

**Lesson Plan: Interdisciplinary:
Prairie/Forest/Decorative Arts/ Historic Native American
Natural Dyes from Plants**

Grade Levels: 4 and up

Illinois State Museum Web site used: Historic Native American, Prairie, Forest, Keeping Us in Stitches (Art)

Objective: After viewing the web modules of MuseumLink and doing this activity, students will be able to:

- Explain and show how the dyeing traditions express the culture of the people. (18.A.2)
- relate the similarities and differences in cultural traditions regarding coloring of functional objects and art objects(18.A.3) (27.B.2)
- Tell how people can change or lose or gain traditions when in contact with other cultures. (18.A.4)
- explain how changes in technology affected cultural traditions (use of natural dyes).(18.A.5)
- explain processes by which one can extract and use dye from plant materials (26.A.2e)
- demonstrate specific effects achieved by varying the processes and materials used in the same (26.A.3e)
- tell and demonstrate how settlers and Native Americans used plants to make dyes for their everyday objects (clothes, fabrics, leather, mats, yarns) (26.B.2d) (26.B.3d)

Time Required: several class periods

Motivation: (see labeled samples of dyed fabric)

Students will see examples of objects that were dyed from natural sources(quilts, coverlet, illustrations of Native American artifacts). They may have read about or seen other fiber traditions of settlers (spinning, weaving, quilting, sewing) that involved natural dyes. The teacher leads a discussion on why settlers and Native Americans may have chosen to dye things from plants, why they could not just buy them, and how trade items from imports and new technology changed that situation. The still-continuing artistic traditions of hand dyeing could be discussed as a legacy of settlers and native Americans influencing our culture and a reaction to the high-tech one-size-fits-all culture of today. Have students guess how long, how many steps, how difficult they predict it to be to dye fibers from plant sources by hand. At the end of the project, have them discuss their results, some problems, some successes, and their predictions —right or wrong and why. Have them think about and discuss why some fiber artists and fiber wearers today might prefer natural dyes.



*From top to bottom:
1 and 2 are original fabrics
3 and 4 are dyed with walnut shells
5 and 6 are dyed with parsley (6 with an alum mordant)*

Potawatomi Indians made dyes from these plants:

Black-eyed Susan (*Rudbeckia hirta*) - boil disk florets - yellow

Bloodroot (*Sanguinaria canadense*) - boil to a paste - red face paint

Bristly Crowfoot (*Ranunculus pennsylvanicus*)- boil whole plant - yellow
rare, scattered throughout Illinois

Broomsedge (*Andropogon virginicus*)(southern half of Illinois)- stalks, leaves - green,
greenish-yellow absent in the northern third of the state, except for Will, Cook, DuPage,
Grundy, and Kankakee counties

Goldthread (*Coptis trifolia*) - roots cooked with cloth - yellow

Goosefoot (*Chenopodium capitatum*) - crushed red calyx - red

Horsetail (*Equisetum arvense*) - whole plant - yellow, gray-green, green

Jewelweed or Orange Touch-Me-Not (*Impatiens capensis*) - boiled juice and flowers-yellow
to orange

Speckled Alder (*Alnus rugosa*) - inner bark - brown and red
found in damp thickets in Boone, Cook, Kane, Lake, McHenry, and Winnebago counties

Red Oak (*Quercus rubra*) - inner bark - red-brown

White Oak (*Quercus alba*) - inner bark - brown

Willow or sandbar willow (*Salix exigua*) - crushed twigs - red

Sources:

Moerman, Daniel E. *Native American Ethnobotany*. Timber Press, Portland, Oregon, 1998.

King, Frances B. *Plants, People, and Paleoecology*. Illinois State Museum, Scientific Papers, vol. Xx, Springfield, Illinois, 1984.

