

Exploring Natural Dyes Demo

Program Type: Demonstration	Audience Type: Grades 6–8, ages 11–14 (emphasis on Native youth)
Program Length: 15 Minutes	Class Size: 1–5 Participants

Description: Natural materials from the local environment or fruit and vegetables from your kitchen can be used to make beautiful natural dyes. If time and materials permit, use dyes to create a bookmark that you can take home.

Topics: Dyes, patterns, natural resources, environmental science

Process Skills Focus: Observing, predicting, experimenting

LEARNING OBJECTIVES

For Next Generation Science Standards, see end of outline.

- Natural dyes can be made from organic materials such as plants, fungi, invertebrates, or minerals.
- Native peoples worldwide have used natural dyes for generations.
- Passing down knowledge through generations is a valuable way to gain skills and learn about the environment.

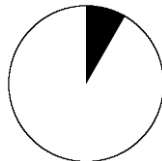
TIME REQUIRED

Advance Prep



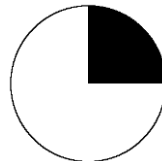
60+ minutes

Set Up



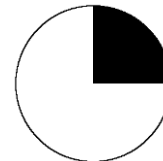
5 minutes

Activity



15 minutes

Clean Up



15 minutes

PROGRAM FORMAT

Segment

Format

Time

Introduction
Natural Dye Activity
Wrap-up

Instructor-led Activity
Individual Activity
Instructor-led Activity

1–2 min
10 min
1–2 min

SITE REQUIREMENTS

- One table (8' × 4' or so) with four chairs
- Access to water source (for advance preparation and clean up) and stove (for advance preparation)

SUPPLIES

Permanent Supplies	Amount
Paintbrushes, fine point	5
Cheesecloth	1 ft × 1ft
Pint-sized glass jars with lids	1 per dye
Table (8' × 4' or so)	1
Plastic tablecloth	1
Chairs	5
Teaspoon measure	1

Major Consumables	Amount
White cotton, silk, wool, or linen cloth	Square yard, approximately
Tea, beets, turmeric, dried black beans, blueberries	as needed; see Advance Preparation
Cream of tartar	4 teaspoons
Alum (potassium aluminum sulfate)	½ cup
Paper towels	1 roll per table
Jumbo index cards (5" × 8")	20

ADVANCE PREPARATION

- Collect 3 types of plants from the natural environment that can be used to make dyes (see [Native Plant Dyes](#)¹) and 2 products from a grocery store that can be used to make dyes (see [Native Plant Dyes](#)). Create the dyes by chopping up the source material and simmering it in water (1 part source material to 4 parts water) for up to several hours, allowing it to cool and sit overnight, before straining each dye with cheesecloth into a glass jar or other clear container.
 - The following colors can be made from common items:
 - Brown: Black tea, brewed strong
 - Red: Beet, fresh (heat slowly and do not boil) or canned
 - Blue: Blueberry, fresh or canned
 - Yellow: Turmeric, powdered
 - Orange: Yellow onion skins, boiled
 - Purple/Black: Black beans, dried
- Optional time savers:
 - Steep materials for less time or use juice from fruits or vegetables.
 - Many vegetable and fruit juices such as carrot, pomegranate, and grape need no special preparation other than pouring into a container.
 - Dried herbs and spices may also be steeped in water for a simple dye preparation. *Caution – the resulting shade of color will be lighter and more prone to fading using either of these methods.*
- Add 2 teaspoons of the alum and ¼ teaspoon of cream of tartar to each cup of dye and mix well; the alum and the cream of tartar act as a *mordant* to fix the dye onto the cloth.
- Cut the cloth into bookmark-sized pieces (suggested size: 2" × 8").
- Facilitators are encouraged to ask for examples of color significance from members of locally based indigenous cultures.

SET UP

- Place the plastic tablecloth over the table.
- Put the five clear containers of prepared dyes on the table, along with the paintbrushes, roll of paper towels, index cards, and pre-cut pieces of cloth.

¹ <http://www.fs.fed.us/wildflowers/ethnobotany/dyes.shtml>

introduction

1 – 2 minutes

Let students speculate before offering answers to any questions. The answers given are provided primarily for the instructor's benefit.

Suggested script is shaded. Important points or questions are in **bold**. Possible answers are shown in *italics*.

Welcome! Would you like to learn about using natural materials to create different colored dyes? **People from all over the world have been using locally sourced materials to create dyes for thousands of years.** I've created some dyes here out of things collected in the local environment as well as a few things from the grocery store.

Indigenous cultures from around the world have used dye for making patterns and designs for many reasons. Just as any country's flag's colors and patterns are powerful symbols today, objects decorated with natural dyes can be used to identify different indigenous groups of people, indicate a family's status, and portray tribal values.

Let's think about some of the deeper, more symbolic meanings of colors and patterns in our society today. For example, *red can mean stop, or signify anger. Yellow can be cheerful or can describe someone acting cowardly. White often indicates cleanliness and purity. Black is often associated with grief, formalwear, and even punk rockers!*

NATURAL-DYE ACTIVITY

10 minutes

Here at this table, you can experiment with using natural dyes on a piece of fabric, similar to what indigenous cultures have done for generations.

