



## Making Paper from Recycled Paper

**Grade Level:** Art and Social Studies Grades 2-8 (activity can be done with younger and older audiences. Young students require greater supervision when they are using papermaking tools)

**Time:** 45 minutes

**Objective:** Students will make paper by using recycled paper so that they will understand the western style process of hand papermaking and the importance of recycling paper

**I Can Statements:** I can (1) use materials to make paper pulp, sheets of paper and achieve expected results; (2) use accurate vocabulary; (3) identify sequential procedures for making paper from recycled materials; (4) will have an understanding of the history of papermaking; (5) will have an understanding of the science behind making and recycling paper.

### Georgia Standards of Excellence:

#### Science:

2<sup>nd</sup> grade S2E3; 3<sup>rd</sup> grade S3L2.b; 4<sup>th</sup> grade S4L1; 5<sup>th</sup> Grade: S5P1.a.a; 6<sup>th</sup> Grade: S6E6.a; 7<sup>th</sup> grade S7L4.c; (with Addition of information from Recycled Paper Appendix) S2P1.c, S3P1.a, S8P1.b.c.f

#### Social Studies (with use of History of Papermaking PDF):

2<sup>nd</sup> Grade: SS2E3; 3<sup>rd</sup> Grade: SS3E2; 4<sup>th</sup> Grade: SS4E1, SS4H1.a, SS4H5.e; 5<sup>th</sup> Grade: SS5E2.a, SS5E1, SS5H2.b; 7<sup>th</sup> Grade: SS6E8.a-c; 7<sup>th</sup> Grade: SS7E7.a, SS7E9, SS7EH.a, SS7E4.a, SS8H4.c, SS8H1.b; L6.8RHSS 3, 4, 5

#### Art:

2<sup>nd</sup> Grade: VA2.CR.4.c, VA2.CR.5, VA.RE.1.b, VA2.CN.1.a-b, VA2.CN.2, VA2.CN.3  
3<sup>rd</sup> Grade: VA3.CR.4.c, VA4.CR.5, VA3.RE.1.a, VA3.CN.1.a-b, VA3.CN.3  
4<sup>th</sup> Grade: VA4.CR.4.c, VA4.CR.5, VA4.RE.1.a, VA4.CN.1.a-c, VA.CN.3  
5<sup>th</sup> Grade: VA5.CR.2.d, VA5.CR.4.c, VA5.CR.5, VA5.RE.1.a, VA5.CN.1.a-d, VA5.CN.3  
6<sup>th</sup> Grade: VA6.CR.2.b, VA6.CR.3.a-c, VA6.CR.5.b, VA6.RE.1a, VA6.CN.1a-c, VA6.CN.3.c  
7<sup>th</sup> Grade: VA7.CR.1.b, VA7.CR.3.a-c, VA7.CR.5.b, VA7.RE.1a, VA7.CN.1a-c, VA7.CN.3.c  
8<sup>th</sup> Grade: VA8.CR.1.b, VA8.CR.3.a-c, VA8.CR.5.b, VA8.RE.1a, VA8.CN.1a-c, VA8.CN.3.c

### Background:

The Chinese recycled fishing nets, ropes, and mulberry trees to make the first paper. Centuries later, Europeans used cotton and linen rags in papermaking. In 1800, Mathias Koops received the first patent for making paper out of wood pulp. Today, about 80% of recovered paper can be recycled to make new paper. *Recovered paper* describes the paper itself, and the stuff that comes along with it. Food, plastic, staples, and glue are just a few things that might be found on paper and cannot be recycled into new paper. This makes sorting very important.

Recycled pulp for hand papermaking can be made out of old newspapers, homework, paper towels, construction paper, and more!

\*\*\*Refer to the *Recycled Paper Appendix* for additional information on how different forms of paper are industrially recycled and turned into new paper.

\*\*\*\* Refer to *History of Papermaking* PDF for additional information regarding the history of papermaking.

### **Vocabulary:**

*couching* – pronounced “koo-ching.” Method of transferring a newly formed sheet of paper from a papermaking screen onto a felt or other couching sheet. In order to create a multi-layered sheet, newly formed sheets of paper are couched onto one another.

*deckle* – a wooden frame that sits on top of the mold, which acts as a rim and determines the sheet of paper’s dimensions and thickness. A deckle is the removable top part of a hand mold.

*fiber* – material used to make paper, a cellulose fiber produced by a plant. Cellulose is produced through the process of photosynthesis, creating fiber which can be separated from the plant via chemical or mechanical means.

*hand mold* – the basic tool in hand papermaking, on which a sheet of paper is formed. It consists of a frame with a mesh screen stretched across. Used with the deckle to form the sheet of wet pulp.

*hogging* – a term used when mixing the fibrous pulp in water to create a suspension in preparation of pulling a sheet of paper in hand-papermaking. Generally, a ratio of 5% paper pulp to 95% water is used in hand papermaking.

*pulling* – a term used to refer to the act of dipping and raising a mold and deckle in a charged vat to create a sheet of paper in hand-papermaking.

*pulp* – the material used for papermaking in its fibrous, macerated, disintegrated, wet state.

*pulping* – process of macerating and beating plant materials into pulp using either hand or mechanized methods.

*recycled paper* – blending existing torn and beaten pieces of paper with water to disperse the fibers into wet pulp. The pulp is then used to make a new sheet of paper. This process can be done with a blender at home; however, a blender cuts the paper fibers instead of breaking them down.

*slurry* – water with fibers or pulp in it.

*vat* – the container which holds the slurry (pulp and water), must be large enough to accommodate the mold and the papermakers' hands.

