Lesson 3:
Researching Recyclables

At a Glance:

This lesson provides students the opportunity to follow the pathway of a recyclable material from the gathering and sorting stage through its production and marketing as a re-manufactured product. Following a set of guiding questions, students work individually or in small teams to research and take notes on specific stages of the process. They use only their notes to present their findings to the class. (Internet access recommended.)

Arizona Department of Education Academic Standards:

Please refer to the Arizona Department of Education Academic Standards section for the ADE standards addressed by this lesson.

Learning Objectives:

Students will be able to:

- ☛ explain the importance of producing and purchasing 'made from recycled' products in "closing the loop" in the resource use cycle
- ☛ research, list, define, and explain the steps used in creating a product of their choice from a specific recyclable material

Materials:

- ❑ Overhead Transparency: *Tucson Recycles*
- ❑ Student Handout: *Tucson, Where Does Your Recycling Go?* – photocopy one per student
- ❑ Overhead Transparency: *Environmental Benefits of Recycling*
- ❑ Student Worksheet: *Guided Questions for Researching Recyclables* – photocopy one per student
- ❑ Books and Internet availability for research on the recycling process
- ❑ Several items made from recycled materials (e.g., cardboard, polyester fabric, paper)

Procedure:

Part One: Research Preparation

1. Begin the lesson by writing the following words on the board or chart paper: Collection – Processing – Purchasing. Next, display the overhead transparency, Tucson Recycles, and point out the three "chasing arrows" on the Blue Barrel image at the top of the page. Explain that these arrows symbolize "closing the loop" in the sequence of materials use. Emphasize that a successful recycling program needs to include support from producers to use recyclables as resources and from consumers to purchase "made from recycled" products.

2. To further illustrate this process, brainstorm with the students a list of the basic natural resources and the recyclable products that are manufactured using them. List their responses on the board or chart paper. These may include resources such as bauxite (becomes aluminum for soda cans), trees (become paper), oil (becomes plastic), etc.

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Lesson 3: Researching Recyclables (continued)

Procedure: (continued)

3. Next, display a few items that are made from recycled materials such as those listed in the center column on the Student Handout, *Tucson, Where Does Your Recycling Go?*. Ask students to hypothesize which recyclable material was the main resource used to make the display item. Have them explain why they made the choice.

4. Ask students to name some of the potential benefits for using recycled materials to manufacture another product instead of using raw materials. These may include raw materials are saved for future generations, less energy is used to produce from recycled materials or it costs less to manufacture using recyclables.

5. Display the overhead transparency, *Environmental Benefits of Recycling.* Have several students read the text aloud and discuss some of the facts as stated. Ask students if they were a manufacturer, would they buy recycled materials as their primary resource for making their product. Encourage them to express their reasons why or why not.

6. Explain that during the remainder of this lesson the students will be conducting a brief online and/or literature research project focused on the manufacture of a product using a recyclable resource material. Provide note cards for their use. Pass out the Student Worksheet, *Guided Questions for Researching Recyclables* for the students to use while collecting information. Go over these questions aloud with the class to be sure they understand what they will need to do.

7. Have the students work independently or in pairs to research an object or material of their choice. They should gather information on the process of "closing the loop" for their chosen product including how the recyclable resource was collected, processed and re-manufactured. Cost and environmental benefits of the process should also be included.

Part Two: Presentation of Research

1. Provide a limited amount of time for the students to present their research findings to the rest of the class. You may also require them to have at least one illustration or diagram showing the pathway from sorting to processing to the manufacture of the product.

2. During the presentations you may choose to have the students in the audience take notes on specific aspects of each presentation. Students in the audience should use the guiding questions as a reference for these notes.

Extension Activities

- Have students complete a short written report using the note cards that they developed.
- Assign students to create a PowerPoint presentation of the recyclables' path to becoming a new product.

Overhead Transparency: *Tucson Recycles*

tucsonrecycles.org

Recycling & Waste Reduction

Weekly curbside recycling collection is offered to single family homes, duplexes, triplexes, fourplexes, and small businesses with plastic container garbage service. To order a free blue barrel recycling container and find out the recycling schedule for your neighborhood, call 791-3171.

There are also 16 neighborhood drop-off sites, convenient for households without curbside service and small businesses.

Guidelines for blue barrel recycling:

- **Please make sure materials are clean, empty and dry.**
- **Set out your blue barrel for collection when it is more than half full. Having the truck stop for nearly-empty containers increases fuel consumption and air pollution.**
- **Have the barrel out at the curb by 6 a.m. to ensure pick up.**
- **All recyclables go into the blue barrel together – no sorting! Please put them in individually, not inside a box or especially not in a plastic bag.**

Student Handout: *Tucson, Where Does Your Recycling Go?*

Where Does Your Recycling Go?

Tucson Recycles features an expanded list of recyclable materials, which the City collects from the blue recycling barrels and neighborhood recycling centers each week. These commodities are delivered to Waste Management Recycle America, a local materials recovery facility. There, the materials are sorted, baled and shipped to the manufacturers listed below to be made into new products. From their sale, the City of Tucson's share is approximately $1,000,000, in addition to the saving of expensive landfill capacity.

