# ROOTS OF WISDOM:
## NATIVE KNOWLEDGE. SHARED SCIENCE.

*Activity Kit*

OMSI

# Exploring Natural Dyes Activity

| | |
|---|---|
| ***Program Type:*** After-school, community center, classroom, museum education activity | ***Audience Type:*** Grades 6–8, ages 11–14 (emphasis on Native youth) |
| ***Program Length***: 1–2 hours | ***Class Size:*** Up to 36 students |

***Description****:*
Learn traditional* knowledge and environmental science through the craft of creating and using natural dyes. Participants will explore how to create dyes using natural and organic materials, how they behave on different types of fabrics, and how a range of colors can be created with just a few ingredients from the yard or kitchen.

**Traditional knowledge refers to information, skills, and practices that are developed, sustained, and passed on from generation to generation within a community.*

***Topics***: Dyes, patterns, natural resources, environmental science, traditional knowledge

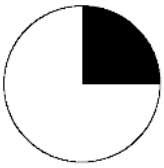
***Process Skills Focus***: Observing, predicting, inquiry, critical thinking, controlling variables, experimenting

## LEARNING OBJECTIVES

*For Next Generation Science Standards, see end of outline.*

- Indigenous peoples from around the world create dyes from locally available materials.
- Natural dyes can be made from organic materials such as plants, fungi, invertebrates, or minerals.
- Passing down knowledge through generations is a valuable way to gain skills and learn about the environment.

## TIME REQUIRED

| Advance Prep | Set Up | Activity | Clean Up |
|---|---|---|---|
|  |  |  |  |
| **60+ minutes** | **45 minutes** | **60+ minutes** | **15 minutes** |

## PROGRAM FORMAT

| Segment | Format | Time |
|---|---|---|
| Introduction | Facilitator-led/partner discussion | 10 min |
| Guest Speaker (optional) | Group Activity | 30–60 min |
| Exploring Natural Dyes | Individual Activity | 20–30 min |
| Wrap-Up | Guided Discussion | 5 min |

## SITE REQUIREMENTS

- Classroom or community space large enough for class size
- Tables with chairs grouped into fours (each table shares supplies)
- Access to water source
- 1–2 adults per 20 students

## SUPPLIES

| Permanent Supplies | Amount |
|---|---|
| Paintbrushes, fine point | 1 per student |
| Containers for dye | 1 for each dye, per table |
| Container for rinse water | 1 per student |
| | |
| Plastic tablecloths | 1 per table |
| Drying rack | 1 |
| Rulers | 1 per student |
| Pencils | 1 per student |

| Major Consumables | Amount |
|---|---|
| Plant-based fabric (cotton, linen), laundered, cut into 7–10 cm (3–4”) squares | 1 square per student |
| Animal-based fabric (silk, wool), laundered, cut into 7–10 cm (3–4”) squares | 1 square per student |
| Silk fabric, laundered, cut into 7–10 cm (3–4”) squares | 1 square per student |
| Tea, beets, spinach, turmeric, dried black beans | as needed |
| Alum (potassium aluminum sulfate) | 4 oz. per lb fabric |
| Cream of tartar | 1 oz. per lb. fabric |
| Iron (ferrous sulfate/scrap iron) | ½ oz. per lb. fabric |
| Additional source materials for extracting dye (e.g., vegetables, fruits) | as desired |
| Paper towels | 1 roll per table |
| Paper cups (option for permanent dye containers) | as needed |
| Paper (blank, unlined for creating observation chart) | 1 per student |
| Drying rack or drying area | 1 |
| Observation chart (see the Resources section) | 1 per student |

## ADVANCE PREPARATION

- Reach out to members of the local Native community and ask if they are willing to share information about what in the local environment was historically used to create natural dyes.
  - Suggestions for where to find a Native community member:
    - Family members of youth
    - Tribal or cultural center
    - Retirement or assisted living center
    - Local Native-owned companies and businesses
- Cultural sensitivity should be taken into consideration when reaching out to an elder and asking for an interview. The facilitator is encouraged to speak with people in the Native community and learn protocol for asking an elder to present. This protocol may vary among different communities.
- An honorarium is often appropriate to offer in return for someone sharing cultural knowledge.
- **Always** have a gift to present a guest from the Native community. This gift can be flowers, food, a card signed by the students, or even a gift made by the students.
- Create 2–3 dyes from materials in the local environment (see Native Plant Dyes[1]) and 2–3 from products purchased from a grocery store.
  - In general, chop up the source material and simmer in water (1 part source material to 4 parts water) for an extended period of time, allowing it to cool and sit overnight, before straining.
  - The following colors can be made from common grocery store items:
    Brown: Black tea, brewed strong
    Red: Beet, fresh (heat slowly and do not boil) or canned
    Blue: Blueberry, fresh or canned
    Green: Spinach, fresh or frozen
    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.*
- Take 1–2 of the dyes and pour a portion of each into a separate container with the alum or cream of tartar, which act as a *mordant* to fix the color onto the materials. Choose either silk or wool as an animal-based fabric to be

[1] http://www.fs.fed.us/wildflowers/ethnobotany/dyes.shtml

saturated with an iron mordant by soaking fabric for an hour in a solution of water that has been boiled with ferrous sulfate, old iron nails, a cast iron pan, or even scrap iron. Cut all fabric into 7–10 cm (3–4") squares (one square per student).

- Optional (if time allows): Launder all fabric *without using fabric softener* to open up fibers to allow the dye to be more readily absorbed.
- Print the observation charts (see the Resources section), one per student.

