Recycling

Making Paper From Paper

SUGGESTED GRADE LEVEL: K-6

OBJECTIVE:
To learn how new paper can be made from old.

TIME:
Approximately 20-30 minutes (plus drying time).

MATERIALS:
for every 2-3 students:

- a piece of window screen 5" square
- a pan big enough for the screen to lie flat
- a large spoon
- 2 Tbs. of liquid starch
- a large jar, can or rolling pin
- 2 pieces of blotting paper (ordinary paper) the same size as the screen
- 2 blank 8-1/2 x 11 pieces of paper
- 2 cups of hot water
- a blender
- newspaper

PROCEDURE:

1. Tear paper into very small pieces in the pan (do not cut). Add 2 cups of hot water and stir for 3-5 minutes. Use a blender for best results in making pulp.
2. Add Tbs. of starch and stir 3 more minutes. Slide screen under the paper pulp and move pulp around until screen is completely covered.
3. Lift screen out, let it drain a few seconds, then place it on a piece of blotting paper on a section of newspaper. Place another sheet of blotting paper on top, and then the second section of newspaper.
4. Press the excess water out by rolling the jar, can or rolling pin over the newspaper. Take off the top newspaper, turn the blotting paper sandwich over and take off the top piece of blotting paper and the screen.
5. Let the recycled paper dry for 2 hours, then loosen it from the blotting paper and gently peel it off. Let the recycled paper dry overnight before writing on it.

Discussion questions:

1. How does your new paper look? (*thick, lumpy, ragged)*
2. Would you like to recycle all your own paper yourself?
3. Do you get the same amount of new paper out as you put old paper in? *(No, you get less because there is some waste.)*

SOURCE:
Cornell Waste Management Institute. 1991.
Trash Goes to School
(http://cwmi.css.cornell.edu/TrashGoesToSchool/TrashIntro.html).

4 R's - Everything Old Is New Again

SUGGESTED GRADE LEVEL: 3

OBJECTIVE:
By recycling used paper into new, usable paper, students will be able to visualize how recycled paper is made and explain why it is important to use recycled paper.

BACKGROUND:
The water-to-paper ratio should be 4:1. Slurry is the mushy water and paper mixture used to make new paper. It is also called pulp.

TIME:
Thirty minutes to mix ingredients, wait one day, then thirty minutes to prepare pulp, dry overnight, then use.

MATERIALS: large mixing bowl, small pieces of used papers, starch, mixer, screen, flat pan, newspapers, soft drink bottle

PROCEDURE:
Leading Question
What actually happens during the recycling process?

1. Since paper takes up 35% to 40% of the space in modern landfills, it is important to recycle it whenever possible instead of tossing it away. To see what happens during the recycling process, the class (or each team) will make some recycled paper.
2. Follow the ***Simple-to-Make Recycled Paper*** directions handout. (One batch for the whole class may be made or you may wish to supply each team with necessary materials to make their own batch.)
3. After the recycled paper dries, write recycling poems on it or draw on it with watercolor markers or paints. Display publicly.

What Now?
1. Do research to find out how much energy is used in the regular paper-making process.
2. Find out what kinds of paper can be recycled.
3. Try making recycled paper adding such items as small feathers, grasses, seed and seed pods, thread, small flowers, pieces of colored construction paper, food coloring, etc.
4. Find out if your school uses recycled paper for letterhead or student exercises.

SOURCE:
Weekly Reader's ***"Exploring the Environment"***

Simple-To-Make-Recycled Paper

WHAT YOU NEED:

- Lots of used white paper, newspaper or old telephone book
- A large bowl
- 4 cups of water
- An eggbeater or a whisk
- A flat baking pan
- 1 teaspoon of starch, if needed
- A piece of window screen that fits inside pan
- Two thick layers of newspaper
- A rolling pin or a full, 1-liter soft drink bottle

WHAT TO DO:

1. Tear used paper into very small pieces, about the size of a dime. Cover with warm water. Let the mixture sit overnight.

2. The next day, use the eggbeater or whisk to beat the water and paper mixture until it looks like mush. This mush is called slurry. A teaspoon of starch may be added if the slurry is too runny.

3. Put the screen into the flat pan and place slurry on the screen. For smaller pieces of recycled paper, place about 1 cup of slurry at a time on the screen. Drain and dry in the regular way.

4. Lift the screen slightly. Let it drain for a few minutes. Place the screen pulp side up, on a thick layer of newspaper, put another layer of newspaper on top.

