

Waste Management

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Objectives

The purpose of this unit is to make students aware of the amount of trash they generate, the problems that result, and possible solutions. Students will investigate household trash, biodegradability, packaging, and recycling. After completing these activities, many students will show interest in these and other local environmental issues. This interest often translates into the type of involvement needed to solve modern problems.

Background

These activities can be used to introduce the study of land use and resource management. They are an appropriate prologue to developing an understanding of issues involving energy and ecological management.

Activity 1. Analysis of Household Trash

Materials

- Household trash
- Rubber aprons
- Old clothes (long pants)
- Gloves
- Safety goggles
- Large sealable plastic bags
- Plastic garbage bags
- Tongs (crucible, if possible)
- Bathroom scale
- Disposable breathing mask

Procedure

1. Assign ten or more students to collect and separate the trash generated by their families over the period of two days. Specify that they include only household refuse. Yard, construction, or chemical wastes are not permitted for safety reasons. Separate bags will be required for plastics, metals, glass, food waste, and miscellaneous. Food waste should be placed in large sealable plastic bags. All other materials should be kept in tied trash bags. Precautions must be taken to avoid spillage during transport and handling.
2. On the day of the lab, collections should be delivered to a common site. The best site would be a paved area next to a large school refuse bin.
3. Students should record the mass of each bag. Find the total mass in each category, and the average mass produced per person in each category. After this, dispose of the food waste bags and the miscellaneous bags without opening them. They may represent a health hazard.
4. Open the remaining bags and subdivide their contents. Separate piles of paper can include craft, colored, newsprint, glossy, miscellaneous, and stationery. A separate pile should contain cardboard. Similar divisions can be made to separate different types of metals, plastics (look at the recycling number at the bottom of plastic containers), and colors of glass. Record the mass of each pile. Calculate the mass generated by each person and use this to estimate the total amount of each substance thrown away in your community. After classification, recycle materials that can be recycled and dispose of the rest.

Note: Activities listed to this point are suitable for all levels of students. The following activities are suitable for higher achieving students.

5. Divide the class into research groups. Each group will be responsible for gathering information and articles from periodicals relating to one or more of the refuse categories. Topics for articles should include possibilities and problems involving reuse, recycling, composting, incineration, landfill, or other solutions pertaining to a particular type of refuse. Primary concerns of cost, safety, environmental impact, and energy requirements should be kept in mind. The Readers' Guide to Periodic Literature may be one of the best sources of current information for general readers.
6. Each group should make a recommendation for dealing with their category of refuse. This should be based on their own research.
7. The entire group can formulate a plan for dealing with their community's household trash. Plans should include means of paying for the plan. It should also address whether the material should be sorted. In other words, should it be sorted by the persons generating it, or should be sorted in a central collection facility?
8. Have each student submit a report about the activity for evaluation by class and teacher. Additional activities may include assigning students to examine disposal problems not addressed by the group. This may include chemical waste, nuclear waste, tires, medical waste. In other words, should it be sorted by the persons generating it, or should be sorted in a central collection

- facility?
9. Have each student submit a report about the activity for evaluation by class and teacher. Additional activities may include assigning students to examine disposal problems not addressed by the group. This may include chemical waste, nuclear waste, tires, medical waste, yard waste, motor oil, batteries, etc.
 10. Students may choose to present the results of these studies to local governmental officials and media.
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Activity 2. What is Biodegradability?

1. Ask students to bring about 4 cups (approximately one liter) of garden or other soil from an outdoor area. Ask them to bring objects and materials from home that they consider biodegradable or non-biodegradable. Substances may be small pieces of fruit, bread, meat, plastic, paper or cardboard, charcoal, etc.. etc. The soil is then placed in a metal tray or bread pan. The soil should be at least 7 cm deep (2 1/2 inches). Divide the pan into 6 areas, and bury a small piece (about 1 cc) of material in each area. Place a plant label or ice cream stick in each area, telling what material is buried there.

Every other day for two weeks, dig up the substance and describe its appearance, smell, etc. How has it changed? Why? What materials show little or no change? Why not?

(Note: This is a modification of a BSCS Green Version experiment used successfully for many years in high school classrooms.

2. Ask students to conduct a survey of their neighborhood supermarkets. Find out if the markets provide information about packaging, biodegradability, and toxicity.
 3. Ask students to learn about local landfill and waste treatment practices. This can be done by library research, interviewing government officials, and obtaining information from community action groups and service organizations.
 4. Ask students to interview people who work in various waste management fields. This can include employees of solid waste management companies, sanitary engineers, landfill operators, or managers of recycling companies. Local, state and federal regulatory agency employees, and elected government official could also be interviewed.
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Activity 3 - Pick The Best Package

Objectives:

1. Students will be able to distinguish between different types of packaging.
2. Students will be able to determine whether packaging can be recycled or not.

