

Lesson 3: Using Recycled Materials Researching Recyclables

At a Glance:

This lesson provides students the opportunity to follow the pathway of a recyclable material from the recycling stage through its production and marketing as a re-manufactured product. Using a set of guiding questions, students work individually or in small teams to research and take notes on specific stages of the process. Students will present their findings to the class and will diagram how recycling their product can “close the loop” in the resource use cycle. (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 products made from recyclables in order to “close the loop” in the resource use cycle.
- ☛ Research and describe the steps used in creating a product of their choice from a specific recyclable material.

Materials:

- ☐ Display Sheet: *Closing the Loop* – use a Smart Board or overhead projector
- ☐ Display Sheet: *Environmental Benefits of Recycling* - use a Smart Board or overhead projector
- ☐ Student Worksheet: *Guided Questions for Researching Recyclables* – photocopy one per student
- ☐ Books and Internet for research on the recycling process
- ☐ Several items made from recycled materials (e.g., soda can, notebook paper, cereal box)

Procedure:

Part One: Research Preparation

1. Begin the lesson by writing “Closing the Loop” on the chalkboard. Ask students what they think it means in terms of the waste management issues discussed in Lessons 1 and 2.
2. Present the Display Sheet: *Closing the Loop* using a Smart Board or overhead projector. “Closing the loop” means that there should be a continuous cycle for a product from production, to purchasing, to consumption, to recycling, to ultimately returning to production. Using “paper” as an example, describe the process of “closing the loop” using the Display Sheet diagram: The natural resource is trees. After the trees are cut down and made into paper, the paper is purchased, then consumed. When the paper is no longer needed, it can be thrown away, to end up in the landfill – a dead end. To make more paper, we would have to cut down more trees. BUT, if the paper is recycled, then it can be made

Lesson 3: Researching Recyclables *(continued)*

into new paper, and the loop is closed - the cycle can continue. Note that "closing the loop" saves natural resources and saves space in the landfill (as discussed in Lesson 1).

3. Next, display a few items that are made from recycled materials. 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 other potential benefits (in addition to saving natural resources and saving space in the landfill) for using recycled materials to manufacture another product instead of using raw materials. Answers may include:
 - Less energy is used.
 - Less pollution is created.
 - Less water is used.
 - It costs less.
5. Present the Display Sheet: *Environmental Benefits of Recycling*. As an example, review "paper" to show the additional benefits of "closing the loop" and making paper from recycled paper.
6. Explain that during the remainder of this lesson students will be conducting an online and/or literature research project focused on the manufacture of a product using a recyclable resource material. Hand out the Student Worksheet: *Guided Questions for Researching Recyclables* to be used for their research. Review these questions aloud with the class to be sure they understand what they will need to do.
7. Have students work independently or in pairs to research a product of their choice. They should gather information on the process of "closing the loop" for their chosen product including how the recyclable resource is collected, processed and re-manufactured into the new product, followed by how it is marketed/purchased. Cost and environmental benefits of the process should also be included. Students should be sure to cite all sources used in their research. After their research has been completed, students should draw a "Closing the Loop" diagram for their specific product.

Note: It may be difficult to find all of the information about some products. Some general websites to get started include:

- <http://www.epa.gov/osw/conserve/rrr/buyrecycled.htm>
- <http://www.epa.gov/epawaste/conserve/smm/wastewise/wrr/buyman.htm>
- <http://www.calrecycle.ca.gov/recyclestore/>
- <http://www.closestheoop.com/home.html>