5. Roll the rolling pin or soft-drink bottle over the newspaper to squeeze the water out of the pulp. Turn the pile over. Carefully remove the newspaper and then the screen. Let the pulp air dry and then peel the new sheet of paper off of the newspaper.

4 R's - What's a Cycle

SUGGESTED GRADE LEVEL: 1

OBJECTIVE:
By brainstorming and illustrating the cycles that they know about (day/night, butterfly, tree, seasons), children will become aware of cycles to help them understand recycling.

BACKGROUND:
Through recycling, the amount of solid waste produced can be greatly reduced.

TIME:
One class period.

MATERIALS:
Graph paper, old magazines, glue, scissors, poster board, recycling logo, ***Save! Sort! Recycle!*** worksheet, "cans" made from cardboard or tag board

PROCEDURE:
Leading Question
What's a cycle?

1. Brainstorm different cycles the children know about.

2. How is a cycle like a wheel?

3. Introduce the term recycle – ask the children what they think it means.

4. Ask if they reuse and recycle things at their home. For example: refill water bottles to drink from again.

Ask:

- Do you buy toilet paper with recycled content?
- What about your cereal boxes?
- Are they gray?
- If they are, then they are made from recycled paper.

What Now?

1. Color the recycling logo. Copy on backside of already used paper, if possible.

2. Cut out pictures from old magazines of things that can be recycled. Use these pictures for the activity, "What's Recyclable?"

3. Make copies of the ***Save! Sort! Recycle!*** worksheet for each child. Have the children color the pictures, cut them out, and glue them on the appropriate can – reuse or recycle.

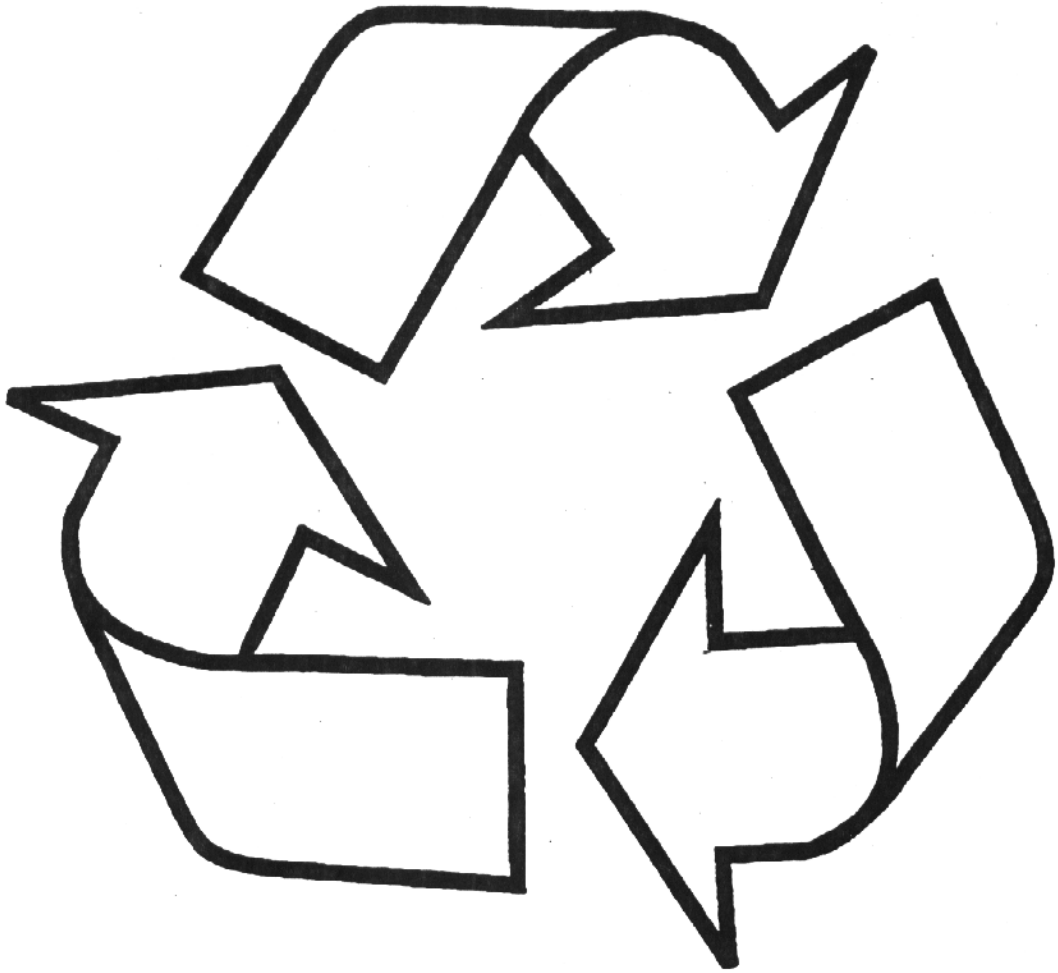
4. Laminate the worksheet and do this as a whole group activity.

