

Landfill in a Bottle

Background:

Consumers can make a significant impact on the environment simply by the choices that they make at the store. Much of what we buy quickly becomes waste and is thrown away. Approximately one-third of this waste comes from packaging according to the Clean Air Council. All of this waste requires armies of dump trucks (which burn fossil fuels) to collect it in towns and cities all over the world and take it “away”. According to a report by Environmental Defense called “Trash in the City, “ Manhattan uses diesel trucks to carry garbage 7.8 million miles every year. That would be the equivalent of circling the Earth 312 times every year. The Clean Air Council estimates that Americans throw away an average of 230 million tons of garbage per year and about 2.5 million plastic bottles every hour. Some of this waste gets recycled, but most of it ends up in landfills or in the ocean. The good news is that you and your students can do something right now to reduce your impact on the environment and protect its inhabitants.

Procedure:

1. Before beginning the project get students thinking about waste by asking some or all of the questions below
 - a. What do people throw away?
 - b. What do you throw away?
 - c. Can pollution come from the trash that you throw away? (Yes, pollution to the environment can come from many sources.)
 - d. What can pollution affect? (Pollution affects both plants and animals, including humans. It can even affect the way an ecosystem functions. Pollution, such as carbon dioxide emissions, also affects the Earth’s climate.
 - e. How does pollution affect humans and animals? List specific ways such as causing plants and animals to become threatened or endangered or even decreasing biodiversity by causing plants or animals to become extinct from specific areas.
2. To help students gain a better understanding of how household/school waste breaks down in a landfill, have students bring a few pieces of trash from home (such as paper, plastic, steel, aluminum, cardboard, etc) or collect trash from your own school (a cleanup after lunch will yield enough for this experiment). Be sure to include a few food items. Provide students with exact lists of garbage to bring to class so as to avoid any health concerns.
3. Explain to students that they will be creating a miniature landfill using a few pieces of garbage and a 2-liter bottle.
 - a. Cut the top off of a 2-liter bottle (1-liter bottles work as well)
 - b. Cover the sides of the bottle with a light eliminating shield (such as a paper bag or other opaque item.) This will keep any extra light from getting into the “landfill” and only allow it to hit the surface (as the sun naturally would).
 - c. Alternatively layer dirt (from the yard, not from a bag) with the pieces of garbage.
 - d. Mist the top of the dirt with approximately 1/8 cup of water.
 - e. Set the bottle near a window so that it will receive exposure to the sun or if possible set bottles outside.
 - f. Be sure to add water to your landfill daily or as necessary to keep the soil lightly moist.

Grade: 4-6

Objectives: By the end of this activity, participants will:

- Understand how household/school waste breaks down in a landfill
- Recognize the impact of waste on the environment
- Be informed and empowered on ways to reduce, reuse and recycle

Time Needed to Complete: Set-up = 30 minutes; entire project will take 1 month. It is up to the teacher how often students will observe their landfills during the course of that month.

Materials Needed:

- 2 liter soda pop bottle per students
- Paper bags
- Dirt (from a yard, not a bag)
- Newspaper to cover the tables
- Spray bottle with water
- Pieces of trash (i.e. aluminum, lint, paper, orange peel, plastic bag, straw)

