from being polluted in the first place, students are taking steps toward reducing pollution's harmful effects on people, wildlife and habitats.

As students learn about pollution, they naturally begin to ask what can be done—by the government, by business, by their parents, or by themselves. Some may have asked for ideas for action projects or for personal behavior change at earlier points in the curriculum. Discussion of these steps has been left until now to make the point that actions should be well-researched and carefully considered. Any actions that students undertake have the potential for affecting large numbers of people. As a result, it is important that students learn the importance of obtaining relevant facts about a situation, understand how to develop proposals and plans, and begin to consider the consequences of their own efforts.

Although a few individual actions are included in this section's activities, most focus on group activities—efforts that can be made in cooperation with their classmates or others in the community. This emphasis is employed in part because it gives students the opportunity to share and explore different ideas, to learn about sharing success (or failure) with a group, and to help them recognize that some solutions have a better chance of success when large numbers of people are in support. However, this should not cause anyone to lose sight of the importance of individual behavior as well. For those students (or their teachers) who remain interested in what they can do as individuals, the following items are suggested.

Individual "Can Do's"

Each of us has the power to use resources wisely or foolishly, to create waste and pollution that we will later have to live with, or to choose not to use or consume resources in ways that produce pollution. Our choices today can help determine how healthy our world will be tomorrow and the next day. The following pages provide some basic actions that we can take that will help us see the significance of our own choices.

Be Water Wise

We all need water to live. The average person uses 80 to 100 gallons (300 to 379 liters) of water every day. But the amount of water that

you actually need to survive is two and a half quarts (a little more than a two liter bottle full)! The rest of the water we use every day isn't necessary for our survival; it just makes our lives a lot easier.

How Much Water Do You Use?

You use water throughout the day for many different tasks. In the morning, your water use starts when you flush the toilet, take a shower, and brush your teeth. After breakfast you may start the dishwasher or wash the family's morning dishes in the sink. At school, you drink water from the fountain and wash your hands after recess or a messy art project.

After school you may realize that your sports uniform is dirty and that you need to wear it for a game tonight. So, you throw your uniform into the washing machine. Later, you probably brush your teeth again and wash your face before you go to bed. Believe it or not, you may have used more than 80 gallons (300 liters) of water during that day!

Make Every Drop Count

There are many ways to conserve water or to reduce the amount of water we use at home, school, work and places we visit. It's important that we think before we turn on the water, so that every drop we use counts. Look at these examples:

- Waiting to fix a leaky faucet
- Watering the lawn at noon
- Using the garbage disposal all the time

These are examples of behaviors that result in the excess use of water.

The following is a list of activities people could undertake if they wanted to reduce the amount of water they use.

♦ Check for leaky faucets and toilets. If you wait a week to fix a leaky faucet, the faucet can drip up to 140 gallons of water. If you wait to fix a leaking toilet, up to 200 gallons of water a day could be lost.

♦ Turning the lawn sprinkler on at noon is not a good idea. The hot sun evaporates the water your lawn needs. It is usually better to water early in the morning when water evaporates more slowly.

♦ A garbage disposal uses one gallon of water per minute. Many food scraps can be composted. This not only saves water, but produces a rich material to put on your flowers and garden.

♦ Taking shorter showers or using less water in the bathtub can save a lot of the 35 gallons of water you could be using currently to bathe yourself. To save additional water, turn off the water in the shower while soaping up and shampooing your hair.

♦ By turning off the faucet and not letting the water run continuously when you brush your teeth or wash your face, you can save up to five gallons of water a minute.

♦ Run the washing machine and the dishwasher only with full loads.

♦ Install water-saving shower heads.

♦ Install toilet devices that reduce the amount of water used to flush waste; when replacing a toilet purchase a low-flow toilet which uses less water per flush.

Leaking faucets, hoses, and pipes are the biggest water wasters in the home. Proper maintenance is one way to stop this waste, and there are also many devices that can help save water. These devices will more than pay for themselves in the amount of water (and

money) they will save. Items that help save on the amount of water used by toilets, showers, washing machines and lawn sprinklers are usually inexpensive and easy to install.

The other way you can conserve involves the way you think about water. Be creative in looking for ways to cut back on the amount of water you use. Good examples include: keeping a pitcher of water in the refrigerator so you don't have to run the tap water to get it cold; using a bucket of water to wash and rinse the car instead of running water from a hose; or planting drought resistant grass, flowers, shrubs and trees that require little water in your yard, school, or park.

Nonpoint Source Pollution and You

As we learned in Section 3, nonpoint source pollution is polluted water that runs off from places such as agricultural fields, livestock feedlots, construction sites, city streets, mines and logging operations. Each of us, whether we know it or not, contributes to nonpoint source pollution through our daily activities. Because of this, nonpoint source pollution is the biggest threat to many of Illinois' wetlands, rivers, streams and lakes.

In our everyday activities we can help prevent or stop nonpoint source pollution and keep our environment clean. Small changes in your life can make a big difference in the quality of Illinois' water resources. Most nonpoint source pollution in your neighborhood is caused by the runoff of stormwater (rain and melting snow that flow across the ground and pavement in urban areas). The stormwater can pick up and carry pollutants into storm sewers. Storm sewers carry this water, untreated, through miles of pipes to nearby rivers, streams and lakes. Here are a few ways that nonpoint source pollution can be reduced in your neighborhood. Making even a couple of these changes can help reduce nonpoint source pollution and result in cleaner water in Illinois.