5. Have students make a "How to Recycle" book to take home. These books can be made from the bottoms of brown grocery bags. Let them use their imagination.

6. Share the "Save! Sort! Recycle!" activity with the class. You may want to laminate the worksheet for permanent use.

SOURCE:
South Carolina Department of Health and Environmental Control. 2001.
Action for a Cleaner Tomorrow: A South Carolina Environmental Curriculum Supplement.
Columbia, SC.

RECYCLING



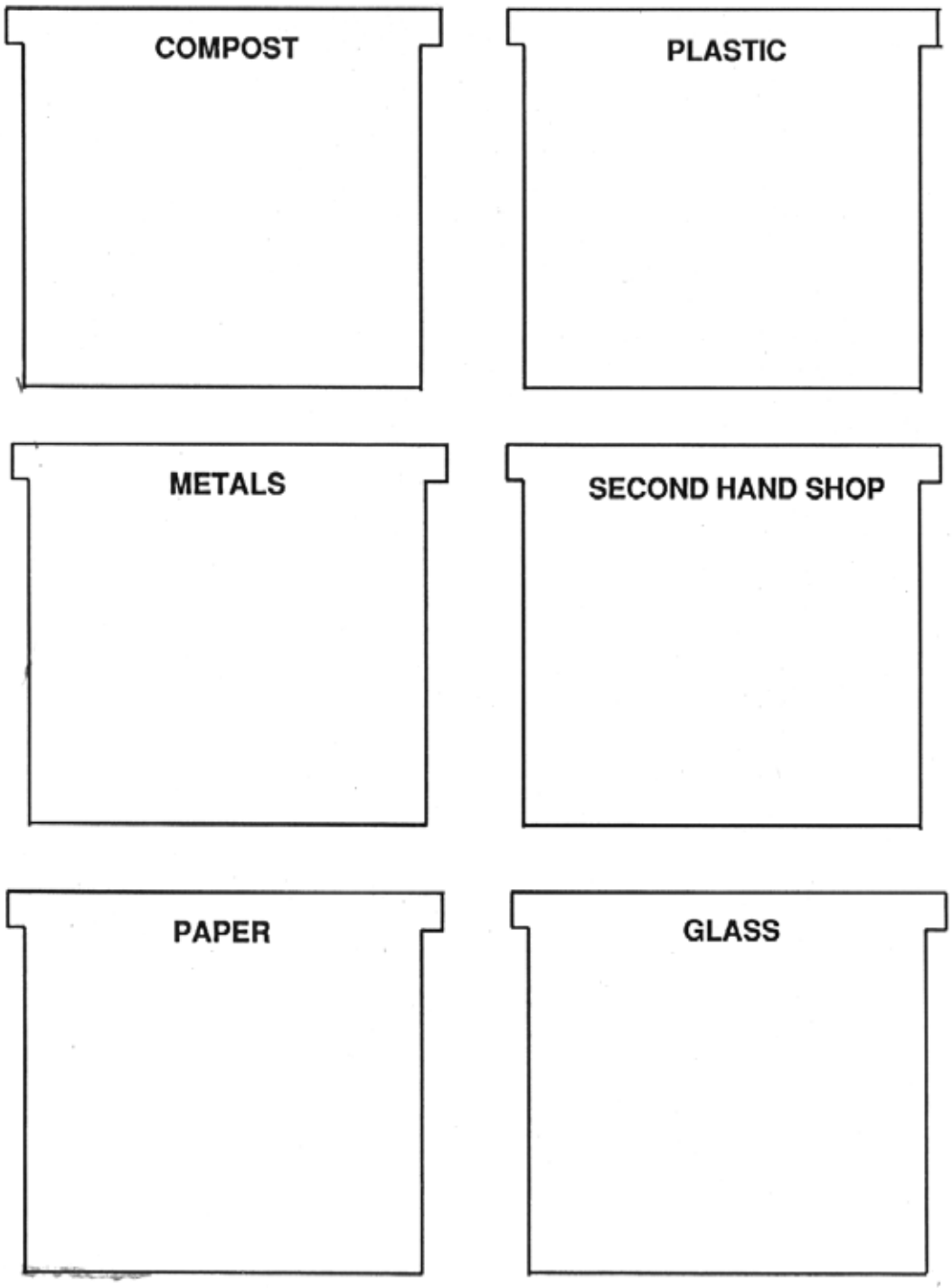
Recycle

SOURCE:
South Carolina Department of Health and Environmental Control. 2001.
Action for a Cleaner Tomorrow: A South Carolina Environmental Curriculum Supplement.
Columbia, SC.

