

LESSON 3: Model Community Relay

LESSON'S CONCEPTS

- People can reduce their solid waste by learning the ways that waste can be sorted, according to materials which can be reused and recycled.
- Through the process of reusing and recycling, people can save the energy and natural resources it takes to acquire and manufacture items from raw materials.

PURPOSE

Students will learn the difference between reusing and recycling, and they will learn that reusing and recycling materials are more energy-efficient practices than making new items from raw materials.

OVERVIEW

In this lesson students will:

- Listen to and/or read parts of *Recycle!* by Gail Gibbons to identify the difference between reusing and recycling.
- Use clay to mold a new item and/or make recycled paper in order to understand the process of recycling.
- Compare reusing to recycling.
- Work in teams and participate in a relay race to show how waste can be diverted from a landfill through reusing and recycling practices.

CORRELATIONS TO CALIFORNIA'S CONTENT STANDARDS AND FRAMEWORKS

- Students identify items that are reusable and recyclable and describe at least one way a reusable item can be reused.
 - Students "use details, examples, anecdotes, or experiences to explain or clarify information." (*English–Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve*, page 26)

- Students classify ten objects by categories of those that can be reused, recycled, or need to be sent to a landfill.
 - Students "classify objects . . . based on appropriate criteria." (*Science Content Standards, Grades K–12; Grade 5; Investigation and Experimentation, Standard 5a*)
- Students read *Recycle!* by Gail Gibbons to identify the difference between reusing and recycling.
 - "Students read and understand grade-level-appropriate material." (*English–Language Arts Content Standards for California Public Schools, Kindergarten Through Grade Twelve*, page 21)

SCIENTIFIC THINKING PROCESSES

observing, communicating, comparing, classifying, relating, inferring

TIME

30–45 minutes to prepare for the lesson;
60–90 minutes to implement the lesson

VOCABULARY

raw material, recycling

PREPARATION

1. Read the "Background Information for the Teacher" at the end of this lesson.

- 2. Read “Procedure, Part II,” section “C” in this lesson and decide whether you want your students to mold clay, make recycled paper, or do both. If students will be making recycled paper, see the K–3 Module, Unit 2, Lesson 4, gather the materials, and follow the procedure described in that lesson.
- 3. Make a copy of “Model Community Relay Planning Sheet” for each group of students (page 339).
- 4. Find out what materials can be recycled in your community. Contact your local recycling coordinator for more information. (For a telephone number of your local recycling center, check your telephone directory.)

Note: For this lesson, students should know which items can be recycled in their community.

MATERIALS

For “Pre-Activity Questions”

- A pile (approximately ten pieces) of unsorted clean garbage and a plastic tarp on which to place the garbage (which should be different from the garbage described in Part III); there should be at least three recyclable (e.g., paper, cardboard, aluminum) and two reusable items (plastic container, article of clothing).

For “Part I, Reading *Recycle!* by Gail Gibbons”

- The book *Recycle!* by Gail Gibbons (a second copy of this book could be useful)

For “Part II, Understanding the Difference Between Reusing and Recycling”

- A piece of clay (about one-fourth of a pound) for each student and/or materials from the materials list from the K–3 Module, Unit 2, Lesson 4

For “Part III, Participating in a Trash Relay Race”

- At least ten pieces of clean unsorted garbage for each team of five to eight students (Each team should receive the same type of garbage; for example: [1] piece of white paper; [2] piece of cardboard; [3] aluminum can; [4] plastic cup; [5] an article of clothing; [6] jar; [7] polystyrene [Styrofoam] meat tray or cup; [8] tissue; [9] soup can; and [10] paper plate.)
- Masking tape and nontoxic permanent marker

- One container for reusables labeled “reuse”
- One container for recyclables labeled “recycle”
- One container for waste to be landfilled labeled “landfill”

PRE-ACTIVITY QUESTIONS

With the pile of unsorted garbage in front of the students, lead a discussion:

- Name three items in this pile that can be recycled. *Paper, cardboard, aluminum.*
- Name two items in this pile that can be reused. *Plastic container, article of clothing.*

Note: Students will learn the difference between reusing and recycling in this lesson, so you do not need to explain the difference at this time.

