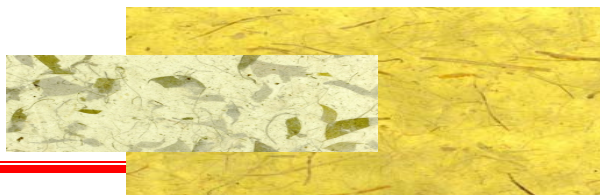


# Papermaking



**Grade Level:** 5-12<sup>th</sup> grades

## Objectives:

1. Youth create handmade paper.
2. Youth collect fibrous materials to explore plant characteristics.
3. Youth demonstrate the importance of recycling.
4. Youth use the Internet to research traditional and modern technologies, history, and science of papermaking.
5. Youth work with others to link project to community.

## NYS Learning Standards:

### Math, Science, and Technology

- Students access, generate, process, and transfer information using technologies.
- Students apply technological knowledge and skills to design, construct, use and evaluate products.

## National Science Standards:

### Content - Grades 5-12

#### Science as Inquiry

- Ability to do scientific inquiry (5-12)

#### Physical Science

- Properties and changes of properties in matter (5-12)

#### Science & Technology

- Understanding about science and technology (5-12)

#### Science in Personal & Social

#### Perspectives

- Science and technology in society (5-8)
- Natural Resources (9-12)

#### History and Nature of Science

- Science as a human endeavor (5-12)
- History of science (5-8)
- Historical perspective (9-12)

## Vocabulary

**Abaca (Manila Hemp)** – *Musa textiles*, a member of the banana family whose stalk fibers are used to make paper.

**Cotton Linter** – short fibers that cling to cottonseeds after the first ginning. Available in flat sheets for papermaking.

**Mold and Deckle** – frames used to hold the pulp and shape the paper.

**Non-woven** – textile web of fibers in a random arrangement.

## History

"Invented" in China in 104 AD, papermaking was a well-kept secret until 700 AD, when Arabs captured an entire village of Chinese papermakers. While the Chinese seem to have developed the first "modern" paper making process, the early Egyptians had developed a non-woven material that they used to write and draw on made from the papyrus reed. The Mayans also independently "invented" paper but later than the Chinese.

The first paper mill in the US was established in Philadelphia in 1690. By the early 1800s, papermaking became a major industry in New York. In the 1970s, several specialty mills opened to produce handmade paper for artists. These "new traditions" continue today, with both mills and artists researching ancient techniques, new technology, and different plant fibers.

## Science

Paper is a non-woven textile, a web in which the plant fibers cross and interlock in random ways. They mat together because of friction, pressure, or adhesives. Plant fibers for papermaking are truly infinite! The challenge is extracting those fibers. *Bast* fibers come from the inner bark between the outer bark and the plant core. *Grass* fibers that are difficult to tear, such as rushes, sedges, and corn stalks, make the best paper. Likewise, strong *Leaf* fibers come from sturdy leaves. *Other* fibers include seed fibers, fruits, vegetables, and recycled paper. The table below gives examples of common papermaking fibers.

Bast	Grass	Leaf	Other
Willow stems/branches	Cornstalks/husks	Pineapple tops	Citrus or banana peels
Okra stems	Sedges	Gladiolus	Melon rinds
Blackberry canes	Straw	Artichoke	Pumpkin shells
Hollyhock stems	Rushes	Leek	Broccoli stalks
Milkweed stems	Bamboo	Iris	Onion skins

## Technology

Mold and deckle are used to create wet paper sheets.

The mold is a framed screen on which the sheet is formed, while the deckle is the frame that holds the pulp on top of the mold, and determines the shape, size and thickness of the paper. This technique is considered to be a western style. Other approaches include the Japanese *sugeta* and the deckle box found throughout Nepal and Tibet.