

From Tree to Paper



OBJECTIVES:

Students will:

1. learn how paper is made from trees.
2. make recycled paper and learn ways to conserve resources by recycling paper.



STANDARDS: Science



SKILLS: Analysis, classification, description, problem solving



SETTING: Classroom



TIME: Day One
(prepare paper pulp):
30 minutes
Day Two (make paper):
40 minutes



VOCABULARY:

Paper
Recycle

Introduction

Overview:

In this lesson, students will learn about how trees are harvested to make paper. They will participate in an experiment and make a recycled piece of paper from newspaper.

Teacher Background:

Trees provide numerous benefits to humans and the environment. They provide habitat for wildlife species and absorb carbon dioxide, giving off oxygen we breathe. Trees also enhance the environment in which we live by providing wind breaks and altering climate, temperature and air quality. Trees provide economic benefits as timber for building materials, furniture, paper products, fuel, and food.

The word “paper” comes from the Egyptian word “papyrus,” a plant whose leaves were used as sheets for writing. Today, most paper is made from wood harvested from trees. Most of the trees harvested for the papermaking process are planted for this purpose. Another source of material for making paper is wood scraps from saw mills where lumber is made.

Wood is made up of strong fibers or strands of cellulose that are stuck together by lignin. The papermaking process separates and reorganizes these fibers to produce a flat sheet of paper. It takes approximately seventeen trees to make one ton of paper in addition to many other resources

including energy and water, to name a few.

When paper is recycled, the recovered paper can be used to make recycled paper, saving trees, water, and energy required to make a new sheet of paper from raw materials.

Materials:

Students (for six groups of five students)

- Bucket, tub, or tray (one per group)
- Material to cover tables or floor
- Newspaper (twelve sheets per group)
- “From Tree to Paper” worksheet (one per student)
- Pencils to flatten wet paper

Teachers:

- “From Tree to Paper” overhead
- Water to fill buckets
- Two bags of used newspaper
- Rolling pins or dowels to flatten paper
- Rubric overhead
- Rubrics (one per student)

Preparation:

Be prepared to organize students into groups of six.

Ask other adults to assist on day two if possible.

Have extra towels on hand for cleanup.



ACTIVITY

Discussion

Day One:

1. Ask the students where they think paper comes from. Tell them paper is made from trees that are harvested for wood. Trees are considered a natural resource.
2. The practice of recycling paper not only saves trees, but it also conserves other resources such as energy and water while reducing pollutants that are released in the environment during the manufacturing process.
3. Post the overhead "From Tree to Paper" and explain how paper is made by describing the steps listed on the overhead.
4. Have students raise their hands if they recycle paper at home or school. Ask students to predict what happens to paper when it gets recycled. Write their predictions on the board.
5. Have students look at the overhead and describe which steps of the papermaking process are not needed when paper that gets recycled is used to make new paper.
6. Tell the students they will learn about how recycled paper is made and participate in an activity that will test whether newspaper can be recycled to make new paper in the classroom.
7. Show an overhead of the lesson rubric, and review the expectations for this lesson.
7. Have the groups tear or cut the newspaper into small pieces (approximately two inches by two inches) and soak the paper pieces in warm water for at least one day.
8. Ask the groups to write their group number on a piece of tape and place it on the bucket.

Day Two (Making Paper Pulp)

1. Organize students into their groups from the day before.
2. Introduce students to the materials that each group will collect. Describe or model how the materials will be used.
3. Assign two students from each group to collect their group's bucket and sheets of newspaper. Each student in the group will share one set of supplies so they will have to take turns making paper.
4. Have the students observe what happened to the newspaper in the bucket, tubs or trays from the day before and record their observations on their worksheet.
5. Ask students to describe whether or not their predictions were correct. Have them answer the question they wrote on their worksheet based on their observations.
6. Using their hands, have the students squeeze water from lumps of soaked paper (wood fibers) in the bucket.
7. Have students spread out the paper pulp onto a tray lined with sheets of dry newspaper and flatten out the pulp using their hands, rolling pin or pencil.
8. After a day or two, or when the pulp is dry, have the students describe whether or not they were able to make new paper out of newspaper. Then have them write instructions for a friend that describes how to make recycled paper from newspaper using the same steps they followed in the classroom.

