

Recycling Paper

BROWARD COUNTY ELEMENTARY SCIENCE BENCHMARK PLAN

Grade 5—Quarter 4

Activity 33

SC.D.2.2.1

The student knows that reusing, recycling, and reducing the use of natural resources improve and protect the quality of life.

SC.H.3.2.4

The student knows that through the use of science processes and knowledge, people can solve problems, make decisions, and form new ideas.

ACTIVITY ASSESSMENT OPPORTUNITIES

The following suggestions are intended to help identify major concepts covered in the activity that may need extra reinforcement. The goal is to provide opportunities to assess student progress without creating the need for a separate, formal assessment session (or activity) for each of the 39 hands-on activities at your grade.

1. Have students make a list of pros and cons for recycling paper like they did by making the bowls. Ask them to include tasks they think would be easy to do. Also have them include tasks that could be a problem if the recycling effort was increased to include the whole town or city. (Collection might be easy, but the storage of such large amounts of paper might be a problem. Tearing or cutting the paper might be easy on a large scale, and dipping the strips into a large container of paste might also be easy. But, placing the individual strips in place would require a lot of time and people.)
2. Use the Activity Sheet(s) to assess student understanding of the major concepts in the activity.

In addition to the above assessment suggestions, the questions in bold and tasks that students perform throughout the activity provide opportunities to identify areas that may require additional review before proceeding further with the activity.

Recycling Paper

OBJECTIVES

Students investigate one method of recycling paper and then brainstorm additional uses for recycled-paper products.

The students

- ▶ recycle old newspaper into papier-mâché bowls
- ▶ examine the properties of paper to determine its suitability for other uses
- ▶ brainstorm ideas for other recycled-paper products

SCHEDULE

About 45 minutes

VOCABULARY

recycle

MATERIALS



For each student

- 1 Activity Sheet 33
- 1 pr safety goggles*

For each team of four

- 1 balloon
- 1 container, fluted, 1/2-gal
- 1 cotton ball
- 1 stack newspaper*
- 1 tray, plastic, clear

For the class

- 1 ladle (or cup)*
- 1 btl oil, cooking

- 1 pail*
- 1 pkg paste, wallpaper
- water, tap*

*provided by the teacher

PREPARATION

- 1 Make a copy of Activity Sheet 33 for each student.
- 2 One week before the activity, ask students to begin saving old newspapers. A day or two before the activity, have the students bring them to class.
- 3 In a large pail, slowly combine the package of wallpaper paste with 1 gal plus 2 cups of water. Add the paste a few spoonfuls at a time, stirring continuously to prevent lumps. The mixture should be the consistency of cream.
- 4 Establish a materials distribution center for the following items: the pail of paste, a ladle (or cup) for ladling paste, 1/2-gal fluted containers, trays, balloons, cotton balls, the bottle of cooking oil, and a large pile of old newspapers.
- 5 Each team of four students will need one tray, one fluted container into which 3 cups of paste have been ladled, one balloon, one cotton ball saturated with about half a teaspoon of oil, and a small stack of newspapers.
- 6 You will also need to clear an area where the students' papier-mâché bowls can dry. A warm, sunny spot will speed drying. Cover the area with newspaper to protect from drips.

BACKGROUND INFORMATION

In the last two activities, students learned firsthand how quickly trash is generated, trash that eventually ends up in landfills—or worse yet—as litter. Subsequently, many students will be eager to examine ways to reduce the amount of waste they produce.

Recycling is one of the most effective ways to reduce waste. It not only saves landfill space but also conserves natural resources, such as trees. Unfortunately, hundreds of recycling programs in this country have had to reduce the amount of materials they collect, or exclude some recyclable materials altogether, simply because there is no one to sell them to. Recycling works only if there is a market for the recycled materials.

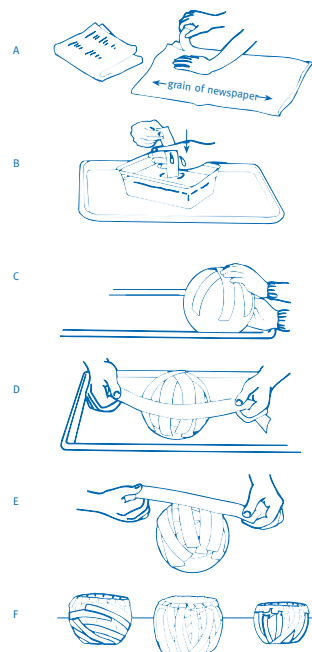
In this activity students “manufacture” a product from recycled newspaper: a papier-mâché bowl. Then they examine the properties of newspaper that make it suitable for other uses, and brainstorm ideas for additional products that can be made from recycled newspaper.

▼ Activity Sheet 33

Recycling Paper

Follow the directions below to make a papier-mâché bowl.