❑ *Litter* - Litter, including extinguished cigarette butts, belongs in trash containers. Never throw litter in streets, yards, playgrounds, or down storm drains.

❑ *Fertilizers* - Fertilizers contain nitrates and phosphates that, in abundance, cause too much algae in rivers, streams and lakes. This can lead to fish kills. Avoid overuse of fertilizers. Do not apply them on your lawn or garden when it seems likely to rain and the fertilizers can easily wash away. Mulching grass and leaving it on the lawn returns nutrients to the lawn and lets you avoid bagging and disposing of yard waste. Unused fertilizer can be taken to a permanent collection site or a one day Household Hazardous Waste (HHW) collection event.

❑ *Pesticides* - Many products made to kill pests in your home or yard are also toxic to humans, other animals, aquatic organisms, or plants. Carefully follow the directions on the labels of these products. Do not overuse pesticides. Consider using nature's own "pesticides," such as ladybugs and praying mantises, in place of chemical pesticides. If possible, avoid using a potentially toxic substance (one that says poison, caution, danger or warning on the label). If you have to purchase this type of product, buy only the amount you need and use it all. Unused pesticides can be taken to a permanent collection site or a one day HHW collection event.

❑ *Household Hazardous Waste* - Many common household products (paint thinner, moth balls, oven cleaners, etc.) contain hazardous ingredients. Never pour these products on your driveway, yard, or down the sink or storm drain. Try to reduce the amount of hazardous products you use by substituting less hazardous alternatives (e.g., cedar chips for mothballs, using baking soda and a little elbow grease instead of oven cleaner). Always be on the lookout for ways to reduce the number of hazardous products you use. If you have to purchase this type of product, buy only the amount you need and use it all. Unused products of this sort can also be taken to a permanent collection site or a one day HHW collection event.

❑ *Motor Oil* - Motor oil contains chemicals that are harmful to animals, including humans and fish. When oil in a car is changed, the used motor oil should not be poured down storm drains, on the driveway or the ground. Put motor oil in a clean container with a top (an empty milk jug is handy) and take it to a service station for recycling. This product can also be taken to a permanent collection site or a one day HHW collection event. Another alternative is to take your car to service stations that perform oil changes. They are required by law to dispose of dirty oil properly.

❑ *Car Washing* - Many car detergents contain phosphates that can pollute water. Use only non-phosphate detergents when washing a car.

❑ *Pet Waste* - Animal waste contains bacteria and viruses that can contaminate aquatic organisms and cause swimming areas in lakes and rivers to be closed. Pet owners should clean up animal waste with newspaper or a scooper and place it in the garbage.

❑ *Leaves and Grass* - Never dump leaves or grass into the street where the rain will wash them into a storm drain and clog it. When the leaves and grass enter a body of water, their decomposition could cause a fish kill by using up the oxygen.

❑ *Lakes, Rivers and Stream Banks* - If you live near a stream, river or lake, you can protect it from nonpoint source pollution by removing trash from the water and keeping humans, cars, and farm animals away from the edge of the water. Building steps or a ramp to the water protects the bank from erosion and planting vegetation on the banks holds the soil in place. These activities protect a stream or lake from the nonpoint source pollution caused by the runoff of soil into the water.

Everything Deserves a Second Chance - Even Tires

Nearly everyone has heard of recycling used aluminum cans, glass, plastic and newspaper. Many people recycle at home, school, or at work. However, the majority of people do not know that scrap tires are a recyclable product as well. Used tires are being recycled, reused, or made into different products to serve a variety of uses.

Every year in the United States 270 million tires, or about one tire per person, are scrapped. The state of Illinois produces more than 12 million of these used tires. Since they do not easily or quickly degrade or decompose, piles of tires become a real problem.

Used tires can pose a serious threat to humans and the environment when disposed of improperly. Piles of scrap tires collect rain water and become a perfect breeding ground for mosquitoes and other disease-carrying organisms. Open burning of tires produces air pollution and can release toxic oils into the

soil and groundwater. For these reasons, used tires must be carefully disposed of.

The IEPA is responsible for the transport, storage, disposal and recycling of used tires in Illinois. As of July 1994, whole used tires cannot be disposed of in a landfill. So what can be done with all those tires?

Shredded scrap tires can be used as tire derived fuel (TDF) to burn with coal in power plants and factories to produce energy. Air pollution is reduced when TDF is blended and burned with coal.

When the steel belting is removed from shredded steel-belted tires, the material can be used as playground turf instead of gravel, concrete, asphalt, or wood chips. This rubber turf provides a much safer play area because of the cushioning properties of the rubber. When a glue is added to this material and it is pressed and flattened, the result is "elastocrete," a flooring material that can be used for playgrounds and exercise rooms.

Rubber that does not contain wire can be ground into a sand-like material. This "crumb rubber" is used in rubberized asphalt (an experimental pavement for roads), railroad crossing mats, ink pens, rulers, and in the manufacture of many other products. Used tires can be refurbished and reused through a process called retreading. Retreading a tire involves replacing the grooved surface of a tire with new rubber. Planters, swings, playground equipment and sandboxes can also be made from scrap tires.