Save! Sort! Recycle!

Color the recyclables in the boxes on this page. Then cut them out and paste them into the proper recycling bins on the other page.

RECYCLING



SOURCE:
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Columbia, SC.

Foiled Again

SUGGESTED GRADE LEVEL: 2-3

OBJECTIVE:
Students will predict the number of times an aluminum can could be recycled and distinguish between aluminum, steel and tin.

BACKGROUND:
Product packaging is a significant part of our solid waste stream. Much of the packaging that ends up in landfills can be recycled. Recycling saves landfill space, as well as energy and the natural resources used to make new packaging.

TIME:
Two class periods

MATERIALS:
Healthy snacks (two kinds); bowl of sudsy water, sponge, towel, trash can, rolling pin, box, aluminum foil, string, tape, various examples of aluminum cans, magnet, ***Recycle Cycle*** handout made into a transparency

PROCEDURE:
Each student will create an aluminum foil container to fill with popcorn, raisins or some other healthy snack. After it is used, it will be thrown into a box, representing aluminum recycling. Each student playing the role of **recycler** will then take a used container from the box to recycle into a new, useful product. This process will be compared to the process of recycling **aluminum.**

1. Give each student a 12-inch square of aluminum foil to form into a container for a healthy snack (raisins, popcorn, fruit, etc).

2. Have students share their designs with the class.

3. Fill each container with the snack and, as they are enjoying their snacks, talk about the kinds of containers made from aluminum. Show some examples.

4. When snacks are gone, all of the empty homemade snack containers will be tossed into a box marked "Recycle Aluminum Here".

5. Have each student select a container from the recycle box, flatten it, wash and rinse it and reshape the aluminum into a container to hold a second snack.

6. Ask students how many times their aluminum could be recycled. Help them compare this activity to the real process of recycling aluminum using the ***Recycle Cycle*** transparency.

7. Write this fact on the board: "Americans throw away enough aluminum every three months to rebuild our entire commercial airline fleet." Let the students, either individually or as a team, build an aluminum foil boat or airplane from their foil.

8. After the boats and planes have been properly test-piloted, make a class mobile using their crafts and some high-flying facts about aluminum and other recyclable metals.

RECYCLING

EXTENSION ACTIVITIES:

1. Research aluminum production. Write to ALCOA for information and/or pictures:
   ALCOA Corporate Center
   201 Isabella St.
   Pittsburgh, PA 15212-5858
   website: www.alcoa.com

2. Show the students how to tell the difference between aluminum and tinned cans. (The typical tinned can is 99 percent steel and 1 percent tin. This type of can will be attracted by a magnet and will have a seam. Aluminum cans will not have a seam and will not be attracted by a magnet.)

3. Bring out several magnets and a variety of cans and let students experiment and separate the cans into categories. Tell students that the raw material for aluminum is bauxite, and tin and/or iron (steel) is the raw material for "tinned" cans.

