



*Drexel-SDP GK-12 ACTIVITY*

## **Activity: Recycling Plastics**

**Subject Area(s)** Environments

**Associated Unit** Environments, module 4

**Associated Lesson** None

**Activity Title** Recycling plastics

**Grade Level** 6 (3-8)

**Activity Dependency** None

**Time Required** 100 minute

**Group Size** 2

**Expendable Cost per Group** \$0.50

### **Summary**

Students learned about how plastics are recycled and what problems are associated with recycling plastics. Students evaluated plastics and determined that they brought in to demonstrate reusable, renewable and nonrenewable. The class discussed recycling as a human activity.

### **Engineering Connection**

Engineers are deeply vested in the sustainability of our manufacturing processes. Sustainability calls for the responsible use, disposal and recycling of raw materials to ensure their availability for future generations. Engineers design ways to recycle previously used materials to extend their life span. For example, engineers are involved in the recycling of plastic soda bottles to

that the petroleum-based plastic may be used multiple times, reducing waste and the amount of raw materials used in the manufacturing of new bottles.

### **Keywords**

Environment, recycling, environmental engineers, petroleum, plastics, landfills

### **Educational Standards**

- Environments and Ecology: Renewable and nonrenewable resources 4.2.A. Uses, 4.2.B. Availability, 4.2.C. Management, 4.2.D. Influential factors  
Environmental Health 4.3.A. Environmental health issues, 4.3.B. Human actions, 4.3.C. Biological diversity  
Humans and the Environment 4.8.A. Societal needs, 4.8.B. Sustainability, 4.8.C. Human impacts, 4.8.D. Supply and demand
- Science: Technology Education – Science, Technology and Human Endeavors – Meeting Human Needs 3.8.B, Science, Technology and Human Endeavors – Consequences and Impacts 3.8.C

### **Pre-Requisite Knowledge**

None.

### **Learning Objectives**

Students will review their knowledge of how recycling could help. Students will learn how plastics are recycled and learn about biodegradation.

### **Materials**

Corn based plastic cup (degradable)  
Stryofoam cup  
Plastic cup  
Rubbermaid tub with lid (shoe box size)  
Tooth picks  
Dirt (not store bought)  
Scissors  
Paper  
Tape

### **Introduction / Motivation**

Students learned about how plastics are recycled and what problems are associated with recycling plastics. Students evaluated plastics that they brought in to see how many different types of plastics they used everyday and what they new uses could be if recycled. The class discussed why recycling was so limited in their school, and what they could do about it.

Review the background material with the students, discuss the vocabulary, then begin the activity.

### Vocabulary / Definitions

Word	Definition
Environmental engineering	The application of science and engineering principles to improve the environment (air, water, and/or land resources).
landfill	A method for final disposal of solid waste on land. Garbage is placed in holes in the ground and covered over.
Petroleum plastics	A material made from petroleum capable of being molded, extruded, or cast into various shapes. Non-renewable resource.
Renewable resource	A material made from petroleum capable of being molded, extruded, or cast into various shapes.
Nonrenewable resource	A finite resource that cannot be replaced once it is used (for example, petroleum, minerals).

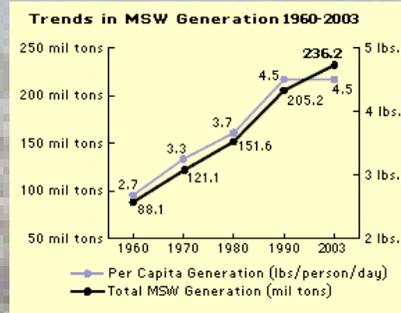
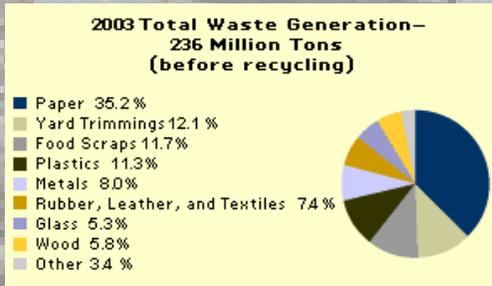
### Procedure

### Background



# Why?

- Solid waste is a big challenge in the US today



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# Why ?