**Materials:** Paper to be recycled, a blender, water, a vat (any large plastic container larger than the paper mold), paper mold, newspaper, and sponges, irons & ironing board, blotter paper. Optional: rolling pins

**Preparations:** Gather paper for students to recycle into pulp, remove any staples or non-paper materials, cut blotter paper down to a few inches larger than your papermold. (**TIP:** You

can buy blotter paper from any art supply store, or improvise with heavy paper towels, or woolen blankets. Anything that will absorb a lot of water will work) We recommend that you set up different stations in your classroom for the different steps of papermaking: pulp-making, paper pulling, couching, blotting, and ironing.

**Essential Questions:** (1) What is paper used for? (2) What is paper made of? (2) What materials can be recycled to make paper? (4) What is non-recycled paper made from? (5) What are other methods to make pulp? (5) How can water, pulp and a screen be used together to create a new substance? (6) What is the process of handmaking paper? (7) What happens when heat and water are applied to recyclable paper?

**Introduction:** Instructors will introduce students to a brief history of papermaking and or the process of how paper is recycled industrially. Demonstrate how to tear and blend recycled paper in blender. Instructors will then demonstrate how to pull a sheet of paper in a vat, or large plastic container. Then couch the paper onto a blotter, and remove excess water, leaving the paper to dry.

The following can be used as an instructional guide:

1. Paper is first recorded as being invented in 105 CE, in China, by T'sai Lun, who was an inventor and advisor who worked for the emperor. Paper was a new technology, and the knowledge of how to make paper traveled along a path similar to the Silk Road until it reached Europe nearly a thousand years later. The style of hand papermaking that was developed in Europe is the same style of hand papermaking most commonly used in America today, with a mold and deckle that are pulled through a vat of paper pulp. How can water, pulp and a screen be used together to create a new substance?
2. Today, most of the paper we use is made out of trees, and about 80% of recovered paper can be recycled to make new paper. Food, plastic, staples, and glue are just a few things that might be found on paper that cannot be recycled with it, therefore it must be sorted to remove those items. Then the paper goes through a re-pulping and screening process where the material is heated with chemicals and broken down. Next, the material is spun in a large cylinder to further remove contaminants, de-inked, and bleached. New paper is ready to be made from the resulting slurry. What happens when heat and water are applied to recyclable paper?

**Procedure:**

1. Choose a few sheets of paper from the table and tear these sheets into approximately one-inch pieces.
2. Place a small handful of the torn sheets into a blender filled half-full of water.
3. Blend paper and water for about one minute, pausing the blender every few seconds. Use the pulse setting for best results. The blender breaks the paper down into fibers called *pulp*. Repeat these steps until you have enough pulp for papermaking. Remember that when it comes to pulp, a little bit goes a long way.
4. Place a handful of pulp into the vat, which should be filled half-way with water, and mix well. Adding pulp is called *charging* the vat. Remember, the vat can be any large plastic container. *Hog* the vat by putting one or both hands in the water, spreading fingers wide and make a waving motion. This loosens the fibers, and distributes them through the water.  
(NOTE: to shorten the lesson pulp can be pre-made and vats prepared)

5. Hold the deckle and paper mold together tightly (the deckle should be on top of the screen side of the mold) and dip them into the vat, “pulling” a sheet of paper. The deckle keeps pulp from flowing over the sides of the paper mold. Then lift the mold and deckle straight out of the water, with the screen parallel to the surface of the water. Let the water drain through the screen.
6. Remove the deckle and set it aside.
7. Place a blotter sheet on top of a stack of newspapers. The newspapers will absorb much of the water, and can then be recycled. *Couch* newly formed paper onto the blotter by flipping it over so the paper faces the blotter. Sponge off the excess water by pressing down into the back of the mold. Then lift the mold off the blotter. Your paper should stick to the blotter!
8. Place another blotter sheet on top of the newly made paper and use the rolling pin to squeeze out the excess water.
9. Place the blotters with the wet paper in-between on the ironing board and run the hot iron over the paper. Iron for about 10 seconds, then flip the blotters and paper over. Keep ironing, flipping the paper “sandwich” several times. Remove the still-damp paper from the blotters after three or four “flips.” The damp paper can be directly ironed on at this point, until it is dry.
10. Wrap up questions: What is paper used for? What is paper made of? What materials can be recycled to make paper? What is non-recycled paper made from? What are other methods to make pulp? How can water, pulp and a screen be used together to create a new substance? What is the process of handmaking paper? What happens when heat and water are applied to recyclable paper?
11. Students will articulate the process of how paper is made and reasons why paper is recycled. Students will identify universal themes related to papermaking from diverse cultures, both past and present. Students will evaluate their own papermaking through verbal discussion with other students discussing topics such as craftsmanship, and cultural relevance.

***TIP: Iron alternative:*** Squeeze out as much water as you can with the rolling pin, then peel the damp paper off the blotter paper. The damp paper can be stuck to a window and the sun will do the rest! This method is recommended for younger papermakers.

***TIP: Pulp Storage:*** Unused pulp can be stored for later use in plastic bags, containers, glass jars - anything you can seal. Pulp will be good for 2-3 weeks in the refrigerator. If you are making a lot of pulp, you may want to run the unused portions through a sieve with small holes to drain the water. Just pour in the pulp, squeeze out the excess water, and form it into a ball. Store your “pulp ball” in a cool dry place. The dried pulp will dissolve in water when you are ready to use it again. You can also use this method for discarding old pulp.

***TIP: Pulp Disposal:*** Do not pour pulp slurry down the drain. The pulp will block the pipes, and cause plumbing backups. Use the method listed above to get rid of unused, wet pulp.