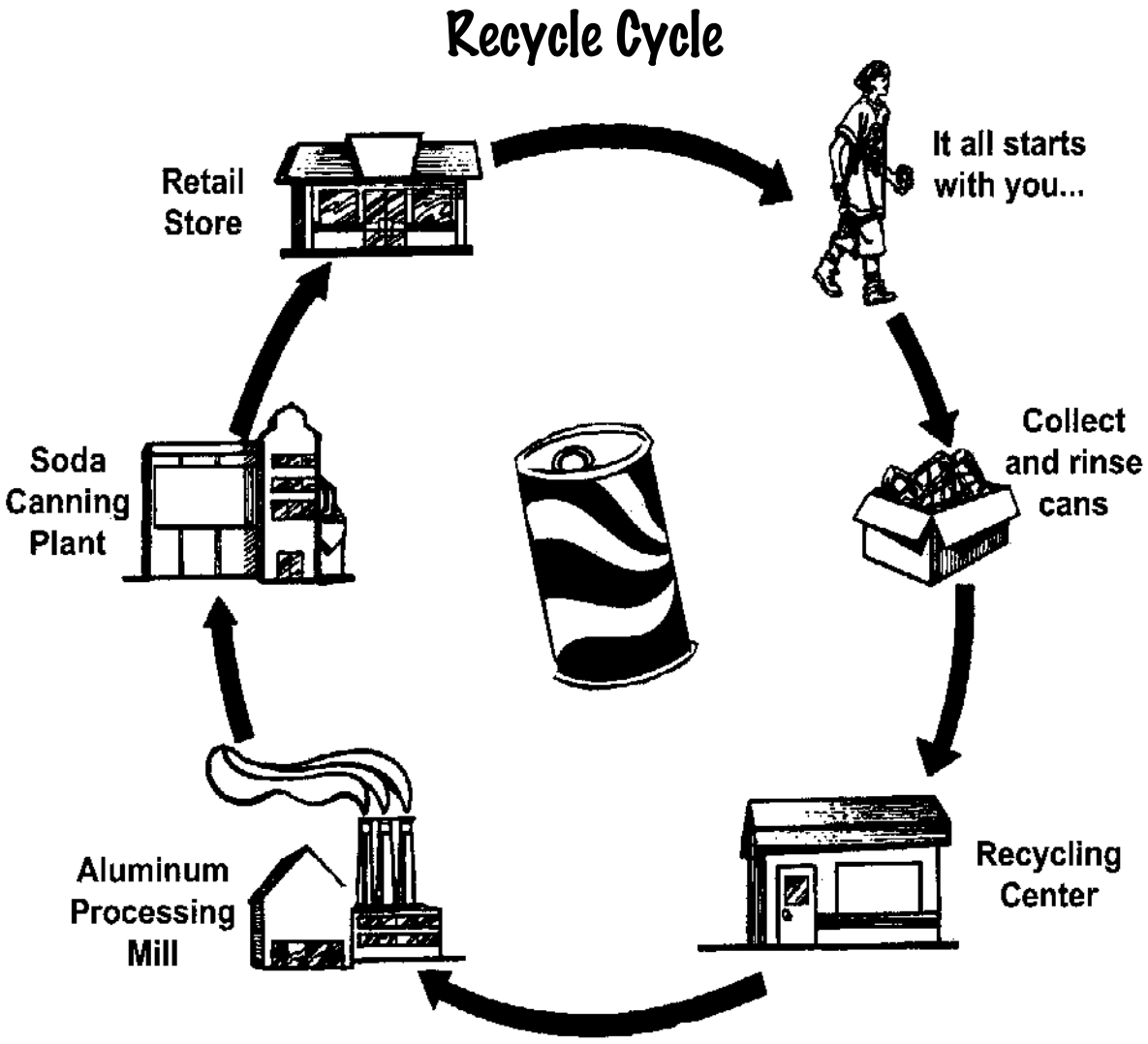
4. Set up a display of recyclable metal containers. Ask the manager of a local grocery store if your class can display this to educate and inform people about recycling.

Did You Know?

- More than one-half of all aluminum beverage cans are recycled.
- If an aluminum can is thrown away, as much energy is wasted as pouring out a can half-filled with gasoline.
- In a single year, an estimated 2 million aluminum can collectors earned more than $200 million by recycling.
- The aluminum can you recycle today may be back in the store as a recycled can in as little as six weeks.
- About 33 cans make a pound of aluminum.
- Pulling off a can pull tab is dangerous. Do not encourage anyone to collect pull tabs. Collect whole cans. Cans have been designed to keep the tab on through the recycling process.

SOURCE:
South Carolina Department of Health and Environmental Control. 2001.
Action for a Cleaner Tomorrow: A South Carolina Environmental Curriculum Supplement.
Columbia, SC.

RECYCLING



SOURCE:
South Carolina Department of Health and Environmental Control. 2001.
Action for a Cleaner Tomorrow: A South Carolina Environmental Curriculum Supplement.
Columbia, SC.

History of Glass

SUGGESTED GRADE LEVEL: 4

OBJECTIVE:
To learn about the history of glass, what it is made of, and how it is used.

TIME:
One to two class periods.

MATERIALS:
handout: ***History of Glass***

PROCEDURE:
1. Have students read ***History of Glass*** and answer the question on the following pages. Answers: 1-T, 2-T, 3-T, 4-F, 5-T, 6-T, 7-T, 8-T

2. Using an encyclopedia, research the following topics and make your own time line for their discovery and use to the present time.

