



School Recycling Program

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Life Cycles of Aluminum and Paper

Grades: 6-8

Materials: Information about life cycles of aluminum (included), creative aluminum story and overhead (included), grading rubric (included).

Activity Time: 30 minutes (lesson), 2-4 class periods (follow-up)

Concepts Taught: Sequencing, Recycling, Life Cycles, Creative Writing

North Carolina Curriculum Correlations: **Grade 6:** English Language Arts Objective 1.01, Competency Goal 6; Science Objectives 3.08, 6.06, 6.07; **Grade 7:** English Language Arts Competency Goal 6; **Grade 8:** English Language Arts Competency Goal 6; Science Objectives 4.04, 4.06.

Preparation:

This lesson should be taught after students have heard the presentation about the Wake County School Recycling Program. An electronic version of the presentation can be found on the web at <http://www.wakegov.com/>, then, in the search tool at the top of the page, enter "Feed the Bin." Please contact your school recycling coordinator or contact us at FeedTheBin@co.wake.nc.us or 919-856-6006 for more information.

Major Points Covered in Presentation:

- Feeding the bin helps save natural resources such as energy, landfill space, and raw materials and creates jobs.
- Do Feed your Bin things like notebook paper, white and colored paper, letterhead, envelopes, newspapers (if your school does not have a News and Observer recycling cart), file folders, sticky notes and magazines.
- Don't Feed your Bin things like paper towels, tissues, napkins, food wrappers, construction paper, writing paper, laminated paper, photos, cardboard or contaminated paper.
- Each classroom will have its own paper bin to feed.
- Your school may also have bins to recycle empty plastic bottles and aluminum cans.
- A group of students at your school will collect paper from the classroom bins and place it outside. The three arrow symbol represents the three steps of recycling: 1) collection of recyclables, 2) manufacturing new products from recyclables, and 3) buying recycled.
 - It is important to complete all three steps in the process in order for the recycling cycle to work.
 - The paper from your school will be picked up, processed, and made into new products such as notebooks, sticky notes, greeting cards, and toilet paper.

Lesson:

1. Review the Feed the Bin presentation with students. Remind them that they will follow a certain procedure to recycle paper, plastic, and aluminum at their school. Explain that recycling is just one part of the entire life cycle of paper, plastic, and aluminum. Included is background material from the National Energy Education Development (NEED) Project –The Museum of Solid Waste and Energy book included in your Feed Bucket.

For other school environmental information call EnergySaversSM at 856-SAVE.

Sponsored by the Wake County Solid Waste Management Division, along with these partners: Wake County Public School System (Curriculum and Instruction Department, Auxiliary Services Division: EnergySaversSM and Child Nutrition Services), the News and Observer, the North Carolina Division of Pollution Prevention and Environmental Assistance, Orange Recycling Services, Paper Stock Dealers, and Sparrow Educational Consulting, LLC.

2. Ask students what life cycles they have studied in school (butterfly, humans, etc.). Ask what a cycle means (that the process continues over and over). Explain that the objects that we will recycle at school each have their own life cycle. Using the included information taken from the NEED book, go through the life cycle of an aluminum can (pages 13 and 26).
3. We start at the ore where aluminum is mined. The aluminum is still mixed with other elements, so it is sent to a plant. At the plant, the aluminum is dissolved into a liquid salt. Then an electric current separates the aluminum from other elements. The aluminum sinks to the bottom. The electric current requires an enormous amount of energy.
4. Next the aluminum is likely to be sent to another factory where it is melted and formed into cans.
 - a. The cans are sent to another factory where they are filled with liquid. The can is now shipped to a store to be sold. Once the can is sold, someone uses the liquid inside.
 - b. Assuming the consumer is a responsible recycler, the can is placed in a recycling bin. After the materials in the bin are collected, a truck picks up the material and takes it to a MRF (Materials Recovery Facility) to be sorted.
 - c. The cans are sorted and taken to a recycling plant. The aluminum is then shredded and melted and formed into a mold called an ingot (information taken from NEED book, page 27).
 - d. The aluminum is then perhaps re-formed into a can and the cycle begins again. Note that the cycle does not include mining the ore & separating the aluminum from other elements. This only has to be completed once.
5. Explain to students that this life cycle can be used to write a creative story about a can. Read aloud the included aluminum story or another you have created. Ask students to pay attention to how each part of the life cycle is used in the story. This will serve as a model of the story they will write independently.