**CAUTION: Do not use fabric softener when laundering the fabrics.**

## SET UP

Set out supplies at each table of 4 students with the following items on each table:

- Plastic tablecloth to cover tabletop
- 1 roll of paper towels/clean rags to blot brushes and wipe up spills
- 1 container of each type of prepared dye (2–3 from store-bought materials and 2–3 collected from the local environment)
- 1 container of water to clean brushes when changing colors
- 1 square of each type per student:
    1. plant-based fabric (cotton or linen)
    2. animal-based fabric (silk or wool)
    3. a second piece of the same type of animal-based fabric, treated with an iron mordant
    4. synthetic fabric (examples: polyester, rayon, or spandex)
- 1 paintbrush per student
- 1 ruler, pencil, and sheet of blank, unlined paper per person

## INTRODUCTION

30 minutes

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

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

**Recommended Introduction with Guest Speaker**

Today we are going to learn about the ancient practice of creating and using natural dyes. People from all over the world have been using materials they find in nature to create dyes for thousands of years. Before we explore different dyes on our own, I've asked a Native Elder from our local community to join us today and talk about the current and historical practices of creating and using dyes amongst our local Native American community.

Refer to the *Voices from our Community* activity guide for information and protocol on interviewing a Native Elder. The guide is also available on the *Roots of Wisdom* website at www.omsi.edu/exhibits/row.

**Alternative Introduction with Guided Discussion (if a guest speaker is not available)**

Today we are going to learn about the ancient practice of creating and using natural dyes. People from all over the world have been using materials found in local environment to create dyes for thousands of years. Plants, fungi, invertebrates, and minerals are all sources for creating dye.

Today, dye is still a huge part of our culture and daily life.
For example:

- It is really hot outside, so I am wearing white to stay cool.
- I am wearing our school's logo because we have a game tonight.
- I am wearing my favorite color because it makes me happy!

Now partner up with your neighbor and take 30 seconds each to tell each other about why you choose to wear certain articles of clothing today. You can discuss things like colors, patterns, and designs. Ready, set, go!

If time allows, have a few students share what they discussed with their partner.

We all have deeper reasons for choosing our clothes each day than just covering ourselves and staying warm. Our day's activities, personal needs, social identity, and the roles we play (like being a teacher or a student) all contribute to the choices we make. The way we make ourselves look tell us a lot about each

other. Colors, as well as the patterns and designs we make with them, often have deeper, symbolic meanings. Team uniforms are a common example. However, what is true for us today and our culture didn't always hold true in past times and other cultures.

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 cowardly. White can indicate cleanliness and purity. Black is often associated with grief, formalwear, and even punk rockers!*

If time allows, ask students to come up with more examples of what colors symbolize in our society.

Now let's compare how some of our views to those of one particular Native American community. Red, yellow, black and white are four sacred colors to the Cheyenne people, a plains tribe from the Upper Midwest on the United States. To the Cheyenne people, red traditionally symbolized life, yellow the sun's power, black victory, and white dawn.

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. Traditional knowledge was handed down for generations on 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.

While natural dyes have been around for thousands of years, industrially made dyes have only been around for a few hundred years. Since then, the synthetic textile and dye industry has become a huge part of modern society and also one of the largest sources of industrial water pollution on earth.

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

INDIVIDUAL ACTIVITY

# Exploring Natural Dyes

20–30 minutes

Now that we have a little background information about dyes, let's talk about how we are going to explore the ones on our tables.

**Can anybody guess why some stains are easy to wash out and others aren't?** *Some plants stick better than others. Some colors are brighter than others. Chemicals in some plants stick to fabric better than others.*

Those are good guesses. Different types of materials are made up of different types of threads, called fibers. These fibers play an important role in determining how dyes and fabrics respond to one another. Animal fibers are considered easier to dye because they are mainly composed of proteins. Plant fibers can be more difficult because they a have thicker and smoother surface, making it difficult for dyes to bond.

**Who can name an example of a fabric made from plants?** *Cotton from the cotton plant, linen from flax*

**Who can name an example of a material made from animals?** *Leather from cows, silk from silk worms, wool from sheep*

Natural dyes can often fade less and last longer if a substance to fix the color onto a material – a mordant – is applied to the material before or after the dye. For example, fabric dyed with berries will fade quickly and wash out, if not treated with a mordant. Mordants work by binding with the dye to create an insoluble compound. They create more of an affinity between the dye and the fabric. The metal ions in the mordants form strong bonds between the dye and the fiber. Mordants like salt, vinegar, and baking soda are good for plant-based fabrics. Metallic mordants like alum, iron, and copper are better for animal-based fabrics, such as wool and silk. Some mordants have been used for centuries, such as wood ash and even stale urine! Urine is most effective when "aged" at least 2 weeks before using. Whew! What an odor!

Some dyes don't need any type of added mordant to work well. These dyes often contain tannin, which is a naturally occurring mordant in black walnut, safflower, and lichen.

Over time, Native communities learned which dyes affixed well to which materials. This knowledge was passed down through generations, becoming traditional knowledge. Careful observations of the natural world result in learned knowledge, which is also how scientists conduct their studies. Traditional knowledge and science both try to explain the world we live in.

Divide the class into groups of 2–4 students so they can share supplies and have conversations around the activity.

1. Provide each student with an observation chart (see the Resources section) and instruct the students to fill out their charts as they use different fabrics and dyes.

2. Have students use a paintbrush to apply the dyes to the fabric and create a pattern. Ensure that the students record their observations.

*Instruct the students to rinse their brushes in the rinse water when changing to a different dye color.*

3. Tell the students that they can take home their fabric samples and observation chart.

## WRAP-UP

5 minutes

*Lead a discussion with the students, prompted by the following questions.*

**Which dye on which fabric was your favorite color?**

**How did the colors vary using fabrics or dyes that had been treated with mordants? Were the colors brighter or dimmer when mordants were used?**

**Why do you think dyes react differently on different fabrics?**

**What kind of pattern did you create?**

**Why did you choose it?**

**Does it have any personal or social meaning for you or for your culture?**

## CLEAN UP

- Place the dyed fabric squares onto the drying rack or drying area and instruct students to clean up their tables by discarding trash and wiping up spills.
- Students should place all unused materials into center of tables for reuse.
- **Remind students to take home their observation charts and continue to observe the effects of mordants on dyes.**
- Save leftover dyes in a refrigerator to extend their shelf life for another class.
- Clean all the paintbrushes and containers.