Procedure

Day One (Preparation to Make Paper Pulp)

1. Show students the tools they will be using to make recycled paper out of newspaper. Ask the students to describe how they might use these tools to make a new piece of paper from newspaper.
2. Pass out the "From Tree to Paper" worksheet to each student.
3. Have students predict what will happen to the newspaper if it is placed in a bucket of water and left to soak overnight. Ask them to record their prediction on the worksheet and justify it using a cause-and-effect relationship. For example, "I predict that the paper will begin to fall apart because the wet paper will not be as strong as dry paper."
4. Now have the students write a testable question based on their prediction statement about what will happen to newspaper when it is placed in water. For example, "Will newspaper lose its strength when soaked in water overnight?"
5. Organize the students into six groups.
6. Pass out at least six sheets of newspaper to each group and a bucket (or small tubs or trays) filled with water.
1. Discuss different uses for recycled paper and share examples of products made from recycled paper, e.g., paper towels, cereal boxes, writing paper.
2. Ask students what natural resources are saved by recycling paper.
3. Brainstorm ways to conserve trees as a natural resource, e.g., reuse paper bags, use both sides of a piece of paper, use durable napkins and plates, etc., instead of disposables.

Wrap-Up

Final Assessment Idea

Have students describe how the practice of recycling paper saves natural resources.



RESOURCES

Extensions:

Have students participate in a papermaking activity in the classroom. Resource Area For Teaching (RAFT) offers a papermaking lesson (www.raft.net/ideas/Paper%20Recycling.pdf) and classroom kit as well as other low-cost reuse kits available for teachers. Visit their website for more information: www.raft.net.

When making paper, add seeds to the pulp and plant the seed cards in a garden or planter using compost or potting soil.

Have students research the history of paper and describe how the process of making paper has changed throughout time. A historical timeline can be created to illustrate their findings.

Teacher Materials:

California State Content Standards

The standards below represent broad academic concepts. This lesson provides connections to these academic concepts through hands-on activities and exploration. This lesson is not designed for a student to master the concepts presented in the standards. Additional lessons in the classroom that build on this lesson or the standard(s) ensure that students will have the opportunity to master these concepts.

SCIENCE	CONTENT STANDARDS
Grade 4	Investigation and Experimentation 6.c. Students will formulate and justify predictions based on cause-and-effect relationships.
Grade 5	Investigation and Experimentation 6.c. Students will plan and conduct a simple investigation based on a student-developed question and write instructions others can follow to carry out a procedure.





From Tree to Paper Rubric

A rubric is a scoring tool that defines the criteria by which a student's work will be evaluated. This rubric is provided to assist you in setting expectations for students and assessing their performance and engagement during the lesson based on specific tasks. Ideally, a rubric is developed with the cooperation of the students. Two blank rows have been provided for you and your class to develop and add your own assessment criteria.