Alternative Fuels

Since the 1990s, federal and state policies have been directed toward cleaner air and energy independence. Alternative fuels provide both a reduction in vehicle emissions and a use of domestic energy resources. The United States has been accustomed to importing a majority of its petroleum for transportation uses and consuming seven million barrels of oil per day more than it produces. Other countries, including Brazil, the Netherlands, New Zealand, Italy and Japan have established their own fuel programs utilizing domestic resources to gain a larger degree of energy independence.

Listed below are some alternative fuels that are technologically and economically feasible. The only major problem with alternative fuels at this time is the lack of widespread refueling infastructure, but that is a solvable problem.

For current information on alternative fuels, such as E-85, please visit IEPA's Illinois Green Fleets web page at http://www.illinois-greenfleets.org/, or the U.S. Department of Energy, Energy Efficiency and Renewable Energy's web page at http://www.eere.energy.gov/afdc/altfuel/altfuels.html.

All alternative fuel information comes from the "Alternative Fuels Resource Guide For Fleet Managers," IEPA, Springfield, IL, 1998. http://www.epa.state.il.us/air/clean-fuel-fleet/index.html

Natural *Gas*****

Natural gas is used as a vehicle fuel in nearly 40 countries around the world. Natural gas vehicles are much cleaner than conventional gasoline burning cars, having 95 percent less tailpipe emissions. Carbon monoxide, nitrous oxides and hydrocarbons are all much lower than the emissions from gasoline engines.

Natural gas does not have to be manufactured as other types of fuels do. It requires no refining and very little processing. Natural gas is retrieved under pressure from an underground field, cleaned and purified to meet specifications and distributed through an existing pipeline network.

Contrary to popular belief, natural gas is not a highly explosive fuel and in fact is less hazardous than gasoline. This is because its ignition temperature is twice that of gasoline and it does not burn as well in open air. The only perceived disadvantage of a natural gas vehicle is the added weight and size of special large fuel tanks to hold the natural gas.

Liquid Petroleum

Liquefied petroleum gas (LPG), or propane, has been used as a motor vehicle fuel for more than 80 years. It became more popular in the 1950s as a fuel to power indoor factory equipment such as forklifts, so as to reduce harmful carbon dioxide emissions and workers' exposure to them.

LPG is a by-product of natural gas or petroleum refining. The chemical and physical properties of it offer several advantages over gasoline. It has an octane of 104, which reduces "knocking" of the engine. Propane engines have been reported to experience less wear and require less maintenance than gasoline engines, because of its cleaner burning properties—a characteristic of natural gas as well.

The primary air quality benefit of LPGs as a motor fuel is lower hydrocarbon and carbon dioxide emissions compared with conventional gasoline. It burns clean and produces virtually no particulates or sulfur emissions. LPG is a nontoxic gas. No long-term effects have been reported from exposure to propane vapors.

Ethanol

Many of the harmful pollutants that automobiles emit into the air are caused by the burning of fuels. A special fuel made from corn and other high-starch content crops called ethanol is being used in cars and trucks. Brazil leads the world in experience with ethanol as a transportation fuel. It has been producing ethanol from sugarcane since the 1930s. Currently, more than four million vehicles run on ethanol in Brazil as a result of a government program to make ethanol from sugar cane.

Ethanol can be used alone as a fuel, or it can be blended with gasoline. Each bushel of corn that is processed can make two and a half gallons of ethanol. Over 17 percent of the corn grown in Illinois, or one out of every six rows of corn, goes to the production of ethanol in the state.

Electricity

Electric cars are not a new concept for today's auto manufacturers. General Motors has maintained some type of electric vehicle program since the early 1900s. Prior to World War I, more than one-third of the motor vehicles in the United States were electric, many of them powered by Thomas Edison's nickel-iron battery. The advances of gasoline engines eventually caused electric cars to be phased out.

Electric vehicles do not have any direct emissions and so have the distinction of being "zero emission vehicles" or ZEVs. They are powered by electricity stored in a rechargeable battery pack. The electricity comes from the electric grid; the emissions come from somewhere, but not the car.

Problems associated with ZEVs are technology, price, production and availability of the vehicles. The biggest obstacle facing electric vehicles is the development of batteries that are capable of holding an electric charge for long distance travel.

Pollution Prevention Opportunities in the Home

How many throwaway conveniences have you come to enjoy—even taken for granted—in your home, at school, or when you're out

having fun? So many that experts have called the United States a "disposable society." Those disposable products and other trash have also helped us to set a world record for the mountain of garbage that we produce each year.

We all generate waste in our daily activities. There are many ways each of us can help reduce or prevent the pollution we cause – at the same time we can save money, too. Here is a simple list of ways to reduce and reuse. For a more detailed listing visit http://www.epa.state.il.us/p2/p2-at-home.html, or http://www.epa.state.il.us/citizens/green-tips.html.

Reduce

It's easy to reduce the amount and/or toxicity of waste you generate! Here are a few things you can do:

- Look for less packaging in the things you purchase.
- Reduce the water you use.
- Reduce the amount of energy (electricity, gas, etc.) you use.
- Reduce the amount of paper you use.
- Use non-toxic (or less toxic) products.

Reuse

Here are some simple suggestions that will also help lessen the amount of solid waste going to the landfill:

- Use reusable, long-life products.
- Think of creative ways to reuse things.