## OPTIONAL EXTENSIONS

- Create sample pieces of fabric dyed naturally with and without the use of mordants. Expose some of them to sunlight for an extended time, creating a visual aid that would show how the effects of light contribute to colors fading over time, and how mordants and fixatives prevent color loss.
- Locate local Native items that have been made with natural dyes to show students. If these items not readily available, a slideshow or some other kind of visual aid can be created.
- At-Home Extension: Test the fabric samples for colorfastness by rinsing the samples with clean, cold water. If the dyes rinse out easily, you can always make a new design on the same fabric with dyes you create at home for yourself.

## 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

# Observation chart

Name: _____

**Example:**
Light pink in color, really pretty.

Fabric: Silk Mordant: No
Dye: Beet juice

Fabric: Mordant:
Dye:

Fabric: Mordant:
Dye:

Fabric: Mordant:
Dye:

Fabric: Mordant:
Dye:

Fabric: Mordant:
Dye:

Fabric: Mordant:
Dye:

Fabric: Mordant:
Dye:

## GLOSSARY

| Vocabulary | Definition |
|---|---|
| **Dye** | Substance (natural or synthetic) that changes the color of something.<br>Adjective dye: A dye that requires a mordant to bond the dye to the fabric.<br>Substantive dye: 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.<br>Synthetic fiber: Manmade fiber.<br>Plant-based fiber: Fiber derived from plant sources, like cotton and linen.<br>Animal-based fiber: 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. |

## 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 | | | | | | | ✓ | |

Indigenous peoples living in the Northeast United States were the first known people to have used the sap of maple trees.

1

Maple syrup is made from the xylem sap of maple trees and is now a common food all around the country.

Native Americans and other indigenous cultures used parts of the willow plant for pain relief.

2

Aspirin contains acetylsalicylic acid, extracted from willow and other salicylate-rich plants. Although Aspirin has only been manufactured since 1897, the medical use of this main ingredient has been used for thousands of years.

Beans are one of the oldest-cultivated plants in human history! Native peoples across the Americas grew beans for food, and in combination with other plants (often squash and corn) to promote soil fertility.



A variety of beans native to North America are now used around the world as cover crops– plants that are used to naturally increase nutrients in soils for food production.

This crop is native to the Andes Mountains of Bolivia, Chile, and Peru. It is a high-energy grain that has been eaten for over five thousand years.

4

Quinoa has been an important food in indigenous cultures for thousands of years. The Inca thought the crop to be sacred and referred to it as “the mother of all grains.”

Native peoples in Mesoamerica developed a method of cooking ground corn with alkaline substances. This produces a chemical reaction that releases niacin. This softens the corn, increases its protein content, and prevents against a skin disease called pellagra.

5

This alkali treatment process (called “nixtamalization”) is used in the production of several foods that are eaten across the Americas, such as grits, corn tortillas, and tamales.

This grain is composed of tall grasses that grow in marshes or open water. Its dark-colored seeds have been traditionally gathered for food by indigenous peoples of the northern United States and Canada.

6

Native Americans traditionally harvest wild rice by canoeing into the plants, bending stalks over a canoe with wooden sticks, and knocking off rice kernels into the canoe.

The cultivated peanut was eaten over 4,000 years ago by the people of the Ñanchoc Valley in Peru. It is now grown throughout warm regions of the world.

7

Peanut oil can now be used to power biodiesel motors. It is also commonly used to fry foods.

A wide variety of grain plants were domesticated by indigenous peoples across the world over thousands of years.

8

Cereal is a food made from processed grains such as corn or barley that is often eaten as the first meal of the day. A wide variety of grain plants were domesticated by indigenous peoples across the world over thousands of years.

Native peoples in the Andes region were the first to cultivate the potato plant, which became an essential crop in many parts of the world.

9

Potato starch is valued for its binding qualities. Scientists working in the bioplastics industry have created biodegradable trash bags, food packaging, and even golf tees using potato starch.

The Menominee, among many other North American native groups, used the leaves, bark, or twigs of the Witch Hazel plant to treat skin conditions, soothe muscles, and treat coughs and colds.



Witch hazel extract can be used to constrict body tissues. It is a common ingredient in products used to treat skin irritations like bites, burns, and inflammation.

The Quechua people, native to South America, used the bark of the cinchona tree to create a medicinal drink.



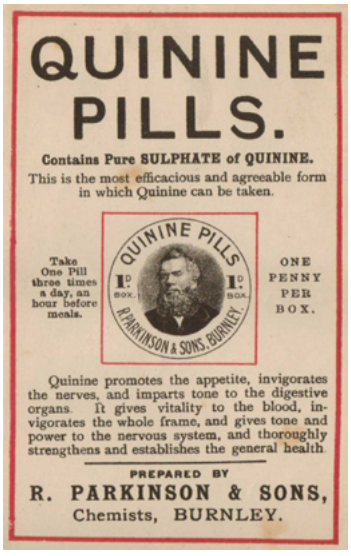



photo by ParkinsonsLtdBurnley

Quinine, a chemical compound derived from the bark of the cinchona tree, was used as early as the 1600s to combat malaria, and is still considered an effective treatment for malaria today.

Native Mesoamericans harvested sap from what we call the “rubber tree” and made an important contribution to team sports.

12

The Olmec, the Maya, and Aztec of Mesoamerica used the sap from certain trees to make rubber balls. The Maya still make them today! These balls are considered a precursor to the bouncing ball used in modern games.

To create a long-lasting source of food, the Inca people (and today, their direct descendants) would freeze potatoes, overnight, walk on them to squeeze out the moisture, then allow them to dry.



Freeze-drying removes water from food and makes it last longer by slowing down decomposition. Many of the foods that astronauts take into space are freeze-dried, so they can store easily and rehydrate quickly.