Tin	Iron	Gold
Aluminum	Steel	Uranium
Plastic	Copper	Silver
Petroleum	Lead	

The History of Glass

Glass is a material that comes from three ground-up, powder-like substances: sand, baking soda, and dusty limestone. It is recyclable again and again and is easy to dispose of with little harm to the environment.

But how is it made? The three ingredients are mixed in large containers or vats and heated at a very high temperature until they melt and become liquid. This hot, clear liquid is now what we call glass. It is then shaped, cooled, and left to harden for use everywhere.

Years ago, scientists discovered a way to spin the glass into wool-like thread or fiber. These fibers were found to be good for building materials in boats, homes and offices. This material is called fiberglass.

Glass is indeed an old but very useful product but remember that when broken it has sharp edges that can cut people and animals.

Below is a time line showing when and how long glass has been manufactured.

Time Line - The History of Glass

First jar made of glass	3000 BC	
All glass ancient container	1500 BC	
Blowpipe is used to shape glass	30 BC	
	50 AD	First glass window
	1535 AD	First window in Western Hemisphere
	1685 AD	First mirror
	1790 AD	First glass eyeglasses
	1980 AD	Microwavable glass & fiber for telephone cables

SOURCE:
Cornell Waste Management Institute. 1991.
Trash Goes to School (http://cwmi.css.cornell.edu/TrashGoesToSchool/TrashIntro.html)

RECYCLING

Based on your reading on glass and the Time Line, complete the following worksheet.

A. Be a Glass Recipe Writer…

Write the directions to make glass. Ingredients:

1. _____
2. _____
3. _____

Procedure: Combine your ingredients and place them at a very high temperature in a ___ _____ or _____. Let _____ and _____ and then _____ into _____.

List five (5) different uses of glass.

1. _____
2. _____
3. _____
4. _____
5. _____

B. Circle T for true – F for false.

1. Glass is one of the oldest materials made by humans. T/F
2. Glass has been used for more than 3000 years. T/F
3. Ancient people probably used glass for carrying liquid. T/F
4. The blowpipe was invented in 30 A.D. T/F
5. The first use of glass for home construction took place in 50 A.D. T/F
6. The mirror was invented about 150 years after the first window in the Western Hemisphere. T/F
7. Eyeglasses were invented in the 18th Century. T/F
8. The use of glass is about 5000 years old. T/F

Let's Get Organized

SUGGESTED GRADE LEVEL: 3-4

OBJECTIVE:
To teach organizational skills and involve youth in the planning of their school and home recycling project (if children participate they will have a vested interest in the program's success). Students will design a usable school recycling system.

BACKGROUND:
Teaching youth to be organized and efficient is important. In the following activity they will help set up a collection system that is efficient for students, teachers, and custodians.

TIME:
Two - three class periods.

MATERIALS:
paper, pencils, and ruler

PROCEDURE:
1. Check with the recycling coordinator to see what items are being recycled in your area, then decide which ones you want to collect.

2. Have a brainstorming session to find the most efficient way to set up a recycling collection system. This discussion may center on the classroom, cafeteria, or other offices. You can sketch out your own designs and tell why your design will work well.

3. Sketch a design of the recycling program in school or home. Include:

    a. Which materials will be collected?

    b. What types and sizes of containers will be used? What will they cost?

    c. Where will the containers be placed?

    d. Who will collect the recyclables?

    e. How often will they be collected? If collection occurs one time per week, you will need larger containers than if it occurs every day.

    f. Where will the recyclables go after they are collected in school?

    g. What kinds of products can they be made into?

    h. Does your family buy those products?

Further exploration: As a homework assignment or project have students design a system for their own homes.

SOURCE:
Cornell Waste Management Institute. 1991.
Trash Goes to School (http://cwmi.css.cornell.edu/TrashGoesToSchool/TrashIntro.html)

Solid Waste/Recycling

SUGGESTED GRADE LEVEL: 3-4

OBJECTIVE:
To see what percentage of waste is packaging and stimulate thought on what we throw away.

BACKGROUND:
When we throw away garbage, it usually ends up in a landfill. Landfill space is getting increasingly scarce, and every time we throw something away we throw with it the energy, the money, the raw materials, and the water it took to make it.

The average American throws away 4 pounds of garbage per day. In the year 2000, Americans threw away over 2 million tons of aluminum cans and foil, nearly 10 million tons of glass bottles and jars, over 25 million tons of food and over 45 million tons of paper. Almost all of this material could be recycled.