Information provided by Recycle America

Commodity	End Product	Company
Cardboard, newspaper, magazines	Cardboard, box board, blank newsprint	Abitibi Consolidated P.O. Box 128 Snowflake, AZ 85937
Cardboard	Packaging boxes, box liners, shoe paper (inserted inside new shoes)	McKinley Paper Co. 10501 Montgomery, Ste. 300 Albuquerque, NM 87111
Office paper, white ledger paper, colored paper	Tissue paper, white coating on cardboard	Weyerhaeuser 301 N. 30th St. Phoenix, AZ 85034
Phone books	Building/construction insulation	Green Fiber 601 S. 55th Ave. Phoenix, AZ 85043
Aluminum cans	Can sheet used to make new cans	Anheuser Busch Recycling 3636 S. Geyer Rd. St. Louis, MO 63127
Glass food & beverage containers	Glassphalt	Tucson Ready Mix I-10 at Orange Grove 744-3222
Tin cans	90% made into new steel; 10% sold to copper industry	AMG 1622 22nd Ave. Seattle, WA 98112
#1 PETE plastic bottles & jars	Polyester fiber to make comforters, pillows, clothing or carpet	Wellman Hwy. 41/51N Johnsonville, SC
#2 HDPE plastic bottles & jars	Drainage pipes, flower pots, other plastic items	USA Polymer Corp. 9295 Baythorne Houston, TX
Milk cartons, drink boxes	Writing paper	America Chung Nam 1206 Lexington Ave. Pomona, CA 91766
Chipboard/paperboard (like cereal boxes)	Filler medium for cardboard	America Chung Nam (same as above)

Overhead Transparency: *Environmental Benefits of Recycling*

Environmental Effects of Recycling

Material	Energy Savings with Recycled vs. Raw Material	Environmental Impact with Recycled vs. Raw Material	Natural Resource Savings with Recycled vs. Raw Material	Additional Information
Aluminum	95% energy savings; recycling of one aluminum can saves enough energy to run a TV for 3 hours	Reduces pollution by 95%	4 lbs. of bauxite saved, therefore, less mining, for every pound of aluminum recycled	Enough aluminum is thrown away to rebuild our commercial air fleet 4 times every year
Glass	50% energy savings; recycling of one glass container saves enough energy to light a 100-watt bulb for 4 hours	20% less air pollution; 50% less water pollution	1 ton of glass made from 50% recycled materials saves 250 lbs. of mining waste	Glass can be reused an infinite number of times; over 41 billion glass containers are made each year
Paper	60% energy savings	95% less air pollution; each ton prevents 60 lbs. of air pollution	Recycling of each ton of paper saves 17 trees and 7000 gallons of water	Every year enough paper is thrown away to make a 12' wall from New York to California
Plastic	Producing new plastic from recycled material uses 2/3 of the energy for making them from raw materials	Recycling a ton of plastic saves about as much energy as is stored in 197 gallons of gasoline	If we recycled every plastic bottle we used, we would keep 2 billion tons of plastic out of landfills	We use enough plastic wrap to wrap all of Texas every year
Steel	74% energy savings; every pound of steel being recycled saves enough energy to light a 60-watt bulb for 24 hours	Every year we create 11.5 million tons of ferrous wastes	One ton of recycled steel saves 2,500 lbs. of ore, 1000 lbs. of coal, and 40 lbs. of limestone	Enough iron & steel is discarded in the US to continually supply the nation's automakers

Sources: http://www.umass.edu/recycle/environmental_benefits.html *and* http://www.dnr.state.oh.us/recycling/plastics/vsdisposal.htm *and* http://www.cce.cornell.edu/~schuyler/recycle/fast_facts.htm

Student Worksheet:
Guided Questions for Researching Recyclables

Name:_____ **Class/Period**_____ **Date**_____

Instructions: Refer to the following questions to help guide your research on your chosen recyclable material or object. Develop a set of note cards to record your responses and organize your information. Sources should be cited on the last note card. Number the note cards to match the question that you researched. You will use only these cards when presenting your information in an oral report to the class.

There should be at least one note card for each question. If you are working with a group, the questions should be divided fairly among group members. The group is to decide the order of presentation.

Collection:

1. What are the main raw materials used in making this recyclable item?

2. How much of this item is produced and/or used in any given period of time?

3. How is this item typically disposed?

4. Where should the items go to be recycled?

Processing:

5. What products are made with your material or how is this object used?

6. What are the steps involved in recycling the object/material into the new product?

7. How does using the recyclable material in re-manufacturing benefit the environment?

Marketing:

8. Where is this product usually sold?

9. Who might buy this re-manufactured product?

10. Name and describe a unique invention or common item that is not currently known to you that might be made from recycled content in the future.

Research:

11. Cite the resources used in gathering the above information.