Documented European Settlers Dye Plants (commercial and home dyeing)

17th century:

Hickory bark (*Juglans cinerea*) - documented in a 1669 letter from Gov. John Winthrop of Connecticut - brown

Puritans brought **dandelions** to the colonies in the 17th century - yellow from the flowers and magenta from the roots.

Madder (*Rubia tinctorum*) imported to the Colonies rather than grown. Dry goods stores sold it in packets of powder - red. Used through the late 19th century.

18th century

Logwood (*Condalia obovata*) - black - industry began before 1730; dye used until 1940. The tree grows in Texas, Mexico and South America. England and the United States produced dye from imported logwood even after synthetic dyes were invented.

By 1785, Americans were exporting Black Oak (*Quercus nigra*) dye to England - yellow

Sassafras (*Sassafras albidum*) - documented in 1748 in Philadelphia - orange

19th century

Mormon pioneers in 1857:

(www.cc.utah.edu/~joseph/geneaology/RDDutson.html)

Walnut (*Juglans nigra*) - brown

dried **peach** leaves (*Prunus persica*) - yellow, not a permanent dye.

Rabbit Brush

Sagebrush

Goldenrod (*Solidago* sp.) was used by home dyers with alum mordant - yellow. Pick flowers as they begin to bloom.

Lichens (*Peltigera* sp.) - dyeing tradition brought over from Sweden, Ireland and Scotland - red through lavender to blue.

Safflowers - yellow to red for silk fabric.

Coreopsis (*Coreopsis* sp.) flowers - commonly known as the "yellow dye flower"

Sources:

Adrosko, Rita. *Natural Dyes in the United States*. US National Museum Bulletin #281. Smithsonian Institution Press, Washington, DC, 1968.

Wass, Janet Tauer. *Weaver's Choice: Patterns in American Coverlets*. Illinois State Museum, Springfield, Illinois, 1988.

Materials: Safety with heat and chemicals should be monitored.

- fiber products to be dyed —wool yarn (spun or bought), cattail leaves, handmade paper, cotton, linen, silk, and wool fabrics (plain and printed) leather pieces.
- Plant materials from which to extract pigments (see list)
- water
- vinegar, cream of tartar, alum, salt, baking soda as mordants/reactors
- hotplate or microwave oven
- tempered-glass pots or casserole dishes, covered
- wooden spoons
- old blender
- plastic or wood scoop with holes for removing plant material from dye pot
- latex gloves
- paper towels and newspapers to catch drips and spills
- pen and paper for keeping notes

Procedure:

There are two types of procedures to follow: 1) following recipes or 2) experimenting. Your choice may depend upon the age and experience of your students, on the learning styles of students, or on the emphasis the teacher places on the process of dyeing and the discovery process. Time and space for setup are also factors.

1) students follow recipes for certain colors and fibers. (Gwet recipes from Adrosko book, other books on dyeing, or from the WWW. Adapt them to microwave use.

2) students experiment with plants, methods, mordants, fibers, and mixes thereof, keeping a written record of their ingredients, processes, and results. They are, in effect, creating recipes.

Basic Steps:

Step One: Mordanting the cloth.

- Add mordant to a 3/4-full pot of water, stir to mix.
- Add fiber or cloth pieces to pot.
- Bring to a boil, boil for 20-30 minutes, adding more water if needed.
- Let pot stand until cool.
- Wring out cloth and dispose of mordant water. OR add plant material and water to mordanted water.

Step Two: Preparing the plant material.

- Prepare plant material for dyeing by putting it in the blender with 1/4 cup of water and blending until plant fibers are pureed (about 30 seconds).
- Add plant material to water in enamel/glass pot and set to boil for 30-60 minutes(covered) or until a heavy concentration of pigment had been released to color the water.
- (optional) Take pot off boil and remove plant material only from pot

Step Three: Dyeing the fiber.