Ask participants to sit or stand around the table. Hand each person a piece of cloth on top of an index card for creating a take-home bookmark or have them work on a large piece of cloth while at the table.

Here are the natural dyes that you can use. I made these using [explain the materials]. You can use the paintbrush next to each dye to paint on your fabric.

If materials are available for creating a bookmark, let participants know that they can carry their bookmark on top of an index card while it dries.

Ask participants inquiry-based questions while they are completing the activity. For example: **How do you use colors to represent certain ideas or meanings? Can you think of examples of colors that have significant meaning in your culture?**

Optional Additional Talking Points

Natural dyes are better for the environment because they don't use toxic chemicals like formaldehyde, chlorine, lead, and mercury. Natural dyes are less toxic to the environment and the people who work with them.

Native American cultures used dye for making patterns and designs with color for many reasons such as to identify different groups of people, indicate a family's status, and portray tribal values. Red, yellow, black and white are four sacred colors to the Cheyenne people, a plains tribe from the Upper Midwest of the United States. To the Cheyenne people, red traditionally symbolized life, yellow the sun's power, black victory, and white dawn.

WRAP-UP

1 – 2 minutes

Traditional knowledge about natural dyes has been handed down for generations. People share information about how to collect natural materials and create dyes for making particular colors and designs. Archeologists can sometimes learn a lot about past cultures and how they changed over time by studying the colors and designs of objects found in a particular place.

CLEAN UP

- Clean up any dye spills on the table using the paper towels.
- Put the lids back on the glass jars and wash the paintbrushes in water.
- Save leftover dyes in a refrigerator to extend their shelf life for another demonstration.

RESOURCES

Colors from Nature: Growing, Collecting, and Using Natural Dyes. Bobbi A. McRae. Timber Press, 1993.
A good beginner's guide to dyeing.

Dyes from American Native Plants: A Practical Guide. Lynne Richards and Ronald J. Tyrl. Timber Press, 2005.
An excellent guide to North American dye plants and their effects.

[Resource and dye plant guide](#)² from the USDA Forest Service. Provides a useful "color guide" to Native North American plants.

[Database](#)³ of Native plants and their known uses by Native American communities.

[Resource](#)⁴ with very detailed information on culturally significant plants.

[Listing](#)⁵ of regional dyeing organizations and dyeing resources.

² <http://www.fs.fed.us/wildflowers/ethnobotany/dyes.shtml>

³ <http://herb.umd.umich.edu/>

⁴ <http://plants.usda.gov/java/factSheet?cultural=yes>

⁵ <http://www.naturaldyes.org/organizations.htm>

GLOSSARY

Vocabulary	Definition
Dye	Substance (natural or synthetic) that changes the color of something. <u>Adjective dye</u> : A dye that requires a mordant to bond the dye to the fabric. <u>Substantive dye</u> : A dye that readily bonds to fabric without the use of added mordants.
Dyebath	Mixture of water and dye that the object is soaked in.
Fiber	A thread that forms a material. <u>Synthetic fiber</u> : Manmade fiber. <u>Plant-based fiber</u> : Fiber derived from plant sources, like cotton and linen. <u>Animal-based fiber</u> : Fiber derived from animal sources, like silk and wool.
Mordant	A fixative, typically a metallic salt solution, which helps to permanently bond the dye to the fiber.
Elder	A person who has gathered knowledge and wisdom about his or her culture; not all elderly people are elders
Indigenous/Native	An individual who has an ancestral claim to a particular environment or region
Traditional knowledge	Wisdom held by elders that is passed down to younger generations
Ways of knowing	Information gained by patient observations, life wisdom, and accumulated knowledge
Western science	A system of knowledge which relies on certain laws that have been established through the application of the scientific method to phenomena in the world around us

NEXT GENERATION SCIENCE STANDARDS

Practices

- Asking questions and defining problems
- Planning and carrying out investigations
- Analyzing and interpreting data
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Crosscutting Concepts

- Patterns
- Cause and effect
- Energy and matter
- Structure and function
- Stability and change

	Disciplinary Core Idea	K	1	2	3	4	5	MS	HS
Physical Science									
PS1	Matter and Its Interaction	n/a	n/a		n/a	n/a		✓	
PS2	Motion and Stability: Forces and Interactions		n/a	n/a		n/a			
PS3	Energy		n/a	n/a	n/a				
PS4	Waves and Their Applications in Technologies for Information Transfer	n/a		n/a	n/a		n/a		
Life Science									
LS1	From molecules to organisms: Structures and processes			n/a					
LS2	Ecosystems: Interactions, Energy, and Dynamics	n/a	n/a			n/a		✓	
LS3	Heredity: Inheritance and Variation of Traits	n/a		n/a		n/a	n/a		
LS4	Biological Evolution: Unity and Diversity	n/a	n/a			n/a	n/a		
Earth & Space Science									
ESS1	Earth's Place in the Universe	n/a			n/a				
ESS2	Earth's Systems		n/a						
ESS3	Earth and Human Activity		n/a	n/a				✓	
Engineering, Technology, and Applications of Science									
ETS1	Engineering Design							✓	