4. Ask students, “where do items in the landfill come from?” Answers should include that people generate waste, including themselves.
5. Have students make and record observations about their landfills at least once a week. You may also consider having students hypothesize about which items may break down the fastest or not at all.
6. Over the course of the month, as students are observing their landfills, introduce supplemental lesson plans, such as “Pollution and Waste Audit” (included on the pages that follow) to reinforce the concept of waste reduction.
7. Once students have made a few observations ask them the following questions.
 - a. What simple changes can you make in order to keep items that don’t break down out of landfills or ways to keep harmful items out of landfills? Answers might include: recycling, produce less trash, produce trash that will not stick around as long, use cloth shopping bags, etc
 - b. How can you reduce trash and pollution by making wiser purchases? Have the students brainstorm different ideas and write them down. You might choose to make copies of the list for the students to take home. Below are some examples that you can provide:
 - i. Buy products with less packaging or products that have reusable or recyclable packaging.
 - ii. Buy products that are packaged in materials that are made with recycled products.
 - iii. Purchase organic foods, which are grown without the use of pesticides and synthetic fertilizers which are harmful to the environment.
 - iv. Take a reusable lunch box and containers to work or school instead of a paper lunch bag and wrappers that get thrown away.
 - v. Check out books from the library instead of buying your own.
 - vi. Purchase items in bulk. This usually uses less packaging and is cheaper.
 - vii. Buy or make your own household cleaners that are environmentally friendly.
 - viii. Start a recycling program at home or school. If recycling *everything* is not possible, begin by recycling the waste that you produce the most of and move forward from there.
 - ix. Use cloth shopping bags.
 - x. Do not purchase one-use/disposable items
 - xi. Support local farmers by purchasing locally grown produce
 - xii. Support local companies by purchasing locally made items
 - c. After 1 month, have students take apart their landfill to see how the items have changed. If possible, make this a quarter or semester-long project. Students record their observations over the course of many months and finally take apart their landfills for further observations at the end of the quarter or semester.

Extensions:

1. After completing this activity follow up with your students by creating a recycling program at your school or home. Remember, even small steps can make a big difference! Simply recycling all the aluminum or plastic your school or home produces can save fossil fuel and keep tons of trash out of our landfills and waterways. Educating your fellow classmates and even adults is a great first step! Below are a few ideas along with the ideas that students generate to get you started.
 - a. Sign a Reduce, Recycle, Reuse Pledge.
 - b. Create graphs showing the class results vs. the average American.
 - c. Survey teachers or students within the school to find out if they reduce, reuse or recycle. Post the results in a hallway at school.
 - d. Create a public service announcement (via a poster or podcast) on why you should reduce, reuse and recycle.
 - e. Encourage your school or area businesses to reduce, reuse and recycle.
 - f. Have each student research a specific habitat or animal that has been affected by waste pollution and share the projects with the class or school.

2. Arrange a field trip with your class to a waste management facility. Before your trip, brainstorm different questions to ask. While you are there, have the students write about their experiences and thoughts in a journal. You may also choose to include photos and drawings.

National Science Education Standards:

Science as Inquiry

Nature of Science

Science and Technology in Society

Populations, Resources and Environment

Evidence, Models and Explanation



Waste Audit Worksheet

How much waste do you produce in 1 week or 1 month? The answers may surprise you. One of the first steps in reducing waste and creating a good recycling program at your house or school is to conduct a waste audit, so you know what your starting point is and can measure your progress against it.

1. Number of people in your school or household
2. How many plastic shopping bags do you acquire in one week?
3. How many plastic bottles of water does your family drink in one week?
4. How many plastic bottles of soda pop does your family drink in one week?
5. How many soda pop cans does your family go through in one week?
6. How many glass bottles does your family use in 1 week?
7. How many metal cans (food cans) does your family use in 1 week?
8. How many cardboard boxes does your family use in 1 week? (Be sure to include boxes of food, etc.)
9. How many bags of trash does your family produce in 1 week?
10. How many magazines does your family receive in 1 month?
11. How many newspapers does your family receive in 1 week?
12. Does your household recycle? If so, what items?

13. Does your family have old cell phones lying around? (Many places accept cell phones and recycle or reuse them.)



Pollution and Waste Audit

For the Home and/or Classroom

Total number of persons accounted for in data below: _____

Material	# of items/week	# of items/month	# of items/year	Comments
Plastic Shopping/Grocery Bags				
Plastic Water Bottles				
Plastic Soda Bottles				
Aluminum Cans				
Glass				
Metal Cans (food, etc)				
Cardboard Boxes				
Magazines				
Newspapers				
# of Bags of Trash				