- When we put waste into a garbage can, where is it taken for disposal? *To the landfill.*

PROCEDURE

Part I, Reading *Recycle!* by Gail Gibbons

Note: Keep the pile of unsorted garbage where students can see it, as they read the book *Recycle!*

- A. Have students read *Recycle!* by Gail Gibbons. The reading can be separated into two sections, so one section could be read before recess and the other section after recess. You can also select specific pages for students to read, instead of having them read the entire book. One focus should be for students to find out about the connection that recycling has to saving energy. (The concept of *energy* was introduced in Lesson 1 in this unit.) Students should also become aware of how things are recycled. Consider using one of the following methods for the class to get the information from the book:
 - Have one student read a page and show the corresponding illustration to the class. Ask a second student to describe the illustration. Other students can add to the description of the illustration. Then have a third student read the next page, and have a fourth student describe the illustration. When a specific type of material is discussed in the book, students can select that material from the pile of unsorted garbage used in the “Pre-Activity Questions.”

Note: If you have access to two books, then one student can read while another can show the illustrations.

- Pages could also be made into overhead transparencies (you might need to ask the permission from the publisher to do this) and students can read these.
 - A class set of this book can be purchased, and each student can read independently. Then conduct a class discussion.
- B.** Discuss with students what the book, *Recycle!* says about recycling and energy. *Energy is saved when an item is made from recycled materials compared to when the item is made from raw materials.* If needed, share with students additional information about the amount of energy needed to make an aluminum can from scratch versus making a new aluminum can from a recycled can. (Recycling one aluminum can will save 95 percent of the energy that it would have taken to make a similar aluminum can from raw materials. See “Background Information for the Teacher” for additional information.)

Part II, Understanding the Difference Between Reusing and Recycling

- A.** Discuss with students the difference between reusing and recycling. Explain that when an item is reused, it is used as is, although it might get decorated or cut. When an item is recycled, this “old” item will be remanufactured into a new item. Therefore, after you put an item in a place where someone picks it up to be recycled, the item is taken to a manufacturing plant where the item is made into another item. It could be that a can is made into another can, but in order to do that, the original can had to be melted and reshaped into a new can. Newspaper is often recycled to make new newspaper; other paper is recycled and made into cereal boxes and other boxes; used glass is made into new glass containers; and some plastics are recycled into new items, such as combs and plastic siding for homes.
- B.** To illustrate the difference between reusing and recycling, show students a can. Have students brainstorm ways this item can be reused and list these on the chalkboard.

- C.** To illustrate the idea of recycling, which is making a new item out of old material, do one or both of the following:
- Provide each student with a lump of clay. Ask the students to shape the clay into cans and pretend that they are aluminum cans. Then ask them to trade their “cans” with one another for purposes of recycling the cans. (This represents the transportation of recyclables to a location for recycling.) Each student should roll the clay can into a ball and mold another can out of it, or another item, such as an “aluminum” baseball bat. (This represents a manufacturing plant using recycled material to make new items.)
 - Conduct the lesson on paper recycling, described in the K–3 Module, Unit 2, Lesson 4.

Part III, Participating in a Trash Relay Race

Note: Make certain that each team receives the same types of garbage for the relay. This makes the relay more equitable, because it ensures that the only variable will be how team members choose to dispose of or use the garbage.

- A.** Form teams of five to eight students in each team. Assign a number to each team. Make certain that each team has a waste pile containing the same type and equal number of recyclable or reusable items among the nonrecyclable and nonreusable items.
1. Provide the garbage to be used in the relay, masking tape, and a permanent marker to each team. Ask students to write their team’s number on a piece of masking tape and to tape it on each item.
 2. Explain that each team represents a community group that wants to lower the amount of waste going to the landfill. Provide a copy of the “Model Community Relay Planning Sheet” to each team. Review with students the materials that can be recycled in their school or community. If you were able to get brochures, have students read these as a group.
 3. Ask teams to sort their trash and categorize each item into one or two of the following areas:
 - Can be reused.