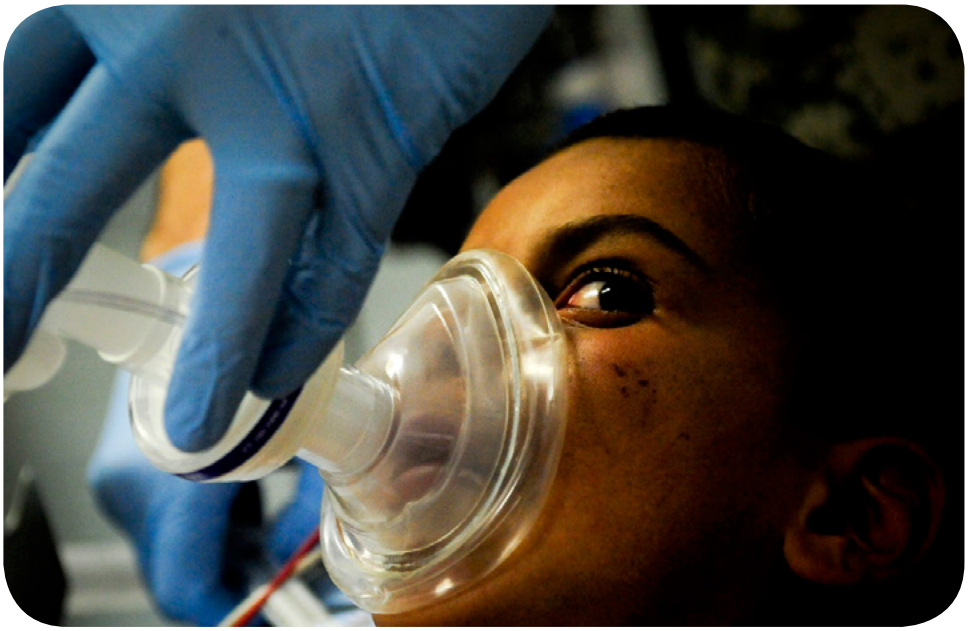
Native Americans from many regions chewed the sap from trees to freshen breath, promote dental health, and for a variety of other health issues.



The sap of the sapodilla tree, known as chicle, was chewed by native peoples in Central America. It was used as the base for the first mass-produced chewing gum, and is still used by some manufacturers today.

Native peoples living in the Amazon painted a poison gum (derived from the Chondrodendron tomentosum vine or plants from the Strychnos family) on the tips of their arrows and darts. This poison produced a paralytic effect.

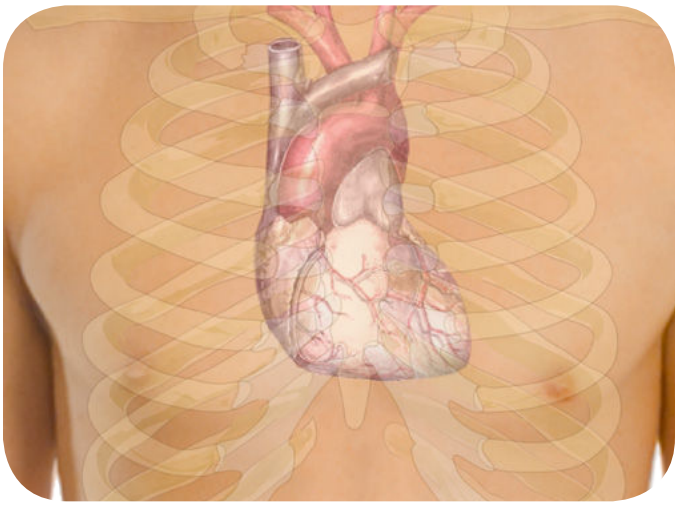




The poison, known as curare, was found to be an effective muscle relaxant and numbing agent when used in small doses, though today more stable, synthesized drugs are more commonly used.

Native peoples in Northeast North America carefully administered small doses from the toxic foxglove plant to treat heart problems.

16



Today, chemicals from the foxglove plant (from the genus digitalis) are used to treat a variety of heart problems, including heart rate regulation.

The First Peoples of northern North America carved goggles out of wood, bone, or shell, to protect their eyes from the blinding reflection of the sun on the snow.



Goggles made from wood, bone or shell were a precursor to modern sunglasses and snow goggles, which protect the eyes from UV rays.

Native Mesoamericans were the first to cultivate the vanilla plant, and perfected the complex curing, heating, and drying process that brings out the plant's flavor.



Not only is vanillin (the compound that creates the flavor and smell of vanilla) a popular flavoring for sweet foods, it is also commonly used in the manufacture of perfume.

# Native Origins Match Game

| | |
|---|---|
| ***Program Type:*** Classroom, afterschool or community center program | ***Audience Type:*** Grades 6–8, ages 11–14 (emphasis on Native youth) |
| ***Program Length***: 30 Minutes | ***Class Size:*** 1–5 Participants |

**Description:** Participants are challenged to match images of items traditionally used by Indigenous people with images of modern day counterpart items in use today. The activity can be facilitated by an educator or group leader, or self-facilitated by the user. After completing the matching challenge, participants can discuss other examples of Indigenous knowledge.

This activity is ideal for a classroom, after-school program or museum. If done in conjunction with the exhibition, the activity can be set up near and complement the *Native Origins* exhibit component within the *Roots of Wisdom* exhibition.

**Marketing Description:** Did you know many of the foods we eat, medications we take, and products we use were first recognized and used by Indigenous people? Join _____ *(museum name, afterschool program, etc.)* for a hands-on activity that will broaden your perspective on how Native peoples have contributed to the way we live.

**Topics**: Traditional knowledge, history, environmental science, generational learning, botany, horticulture

**Process Skills Focus**: Critical thinking, reading, inquiry, observing, predicting

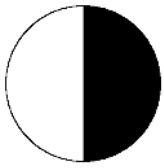
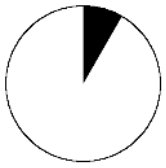
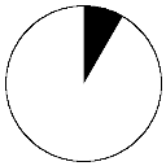
## LEARNING OBJECTIVES

*For Next Generation Science Standards, see end of outline.*

- Many of the common foods we eat, medications we take, and products we use were first recognized and used effectively by Indigenous people.
- Traditional knowledge and Western science are different ways of knowing but have many commonalities.

- Indigenous peoples have been here for thousands of years and are still here today, engaging in both traditional and modern practices.

