



Classroom Activity | Grades K–2

Recycling: Old Made New

GUIDING QUESTIONS

- How is old paper recycled to make new paper?

LEARNING OBJECTIVES

Students will be able to:

- sort materials according to their physical properties.
- observe and describe what happens when different paper products are made wet.
- describe the changes that occur throughout the process of paper recycling.

OVERVIEW

Sorting objects into groups helps students learn more about the physical properties of objects and provides the foundation necessary for understanding more advanced systems of scientific classification. Sorting items for recycling is a meaningful and eco-friendly way for students to apply their understanding of the physical properties of objects. In this lesson, students explore different items that can be recycled and observe and compare the differences between various paper products. Then, students work together to make recycled paper. Throughout the papermaking process, students observe and describe how the paper's physical properties change.

NEXT GENERATION SCIENCE STANDARDS

- PS1.A: Structure and Properties of Matter
 - 2-PS1-1: Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.
 - 2-PS1-2: Different properties are suited to different purposes. (2-PS1-3)
 - 2-PS1-3: A great variety of objects can be built up from a small set of pieces.

- ETS1.A: Defining and Delimiting an Engineering Problem
 - K-2-ETS1-1: A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. (secondary to KPS2-2)

LESSON TIME FRAME

Two 45-minute sessions

BACKGROUND INFORMATION

Recycling helps make the best use of our planet's limited resources. Paper, plastic, glass, and metals such as aluminum and steel are all materials that can be recycled. Recycling programs will vary by community, so it is important to check with local resources to determine the rules for recycling in the students' local community.

Paper recycling is the process of recovering waste paper and remaking it into new paper products. According to the American Forest and Paper Association, in 2020 two-thirds of paper was recycled and transformed into new sustainable paper products and approximately 47 million tons of paper and paperboard were recycled for a recycling rate of 65.7 percent. Every ton of paper recovered for recycling saves 3.3 cubic yards of landfill space. Paper products that can be recycled include corrugated cardboard, magazines, printer paper, newspaper, junk mail, envelopes, and paperboard (e.g. cereal boxes).

Paper comes from trees. It contains fibers that are shredded and mixed with water to make a pulp. This pulp is then dried and pressed to make paper. Each time paper is recycled, the fiber length decreases, which impacts its strength. It is estimated that paper can be recycled up to 7 times.

As students observe and compare different types of paper and go through the process of recycling paper, they may observe how the strength of paper fibers can vary. Young scientists should think about the importance of recycling and discuss the fact that paper comes from trees. Cutting down too many trees is bad for the environment in many ways—animals lose their habitat, deforestation can cause soil erosion, and trees provide the earth with much-needed oxygen. However, it is important to note that paper is made from a renewable resource. While it may take many years for a tree to grow, the U.S. forest products industry plants an average of 1.7 million trees every day. That is 5 new trees for every tree that is harvested for paper products! Through a combination of recycling and replanting trees, we can use our resources responsibly to make sure they are available for years to come.

MATERIALS

Teacher Materials/Prep

- Chart paper
- Marker
- Create a chart showing 3 *Basic Steps to Recycle Paper*
 - a. Cut or tear paper
 - b. Use a blender to make pulp
 - c. Spread the pulp on a screen and let it dry
- Examples of recycled products with the recycle symbol (e.g. sticky notes, padded mailers, etc.)
- Items from a recycle bin (glass, plastic, metal, and paper)
- Blender (Note: Consider the location of your outlets and where students will be sitting to watch the blender part of the paper-making process. You may need to have an extension cord.)
- Pitcher of water
- *Optional*—extension cord
- Print/cut Stoplight Exit tickets for students (1 per student)
- Print Student Capture Sheet: Paper Observations (1 per student)
- Print Home Connection Resource, Recycling: Old Made New (1 per student)

Student Materials

- Scissors
- Student Capture Sheet: Paper Observations
- Recycling: Old Made New: Home Connection Resource
- Smocks (for Session 2)

