

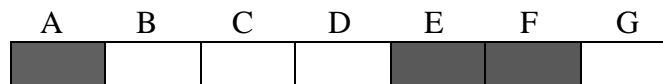
Contributing teachers: Karen Yost  
Dan Breitrick  
Sakeena Haq-Munoz



## There is No "Away"

**Concept:** Technology of landfills

**National Science Standards:**



**Background:**

Landfills are places where trash is dumped, compacted, and covered with dirt. Landfills eliminate blowing paper, control odors and insects, and prevent water entering and/or leaking out.

In the past, the monitoring of the site and leachate was unregulated. Citizens were generally unaware of the hazards that were associated with the use of closed landfill sites.

Today, landfills are designed, built, and operated according to state of the art standards to prevent pollution problems. Licensed landfills are constructed only after considering the operating plan, soil testing, possibility of contamination of ground and surface water, future land use, leachate and methane gas control, capping, and long term care. (Adapted from Wisconsin D.N.R. Publication Publ-IE-049.)

**Objectives:** The student will demonstrate knowledge of a sanitary/solid waste landfill by listing

advantages and disadvantages of landfill.

The student will design and construct a model of a landfill.

The student will gain appreciation for the role of landfills in reducing waste.

**Suggested grade levels:** 3-6 (This activity could be used for grades first and second if done as a classroom demonstration by the facilitator.)

**Estimated time:**

- Teacher prep: Dependent on number of students and availability of materials.
- Activity: approximately 75 minutes (add 30 minutes for video)

**Materials needed:** (Collect enough for the class to work in pairs as well as a teacher demonstration.)

- clear two-liter plastic bottle
- gravel

- solid waste (avoid vegetable waste)
- sand
  - potting soil
  - sod
  - clay (not modeling clay)
  - red food coloring
  - latex gloves
  - water
  - pan

**Safety/Disposal:** The materials are biodegradable or recyclable and maybe composted or recycled in their proper receptacle.

Provide latex gloves for handling of waste and soil.

**Procedure:**

Part I: Introduction

1. Question students:
  - What happens to your non-recyclable garbage?
  - What is a landfill?
  - Can you compare new versus old landfills?
2. Generate discussion.

Part II: Model problem with old landfills.

1. Cut the top off a clear two-liter bottle.
2. Cover bottom with approximately one inch of gravel.
3. Add two inches of solid waste on top of gravel.
4. Pour water and food coloring mixture over solid waste to saturate.
5. Add two inches of sand on top of waste material.
6. Add two inches of potting soil on top of sand.
7. Cover potting soil with a piece of sod to cover completely.
8. Hold over pan of water and poke a hole in the side of bottle midway and through the gravel zone. Then, place in pan.
9. Add about a cup of water to the sod to simulate rain.

Part III: Discuss and define:

1. Leachate: Liquid that has filtered through solid waste. May cause contamination of ground and surface water.

2. Methane Gas: Odorless, colorless, flammable, and explosive gas produced by decomposition of organic matter.
3. Monitoring Well: A well that is constructed to siphon leachate from the bottom of a landfill.
4. Cap: The clay covering over a landfill to keep water and air out. (Definitions adapted from D.N.R Publication Publ-IE-049.)

Part IV: Students will be assigned to design a landfill that will not leak.

1. The students can work in pairs.
2. Remind the students to be as creative as possible. Brainstorm ideas to use to prevent leakage.  
Lead students toward the use of polymers.
3. Provide students with materials needed to implement their design. (Omit step 4 of Part II.)

Part V: Assess the designs.

1. Poke a hole in gravel zone.
2. Place bottle in pan of water and add water and food coloring mixture to sod.
3. Create rubric to assess design.

### **Wrap-up:**

- Expected results: The students will design a landfill that does not leak by use of polymers.
- Compare results and discuss what worked and what did not work as a class.
- Follow-up questions:  
Can you really throw something “away”?

Would you want an old or a new landfill to be built in your community? Why or why not?

### **Extensions:**

- Invite a guest speaker from your local municipal landfill into the classroom.
  - Visit a local landfill.
    - View video, "The Rotten Truth", from the 3-2-1 Contact series. (Video may be purchased through Sunburst Video Catalog.)

### **Resources:**

This activity is based on a presentation at the MATR Institute by Richard Zahn, Professional Engineer, Rust Environment and Infrastructure, Inc.  
K-3 Supplement to the Recycling Study Guide. 1990.  
Publ-IE-049, Wisconsin D.N.R. Publications  
2421 Darwin Rd.  
Madison, WI 53704

Recycling Study Guide. 1993Rev, Publ-IE-020. Wisconsin D.N.R. Publications  
2421 Darwin Rd.  
Madison, WI 53704.