## TIME REQUIRED

| Advance Prep | Set Up | Activity | Wrap-Up |
|---|---|---|---|
|  |  |  |  |
| **30 minutes** | **5 minutes** | **15-20 minutes** | **5 minutes** |

## PROGRAM FORMAT

| Segment | Format | Time |
|---|---|---|
| Native Origins Match Game | Instructor-led Activity or Individual Activity | 5–20 min |
| Wrap-Up | Individual Activity | 2–5 min |

## SITE REQUIREMENTS

- Space for a table
- A quiet area that will allow for group conversations
- Optional: the activity is ideal to facilitate adjacent to the *Native Origins* exhibit component in the *Roots of Wisdom* exhibition.

## SUPPLIES

| Permanent Supplies | Amount |
|---|---|
| Set of printed matching cards: 18 green cards and 18 blue cards | 1 set |
| 4–6 ft. table for displaying cards | 1 |
| Self-facilitated direction sheet (optional) | 1 |
| 8.5” × 11” sign holder (optional) | 1 |

## ADVANCE PREPARATION

- Print the downloadable file of the cards double sided so that the green cards end up blank on the back and the blue cards end up with text on the back.
- If activity will be self-facilitated, print self-facilitated direction sheet and place it in the sign holder.
- Facilitator should be familiar with the content on the cards and the correct matches before facilitating the activity.
- This program can be enriched by making connections with local Native communities and creating additional cards highlighting objects from the local area and their historical uses among Native communities. A Microsoft Word template document is available for download to create additional match cards.
- It is helpful to review any state or local resources that may be available to assist in delivering culturally competent programs for Native youth (see the Resources section).

## SET UP

- Spread the blue cards out evenly across the table picture-side up.
- Stack the green cards picture-side up into one pile adjacent to the blue cards.
- If self-facilitated, display the one-page, self-facilitated direction sheet upright on the table.

## NATIVE ORIGINS MATCH GAME

5 – 20 minutes

*Let participants speculate before offering answers to any questions. The answers given in this outline are provided primarily for the instructor's benefit.*

Suggested script is shaded. Important points or questions are in **bold**.

**Introduction**

Hello, my name is _____. Thanks for being here today. Would you like to play a quick game?

**Facilitation**

Here on this table we have a stack of green cards highlighting images of items that were first put into use by Indigenous people of the Americas. Adjacent to the green cards are several blue cards highlighting images of items that have in some way evolved from the items shown on the green cards. Your challenge is to match the items on the green cards with their counterparts on the blue cards. As an example, we can do the first one together. Let's look at the item on this green card and read the text below the picture *(choose whichever card is on top)*.

For example: Here we have a picture of a willow bush. It reads *Native American and other Indigenous cultures used parts of the willow plant for pain relief*. Looking over the blue cards, what do you think could be a match to this description? Think about pain relief as a big clue.

*Participant selects the card highlighting the aspirin pills*.

That seems like a logical choice. Turn the card over and see what it says. The first sentence reads *Aspirin contains acetylsalicylic acid, extracted from willow and other salicylate-rich plants*.

You're correct! By reading the back of each card, you'll know if you select the correct match. You can also know if you are correct by looking for a corresponding number on the back of each card. Now that you have the hang of it, try matching the rest of the cards on your own or with a partner.

**Conclusion**

**Great job! Now that all (or most) of the cards have been matched, can you think of anything not shown on the table that you use or eat that could have originated from Indigenous communities? Examples can be from all around the world, not just the Americas.**

**Even more specifically, can you think of anything that would have originated from tribal communities in our local area?**

Facilitators are encouraged to reach out to their local Native community and learn examples to share with participants.

If this activity is done in a museum with the *Roots of Wisdom* exhibit, present the activity near the *Native Origins* exhibit component and direct visitors there to learn more about this topic after the activity.

**Tips for facilitation:**

- Create an engaging experience by inviting participants to work together to match the cards.
- It might be helpful to only display some of the cards and not have all of them on the table at one time.
- Some of the cards are harder to match than others. The more difficult cards can be removed if working with younger audiences. For example:

**Harder ……Card Difficulty……Easier**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | **16** | **15** | **9** | **10** | **11** | **5** | **3** | **7** | **6** | **4** | **13** | **8** | **18** | **12** | **17** | **14** | **1** |

## SELF-FACILITATED ACTIVITY

5 – 20 minutes

Participant(s) approach a table displaying the match game and read the directional sign sitting upright in a sign holder on the table.

**Content on Sign** (available at: www.omsi.edu/exhibits/row)**:**

Many of the common foods we eat, medications we take, and products we use were first recognized and used by Indigenous people.

Match the images of items traditionally used by Indigenous people with images of items in use today.

***Directions:***

1. Spread the blue cards out picture-side up.
2. Stack the green cards into one pile picture-side up.
3. Pick up and read the first green card.
4. Look over the blue cards and place the green card next to the card that you think is the correct match.
5. Repeat these steps until all of the green cards have been matched with a blue card.

6. For each match, turn over the blue card and read the description on the back to reveal if the match is correct. Each match will have a corresponding number to confirm the correct answer.
7. Discuss your findings with a neighbor.

## WRAP-UP

2 – 5 minutes

**Can you think of other important contributions discovered by Indigenous communities?**

## OPTIONAL EXTENSIONS

- A Microsoft Word template document is available for download to create additional match cards on Native origins – ideally from the local region. The file is available for download on the *Roots of Wisdom* website at: www.omsi.edu/exhibits/row.