Materials per Student Group

- Set of 10-12 objects from the classroom for sorting
- Samples of paper (tissue paper, newspaper, copy paper, paper egg carton, cardstock, and toilet paper)
- Hand lens/magnifiers
- Paper from the school recycling bin
- Water
- Dropper or Pipette

- Metal screens (enough for groups of 5 or 6)
- Plastic containers slightly larger than the metal screen (optional)
- Newspaper to cover tables
- Soap and water for cleanup
- Rags or towels for spills and cleanup
- Plastic ruler or straight edge

CLASSROOM ACTIVITY

Day 1

1. Divide students into small groups. Provide each group with a set of objects from the classroom to sort based on properties. Circulate among the groups and ask: What is the rule you used to sort the objects? Once students have explained their sorting rule, encourage them to find a different way to sort the objects.
2. Show students a group of objects from a recycling bin. As a class, sort the objects into paper, glass, metal, and plastic. Discuss the properties of each material. Discuss reasons for recycling. (Recycling helps us to conserve limited resources. Instead of burying all of our trash in a landfill, recycling allows us to use materials again and again.)
3. Show students examples of paper products in the classroom that are made from recycled products (e.g. sticky notes, mailing envelopes, etc.). Tell students that in this lesson, they will focus on paper recycling. Ask students to explain what they think they already know about paper recycling and what they would like to learn. Record this on a class KWL chart (a chart with 3 columns showing what students think they *know*, *want to know*, and have *learned*.)
4. Ask students what paper is made from. Discuss how recycling paper helps to cut down on the number of trees that are cut down. Ask students to think about what happens when trees are cut down (animals lose homes, soil erodes more easily, trees provide the Earth with the oxygen we need to breathe). Tell students that paper recycling is the process of recovering waste paper and remaking it into new paper products. Discuss how papers like newspapers, copy paper, cardboard, and magazines are typically recycled. Discuss how papers with special coatings like wax paper and stickers, papers from food products such as juice boxes or greasy pizza boxes, and papers for hygiene like paper towels and tissues are not recycled.
5. Distribute Old Made New: Student Resource Page 1. Provide small groups of students with magnifiers and samples of a variety of paper products to observe (tissue paper, newspaper, copy paper, paper egg carton, cardstock, and toilet paper). Students should observe and describe each type of paper based on its physical properties.

6. Allow students to predict aloud what will happen when 10 drops of water are added to each type of paper. Provide students with droppers and water. Students should test each type of paper and record their findings.
7. Bring closure to Day 1 by refocusing student attention on the class KWL chart they started at the beginning of the lesson. Begin filling in the last column of the chart by asking students to share one thing they have learned so far about paper. Inform students that in the next session, they will be completing an investigation that will require smocks or clothing that can get messy.

Day 2

1. Review and discuss what students learned from Day 1. Tell students that in this session, they will learn more about paper recycling by working together as a class to make their own recycled paper.
2. Protect tables by covering them with newspaper and distribute smocks to protect clothing. Display the chart, *3 Basic Steps to Recycle Paper* (See materials section), for the class to observe during the lesson. Follow the process below to make recycled paper as a class. Explain that for safety reasons, you, the teacher, will be operating the blender. As students go through the steps, ask them to describe orally how the paper is changing through the process.
 - a. Allow students to tear up paper from the recycling bin into little bits.
 - b. Put the paper in a blender.
 - c. Add just enough water to soak the paper thoroughly.
 - d. Place the lid on the blender and blend on medium speed. Add water as needed.
 - e. Be sure each screen is positioned over newspaper or a large plastic container to catch any excess water. Pour the pulpy mixture over each group's screen. Students should work together over the screen using the edge of a plastic ruler or straight edge to smooth out the mixture.
 - f. Allow the pulpy mixture to dry thoroughly (1-2 days).
3. After the paper is dry, allow students to use magnifiers to observe and describe the paper. Show students the samples of tissue paper, newspaper, copy paper, paper egg carton, cardstock, and toilet paper that they observed in Day 1. Students should compare their new recycled paper with the previous samples to determine which sample their new recycled paper most closely resembles in look and texture. Discuss how might the process be modified to make the paper more flat? (e.g. use books to press it down during the drying process.)
4. Provide each student with a sample of the recycled paper to take home. Discuss the assignment students will have as a Home Connection. First, students will need to explain to their parents the process they used to make the recycled paper.