Recycling—The Next Best Solution to Pollution Prevention

For many people, it doesn't seem right to throw something away that can be salvaged and reused. That's the idea behind recycling. Before materials reach the landfill and take up valuable landfill space, we can intercept them and manufacture new, useful products. In 1998, about 28 percent of Illinois' total waste stream – 4.6 million tons per year – was recycled.

Purchasing items that you can easily recycle in your area is a good way to avoid throwing things away. It is also important that you purchase items packaged in containers that are made of recycled materials.

If your community does not offer curbside recycling, look in the yellow pages of your phone book under "recycling" to find your recycling center.

The Solid Waste Planning and Recycling Act, passed in 1988, requires all counties in Illinois and the city of Chicago to have reached recycling goals of 25 percent of their garbage within five years of adopting their solid waste management plan, depending on the availabilty of recycling markets. All Illinois counties and the city of Chicago have developed and are acting on their solid waste management plans. Everyone can contribute to this goal by making a habit of recycling.

Pollution Prevention Opportunities for Industries

Many of the suggestions given in "Pollution Prevention Opportunities in the Home" apply to industry as well. The industrial environment is much more complex than the home environment and deals in higher volumes of materials. Because of this, there are additional pollution prevention opportunities in this setting. On the next page are examples from Illinois companies that have implemented pollution prevention. These suggestions were supplied by college level students recruited by the IEPA Office of Pollution Prevention to assist industries in implementing pollution prevention projects. These are only a few of the internships. For more information contact Richard Reese, Program Coordinator, Illinois EPA - Office of Pollution Prevention, (217) 782-8700. http://www.epa.state.il.us/p2/index.html

Eli Bridge Company

Jacksonville, Illinois

Eli Bridge Company has been in the business of manufacturing amusement park rides since 1900. Currently it manufactures the Ferris Wheel, the Scrambler and a new ride for tots called the Construction Zone. Intern Brian Langkan from SIU, Carbondale, was assigned to perform an energy efficiency assessment at the facility and investigate a material substitute for sandblasting.

Brian's results included:

- The design of an alternative heating system for use within the manufacturing areas of the building. This system is estimated to cut approximately $7,600 a year off the natural gas bill.

- The development of a program to use the company's lighting fixtures more efficiently. The estimated savings could equal $220 per year.

- By repairing all leaks in the compressed air lines and combining two compressors, $1,200 could annually be saved in energy costs.

- Developing guidelines for the use of the electrostatic precipitators that would improve efficiencies to at least 97 percent.

- Using an alternative sandblasting material that could be recycled and reused 10 times resulting in a $200 a year savings in disposal costs.

Matsushita Universal Media Services

Pinckneyville, Illinois

Matsushita Universal Media Services manufactures and packages audio compact discs. Intern Robin Holmberg of SIU, Carbondale, investigated ways to reduce approximately 42.5 tons of polycarbonate scrap generated from disc moldings that did not meet specifications and disc cutouts from the center of each disc (sprues).

Robin's results included:

- Proposing the use of an in-house system to grind and repelletize the scrap. By implementing this system, Matsushita could save more than $85,000 per year. The capital needed for this investment would be paid off in less than eight months of savings.

Piecing Together the Future

Subject: Art
Language Arts
Science
Social Studies

Skills:
- Predicting
- Creative thinking
- Comparing / Contrasting
- Creating

Concepts: 2. D
4. F, H, I, M

Objectives: Students will:
1) identify pollution problems in their community.

2) identify steps that can remedy the problems.

3) identify long term consequences if the problems are not addressed.

4) recognize that people may disagree on the problems and the solutions.

State Standards:
Language Arts: 1.C.2 a, b
4.A.2 a,b & 4.B.2 b
Science: 13.B.2 b, d, f
Social Studies: 15.B.2 c
17.C.2 c & 17.D.2 a

Setting: Indoor

Materials:
- old magazines or other discarded publications with photographs
- scissors
- glue
- poster board

Time: Three class periods

Activity Overview

Students speculate what the future will be like if local pollution problems are not remedied.

Background

One of the reasons that pollution has become a problem is that people were not able to predict the consequences their choices would have. Few people predicted that the burning of fossil fuels would eventually bring a rise in acid precipitation; the scientists who developed CFCs had no idea that their invention could eventually harm the ozone layer.

However, some effects of pollution are predictable, and in some cases probable. The first step in getting people to take action to prevent these problems is getting them to recognize what the results of their actions or inactions are likely to be. Most people can identify short-term results or consequences: a certain behavior may be illegal, thus resulting in a ticket or jail time, or it may be expensive, resulting in a loss of money or resources. People are less likely to consider the long-term effects of behavior, such as what the cost will be to themselves or to the environment, over several years or decades.

Some people may still choose a certain course of action, even knowing that the predictable results are damaging or negative. There are many reasons why a person may choose this, some of which students will consider in this activity. What is most important here is not that students come up with a particular course of action to take, but that they begin to consider both the short and long-term effects that pollution can have.

Preparation

1. Have students bring newspapers, magazines, advertising circulars, and other discarded publication materials with photographs and illustrations.

Procedures

Day One

1. Ask students to brainstorm ideas/answers on a piece of paper or in their journals including:

- List at least five common pollution problems found in your community.
- Pick two problems.
- What are some of the possible causes of these problems?

2. Have students form groups of four. Have them share their journal entries and discuss their answers. Then have the group brainstorm, discuss and write down their ideas for the following questions:

- What do you think the future might look like if nothing was done to correct these problems?
- What steps could be taken to solve these problems?