## RESOURCES

**For learning more about Native origins of the Americas:**
"Do All Indians Live in Tipis?: Questions and Answers from the National Museum of the American Indian" (book)

Links and resources for cultural guides:

Alaska Native Knowledge Network[1]
Guide to Implementing the Alaska Cultural Standards for Educators[2]
Indian Education for All - Montana Office of Public Instruction[3]
Navajo Culture[4]

## GLOSSARY

| Vocabulary | Definition |
|---|---|
| **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 in danger of being forgotten by younger generations |
| **Ways of knowing** | Information gained by patient observations, life wisdom, and accumulated knowledge |
| **Western science** | The observations and actions practiced by Western countries |

[1] http://ankn.uaf.edu/Publications/Knowledge.html
[2] https://education.alaska.gov/standards/pdf/cultural_standards.pdf
[3] http://opi.mt.gov/programs/indianed/IEFA.html
[4] http://serc.carleton.edu/research_education/nativelands/navajo/culture.html

## NEXT GENERATION SCIENCE STANDARDS

**Practices**

- Asking questions and defining problems
- Analyzing and interpreting data
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

**Crosscutting Concepts**

- Patterns
- Cause and effect

| | 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 | | | | | | | | |

# Native Origins Match Game

| | |
|---|---|
| ***Program Type:*** Classroom, afterschool or community center program | ***Audience Type:*** Grades 6–8, ages 11–14 (emphasis on Native youth) |
| ***Program Length***: 30 Minutes | ***Class Size:*** 1–5 Participants |

**Description:** Participants are challenged to match images of items traditionally used by Indigenous people with images of modern day counterpart items in use today. The activity can be facilitated by an educator or group leader, or self-facilitated by the user. After completing the matching challenge, participants can discuss other examples of Indigenous knowledge.

This activity is ideal for a classroom, after-school program or museum. If done in conjunction with the exhibition, the activity can be set up near and complement the *Native Origins* exhibit component within the *Roots of Wisdom* exhibition.

**Marketing Description:** Did you know many of the foods we eat, medications we take, and products we use were first recognized and used by Indigenous people? Join _____ *(museum name, afterschool program, etc.)* for a hands-on activity that will broaden your perspective on how Native peoples have contributed to the way we live.

**Topics**: Traditional knowledge, history, environmental science, generational learning, botany, horticulture

**Process Skills Focus**: Critical thinking, reading, inquiry, observing, predicting

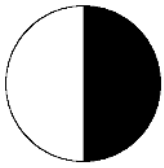
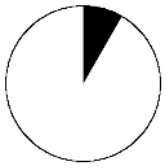
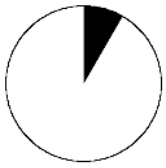
## LEARNING OBJECTIVES

*For Next Generation Science Standards, see end of outline.*

- Many of the common foods we eat, medications we take, and products we use were first recognized and used effectively by Indigenous people.
- Traditional knowledge and Western science are different ways of knowing but have many commonalities.

- Indigenous peoples have been here for thousands of years and are still here today, engaging in both traditional and modern practices.

## TIME REQUIRED

| Advance Prep | Set Up | Activity | Wrap-Up |
|---|---|---|---|
|  |  |  |  |
| **30 minutes** | **5 minutes** | **15-20 minutes** | **5 minutes** |

## PROGRAM FORMAT

| Segment | Format | Time |
|---|---|---|
| Native Origins Match Game | Instructor-led Activity or Individual Activity | 5–20 min |
| Wrap-Up | Individual Activity | 2–5 min |

## SITE REQUIREMENTS

- Space for a table
- A quiet area that will allow for group conversations
- Optional: the activity is ideal to facilitate adjacent to the *Native Origins* exhibit component in the *Roots of Wisdom* exhibition.

## SUPPLIES

| Permanent Supplies | Amount |
|---|---|
| Set of printed matching cards: 18 green cards and 18 blue cards | 1 set |
| 4–6 ft. table for displaying cards | 1 |
| Self-facilitated direction sheet (optional) | 1 |
| 8.5” × 11” sign holder (optional) | 1 |

## ADVANCE PREPARATION

- Print the downloadable file of the cards double sided so that the green cards end up blank on the back and the blue cards end up with text on the back.
- If activity will be self-facilitated, print self-facilitated direction sheet and place it in the sign holder.
- Facilitator should be familiar with the content on the cards and the correct matches before facilitating the activity.
- This program can be enriched by making connections with local Native communities and creating additional cards highlighting objects from the local area and their historical uses among Native communities. A Microsoft Word template document is available for download to create additional match cards.
- It is helpful to review any state or local resources that may be available to assist in delivering culturally competent programs for Native youth (see the Resources section).

## SET UP

- Spread the blue cards out evenly across the table picture-side up.
- Stack the green cards picture-side up into one pile adjacent to the blue cards.
- If self-facilitated, display the one-page, self-facilitated direction sheet upright on the table.

## NATIVE ORIGINS MATCH GAME

5 – 20 minutes

*Let participants speculate before offering answers to any questions. The answers given in this outline are provided primarily for the instructor's benefit.*

Suggested script is shaded. Important points or questions are in **bold**.

**Introduction**

Hello, my name is _____. Thanks for being here today. Would you like to play a quick game?

**Facilitation**

Here on this table we have a stack of green cards highlighting images of items that were first put into use by Indigenous people of the Americas. Adjacent to the green cards are several blue cards highlighting images of items that have in some way evolved from the items shown on the green cards. Your challenge is to match the items on the green cards with their counterparts on the blue cards. As an example, we can do the first one together. Let's look at the item on this green card and read the text below the picture *(choose whichever card is on top)*.

For example: Here we have a picture of a willow bush. It reads *Native American and other Indigenous cultures used parts of the willow plant for pain relief*. Looking over the blue cards, what do you think could be a match to this description? Think about pain relief as a big clue.

*Participant selects the card highlighting the aspirin pills*.

That seems like a logical choice. Turn the card over and see what it says. The first sentence reads *Aspirin contains acetylsalicylic acid, extracted from willow and other salicylate-rich plants*.

You're correct! By reading the back of each card, you'll know if you select the correct match. You can also know if you are correct by looking for a corresponding number on the back of each card. Now that you have the hang of it, try matching the rest of the cards on your own or with a partner.

**Conclusion**

**Great job! Now that all (or most) of the cards have been matched, can you think of anything not shown on the table that you use or eat that could have originated from Indigenous communities? Examples can be from all around the world, not just the Americas.**

**Even more specifically, can you think of anything that would have originated from tribal communities in our local area?**

Facilitators are encouraged to reach out to their local Native community and learn examples to share with participants.

If this activity is done in a museum with the *Roots of Wisdom* exhibit, present the activity near the *Native Origins* exhibit component and direct visitors there to learn more about this topic after the activity.