Independent Follow Up:

Students will use the information provided from the NEED book, pages 15 and 31, (suggest students use other pages from the NEED book for background information) to write a creative life story of a piece of paper, starting from a tree. Have students complete a draft form for comments and then a final version. Their creative writing can be graded using the rubric. Use the aluminum can story as a model. Students can create their own "Paper Guy" to go along with the life cycle story using recycled materials. "Paper Guys" can be displayed alongside of the stories.

My Story: Alum, the Aluminum Can

Hi, my name is Alum. I am an aluminum can and have had a long and exciting life. It all started so long ago, I cannot even remember the exact date. I just remember being pressed tighter and tighter inside of this rock. I was happy to be there, it was safe & cozy and I had my whole family near by.

One day, there was a huge explosion. I was cracked apart. Then, these men came with hammers and ripped me out of my cozy home. They took me away to a plant. Once I was at the plant they put me into a big pot. They made it very hot and dissolved me into a liquid.

Next they ran a huge electric current through me. Wow – it used so much energy! I sunk to the bottom of the liquid, and the oxygen & other elements that had been with me went to the top.

They took me and sent me to another factory. I had to say goodbye to the other elements, because they did not come with me. They got me hot again, melted me, and made me into a flat sheet. Then they made me into something that is called a “can”. This is something that humans used to store liquid.

I then was sent to another factory – this one was called Pepsi. They painted me with neat colors and then filled me up with a sweet and fizzy liquid. Then someone put me in a truck where I rode for a while.

Remember how they made me so hot before? Well, now they made me very cold. I was put in a refrigerator in something called a vending machine. Next thing I knew, I was being bumped all around and came out of a slot. A kid’s hand reached out and grabbed me.

He opened me up, turned me upside down, and emptied me out inside of him! The kid seemed really happy to see me. But then I got scared. I thought, “What if this is the end? Maybe this will be all I ever do.”

Boy, was I wrong! This kid threw me in a special bin that only had other aluminum cans & plastic bottles in it. I even ran into my cousin, Inum, in there! He told me that everything would be okay. Next, someone lifted us out of the bin. I was glad that I could see out since the bag we were in was made of clear plastic. They took us outside.

That afternoon, a truck came. Someone emptied us into the back of the truck with a bunch of other aluminum cans and plastic bottles. The truck drove for about 30 minutes and then brought us to something they called a MRF. The plastic bottle next to me, Dottie Bottle, told me that MRF stood for “Materials Recovery Facility.” I didn’t get to see Dottie again because we were separated – all of the cans were put into one pile.

Then they took all of us aluminum cans to another factory. We were shredded up (Don’t worry, it didn’t hurt me. I don’t have any nerve endings.) and melted. They poured us into these molds, almost like you pour batter into a cake pan. We got hard. Then they melted us again and made us into aluminum sheets by flattening us.

Now here is the wildest part. Guess what they made me into next? Another can! This time I went to something called a grocery store. Someone drank the liquid inside of me, put me in a recycling bin, and then the whole process of being made into a can started over again.

I love being made into a can over and over again. I have gotten to see so many different parts of the world this way. Some cans tell me that I am lucky. There are ghost stories about cans who get put into something called the trash. They don’t get made into a can again. Instead they get buried in the ground with a bunch of other things. I just hope this never happens to me. I love being used over and over and meeting new people!