## Raw Materials are limited

- Renewable vs Nonrenewable



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# Landfills

- A carefully designed site to keep trash from the environment
- Liner of either clay or plastic to prevent leakage into ground water



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## Why are landfills a problem?

- It takes only 7 years to fill a landfill
- After its filled, it must be maintained for 30 years
  - Sealed with dirt and then left
  - Trash doesn't degrade- just stays there
- Take up space
  - Not enough space to use!
  - Not near my house!



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## Alternatives to landfills...

- Reduce
  - Smaller packaging
- Reuse
  - Use ceramic or plastic plates instead of paper
  - Composting- turn natural products back into soil
- Recycle
  - Plastics, paper, cardboard, batteries, computers, etc



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## Plastic Recycling

- **Inspection** - Workers inspect the plastic trash for contaminants like rock and glass, and for plastics that the plant cannot recycle.
- **Chopping and Washing** -? The plastic is washed and chopped into flakes.
- **Flotation Tank**-? If mixed plastics are being recycled, they are sorted in a flotation tank, where some types of plastic sink and others float.



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# Plastic recycling

- **Drying-**? The plastic flakes are dried in a tumble dryer.?
- **Melting-** The dried flakes are fed into an extruder, where heat and pressure melt the plastic. Different types of plastics melt at different temperatures.
- **Filtering-**? The molten plastic is forced through a fine screen to remove any contaminants that slipped through the washing process. The molten plastic is then formed into strands.?
- **Pelletizing-** The strands are cooled in water, then chopped into uniform pellets. Manufacturing companies buy the plastic pellets from recyclers to make new products. Recycled plastics also can be made into flowerpots, lumber, and carpeting.



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## Student Project



- Assume you are the owner of a McDonald's store here in Philadelphia
- Congress has passed a new law stating that no new landfills can be created
- How would you change your store policy to match this law?
- Would it cost you more money?
  - Show your savings/losses in a graph, table or chart



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### Before the Activity

Load the PowerPoint presentation onto a computer connected to the projector.

### With the Students

1. Quick review of landfills/ recycling lesson
2. How does recycling plastics help reduce landfills?
3. Separate students into groups of four

4. Pass out worksheets to groups
5. Have students work on challenge #1 and challenge #2
6. For Challenge #3 students are to cut a strip of each type of plastic and bury it in the dirt in their Rubbermaid tub. Using the toothpicks and paper they can label where each one is buried. Tubs are labeled and kept on the windowsill.
7. Every week have students check the plastics to see if there are any signs of degradation. What is the difference between the plastics?

### **Safety Issues**

- None

### **Troubleshooting Tips**

Help students to navigate the EPA website to the pertinent information.

### **Investigating Questions**

See Activity Embedded Assessment

### **Assessment**

#### **Pre-Activity Assessment**

None

#### **Activity Embedded Assessment**

Print the following into student worksheets.

# RECYCLING PLASTICS

Name :

Team Name :

Challenge #1: Discuss with your group the following questions and answer them below.

1. How does recycling help reduce global warming?

2. What is a landfill?

3. Why are landfills a problem?

4. What recycling codes are recyclable in Pennsylvania?

Challenge #2: Use your recycling codes table to answer the following questions:

1. What is the # of your plastic container?
2. What type of plastic is it made from?
3. What could it be recycled into?
4. How many of these containers do you use a week?
5. Do you recycle them?
6. What could you do to reduce your plastic trash?

Challenge #3: Biodegradable plastics versus Regular plastic containers...do they really work?

With your team cut strips from the different types of plastics you brought in as well as from the "biodegradable plastic" bowls. Place each sample in the dirt and mark its location with a straw and paper. Cover the samples and place on the windowsill. We will observe them over the next few weeks for signs of degradation.

Make a guess...how long do you think it will take the biodegradable sample to degrade?

Do you think any of your plastics will degrade?

### **Post-Activity Assessment**

Evaluation based upon teacher assessment of student participation during activity as well as completion of the worksheet.

### **Activity Extensions**

<http://www.epa.gov/kids/>

### **Owner**

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