3. Tell the students that each group will be making two collages. The first should depict the group's vision of what the future might look like if nothing was done to correct the problems. The second collage will depict what steps could be taken to solve the problems they have identified. Instruct them to cut out and use photographs and images from the magazines, newspapers and circulars they have brought in. Allow them to draw any images they cannot find in the illustrations.

Day Two

4. Give each group two pieces of poster board or similar paper and the materials for making the collages. Remind them what the collages are supposed to depict. Recommend that they look at both sides of the paper before they cut out any images. Have the students make the collages.

Day Three

5. Have each group share its collages and the problems and solutions they identified with the rest of the class. Have them list their top two predictions and solutions. Write their answers on the board and make note of any similarities or common themes.

Wrap Up

Assessment

After all the groups have presented, the teacher will write the following questions on the overhead or chalkboard. Students should individually prepare their answers and discuss them in either a large or small group setting.

- What similarities do they notice between the answers given by the different groups? Will the proposed solutions affect individual lifestyles? Will they cause people to live in different ways? Will they allow people to do something they want to do, or force people to do things they do not want to do?

- Will the proposed solutions affect people's financial situations? How will these solutions be paid for? Would they affect the costs of goods and services? Will they affect taxes? Would they affect peoples' jobs, either by eliminating old ones or creating new ones?

- Who might be opposed to these solutions? Would they only affect the wants or needs of a few community members?

- What effect will the solutions have on air, land or water quality?

Extensions

Community

- Have students interview a senior citizen from their family or community about a pollution problem they experienced. Students might

want to focus on the details of the problem and what, if anything, was done to solve it. What specific steps were taken? Does the problem still exist? Who is affected?

Multidisciplinary

• Have each student develop a survey based on the pollution problems and solutions they developed in the activity. Students could exchange and complete each other's surveys or they could have other classes or family members complete them.

Outdoor

• Have students participate in a local community or river cleanup day, or participate in your county's adopt-a-highway program. If none are offered, have students with the assistance of community members and organizations plan one.

Technology

• Have students visit one or both of the following websites to determine what types of pollutants are in their town, county or state.

Enviromapper
www.epa.gov/enviro/html/em/index.html

Illinois Water Quality Resource Assessments
http://www.epa.state.il.us/water/water-quality/

Resources

• *Enviromapper*
EnviroMapper is a powerful tool to map various types of environmental information, including air releases, drinking water, toxic releases, hazardous wastes, water discharge permits and Superfund sites. View spatial data at the national, state, and county levels, as well as utilize GIS functionality, such as displaying multiple spatial layers, zooming, panning, identifying features, and querying single points.
www.epa.gov/enviro/html/em/index.html

• *Surf Your Watershed*
A service to help locate, use and share environmental information about your state and watershed. http://www.epa.gov/surf

Adapted from: "Ecotopia/Dystopia," Community Connections. The Oakland Museum. Oakland, CA. 1992.

Living with Wants and Needs

Subject: Language Arts
Mathematics
Science
Social Studies

Skills:
- Analyzing
- Classifying
- Creative thinking

Concepts: 2. F
4. H, J, M

Objectives: Students will:
1) identify the difference between wants and needs in their own lives.

2) learn that they have choices as consumers related to their needs and wants.

State Standards:
Language Arts: 4.A.2 b,c
Mathematics: 6.C.2 a & 7.A.2 b
Science: 11.A.2 c & 13.B.2 f
Social Studies: 15.B.2 a, b, c
15.D.2 a, b & 15.E.2 a

Vocabulary:
- source reduction

Setting: Indoor

Materials:
- copies of the Wants and Needs Cards (p. 113)
- three plates
- three types of cookies
- means of measuring water from a sink

Time: Two class periods

Activity Overview

Students examine the concepts of wants and needs and determine ways that their personal choices can affect pollution.

Background

People have different ideas about what constitutes "wants" and "needs." Generally, people will agree on the definition that needs are what we require for survival, and wants are things we would like to have or which would make our lives easier, but which are not necessary for survival. Opinions and decisions will depend upon a person's culture, background, values and personal situation. For example, millions of people around the world live without electricity, yet most people in America would consider it necessary for survival. A person living in rural Illinois might be totally dependent upon her or his car, whereas someone living in Chicago, where public transportation is common, may not even own one. On the other hand, a spinning wheel might have been thought of as a necessity (need) in most households centuries ago to make clothing, but is a craft item (want) for most of us now.

Although people may classify some of these things differently, there are some items which are common needs for all human beings. All people share basic biological needs for food, water, shelter and air. Other important things for all people are medicine, clothing and transportation. Other "wants" may be classified as "needs" if a person requires them to meet basic biological needs.

Preparation

1. Make one set of copies of the Wants and Needs cards for each pair of students. Keep each set of cards separated in an envelope so that they do not get mixed together.

2. Get three different packages (brands) of one type of cookie (e.g., three different kinds of chocolate chip or peanut butter). One package should have excessive packaging, the other two should be different enough from each other that when compared, there is a difference in the amount of packaging and the cost per cookie (or per ounce of cookie).

3. Obtain three plates and label them A, B, and C.

Procedures

Day 1

1. Pair up the students. Tell the class that each pair will be receiving an envelope. Their task is to arrange the cards in two distinct groups, Things People Want and Things People Need. If the students ask for clarification, tell them that each pair must decide what the two terms mean.