**Tips for facilitation:**

- Create an engaging experience by inviting participants to work together to match the cards.
- It might be helpful to only display some of the cards and not have all of them on the table at one time.
- Some of the cards are harder to match than others. The more difficult cards can be removed if working with younger audiences. For example:

**Harder ……Card Difficulty……Easier**

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2** | **16** | **15** | **9** | **10** | **11** | **5** | **3** | **7** | **6** | **4** | **13** | **8** | **18** | **12** | **17** | **14** | **1** |

## SELF-FACILITATED ACTIVITY

5 – 20 minutes

Participant(s) approach a table displaying the match game and read the directional sign sitting upright in a sign holder on the table.

**Content on Sign** (available at: www.omsi.edu/exhibits/row)**:**

Many of the common foods we eat, medications we take, and products we use were first recognized and used by Indigenous people.

Match the images of items traditionally used by Indigenous people with images of items in use today.

***Directions:***

1. Spread the blue cards out picture-side up.
2. Stack the green cards into one pile picture-side up.
3. Pick up and read the first green card.
4. Look over the blue cards and place the green card next to the card that you think is the correct match.
5. Repeat these steps until all of the green cards have been matched with a blue card.

6. For each match, turn over the blue card and read the description on the back to reveal if the match is correct. Each match will have a corresponding number to confirm the correct answer.
7. Discuss your findings with a neighbor.

## WRAP-UP

2 – 5 minutes

**Can you think of other important contributions discovered by Indigenous communities?**

## OPTIONAL EXTENSIONS

- A Microsoft Word template document is available for download to create additional match cards on Native origins – ideally from the local region. The file is available for download on the *Roots of Wisdom* website at: www.omsi.edu/exhibits/row.

## RESOURCES

**For learning more about Native origins of the Americas:**
"Do All Indians Live in Tipis?: Questions and Answers from the National Museum of the American Indian" (book)

Links and resources for cultural guides:

Alaska Native Knowledge Network[1]
Guide to Implementing the Alaska Cultural Standards for Educators[2]
Indian Education for All - Montana Office of Public Instruction[3]
Navajo Culture[4]

## GLOSSARY

| Vocabulary | Definition |
|---|---|
| **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 in danger of being forgotten by younger generations |
| **Ways of knowing** | Information gained by patient observations, life wisdom, and accumulated knowledge |
| **Western science** | The observations and actions practiced by Western countries |

[1] http://ankn.uaf.edu/Publications/Knowledge.html
[2] https://education.alaska.gov/standards/pdf/cultural_standards.pdf
[3] http://opi.mt.gov/programs/indianed/IEFA.html
[4] http://serc.carleton.edu/research_education/nativelands/navajo/culture.html

## NEXT GENERATION SCIENCE STANDARDS

**Practices**

- Asking questions and defining problems
- Analyzing and interpreting data
- Constructing explanations and designing solutions
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

**Crosscutting Concepts**

- Patterns
- Cause and effect

| | 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 | | | | | | | | |

Roots of Wisdom
Native Knowledge. Shared Science.

# *Native Origins*
## Match Game

Many of the common foods we eat, medications we take, and products we use were first recognized and used by indigenous people.

Match items traditionally used by indigenous people with images of items in use today.

***Directions:***

1. Spread the blue cards out picture-side up.

2. Stack the green cards into one pile picture side-up.

3. Pick-up and read the first green card.

4. Look over the blue cards and place the green card next to the card you think is the correct match.

5. Repeat these steps until all green cards have been matched with a blue card.

6. Turn over the blue cards and read the descriptions on the back to reveal if the matches are correct. Each match will have a corresponding number to confirm the correct choice.

7. Discuss your findings with a neighbor.

**Can you think of other important contributions discovered by indigenous communities?**

# 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***:* Organic materials from the local environment or 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.*

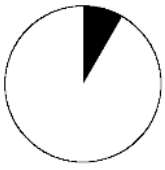
- Natural dyes can be made from organic materials such as plants, fungi, invertebrates, or minerals.
- Native peoples worldwide have used natural dyes for generations.
- Passing down knowledge through generations is a valuable way to gain skills and learn about the environment.

## TIME REQUIRED

**Advance Prep**

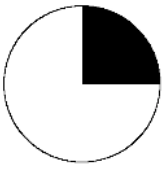
**60+ minutes**

**Set Up**



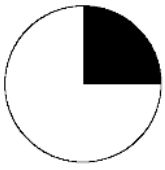
**5 minutes**

**Activity**



**15 minutes**

**Clean Up**



**15 minutes**

## PROGRAM FORMAT

| Segment | Format | Time |
|---|---|---|
| Introduction | Instructor-led Activity | 1–2 min |
| Natural Dye Activity | Individual Activity | 10 min |
| Wrap-up | Instructor-led Activity | 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 | 5 |
| 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 than 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.
    - 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”).

## SET UP

- Place the plastic tablecloth over the table.
- Put the five jars 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.

**Optional Additional Talking Points**

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

## GLOSSARY

| Vocabulary | Definition |
|---|---|
| **Dye** | Substance (natural or synthetic) that changes the color of something. |
| **Mordant** | A fixative, typically a metallic salt solution, which helps to permanently bond the dye to the fiber. |

[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

## 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 | | | | | | | ✓ | |

# Restoration Project Poster Boards

| | |
|---|---|
| ***Program Type:*** Classroom, afterschool, or community center program | ***Audience Type:*** Grades 6–8, ages 11–14 (emphasis on Native youth) |
| ***Program Length***: 1–2 hours | ***Class Size:*** Up to 30 students |

**Description:** Students work in small groups to research a restoration project and create a poster board collage on how science and traditional knowledge* are being used for environmental and cultural restoration. Students make a short presentation on their collage, which is put on display in a classroom or museum hosting the *Roots of Wisdom* exhibition.