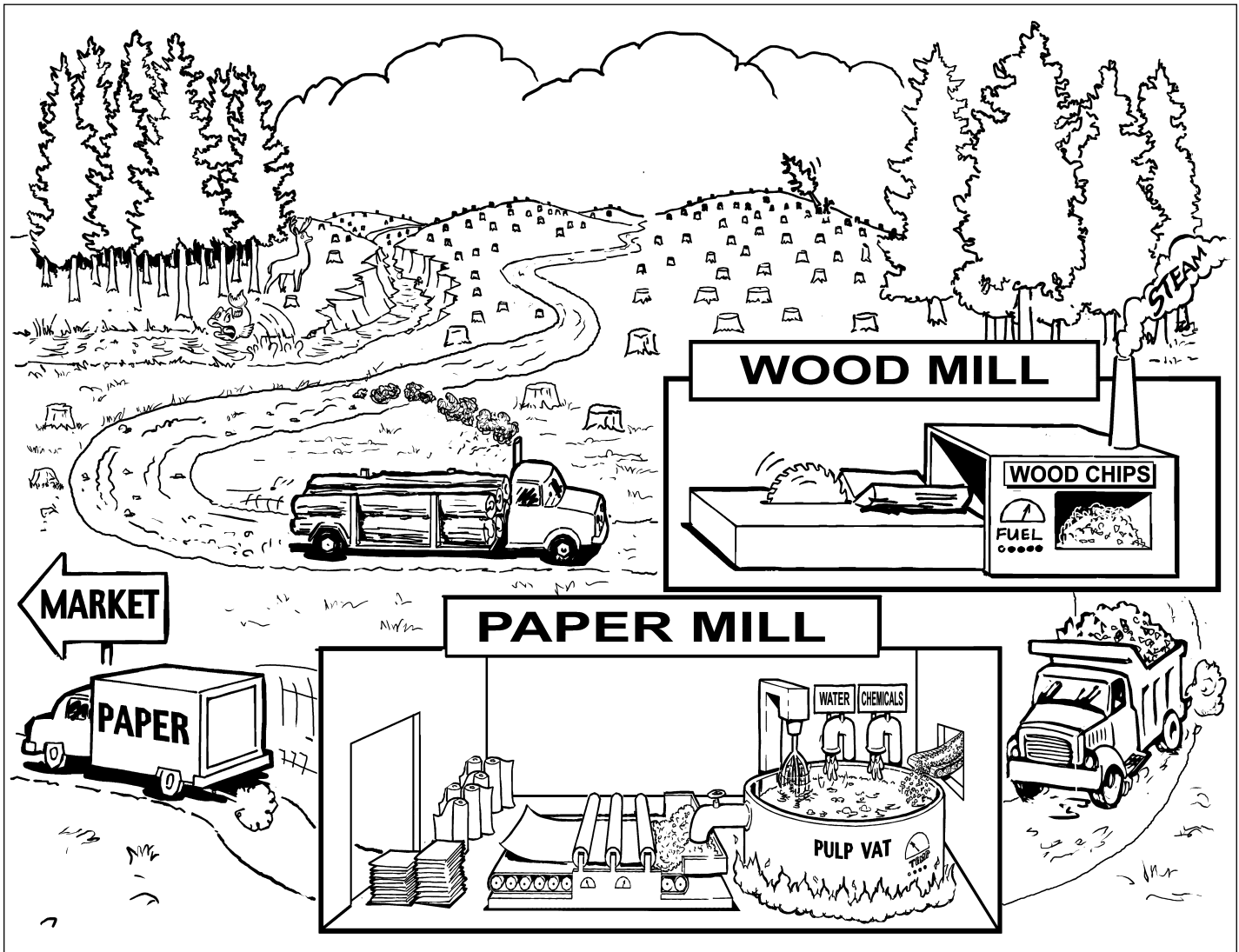
CATEGORY	4	3	2	1
Participates in papermaking experiment	Student follows directions well and produces recycled paper.	Student has difficulty in making recycled paper.	Student attempts to participate but fails to make recycled paper.	Student does not participate in the activity.
Understands how recycled paper is made	Student organizes all of the paper-making steps in the correct order.	Student organizes and lists some papermaking steps in the correct order.	Student organizes and lists a few paper-making steps, but a few are out of order.	Student does not attempt the assignment.





Teacher

From Tree to Paper



Paper is made by processing wood from trees by first chipping the log into small pieces and then placing the pieces in a large pressure-heated digester where the chips are mixed with water and chemicals. When the wood is broken down into cellulose fibers, the fibers are then rinsed and a mushy mixture of water and wood remain. This is called “pulp.” The pulp is sprayed onto large screens where the water begins to drain from the pulp fibers. As the pulp fibers begin to dry, they bond together in a mat that will soon become a sheet of paper.





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Day One:

1. Write your **prediction** of what will happen to newspaper that is torn up and placed in a bucket of water overnight.

2. Write a **testable** question based on your prediction above about what will happen to newspaper when it is place in water.

Question: _____

Day Two:

3. Observe and record what happened to the newspaper in the bucket.

4. Was your prediction correct? Based on your observations, answer your testable question above.

5. Write instructions for a friend describing how to make recycled paper from newspaper using the same steps you followed in the classroom.

Name: _____ Date: _____



DEFINITIONS

Vocabulary:

Paper: a thin material made of pulp from wood, rags or other fibrous material often used for writing, printing or packaging.

Recycle: the process of producing new products from used material or the process of remanufacturing used materials into new products. Some used materials can be made into new items of the same thing. Others are made into entirely new items.