- *Add fiber or mordanted fiber to be dyed to pot and continue to boil, stirring occasionally to even out color.
- Check for depth of fiber color on a wooden spoon dipped in it and lifted up. Dry fiber will be lighter in color than when wet. Try adding another teaspoon of mordant if color is weak.
- When desired color is reached or after one hour, take pot off the boil and set aside to cool.
- When water is cool, remove dyed fibers from pot. Use latex gloves and wring dye water from fiber back into pot or into a bin.
- Rinse loose dye and plant fibers from fiber with clean water in a bin or under faucet at room temperature.
- Hang dyed fiber to dry. If a piece of cloth, iron when dry.

Sample Dye Recipe: (from *Natural Dyes in the United States* by Rita Adrosko)

12" squares (more or less) of fabric. Wool works best; cotton, linen, or silk work.

Prepare fabric by washing to remove sizing.

1-2 cups of fresh marigold flower heads

tempered glass pot 2 qt.+(handled if using burner, casserole if using microwave)

2 cups water

4 teaspoons alum or salt mordant (try each one separately for different results)

more water as needed to fill glass pot over the top of fabric piece in pot.

Boil 2 cups water, mordant, and flower heads for 15 minutes. Remove from heat.

(Remove flower heads with a strainer or keep them in). Add more cold water and add

piece of fabric to pot. Bring to boil again for 20 minutes, stirring to help even the color.

Take off the heat and wait till water cools. Take out the dyed fabric, rinse and dry or iron.

Assessment:

Students tell how they got the color into the fiber. If they are experimenting, they should be able to write a detailed recipe they discovered/invented from their notes. They should be able to iterate the cultural traditions of Native Americans and settlers with regard to the use of natural dyes, and remark on the changes that took place after technology offered synthetic dyes and pre-dyed cloth for sale or trade, and whether this had any impact on the disappearance of prairie, forest, and dye-source plants.

Dye Plant Recipe

Name of dyer

date

Ingredients:

Amount

Substance

plant source

mordant

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Process:

Step 1:

Step 2:

Step 3:

Results:

Color produced

fabric content

special note

Resources:

Good list of dyeing links from About.com (includes many of the links below and others) convenient as main resource.

<http://weaving.about.com/hobbies/weaving/msub3n.htm?once=true&>

Yale-New Haven Teacher's Institute unit on How to Dye Cloth

<http://www.yale.edu/ynhti/curriculum/units/1987/6/87.06.06.x.html>

Native Tech site; Technology and Art; Use of Native plants

<http://www.nativetech.org/plantgath/plantgaht.htm>

Georgia State University, Dr, Nydia Hanna, Environmental Biology course, dye chemistry, includes two printable activities, a vocabulary of expressions in English, and a math activity sheet.

<http://www.gsu.edu/~mstnrhx/edsc84/dye.htm>

Colors for Lower Class Elizabethan Clothing, an About.com dyeing site; has a link to dyes. Background on the European dyeing traditions brought by the Colonists to North America.

<http://weaving.about.com/hobbies/weaving/gi/dynamic/offsite.htm?site=http://www.dnaco.net/%7Ealeed/corsets/lowerclass/lcolors.html>

Dyes and Dyeing in Ireland, continued in America by settlers. Has a good chart of colors and plants.

<http://weaving.about.com/hobbies/weaving/gi/dynamic/offsite.htm?site=http://www47.pair.com/lindo/Dyes.htm>

National Gardening Association site, learning area; Lessons to Dye for

<http://www.garden.org/edu/dye1.htm>

Ogg, Kathy J. Native Dye Plants of the United States. *Ethnobotanical Leaflets*.

Southern Illinois University herbarium

<http://www.siu.edu/~ebl/leaflets/dyes.htm>

Miami Science Museum strategies for constructivist learning linked to the above dye resources

<http://www.miamisci.org/ph/lpintro5e.html#nav>

Dyeing with Kool-aid, salt and vinegar for very young students.