1. Tear newspaper (with the grain) into strips 5 cm (2 in.) wide (Figure A). Blow up and tie the balloon. Wipe the balloon with the oil-coated cotton ball.
2. Dip the newspaper strips into the paste, coating both sides and using your fingers to remove excess paste (Figure B).
3. Apply the first layer of strips in a star pattern over the rounded end of the balloon (Figure C).
4. Apply the second layer of strips in a horizontal pattern around the mold (Figure D). Apply the third layer around the mold at right angles to the second.
5. Apply the fourth layer of strips diagonally to the strips that are on the mold (Figure E), and the fifth layer at right angles to the fourth. Repeat the steps for added strength.
6. Prepare the bowl for drying: Pop and remove the balloon. Reshape the bowl, slightly flattening the base so that it does not rock (Figure F). Set the bowl out to dry. If you wish, apply short strips around the rim of the bowl to build it up.



Guiding the Activity

- 1 Remind students of the ideas they came up with for reducing the amount of waste paper the class generates. Write the term *recycle* on the board and tell students that **recycle** means “to use a material again in the same or in a new way.” Explain that the material may retain its original form or be changed in some way to make something totally new.

Point out that recycling is an excellent way to reduce waste, but that recycling only works if there is someone who will buy those products made from recycled materials. In other words, the new product must be useful and affordable, and there must be a demand for it.

Additional Information

Guiding the Activity

Ask, **What is one product that is made from recycled paper?**

Tell the students that they will investigate one method of recycling old newspaper and that after they have experimented with this method, they will have the opportunity to come up with some ideas for additional recycled-paper products.

2 Divide the class into teams of four and invite one member from each team to come up to the distribution station and get a tray, a fluted container filled with three cups of paste, a balloon, a cotton ball saturated with oil, and a stack of newspapers.

3 Distribute **Activity Sheet 33** and review the instructions with the students, reminding them to share tasks throughout the activity.

4 While some team members tear the newspaper into strips about 5 cm (2 in.) wide, have the others blow up the balloon, tie it off, and wipe the rounded end with the oil-soaked cotton ball.

5 Have the students take turns holding and turning the balloon mold and dipping strips into the paste and applying them to the mold, as shown on the activity sheet.

6 After the students have applied at least five layers of paper strips to the mold, the bowls are ready to dry. Have them pop the balloon with their pencils, remove it, reshape the wet papier-mâché shell if needed, flatten the bottom so that it will stand up by itself, and set it out to dry (see Figure 33-1).

Additional Information

Most students will know that used paper can be recycled into new paper products, such as grocery bags. Encourage the class to come up with additional uses for paper waste.

Although students can work on trays, you may wish to have them cover their work areas with newspaper to keep them clean.

Tell students that their products will be stronger if they tear their paper strips “with the grain.” To determine which direction this is, have them tear one sheet of newspaper vertically, then horizontally. The straightest, cleanest tear is the one made “with the grain.”

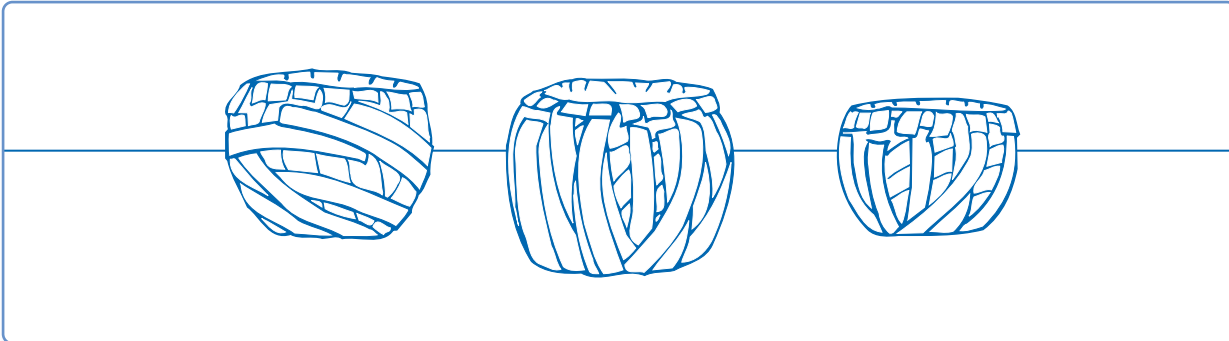
The balloon is the mold for the papier-mâché bowl. Coating it with oil will make it easier to separate the bowl from the balloon later on.

This drying method may result in some odd-shaped bowls, depending on the thickness of the papier-mâché, but the bowls will dry faster and ultimately be more stable than if they had been left to dry on the balloon.

Guiding the Activity

Additional Information

Also note that drying times will vary from one bowl to the next. Most bowls should be dry in about one day. If a bowl feels cool to the touch, it is not yet dry.



▲ Figure 33-1. Drying the papier-mâché bowls.