Well, that is my life story. You now know all about Alum, the aluminum can. Who knows, maybe I’ll meet you the next time you buy something in an aluminum can. Please, just make sure to remember to recycle me so I can keep going!

Student's Name _____

Creative Writing: Life Cycle of Paper

CATEGORY	4	3	2	1
Writing Process	Student devotes a lot of time and effort to the writing process (prewriting, drafting, reviewing, and editing). Works hard to make the story wonderful.	Student devotes sufficient time and effort to the writing process (prewriting, drafting, reviewing, and editing). Works and gets the job done.	Student devotes some time and effort to the writing process but was not very thorough. Does enough to get by.	Student devotes little time and effort to the writing process. Doesn't seem to care.
Neatness	The final draft of the story is readable, clean, neat and attractive. It is free of erasures and crossed-out words. It looks like the author took great pride in it.	The final draft of the story is readable, neat and attractive. It may have one or two erasures, but they are not distracting. It looks like the author took some pride in it.	The final draft of the story is readable and some of the pages are attractive. It looks like parts of it might have been done in a hurry.	The final draft is not neat or attractive. It looks like the student just wanted to get it done and didn't care what it looked like.
Organization	The story is very well organized. One idea or scene follows another in a logical sequence with clear transitions.	The story is pretty well organized. One idea or scene may seem out of place. Clear transitions are used.	The story is a little hard to follow. The transitions are sometimes not clear.	Ideas and scenes seem to be randomly arranged.
Spelling and Punctuation	There are no spelling or punctuation errors in the final draft. Character and place names that the author invented are spelled consistently throughout.	There is one spelling or punctuation error in the final draft.	There are 2-3 spelling and punctuation errors in the final draft.	The final draft has more than 3 spelling and punctuation errors.
Accuracy of Facts	All facts presented in the story are accurate.	Almost all facts presented in the story are accurate.	Most facts presented in the story are accurate (at least 70%).	There are several factual errors in the story.
Creativity	The story contains many creative details and/or descriptions that contribute to the reader's enjoyment. The author has really used his imagination.	The story contains a few creative details and/or descriptions that contribute to the reader's enjoyment. The author has used his imagination.	The story contains a few creative details and/or descriptions, but they distract from the story. The author has tried to use his imagination.	There is little evidence of creativity in the story. The author does not seem to have used much imagination.
Requirements	All of the written requirements (# of pages, # of graphics, type of graphics, etc.) were met.	Almost all (about 90%) the written requirements were met.	Most (about 75%) of the written requirements were met, but several were not.	Many requirements were not met.

NOTE: Information in the following four pages is taken from NEED Book: Museum of Solid Waste and Energy, pages 26, 13, 31, and 15.

RECYCLED PAPER

Recycled paper is made from waste paper, usually mixed with fresh wood pulp. If the paper contains ink, the paper must be **deinked**. Deinking also removes fillers, clays, and fiber fragments.

Almost all paper can be recycled today, but some types are harder to recycle than others. Papers that are waxed, pasted, or gummed—or papers that are coated with plastic or aluminum foil—are usually not recycled because the process is too expensive.

Even papers that are recycled are not usually recycled together. Waste papers should be sorted. You shouldn't mix newspapers and cardboard boxes together for recycling.

Different grades of paper are recycled into different types of new products. Old newspapers are usually made into new newsprint, egg cartons, or paperboard. Old corrugated boxes are made into new corrugated boxes or paperboard. High-grade white office paper can be made into almost any new paper product—stationery, newsprint, or paper for magazines and books.

Sometimes recyclers ask you to remove the glossy inserts that come with newspapers. The newsprint and glossy inserts are different types of paper.

Glossy inserts have a heavy clay coating that some paper mills cannot accept. Besides, a paper mill gets more recyclable fibers from a ton of pure newsprint than it does from a ton of mixed newsprint that is weighed down with heavy clay-coated papers.