- Can be recycled.
 - Should be taken to a landfill.
4. Tell students that under the category of “can be reused,” each team must describe at least one way the item placed in that category can be reused.
 5. Give each team ten minutes to plan its waste disposal strategy and to complete the chart.

Type of trash	Reused (how)
White paper	Use it for scratch paper. Make an Origami. Make a book cover.
Jar	Coin holder. Water bottle.
Aluminum can	Cut it in half and use it as a planter. Make a pencil holder or a mini trash can.
Article of clothing	Use it to make a quilt. Use it to make doll dresses. Make a table cloth.
Styrofoam	Use it for a box for little toys. Make a bug house or science project.

Submitted by Tina Porter’s science class, Curtner Elementary School, Milpitas Unified School District.

- B. Set up the “reuse” container approximately 10 feet from the starting line; the “recycling” container 20 feet from the starting line; and the container representing the “landfill” as far away on the playground as is reasonably possible. This set up reflects the relative amount of energy required to replace the item for each waste management option.

Note: This relay does not necessarily reflect the energy it took for the consumer to reuse, recycle, or dispose of the item.

- C. Before beginning the relay, review different ways people can deal with waste. Ask students:
 - How does waste get to a landfill? *Residential garbage collection, self-haulers, commercial garbage collection.*
 - What costs are involved in getting waste to a landfill? *Fuel, labor, vehicle maintenance, cost of land space, cost of building and maintaining a landfill.*

- What reasons would communities have for locating their landfills as far away as possible? *Lower population; if situated near a community, there would probably be more traffic and noise from heavy equipment, as well as more air pollution.*
- Is there some type of waste that is not allowed to be dumped in a landfill? (Students might not know about household hazardous wastes.)

Note: Household hazardous wastes are introduced in the 4–6 Module, Unit 4.

- D. Have teams bring their lists, and lead students outside to participate in the relay.
 - Show students the playing area and the “reuse,” “recycle,” and “landfill” containers. Explain that the “reuse” container is closer than the “recycle” container because it takes less energy and natural resources to reuse an item than to recycle it into another product. Ask why the “landfill” container is farther away than the “recycle” container. (Students should say that it usually takes less energy and natural resources to recycle an item than to make a new item from raw materials.)
 - Explain the rules of the game: This is a modified relay race in which only one person at a time from each team can put something in one of the containers and only one item at a time can be deposited. Each group should follow the plan it recorded in the classroom.
- E. There are two suggested ways to organize this relay, “Option 1” and “Option 2.”

Option 1

Call out each item (e.g., paper plate). One student from each team should grab the item and run to the appropriate container. As soon as one student (from any team) returns, call out the next item (e.g., article of clothing). Another member from a team cannot run until the previous team member has returned. Continue calling out items until all items have been placed in the containers.

- The winning team can be the one that finished first, reused the most number of items, had the least number of items placed in the landfill, or had the most creative ways of reusing items. (You can add win-

ning criteria until each team becomes a winner.)

- Have students share ways they planned to reuse items placed in the reuse box.

Option 2

Allow students from each team to select the order of the items they will place in various containers. On a signal, one student from each team places one item in one container and returns to the team. When the team member returns and touches another team member, that team member can then run with an item and place it in the appropriate container. Team members continue running the relay until all items are placed in containers and the last team member is back with the team. Select one specific reason for each team to be a winner.

Note: A compost container can be added as an option. If it is backyard composting, then the container should be placed next to the reuse container. If it is curbside collection of compost materials, then the container should be placed next to the recycle container. Discuss with students why they think the compost container was placed at a specific distance (next to the reuse or the recycle container). Explain that composting is considered recycling, because the compost is usually changed to “new” soil.

Note: Composting is introduced in the 4–6 Module, Unit 3. Vermicomposting is introduced in the K–3 Module, Unit 3.

- F. When the last team finishes sorting its waste, gather everyone together. Bring the reuse, recycle, and landfill containers to class.