Recycling saves large amounts of energy. Recycling one glass jar saves enough energy to light a 100-watt light bulb for four hours. Recycling one soda can saves as much energy as if the can were half full of gasoline.

When waste products are recycled, fewer raw materials are used. Americans throw away billions of aluminum cans per year – enough aluminum to build several entire air fleets. Recycling paper reduces the pressure on our forests for wood pulps.

TIME:
One to two class periods.

MATERIALS:
- Examples of household garbage items
- Paper
- Felt markers or crayons
- Glue sticks
- Handout: ***Home Recycling Survey***

PROCEDURE:
Collect a variety of household items that are thrown into the garbage. Try to include items that could be used again, such as paper grocery bags, aluminum foil, and things to create "instant" garbage such as disposable diapers and over-packaged products. Also include items that could be recycled, such as newspapers or glass jars.

Introduce the notion of reuse by displaying a variety of household items which are frequently thrown into the garbage but could still be used for other purposes. Ask students to describe uses for each of these household products. Survey the class by holding up each item and asking for a show of hands if the item could probably be found in their garbage at home.

Tell the class that, in order to reduce the amount of garbage we produce, some of the items could be used again and some could be "replaced" at the store by purchasing other products in the first place. For example, nondisposable items that produce less garbage than items made to be used only once. Explain to the students that when we use an item more than once (for the same or different use) we call it re-using. Recycling is remaking a product.

Students will take home a set of questions (the ***Home Recycling Survey***) to be answered by themselves and at least one family member.

RECYCLING

FOLLOW-UP:
Discuss the following questions:

- What items can be found in the garbage in most of our households?
- Are any of the items used again (reused) in most of our households?
- If so, what are they used for?
- Does our town have a place where people can take items to be recycled?
- If so, have any of you been there? What kinds of things did you take to be recycled?
- Where do most of the people you surveyed think our garbage goes once it leaves our homes?
- What are some ways you might reduce the amount of garbage in your home?

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Cornell Waste Management Institute. 1991.
Trash Goes to School (http://cwmi.css.cornell.edu/TrashGoesToSchool/TrashIntro.html)

RECYCLING

Home Recycling Survey

1. Put X's by the items that you throw into your garbage:

___ Cans (aluminum and/or tin)

___ Glass bottles

___ Paper

___ Aluminum foil

___ Styrofoam (containers or packaging materials)

___ Cardboard

___ Disposal diapers

___ Plastic containers

___ Newspapers

___ Grocery bags (paper or plastic)

___ Egg cartons

___ Batteries

___ Clothing

___ Catalogs & magazines

2. Which items, (of those listed above), could be recycled – by you or someone else?

_____

_____

_____

_____

3. Does Tompkins County offer curbside pick up to recycle any of these items?
_____ Yes _____ No _____ I don't know

4. Where does your garbage go once it leaves your house? (Draw a picture or explain in words).

_____

_____

_____

_____

_____

_____

5. What are the benefits and drawbacks of recycling to your family? (Talk to family members)

Benefits:

_____

_____

_____

_____

_____

Drawbacks:

_____

_____

_____

_____

_____

6. List five products that produce "instant garbage" commonly purchased by your family. They may come packaged in such a way that you throw away packaging as soon as you open them or they may be disposable so that you throw them away after using them only one time. Can you think of any alternatives to these products?

Instant garbage	Possible alternative
1._____	1._____
2._____	2._____
3._____	3._____
4._____	4._____
5._____	5._____

7. How does reusing things help the environment?

_____

_____

_____

_____

_____

_____

Recycling Word Search

Can you find these words? (All are things that can be recycled.)
Words can be found in any direction.

IRON	TIN CANS	LEAVES
STEEL	ALUMINUM CANS	GLASS
BRASS	CARS	JARS
COPPER	TIRES	RAGS
ZINC	PLASTICS	PAPER
GOLD	ASPHALT	NEWSPAPER
LEAD	CONCRETE	CORRUGATED
METALS	MOTOR OIL	OFFICE PAPER
WOOD		