NOT ALWAYS RECYCLABLE

Unlike most other recyclables, paper cannot be recycled over and over again. Eventually the fibers become too weak and short to be used again. That is why virgin paper fiber is usually mixed with recycled paper when new paper products are made. Most cardboard boxes are a mixture of 50 percent new and 50 percent recycled fibers.

SAVING ENERGY

So does paper recycling save energy? Yes it does, although the energy savings are not as spectacular as they are with aluminum and steel recycling.

PAPER*recovery*

In 1995, the paper industry in the U.S. reached its goal to recover 40 percent of all paper. Today, we recover about 42 percent of the paper we use.

When the industry's goal of 50 percent recovery is achieved, 20 million tons more paper will be recovered than landfilled.

Today, more than a third of all the paper that is recovered in the world is recovered in the U.S.

Old corrugated containers (boxes) account for nearly 50 percent of the total paper that is recycled.

WHAT HAPPENS TO RECOVERED PAPER

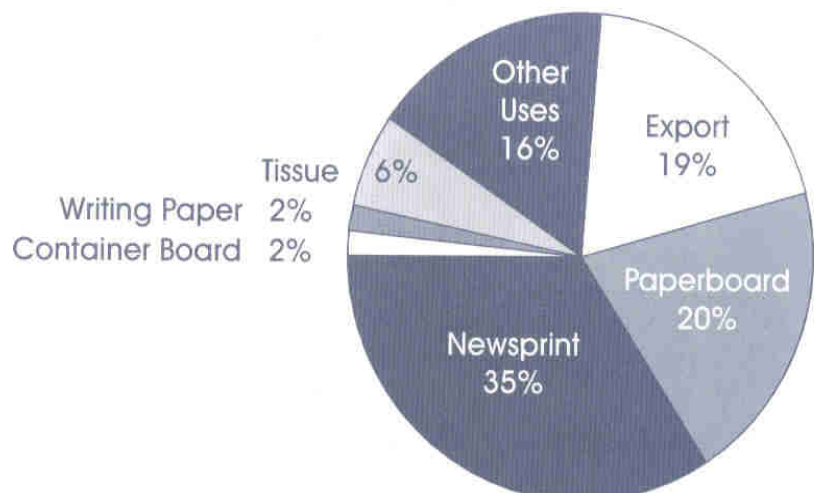


EXHIBIT 5—RECYCLING PAPER AND GLASS

RECYCLING PAPER

What is the number one material in trash? Look around your classroom. What do you see? Posters? Notebooks? Cardboard boxes? Textbooks? Bulletin boards decorated with construction paper? You get the picture. Paper is everywhere!

Paper is the number one material that we throw away. Of every 100 pounds of trash we throw away, 39 pounds is paper. Newspapers take up about 14 percent of landfill space, and paper packaging accounts for 15 to 20 percent.

There are many kinds of paper. It can be glossy or ragged, thin or thick. It can be for newspapers or stuffing diapers. Most paper products are made from trees, though paper can also be made from old cloth or grass.

HOW PAPER IS MADE

Papermaking uses a renewable resource—trees! The first step is cutting down the trees. Paper companies plant trees just for papermaking, like an apple farmer plants apple trees. If one tree is cut down, another is planted.

After the trees are cut, they are taken to a paper mill. Paper mills use every part of the tree, so nothing is wasted. The bark and roots are burned and used for energy to run the paper mill.

The rest of the tree is chopped into small chips to be made into paper. The raw paper is the color of grocery bags. Good papers are whitened with bleach and sometimes coated with clay to make them shiny.

Paper mills need a lot of energy to make paper. About 50 percent of their energy comes from burning wood scraps they cannot use to make paper. They buy the rest.

RECYCLED PAPER

Recycled paper is made from waste paper, usually mixed new materials. Almost all paper can be recycled today, but some types are harder to recycle than others. Papers that have wax, paste, or gum—or papers that are coated with plastic or aluminum foil—are usually not recycled because the process is too expensive.