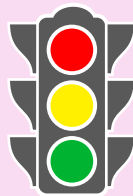
Then, students should work with their parents to use the recycled paper sample they have taken home to decorate a greeting card for a family member or friend. Finally, students should discuss with their parents some ways they can reduce paper waste and recycle more in their homes.

5. Bring closure to the lesson by asking students to share what they have learned about paper and recycling. Record student ideas on the class KWL chart.

REFLECTION

Distribute one Stoplight Exit Ticket to each student. Students will complete the Stoplight Exit Ticket to show their understanding of the lesson. On their Stoplight Exit Ticket handout, students will color in the section of the stoplight that explains their understanding of the lesson.

Refer back to the Guiding Question for the lesson: How is old paper recycled to make new paper? Tell the students they should keep this question in mind while filling out their exit ticket.



Stoplight Exit Ticket

- **Red:** I do not understand today's lesson.
- **Yellow:** I almost understand today's lesson.
- **Green:** I get it! I understand today's lesson.

HOME CONNECTION

Send home the Home Connection Resource: Old Made New. Students will describe the process they used in class to make the sample of recycled paper they have brought home. Families work together to use the paper to decorate a greeting card for someone special. Family members will discuss ways to reduce paper waste and recycle more in their homes.

Director: Observe and describe different types of paper when they are dry and wet. Record your observations in the chart below using words and/or pictures.

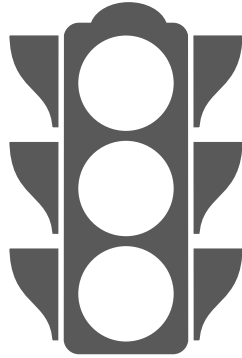
Types of Paper	Dry	Wet (10 drops of water)
Tissue paper		
Newspaper		
Copy paper		
Egg carton		
Cardstock		
Toilet paper		

STOPLIGHT EXIT TICKET



Color in the stoplight to show your understanding of today's lesson.

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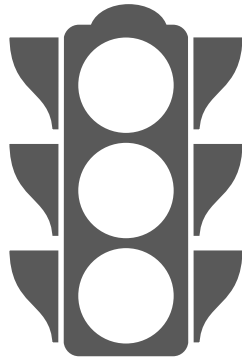
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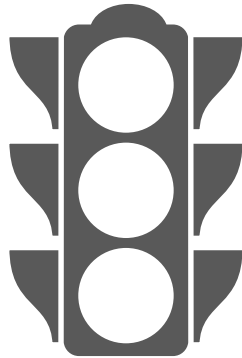
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HOME CONNECTION RESOURCE: RECYCLING, OLD MADE NEW FAMILY ACTIVITY

Dear Family,

Your young scientist has been learning about the properties of objects and how they change. Today they participated in making recycled paper. Just take a look at the sample they brought home! Help reinforce and apply their understanding of science concepts:

- Ask your young scientist to describe the recycled paper sample (e.g. texture, color, etc.)
- Ask your young scientist to explain how paper is recycled. (Cut or tear paper; use a blender to make pulp; spread the pulp on a screen, and let the pulp dry.)
- Use the recycled paper sample and other papers to create a greeting card for a friend or family member.
- Discuss ways your family can reduce paper waste and recycle more in your home. Write down a family plan.

For more detailed directions, please see the *Old Made New Family Activity*, and more activities found at: <https://www.youngscientistlab.com/parents/family-activities>.

We hope you continue learning together with us about the power of science.

See you in science class!