2. After about 15 minutes, have the class discuss the definitions they had for wants and needs. As a class, clarify and define these concepts. (Most groups will define wants as things people would like to have, and needs as those things which are required for survival.)

3. Write "Wants," " Needs," and "Disagree" at the top of the blackboard. Leave enough room to list the cards below each. Ask each pair of students, one at a time, to select one of their cards and state if they felt it was a want or a need. Write it on the board under the appropriate heading. Ask the rest of the class if anyone put that card in the other category. If so, discuss. If the class cannot come to a consensus, write the item under the Disagree heading. Continue asking pairs to discuss their answers until all of the cards have been discussed.

4. Have the class determine which items most living things need to survive. (Food, water, shelter, space are the four primary answers.) Then ask the students to list the things that they may need to acquire a basic survival need (i.e. money, transportation, education).

5. Ask the students if they can think of a reason why it might be important to know the difference between wants and needs. (Answers or discussion points may include: if you need to reduce the things you have, if you want to lessen your consumer habits and simplify, or decide what to take with you on a trip, or if you only have a small amount of money and need to decide what things to spend it on.)

Day 2

6. Tell the students that you are going to look at whether they have a choice over their consumption of things they want.

7. Show the class the three packages of cookies. Remove the packaging from each batch and have students calculate the cost of each cookie by dividing the cost of the package by the number of cookies. (Students may also calculate the cost per ounce or gram.) Which package of cookies offers the best deal for the money? Put the information on the board.

8. Place the cookies from each package on a separate plate, if you have not done so already. Consider blindfolding students, or asking them to keep their eyes closed. Have them sample one of each of the kinds of cookies without knowing which packet they came from. Ask them:

- Which one tasted the best?
- What made it taste best?
- If the best cookie is the most expensive one, is it worth the price?
- If the best cookie had the most packaging, is it worth the waste?
- What could you do if you liked the taste of the cookie with the most packaging?

Potential answers: re-use the packaging; find other cookies that taste as good but produce less waste; get a recipe and make your own cookies; contact the manufacturer and ask that they use less packaging.

9. Revisit the earlier question about the students having control over their consumption. Ask them if this shows that a person has some choice over how much solid waste they generate. Introduce the concept of **Source Reduction**, i.e. reducing the amount of waste before purchasing or consuming.

10. Point out that the cookie demonstration dealt with wants, not needs. Ask them if they think they also have control over their consumption of things they consider needs. If they answer yes, ask them to explain some of the ways. If no, spend a few minutes talking about water, and how they use it. If the students don't mention it, ask if any of them use water for brushing their teeth.

11. If there is a sink in your classroom: demonstrate a wasteful way of brushing your teeth. Leave the water running while brushing, and measure the amount of water that is used.

If there is no sink in your classroom:
Go to the sink in the janitorial area and tell students that you measured how much water you used that morning while brushing your teeth. Tell them that it came to about two gallons.

For both: Ask the students to calculate, given the number you have given them, how many gallons of water are used if you brush your teeth twice a day. Calculate the amount used per week, month, and year, and write the amounts on the chalkboard.

12. Challenge the students to come up with a way that they could still brush their teeth, but use less water. They should be able to get their consumption down to one cup of water per brushing. Have them calculate the amount of water that would be used per day, week, month and year, and write these amounts on the board to contrast the earlier set of numbers.

13. Have students discuss other ways that they can control their consumption. Ask them to consider such areas as electrical power, transportation, clothing, etc.

Wrap Up

Assessment

• Have students develop a personal action plan around source reduction or consumption in general. Determine the length of the personal action plan (at least a week). Have students record daily the things they have done to meet the plan or defeat the plan.

Extensions

Community

• Bring in a guest speaker to talk to the class about recycling, solid waste, or other related concerns, and how they are handled in your community.

Multidisciplinary

• Have students identify other ways of saving water in their homes. Have them calculate how much would be saved by their family if everyone followed their water conservation tactics for a day, week, month, or year.

Outdoor

• Conduct a product life-cycle field trip. Visit an industry that produces a commercially available product. See how the product is made, how it is transported to the store, what happens after the product is purchased, and what happens to the product once it is no longer useful. If possible, visit as many of these steps in the life-cycle as possible during your fieldtrip.

Technology

• Have students explain the difference between reusing and recycling. Then have them use the Internet to research new ways to use old items. Search words might include: recycled building products, recycled home products, recycled products.

Resources

• Contact your local utility or energy services department for speakers or field trips.

Wants and Needs Cards

make a copy for each team and cut along the dotted lines

air	family	medicine	rain
bicycle	friends	milk	school
car	fruit	money	sun
clothes	home	movie theatre	telephone
computer	insects	music	television
cookies	jewelry	park	vegetables
electricity	job	police	water

Looking Locally

Subject: Language Arts
Science
Social Studies

Skills:
- Prioritizing
- Researching
- Evaluating
- Other skills depending on type of research conducted

Concepts: 2. C
4. A, B, C

Objectives: Students will:
1) learn that there are many aspects to an issue

2) develop and implement a research plan on an issue in their community.