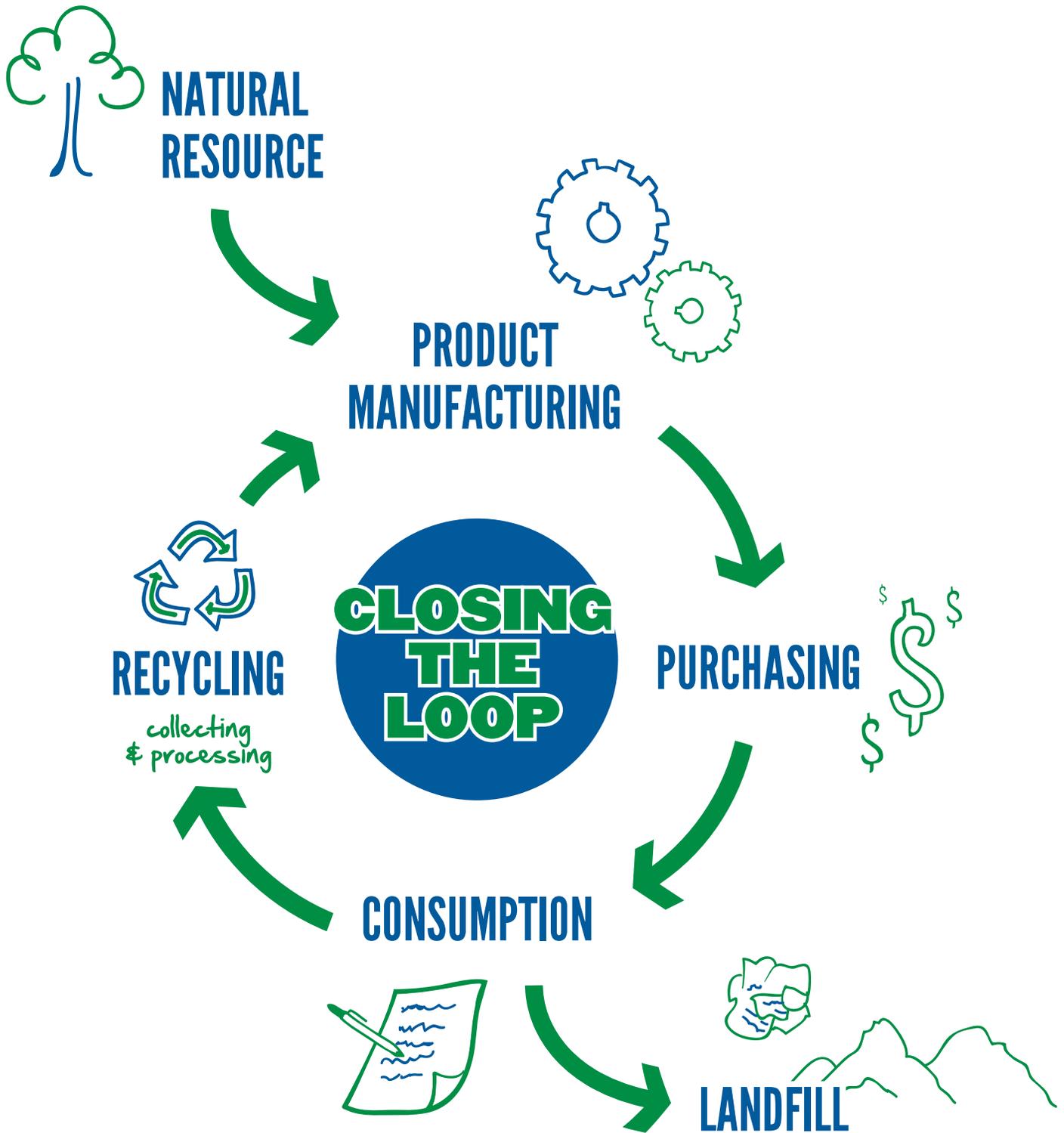
Lesson 3: Researching Recyclables *(continued)***Part Two: Presentation of Research**

1. Have students present their research findings to the rest of the class.
2. During the presentations you may choose to have the students in the audience take notes on specific aspects of each presentation.

Extension Ideas:

- Have students complete a written report about their recyclable's path to becoming a new product.
- Assign students to create a poster or PowerPoint presentation of their recyclable's path to becoming a new product.
- Have students look at packaging and labels of products at home and school to discover if they are using products made from recycled materials.
- Take the Recycling Geography Challenge at tucsonaz.gov/recyclegame to learn about where recyclable materials in Tucson go, and what these materials are turned into after recycling. (Note 1: It may take a few minutes for the website to load; Note 2: The specific information about where the recyclables are sent to may no longer be accurate now that Tucson has a new MRF, but the game is still beneficial because it shows students that many products can be recycled and are sent to a variety of locations around the world.)
- Discuss the differences between upcycling (converting waste materials into new materials or products of better quality) and downcycling (converting materials into new materials of lesser quality).
- Have students make their own upcycled products. Some ideas can be found at http://toponlineengineeringdegree.com/?page_id=116 and <http://www.upcyclemagazine.com/>.

Display Sheet: Closing the Loop



Environmental Benefits 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

Student Worksheet: Guided Questions for Researching Recyclables

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

Product _____

Natural resources used to make the original product _____

Part 1. Research

Refer to the following questions to help guide your research on your chosen recyclable product. Be sure to record your sources in the Works Cited section below. Attach additional paper as needed.

A. Collection of Recyclable Product:

1. How is this product typically disposed of/recycled?

2. After being sorted at the local MRF, where does your product's material go to be processed for remanufacturing?

B. Recycling Process:

3. What are the steps involved in recycling the old product into the new product?

4. What are some specific products made using the materials from your old product?

Student Worksheet: Guided Questions for Researching Recyclables (continued)

5. What are the benefits of using recyclable material to make the new product?

C. Marketing/Purchasing:

6. Where is the recycled product usually sold?

7. Who might buy this recycled product?

8. How does the price of the recycled product compare with the price of the same product made from non-recycled materials (original natural resources)?

Student Worksheet: Guided Questions for Researching Recyclables (continued)

Part 2. Diagram

Draw a “Closing the Loop” diagram for your product. (Determine how you will show it to the class during your presentation – draw on the chalkboard, make a poster, use a Smart Board, or use an overhead projector.)

Part 3. Works Cited

Cite the sources used in your research. Attach additional paper as needed.