DISCUSSION/QUESTIONS

- A. Review the items in the different containers. Are the items in the reuse bin items that are commonly reused? How often are these items really reused? Why? For example, point out that while some people occasionally reuse polystyrene (Styrofoam) cups or meat trays, most of them usually end up in the landfill.
- B. Ask students:
- What methods of waste disposal did each winning team use? *A team recycled and reused materials to the greatest extent possible; a team reused the most number of materials; a team had the least number of materials in the landfill container.*

- How is energy saved by recycling paper? Share with students that making one ton of paper from recycled paper uses 30–64 percent of the energy needed to make paper from raw material (wood). Discuss the meaning of *raw materials*. Raw materials are the original natural resources, such as trees, minerals, and fossil fuels, that are used by people to manufacture products.
- In what other ways is energy tied up in waste? *In acquiring the raw materials, in the manufacturing and transporting of products, in packaging that becomes waste.*
- What does our community do with our waste? *Some of it is recycled; the rest goes to a landfill.*
- What have we learned from this game that might help our school better manage its waste? *Our school should reuse and recycle more materials.*

APPLICATION

Note: With younger students do “A” as a class.

- A. Ask students to work in groups and to select a material often recycled (other than paper), such as aluminum, glass, and plastic. Have each group develop an illustration or diagram of ways energy is used in bringing the object to the store, using raw materials, and then using recycled materials. Make a bulletin board display for your classroom or display the information on the school’s bulletin board.
- B. Remind students of the waste management hierarchy they were introduced to in Lesson 2:
- Waste prevention (also called source reduction) (reducing and reusing)
 - Recycling and composting (including buying products made from recycled materials)
 - Environmentally safe incineration (burning waste-to-energy) and land disposal (landfilling that minimizes impacts on the environment)
1. Reinforce the idea that because of the energy savings and the number of natural resources conserved, this hierarchy serves as a way of setting up priorities for dealing with garbage. Ask students:

- Which products can you reduce your use of?
 - How would your lives be different if you reduced your use of those products?
 - Which products couldn't you reduce your use of?
 - How will your lives be different if you reduce your use of those products?
2. Conduct a discussion on how students can reduce, reuse, and recycle items in their everyday lives.

C. Encourage students to write a pledge describing at least one thing they will do to reduce, reuse, and/or recycle.

Project Idea: Students set up recycling bins in areas at school or in a nearby park that do not have one.

EXTENSION

Visit a nearby recycling center in your community or invite a community recycling coordinator to speak to your class.

RESOURCES

Videos

Recycle. Chatsworth, Calif.: Pied Piper/ AIMS Media, 1992 (16 minutes).

Shows how several items are broken down, sent through the recycling process, and manufactured into new products.

Recycle It! Northbrook, Ill.: Film Ideas, Inc., 1993 (16 minutes).

A music video featuring the World Patrol Kids, who explain how aluminum, plastic, paper, and glass are recycled at industrial plants.

Recycle That Trash. Santa Monica, Calif.: Pyramid Film and Video, 1990 (18 minutes).

Shows students from the town of Goleta, California, participating in various recycling activities. The students visit a landfill, a transfer station, and a recycling center and begin recycling programs at home.

Recycling. Earth Science series. Northbrook, Ill.: Film Ideas, Inc., 1994 (20 minutes).

Shows how products get to market through the mining, milling, and refining of raw materials. Explains why recycling and reprocessing waste is important.

Recycling: The Endless Circle. Washington, D.C.: National Geographic, 1992 (25 minutes).

Explains how recycling returns used materials to make new products, therefore reducing waste. The processes involved in recycling paper, aluminum, and plastic are described.

A Recycling Update. The Green Earth Club series. Chatsworth, Calif.: AIMS Media, 1992 (15 minutes).

Explains how used bottles and cans are processed into new materials.

Books

Fifteen Simple Things Californians Can Do to Recycle. Prepared by The EarthWorks Group and the California Department of Conservation's Division of Recycling. Berkeley: EarthWorks Press, 1991. Prepared for and distributed by the California Department of Conservation.

Provides information on how to recycle.

Gibbons, Gail. *Recycle! A Handbook for Kids.* New York: Little, Brown and Company, 1992.

Easy-to-read style and colored illustrations explain the importance of recycling and describe how various materials are recycled.

Websites

The California Integrated Waste Management Board's website is: www.ciwmb.ca.gov.

The Steel Recycling Institute's website is: www.recycle-steel.org.