State Standards:
Language Arts: 1.C.2 a
3.B.2 a, b 4.B.2 a
5.A.2 a, b & 5.C.2 a, b
Science: 11.A.2 a, b, c, d, e
Social Studies: 14.B.2
15.E.2 a, b & 18.B.2 a, b

Vocabulary:
- primary source
- secondary source

Setting: Indoor

Materials:
- research materials
- students may need A/V equipment such as tape recorders or cameras

Time: Five or more class periods

Activity Overview

Students will research different aspects of a local community issue that they have selected.

Background

Research, by definition, represents a quest for knowledge. It typically involves careful, systematic study and investigation. It does not necessarily involve intervention or experimentation; it may be entirely based on observation and other data-gathering techniques.

The type of research done will depend to a large degree on your sources of information. If you have direct access to the subject of your research (i.e. if you can actually visit the local lake or speak to an employee at the factory), you have the capacity to do basic or fundamental research. You are able to get information directly without relying on the work of a prior researcher. This type of research could include interviewing, experimentation, or observation, among other activities.

If you take information from other sources or from research done by others, it is important to recognize the distinction between primary and secondary sources. A **primary source** of information would be a journal, letter or memoir written by someone who actually witnessed an event, or an article by the scientist who personally conducted the research. A **secondary source** would be one that is at least one step removed. For example, a book on local history that quotes townspeople and paraphrases old documents would be a secondary source.

Preparation

1. Have students brainstorm where they can get information. Let students know that information can obtained from historical documents, town, county and state records and other sources that they may not have considered.

2. Give students information on how to conduct and record research.

Procedures

1. Have the students identify a local community or county issue to investigate. The selection of this issue can be done

in any number of ways. Students can refer back to the problems identified in "Piecing Together the Future" and choose one of the problems from that activity. Alternately, you may wish to open the topic up for brainstorming on a controversial environmental topic. Whichever method is chosen, though, it is important that the students have a voice in selecting an issue that interests them.

2. Identify the different areas that need to be researched. There is no one conclusive list of these areas, as it will depend on the nature of the issue that is chosen. Some of the areas might include the following:

History—What is the history of the issue, or of the location where the issue is involved? What solutions have been tried before? How long has this been an issue?

Psychology—How do local people feel about the issue? What are their values regarding the situation?

Social Science—Who has control over this issue? Who is affected by it? Who contributes to it? Are there authorities outside of the local area who influence the situation?

Agriculture/Industry—What businesses are involved in this issue? Does it involve local or out-of-town businesses? How is agriculture affected?

Biology—What natural cycles are involved with this issue (plants or wildlife affected, water cycle, nutrient cycle, etc.)?

Planning—Who needs to make decisions on this issue? What are the long-terms effects of the issue? What are the long-term effects of the possible solutions?

Economics—What is the cost of this issue? What is the cost of doing nothing about it?

Science—What is known about this issue? Are there disagreements about basic facts? Has previous research been conducted? Is there more information that needs to be acquired before making a decision?

Technology—What technology is involved with this issue? What technology does the resolution of the issue require? Does this issue require changes or advances in technology?

3. Group students into equally sized research teams. Allow each team to select the area of the issue that they want to research. (It may be helpful to ask each group to name a first, second, and third choice.) It may be necessary to break some areas down into smaller or more specific tasks.

4. Have students determine what kinds of questions their team will try to answer. Have them brainstorm how they might get those answers. Alert them that the entire class will be arranging a field trip to the site (or a related site, depending on the issue), and that they should plan what questions they will ask or what research they will do on the field trip.

5. Work with each team individually to sort though and prioritize the items they have come up with. Help them put their ideas into a realistic plan. Have them write down their plans in their own words.

6. Schedule time for the students to conduct research on their issues, either at home or in the school library. Make arrangements for a field trip to the site.

7. Have the students collect information according to their research plans.

8. Allow each group to decide how they are going to present their findings to the class. Some groups may choose to show tables or charts; others may choose to present a skit or

a poster they have constructed. The presentation should not simply be repetition (i.e. they should do more than hand out an agency fact sheet or read an article from the local paper). Discuss after each presentation, and write two or three key points of information on the board for each one.

Wrap Up

Assessment

Have the class as a whole discuss the overall process, then have them write a paper in response to the following questions.

- What did you learn about the issue that you did not know before?
- Has your opinion on the issue changed since beginning this project?
- Is there more than one viewpoint on this issue? If so, what are they?
- Did you find any inconsistent information?
- Are there questions that are still unanswered?
- What would you do if you wanted to find out more about this topic?
- Did you find this a worthwhile project? Why or why not?
- Now that we have this information, what next? What can be done?

Extensions

Community

- This activity was designed to be strong in connecting to the community.

Multidisciplinary

- Have students create an oral history of the topic they are studying and present their findings to the local historical society.

Outdoor

- If the issue chosen relates to an outdoor site, have the class visit it and plan what questions they will ask or what research they will do on the field trip (step #4).

Technology

- Have students create a multimedia presentation using a computerized presentation program that combines all of their research. Have students present their program to other students or to members of the community.

Be Your Own Action Figure

Subject: Language Arts
Science
Social Studies

Skills:
- Creative thinking
- Organizing
- Planning
- Other skills dependent on the project chosen

Concepts: 4. F, G, I, L, M

Objectives: Students will:
1) identify a problem involving pollution in their community;

2) use critical and creative thinking to solve the problem or improve the situation;

3) successfully carry out the project;

4) evaluate the process by which they tried to solve the problem or improve the situation.

