

SECTION 4
MAKE YOUR OWN PAPER

Length of Lesson: 120 min

Desired Results:











1. Technological Literacy Standard 8: Students will develop an understanding of the attributes of design:
 - Design is a creative planning process that leads to useful products and systems
 - Requirements for a design are made up of criteria and constraints.
2. Technological Literacy Standard 11: Students will develop abilities to apply the design process.
 - Specify criteria and constraints for the design
3. Technological Literacy Standard 10: Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving
 - Some technological problems are best solved through experiments
4. Technological Literacy Standard 13: Students will develop abilities to use and maintain technological products and systems.
 - Use information provided in manuals, protocols, or by experienced people to see and understand how things work

Prerequisites:

- Read at sixth grade level or above
- Possess basic computer skills in word processing and search the web

Tools, Materials, and Equipment Required:

- Computers that have access to internet
- Area for students to have discussions
- Laboratory for students to complete hands-on activities
- Materials for making recycled paper:
 - Blenders, window screens, rolling pins, waterproof containers, sponges, scissors, mops for clean-up. (Required)
 - Glitter, small leaves, dry flowers, colored thread, ink. (Optional)

Picture	Material	Type	Price	Amount needed
	Blender	The most simple type	About \$15 From groceries store	2 per class (considering the safety issue, it should be used under the teacher's supervision)
	Window screen	About 1foot by 2 feet	About \$4 From hardware store	2 per group
	Rolling pin	Small	About \$4 From groceries store	1 per group
	Sink or other Waterproof container	Large enough to take the window screen	About \$5 (You can find any container)	1 per group
	Sponge	Median size	About \$2 From groceries store	1 per group
	Scissor	Regular	About \$3 From groceries store	1 per group
	Mop	Regular	About \$10 From groceries store	2 per class
	Jig	Regular	About \$15 From groceries store	1 per group
	Ruler	Regular	About \$2 From groceries store	1 per group
	Coin	Dime or cent		30 per group

Active Learning Plan

Preparation of teacher before lesson is taught (50min)

- Review the ideas and objectives of the lesson.
Visit and review the web sites which offer methods of testing the strength of the paper:
<http://sbufoon.webs.com/procedures.htm>
- Review detailed instructions.
- Obtain enough tools, materials and supplies to make recycled paper.

Presentation (55min)

- Demonstrate the constraints and criteria in the design.
- Discuss how to test the thickness and strength of the recycled paper.
- Discuss safety when making recycled paper

Application (35min)

- Require each work group to work together to try out alternative solutions they searched and make some changes based on alternative solutions.
- Rubric
See Table 3 to check the rubric for section 4.

Teacher Reflection

- What happened during the lesson? How effective was the lesson plan?

- How the desired results were met? What are next steps to improve student learning?

Reference

Science Experiment. (2010). Science Experiment. Retrieved May 29, 2010 from:

<http://sbufoon.webs.com/procedures.htm>

Detailed Instructions

Constraints

1. The process of reusing paper must be done in a school
That is to say, there should not be any professional equipments or dangerous chemical in the process of making recycled paper
2. The process of reusing paper must be feasible for technology class;
3. It should take no longer than one hour to complete the process;
4. No dangerous tools or materials should be used in the process;
5. The use of recycled paper must be demonstrated
Designers should figure out the use of paper according to the characteristic feature of the paper.

Criteria

1. Cost
How to calculate the cost of making recycled paper?
What kinds of materials should be calculated?
2. Strength of the paper
How to test the strength of the paper?
Which way is more accurate?
3. Thickness of the paper
How to measure the thickness of paper?
How to make it more accurate?
4. Safety considerations

Are there any tools or materials in the design that might be dangerous for middle school students?

If there are some, which can be replaced?

Are there any safety measures to avoid accidents?

See the lesson rubric for the section 4 to grade students.

Grading Rubric for Section 4

Student	Making paper			Record		Grade
	Students try more than one solution to make paper	Students make more than two types of paper	Students demonstrate the use of each type of paper	Students record the whole process of making recycled paper completely	Students record the changes they made in making recycled paper	

Note:

- 0 = does not meet the standard
- 1 = partly meets the standard
- 2 = meets the standard
- 3 = better than expected