For additional websites, see "Appendix F-I, Award and Activities websites," and "Appendix F-V, Recycling websites."

Team Members: _____

Team Captain: _____

MODEL COMMUNITY RELAY PLANNING SHEET

List each type of waste, describe how it can be reused, and put a check mark in the appropriate column to indicate whether it can be recycled or needs to be taken to a landfill.

Type of waste	Can be reused (describe how)	Can be recycled (or composted)	Needs to go to the landfill
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

4-6 Module
Unit 2

BACKGROUND INFORMATION FOR THE TEACHER

In California in 1997, approximately 32 percent of the garbage was diverted through waste prevention and recycling (including composting), 2 percent was incinerated (waste-to-energy), and 66 percent was put in landfills.¹ When solid waste is diverted from the landfill through reusing and recycling efforts, natural resources (including energy resources) are conserved.

Recycling is the process of taking an item and remanufacturing it into another item. Technically, recycling is different from reusing. When you reuse an item, you use it as is, although you might cut it or decorate it. When you recycle an item, this item will be remanufactured into a new item. For example, an aluminum can is melted down and reshaped into a new aluminum can or another aluminum product. Newspaper is often recycled to make new newspaper; other paper is recycled and made into cereal boxes and other boxes. Used glass is made into new glass containers or asphalt (called “glassphalt”) for roads. Some plastics are recycled into new items, such as hair combs and plastic siding for homes.

When an item is recycled, and therefore manufactured into another product, much less energy is needed to manufacture that new product, compared to the energy that would have been needed to produce the product from raw materials (i.e., newly extracted material). For more information on recycling, see “Appendix B–III, Recycling.”

Aluminum is made from a mineral called bauxite. Bauxite ore is found in rocks, and large amounts of energy (usually fossil fuels to power bulldozers, trucks, and other machines) are needed to dig up the rock, ship the rock to a manufacturing plant, and separate the bauxite from the rock. Then it takes large amounts of energy to create aluminum from the bauxite ore as it is mixed with soda ash and lime and put under pressure. Then energy (often provided from burning coal and oil) is needed to melt the aluminum, which is then poured into molds. Finally, energy is used to transport the molded items to distribution centers and the completed products to stores.

On the other hand, recycling one aluminum can saves 95 percent of the energy that would be used

to make an aluminum can from raw materials.² Enough energy is saved by recycling one aluminum can into another to power a television for three hours. This is approximately equal to the energy that can be produced by half a can of gas. For more information on aluminum, see “Appendix C–I, Aluminum.”

Recycling other materials, such as paper, also saves energy. Making one ton of paper from recycled paper uses 50–70 percent less energy than it would have taken to make paper from raw material (wood). In addition to saving energy, the process of recycling reduces the amount of water and soil that would have been needed if raw materials had been extracted and processed to produce the paper. The recycling process also creates less air pollution. For more information on paper, see “Appendix C–VII, Paper.”

The purpose of this lesson is to emphasize to students that when materials are placed in a landfill, the materials from which the item was originally made are also disposed, and the energy that it took to make the item is wasted. Therefore, by placing the “recycling” container in the relay (in this lesson) closer to the students than the “landfill,” there is an emphasis that through recycling, natural resources, energy, and fossil fuels are conserved. We are also saving landfill space.

Reusing an item is more energy efficient than recycling, because the item typically does not need to be shipped anywhere and remanufactured into another product. Some people are concerned that recycling has been made so convenient that many people choose not to reuse items. In the relay, the reuse container is closer than the recycling container to show that reusing items is more energy efficient than recycling the same items.

Reducing waste saves more energy and natural resources than would be saved through reusing or recycling materials. By “reducing” the amount we use, we generate little or no waste. The concept of reducing will be addressed in the 4–6 Module, Unit 2, Lesson 5.

¹Written communication on November 23, 1998, from John Sitts, Supervisor, Waste Analysis and Methods Section, Waste Analysis Branch, California Integrated Waste Management Board.

²G. Tyler Miller, Jr. *Environmental Science: Working with the Earth* (Fifth edition). Belmont, Calif.: Wadsworth Publishing Company, 1995, p. 345.