State Standards:
The basic standards addressed by this activity are noted below. Others will be addressed based on the type of problem chosen and how the students decide to carry out the project.

Language Arts: 1.C.2 a 3.B.2 a 4.A.2 b & 5.A.2 a, b
Science: 11.B.2 b & 13.B.2 f
Social Studies: 14.D.2 & 18.B.2 a

Vocabulary:
- self-efficacy

Setting: Indoor and outdoor

Materials:
- varies, dependent upon the type of project students are doing

Time: dependent on project

Activity Overview

Students will plan and undertake an action project of their choosing that will have a positive impact on their school or local community.

Background

Encouraging students to take part in a local action project can create connections between what they have learned about pollution and how they can have a direct impact in their community. Getting involved in community projects can extend the understanding and knowledge your students have already gained and allow them to experience an increased sense of worth and confidence. When students possess a realistic self-confidence in their effectiveness as citizens, or believe that they are able to have an impact on the world around them, they are said to have a high degree of "self-efficacy."

Self-efficacy can appear on a number of different levels. A student may feel that he or she can have an impact on the beliefs or choices of their immediate family or closest friends; for example, they can be instrumental in selecting what movie their family or friends go to see, where they go out to eat, or how they spend their free time. However, these students may not feel that they can influence a class election or the choice of meals served by the school cafeteria. Some children have felt inclined to take on larger challenges, for example (use local example of a young person who publicized or had an impact on an issue or an Eagle Scout or other civic project that had an impact).

Many things can affect children's self-efficacy. They may have no sense of what opportunities for change exist, or they may believe that they personally are incapable of producing any change. Students who have tried unsuccessfully to have an effect in the past may feel this way. Here are some ideas and tips that teachers can use to help student projects be more successful:

- Encourage student ownership and initiative.
- Encourage involvement and buy-in of parents and other community members.
- Encourage student cooperation, compromise, and understanding.
- Help students evaluate their methods

and adapt their plans if necessary.
- Help students appreciate the value of their work, no matter how small.
- Keep your own opinions and beliefs in perspective; do not allow them to bias or predirect the students' inquiries.

Procedures

1. If the students have already done the activity "Looking Locally" (page 114), have them use the concern they investigated as the problem for this action project. Skip to step 4, otherwise begin at step 2.

2. Have students brainstorm a list of problems in the community caused by pollution, along with possible ways that they could improve the situations.

3. Ask students to select one problem that they could realistically handle and do something constructive about. If there is support for more than one idea, have students vote to decide or have students present short persuasive speeches in support of the problem they want the class to work on.

4. As the students select their project, the teacher should be aware of the following:
   - Where will the focus of the project be? Projects where the focus is on the student or the student's family are more likely to show results quicker than those that involve regional, state, or national behavior changes.
   - Are the students interested in the project? Strong personal interest leads to increased prospects of success.
   - Are time frames realistic? Remember that projects almost always take longer than you expect.
   - Help students understand that working on smaller chunks of a larger problem might be more feasible than tackling a large, complex issue.
   - Do the students need instant results? Some projects will show change more quickly than others.
   - Will students have access to the information and research they will need to complete the action project?
   - Is it clear what success will look like? Will the students be able to measure changes and recognize that improvement has taken place?
   - Will the project require a significant amount of time and help from other people? Consider who outside of the class might need to be involved, and how much of their time might be required.

5. On the chalkboard or a piece of posterboard, write out the following list of characteristics of a good action plan:
   - Should solve the problem it was meant to address
   - Is realistic
   - Is helpful to the school or community
   - Is likely to make a lasting contribution
   - Involves the entire class
   - Has a product or result that we can define

Go over this list with the class to be sure that they understand. Ask if they can think of any other characteristics to add to the list.

6. Once the class has chosen a problem, ask students to work alone or in small groups to generate ideas for possible solutions. Instruct them to keep the characteristics of a good action plan in mind.

7. Reconvene the class and have individual students or small groups present their plans to the rest of the class. Students should be allowed to ask questions of each other to clarify what is being proposed. After all of the presentations are done, the students will select the one plan that best meets the characteristics. (You may want students to select one or more alternates in the event that the option

they have chosen is disapproved by school authorities.)

8. The students should present their proposal to the school principal, the city council, school board, or whichever entity needs to give permission for the project. If the plan is not accepted, have the class identify possible reasons, and develop a new action proposal.

9. Once the proper permission has been received, students should outline the exact steps which need to happen for their plan to work. They should then establish committees or work groups, making sure that everyone has a job and that all of the tasks are assigned. The instructor should monitor the plan to ensure that important steps are not missed, that all students are involved, and that safety is addressed throughout the project.

10. Have the students do their project.

11. Meet with the students at the end of the project to reflect on how things went. Ask the following questions:

- What was the result of the project?
- Did things work out the way that you planned them?
- Were there any surprises?
- Were there any unforeseen obstacles?
- What did you like best about the project?
- What was your biggest frustration?
- If you had it to do over, what, if anything, would you have done differently?
- If you had to do it over or chose to do a different project, what would be the next approach you would try?

Wrap Up

Assessment

Have students keep a journal throughout the process. Give them different questions for reflection at different parts of the project.

Extensions

- Extensions for this activity are dependent on the problem chosen and the method of addressing it. If a teacher would like to extend this activity in any way, it will be up to him/her to do in a way that meets the needs of the class.