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Once the bowls have been set out to dry, begin a class discussion by asking, **What are some properties of newspaper that made it easy to form into bowls?**

Ask, **What are some other properties of newspaper that might make it a good material for making things?**

Encourage students to brainstorm by asking, **Based on these properties, and the recycling technique that you used today, what are some additional products that could be made from recycled newspaper?**

Next, engage students in a discussion of the feasibility of each proposed product. For each item ask, **Is this product something that a lot of people would need or want? What would be involved in making the product? Would it take a long time to make? Would it require a lot of extra materials? How much would the product cost to make? How much would you sell it for?**

Students should realize that they were able to form the bowls because wet paper conforms to any shape.

Most students know that newspaper is absorbent, can take on color, is a good insulator, burns when exposed to heat and flame, and dissolves when wet.

Write all student responses, no matter how outlandish, on the board. If students have trouble coming up with ideas, offer a few suggestions to get them started. Building blocks, furniture, trays, storage boxes, shoes, aprons, and toys could all be made from old newspaper.

By going through this process, students should realize that some of the products that have been suggested are more practical than others.

Guiding the Activity

Have students try to come to a consensus regarding which recycled-paper products are the most and least practical. Then ask, **Which recycling program is more likely to succeed: one that collects newspapers to turn into shipping insulation, or one that collects newspapers to turn into clothing?**

Additional Information

Students should acknowledge that the program that turns recycled materials into useful, affordable products is the one most likely to succeed.

REINFORCEMENT

Divide the class into teams and have each team discuss the characteristics of several materials that are currently recycled (glass, cardboard, aluminum, plastic, and so forth). Have them think about how the material is recycled and what products are made from that material. Then have them develop an idea for a product that could be made from the recycled material. Make sure they consider the feasibility—the usefulness and cost—of each of their product ideas.

SCIENCE JOURNALS

Have students place their completed activity sheets in their science journals.

CLEANUP

Discard the cotton balls, popped balloons, and unused paste into a wastebasket lined with a plastic bag. Rinse the pail, ladle, trays, and fluted containers, and return all kit materials. Bundle up any leftover newspaper and save for recycling.

SCIENCE AT HOME

Have students try making some of their suggested products at home. For papier-mâché projects, tell them to use flour or carpenter's glue in place of wallpaper paste.

Connections

Science Challenge

Students might enjoy setting up a worm farm in the classroom or at home for composting organic garbage. Red Wiggler earthworms, which are specifically bred for this purpose, can be ordered by the pound from a commercial worm farm. Any plastic bucket or bin with a lid will make a suitable composting container. Fill the container about two-thirds full of soil, mix in some shredded newspaper, leaves, or grass clippings, moisten the soil, and add the worms. Have students bury food scraps in the container from time to time and observe how the scraps are eaten and broken down by the worms. Tell students that the worms will not eat meat scraps or bones but will eat almost all types of fruits and vegetables cut into small pieces. The composted soil can be used for houseplants or added to an outdoor garden.

Science Extension

- ▶ Ask students to find out whether their community provides recycling with its trash collection or at a recycling center. If so, what types of materials are accepted for recycling? What is done with the materials after they are collected?
- ▶ Give students the following instructions for making new paper from waste paper. Fill a large container with water and add shredded newspaper. Beat the mixture (preferably with a hand-held food mixer) for 4 or 5 minutes, then add more water and beat again for 1 or 2 minutes. Carefully dip a sheet of fine-mesh window screening into the mixture, shaking the screening slightly so paper pulp clings to it. Put the screening on a flat surface protected by paper towels and gently press down on it with additional paper towels to force out as much water as possible. When the pulp holds together in a sheet, carefully lift it from the screen and repeat the blotting

procedure until the paper is as dry as possible. Cover the paper with wet cheesecloth and put it between two wet blotters. Iron both sides of the blotter “sandwich” for about three or four minutes. (*Safety Note:* Depending on the maturity of your students, you may want to do the ironing yourself.) Have students remove the blotters and cheesecloth to uncover their finished sheets of recycled paper.

Science and the Arts

Let students decorate their bowls using paints or colored markers. They also could make other decorative papier-mâché objects such as mobiles or beads for jewelry. If students have done the paper-making Science Extension above, they might enjoy altering the process to make decorative papers. They could add food coloring to the pulp mixture in the container or add threads, feathers, or other materials to the pulp on the screen before it is pressed.

Science and Careers

Invite an artist who designs and makes specialty papers or papier-mâché art objects to visit the class. Encourage the visitor to show examples of his or her work and to describe how they were made. Ask the visitor to explain the education and training that are needed for a career in an art field.

Science and Social Studies

In many less developed nations, people recycle materials by necessity rather than choice. For example, old tires are used to make soles for shoes, and empty cans are used as water buckets or fashioned into dishes and cups. Have students research and report on this type of recycling in less developed countries.