Things That Can Be Recycled

D	**E**	**A**	**G**	**N**	**C**	**O**	**N**	**C**	**R**	**E**	**T**	**E**	**P**	**T**
R	**M**	**O**	**T**	**O**	**R**	**O**	**I**	**L**	**S**	**F**	**Q**	**S**	**I**	**C**
U	**W**	**F**	**Z**	**K**	**L**	**U**	**O**	**T**	**N**	**X**	**X**	**R**	**H**	**O**
V	**L**	**F**	**C**	**J**	**Z**	**D**	**G**	**W**	**A**	**I**	**E**	**T**	**D**	**R**
R	**T**	**I**	**N**	**C**	**A**	**N**	**S**	**L**	**C**	**S**	**I**	**A**	**A**	**R**
E	**S**	**C**	**O**	**P**	**P**	**E**	**R**	**N**	**M**	**M**	**B**	**C**	**E**	**U**
P	**H**	**E**	**G**	**X**	**O**	**Z**	**O**	**W**	**U**	**E**	**V**	**L**	**L**	**G**
A	**D**	**P**	**A**	**P**	**E**	**R**	**S**	**Q**	**N**	**T**	**A**	**T**	**L**	**A**
P	**L**	**A**	**S**	**T**	**I**	**C**	**S**	**W**	**I**	**A**	**J**	**L**	**Z**	**T**
S	**T**	**P**	**I**	**Z**	**U**	**H**	**T**	**O**	**M**	**L**	**M**	**A**	**W**	**E**
W	**B**	**E**	**C**	**U**	**B**	**D**	**E**	**O**	**U**	**S**	**I**	**H**	**R**	**D**
E	**G**	**R**	**A**	**G**	**S**	**T**	**E**	**D**	**L**	**N**	**D**	**P**	**Z**	**S**
N	**F**	**D**	**A**	**W**	**A**	**O**	**L**	**E**	**A**	**V**	**E**	**S**	**P**	**Q**
C	**E**	**O**	**X**	**S**	**U**	**H**	**A**	**J**	**C**	**H**	**C**	**A**	**R**	**S**
E	**C**	**T**	**A**	**S**	**S**	**A**	**L**	**G**	**F**	**T**	**Z**	**I**	**N**	**C**

SOURCE:
Cornell Waste Management Institute. 1991.
Trash Goes to School (http://cwmi.css.cornell.edu/TrashGoesToSchool/TrashIntro.html)

Speaking Up For Recycling

SUGGESTED GRADE LEVEL: 5

OBJECTIVE:
Students will present a persuasive, well-organized speech promoting the establishment of a school recycling program.

TIME:
Several class periods and possibly ongoing.

MATERIALS:
Note cards and a pen

PROCEDURE:
To develop an idea and speech, students will:

1. Think up possible statements.
2. Rework possible statements to produce a positive statement.
3. Brainstorm reasons to support it.
4. Rate the reasons in the order in which they will be presented: least persuasive to most persuasive.
5. Write a short introduction to the speech. Introduction includes: introduction of self, short history of situation or problem at hand and a statement of thesis.
6. Write short transition phrases leading from one reason to the next in order to give the speech continuity.
7. Write a summary or conclusion that restates the problem and summarizes the most persuasive reasons, leaving the audience with an important point to consider.
8. Write the speech onto note cards, one main point per card.
9. Practice the speech so that students can deliver it smoothly, not reading the cards but using them only for reference while looking at their audience and feeling prepared for speaking in public.

FOLLOW-UP:

1. Students present speech to community groups, city council, and county commissioners.
2. Students attend public meetings on other public problems and evaluate the effectiveness of the presentations.
3. Students attend trials and court hearings to evaluate techniques and effectiveness of presentations.
4. Teacher arranges visits from lawyers to discuss techniques of persuasive speaking.
5. Students write letters to the editors of local papers advocating that recycling be included as a method of solid waste management.
6. Students discuss how recycling and "resource recovery" can work together as part of a solid waste management plan.

SOURCE:
Cornell Waste Management Institute. 1991.
Trash Goes to School (http://cwmi.css.cornell.edu/TrashGoesToSchool/TrashIntro.html)

Solid Waste Word Match

Match the left and right columns

1. Recyclable, ground-up glass	A. Paper
2. Changes organic material into a soil-like mixture	B. Motor oil
3. 30% of all landfill waste	C. Cellulose insulation
4. A use of shredded newspaper	D. Aluminum
5. A use of finely ground newspaper	E. Composting
6. Most is imported from Australia and Jamaica; recycling saves 95% of the energy to process	F. Plastics
7. Made from petroleum and natural gas; recycling is still in infancy	G. Natural Resources
8. Some communities require gas stations to collect this for recycling	H. Cullet
9. Some states have deposits on these and collect up to 90% of them	I. Animal bedding
10. Materials that can't be recycled go here	J. Landfills or incinerators
11. If materials aren't recycled, more of these items are used	K. Beverage containers
12. How can we manage our waste in the U.S? (Choose all that fit)	I. Reduce, reuse & recycle