<http://www.handspinning.com/lollipops/dye.htm>

Rainbird Sprinkling Manufacturing company's educational lessons K-8. 6-8Th grade activity: Using Plants as a Natural Source of dyes. Gives good instructions on using alum as a mordant.

<http://www.rainbird.com/rainforest/grade6using.htm>

A classroom web site on pioneers that lists plants used to dye cloth.
<http://www.cmi.k12.il.us/Urbana/projects/LinkOn/dailylife.html>

Article about sunflowers, with link to dye recipe part of virtual museum by museum model-making company
http://www.inhandmuseum.com/Plant_Site/Sunflowers/suncontent.html

Homepage on dyeing of dyer Katy Blanchard who grows own flowers to dye wools; has reading list for more information on natural dyes.
<http://www.urbaneagle.com/ue/ue-natdye.html#dyewk>

Print resources

Non-fiction

Adrosko, Rita. *Natural Dyes and Home Dyeing*. Dover Publications, 1976

Buchanan, Rita. *A Dyer's Garden: From Plant to Pot: Growing Dyes for Natural Fibers*. Interweave Press, 1995

Casselman, Karen L. *Craft of the Dyer: Colour from Plants and Lichens*. Dover Publications, 1993.

Dean, Jenny. *Craft of Natural Dyeing*. Search Press, 1995.

Dean, Jenny. *Wild Color*. Watson-Gupthill, 1999.

Liles, J. N. *The Art and Craft of Natural Dyeing: Traditional Recipes for Modern Use*. Univ. Of Tennessee, 1990.

O'Reilly, Susan. *Batik and Tie-Dye*. Thomson Learning, 1995., Ages 9-11.

Fiction

DePaola, Tomie. *Charlie Needs a Cloak*. Aladdin Paperbacks, 1988. Ages 4-8.

History

Bronson, J. *Early American Weaving and Dyeing : The Domestic Manufacturer's Assistant and Family Directory in the Arts of Weaving and Dyeing*. Dover Publications, 1977.

Sandberg, Gosta. *The Red Dyes: Cochineal, Madder, and Murex Purple: A World of Textile Techniques*. Lark Books, 1997.

Sandberg, Gosta. *Indigo Textiles: Technique and History*. Lark Books, 1989.

Illinois Goals and Standards addressed:

Social Studies: History

GOAL 18: Understand social systems, with an emphasis on the United States.

A. Compare characteristics of culture as reflected in language, literature, the arts, traditions and institutions.

Late Elementary: 18.A.2: Explain ways in which language, stories, folk tales, music, media and artistic creations serve as expressions of culture.

Middle/Junior High: 18.A.3: Explain how language, literature, the arts, architecture and traditions contribute to the development and transmission of culture.

Early High School: 18.A.4: Analyze the influence of cultural factors including customs, traditions, language, media, art and architecture in developing pluralistic societies.

Late High School: 18.A.5: Compare ways in which social systems are affected by political, environmental, economic and technological changes.

Visual Arts

Goal 26: Understand how works of art are produced

A. Understand processes, traditional tools, and modern technologies used in the arts.

Late elementary: 26.A.2e: Describe the relationships among media, tools/technology and processes.

Middle/Junior High: 26.A.3e: Describe how the choices of tools/technologies and processes are used to create specific effects in the arts.

B. Apply skills and knowledge necessary to create and perform in one or more of the arts.

Late elementary: 26.B.2d: Demonstrate knowledge and skills to create works of visual art using problem solving, observing, designing, sketching and constructing.

Middle/Junior High: 26.B.3d: Demonstrate knowledge and skills to create 2- and 3-dimensional works and time arts (e.g., film, animation, video) that are realistic, abstract, functional and decorative.

GOAL 27: Understand the role of the arts in civilizations, past and present.

B. Understand how the arts shape and reflect history, society and everyday life.

Late Elementary: 27.B.2: Identify and describe how the arts communicate the similarities and differences among various people, places and times.