Student Handout

Give the students a copy of this survey sheet at the beginning of class and after 10-15 minutes begin discussing their choices using the answer key given.

When you go shopping, if all other considerations are equal, pick a product wrapped in the least amount of packaging. Given the following list try and classify them according to the ratings listed.

- a check () means the item can be reused or recycled
- a zero (0) means it can be incinerated or landfilled
- a minus (-) means it cannot be disposed of easily and should be avoided if at all possible.

Kind of Package	Grocery Store Item	Rating
No packaging or natural package	Melons, pineapples, fruits	
Returnable glass bottles	Milk bottles, soda and beer bottles with deposit returns	
Reusable Containers	Cookie and cracker tins, heavy-duty plastic plates on which some microwave dinners are packaged	
Uncoated paper	Bags of candy, cookies, chips, and other snacks	
Uncoated cardboard	Cereal boxes, detergent boxes, dessert mix boxes	
All-steel cans	Many canned fruits and "veggies"	
All-aluminum cans	Beverage containers	
Steel cans with aluminum tops	Pull-top cans	
Glass bottles with twist-off tops	Soft drinks	
Wax paper	Liners in cake boxes	
Cellophane, plastics	Windows in paper boxes and plastic bags	
Coated paper	Paper milk and juice cartons	
PVC	Clear plastic bottles and plastic wrap	
Aluminum-foil-based containers	Foil-lined boxes and bags	
Collapsible metal tubes	Toothpaste, hand cream	
Metal and plastic pumps	Toothpaste pumps	
Aerosol cans	Toiletries, deodorants, hairsprays, insecticides	

Answers for the Teacher:

Kind of Package	Rating
No packaging	check +
Returnable glass bottles	check
Reusable containers	check
Uncoated paper	0
Uncoated cardboard	0
All-steel cans	0
All-aluminum cans	check
Steel cans with aluminum tops	0
Glass bottles with twist-off tops	check
Wax paper	0
Cellophane, plastics	0
Coated paper	0
PVC	-
Aluminum-foil-based containers	-
Collapsible metal tubes	-
Metal and plastic pumps	-
Aerosol cans	-

Reference:

Save Our Planet - Diane MacEachern; Dell Publishing 1990.

Activity 4 - Reduce, Reuse, Recycle

Materials:

Have students bring in examples of various packages that were presented in the "Pick the Best Package" activity.

Suggestions:

1. soda containers - aluminum, plastic, returnable
2. shampoo bottles - plastic (no. 1,2, others), glass
3. potato chips - cardboard can, cellophane bag, foil bag

4. ketchup - glass, plastic
5. vegetables - fresh, frozen, canned
6. cookies - boxed, bagged, blister packed
7. juice - frozen concentrate, glass and plastic bottle
8. eggs - styrofoam or cardboard carton
9. hair spray - aerosol can, plastic pump can
10. laundry supplies - box, boxed concentrate, plastic
11. toys - cardboard, cellophane, blister packed
12. margarine - plastic tub or squeeze bottle, cardboard box with foil.

Procedure:

1. Rate each package on its ability to be recycled.
2. Identify which types of packages are being recycled in your community. Then describe the steps involved in recycling each type of package. (Note: This may require some outside research.)
3. Identify the best type of packaging for each product based on the recycling capabilities of your community.
4. Students should make suggestions on how to reduce the use of non-recyclable products in your community

References

Cohen, Levin et al. **Coming Full Circle: Successful Recycling Today**. New York: Environmental Defense Fund, 1988.

Keep America Beautiful, Inc. **Overview: Solid Waste Disposal Alternatives. An Integrated Approach for American Communities**. Stamford, CT. 1989.

O'Leary, Philip R. "Managing Solid Waste." **Scientific American**. December, 1988.

Schwartz, Anne. "Drowning in Trash, We Begin to Discard Our Wasteful Ways." **Audubon Activist**, May- June, 1988.

Waste Management "Grabbers"

"Grabbers", used to generate interest in solid waste management, could include the following:

1. Arouse students' interest in this issue by asking them such questions as: (1) How many automobiles are junked in the United States each year? (Ans. 7 million), and (2) Which NFL stadium is built on garbage (sanitary landfill). (Ans. Mile High Stadium in Denver, Colorado).

2. Give students a medium-sized plastic bag. Ask them to attach it to their belt or bookbag, and put into it every bit of waste they generate (except food waste) for a 24 hour period. At the end of that period, weigh and examine it. Does it come from overpackaging? Is there anything that the student didn't really need? What is the difference between needs and wants?
 3. Give the students information about amounts, including volume and mass, of garbage generated by the average American each day. Use this amount to show how much land is needed to hold that amount, and then consider the environmental consequences of the large volume of waste generated in the United States.
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