**Traditional knowledge refers to information, skills, and practices that are developed, sustained, and passed on from generation to generation within a community.*

**Topics**: Traditional Knowledge, History, Environmental Science, Generational Learning, Careers in Science

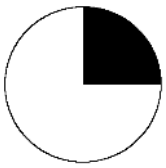
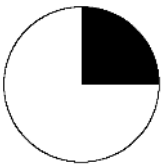
**Process Skills Focus**: Critical thinking, research, reading, writing

## LEARNING OBJECTIVES

*For Next Generation Science Standards alignment, see end of outline.*

- Students will understand that there are many cultural and environmental restoration projects happening around the country
- Students will research a specific restoration project related to a Native community
- Students will learn about contributions of traditional knowledge and Western science to restoration projects

## TIME REQUIRED

| Advance Prep | Set Up | Activity | Wrap-Up |
|---|---|---|---|
|  |  |  |  |
| **60 minutes** | **15 minutes** | **60+ minutes** | **15 minutes** |

## PROGRAM FORMAT

| Segment | Format | Time |
|---|---|---|
| Introduction | Instructor-led discussion | 10 min |
| Videos | Instructor-led discussion | 5–10 min |
| Creating Poster Boards | Participant-led group activity | 30–40 min |
| Group Presentations | Participant-led group discussion | 10–20 min |

## SITE REQUIREMENTS

- Access to tables or floor space large enough for groups of 2–3 students to create poster board collages with arts and craft supplies
- Access to a chalk or dry erase board
- Access to a computer and projector for screening introduction videos
- Access to computers or iPads (1 per 2–3 students) **or** printed materials for researching restoration projects *(see Advance Preparation for more details)*

## SUPPLIES

| Supplies | Amount | Notes |
|---|---|---|
| Chalk board or dry erase board | 1 | Large enough for students to come up and write notes |
| Computer (preferable) | 1 | For watching intro videos |
| Projector (preferable) | 1 | For watching intro videos |
| Computers or iPads (optional) | 1 per group of 2–3 students | For researching information. Printed materials can be used as an alternative. |
| Printer (optional; color printer preferred) | 1 | For printing information and graphics for poster boards |
| Tables or group of desks | 1 per group | For assembling poster boards (students can work on the floor as an alternative) |
| Poster boards (around 64 cm × 64 cm or 24” × 24”) | 1 per group | Cardboard or foam core could also be used |
| Markers | 5 per group | A variety of colors |
| Scissors | 1 per student | |
| Glue stick | 1 per group | |
| Pencils | 1 per student | For taking notes / making a draft |

## ADVANCE PREPARATION

- Instructor should find one local restoration project for each group of students to research. Making contact with local tribal offices such as the Department of Natural Resources is a good place to start. As an alternative, students can research one of the several projects highlighted on either the Roots of Wisdom[1] or American Indian Responses to Environmental Challenges[2] websites if local stories are difficult to find.
- Instructor can select a limited amount of information on each restoration project to print for each group instead of having students use computers or iPads. Printing extra-large font works well for students to read over as a group and for cutting and pasting onto poster boards.
- Each group should have at least 3–5 images printed out to cut and paste onto poster boards. Students can draw pictures as an alternative.

[1] http://omsi.edu/exhibits/row/
[2] http://www.nmai.si.edu/environment/

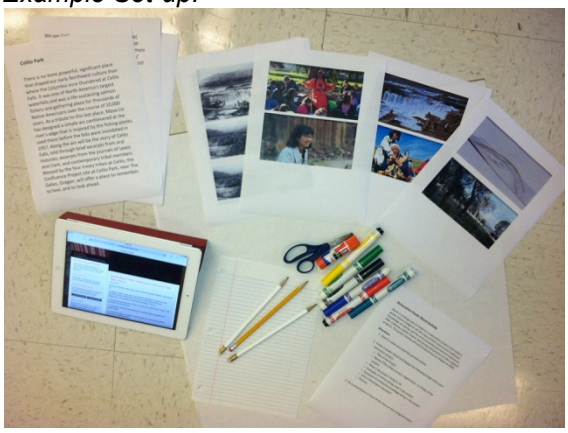
- Select 2–3 students who can work well together for each group.
- If students are a different ages and have varying reading abilities, adjust the amount of research information assigned to the groups.

## SET UP

15 minutes

- Set-up computer and projector (if available) to display introduction videos.
- Give each group of students all materials needed to research a restoration project and create a poster board:
  - Poster board
  - Computer or iPad and printer **or** pre-printed information and graphics
  - Markers
  - Scissors
  - Glue
  - Pencils

*Example Set-up:*



## INTRODUCTION

10 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.* Feel free to improvise as needed.

To begin the activity, draw a vertical line down the middle of the board and write "science" on one side and "traditional knowledge" on the other.

**Introduction**

Today we are going to learn about environmental restoration projects, why they are important and how people can use information shared by scientists and Native Americans to care for the Earth.

Environmental restoration can happen in a variety of situations. Restoration projects are sometimes very involved, like removing a parking lot to plant Native plants or re-directing the flow of a river to restore salmon habitats. These projects rely on heavy equipment like cranes and bulldozers. Often projects are much smaller, like digging out invasive species from a backyard using common gardening tools like rakes and shovels. Sometime these projects need to be informed by professionals like scientists and engineers and sometimes they can be led by whoever feels passionate about caring for the Earth. **Let's think about projects happening around our local area. Can anyone name an example?** *My mom removed blackberry bushes in our backyard, people planted trees along our road, I saw people working on the river to help fish, etc.* Those are all good examples. **Can you now tell me why these projects are important?**

Building on projects happening in the local area and those that students may have named as examples, discuss why environmental projects are important to heal and protect the Earth.

Let's now think about useful information for carrying out an environmental restoration project. For example, it might be important to know what the place looked like before it was impacted by people, what plants and animals used to live there, etc.

**What else can you think of that's important to know about a restoration project?**

Let's now focus on how science and knowledge shared from Native Americans, often called traditional knowledge, can help restore the environment.

**What comes to mind when you think of science and the environment?**

Science can be very broad, so think big!

*A person studying water, learning about the weather, animals, plants, test tubes, experiments, etc.*

Have students brainstorm what science is in the broadest sense and have them write comments on the board to create a list to reflect upon during the activity.

That's a great list. Let's now think about what comes to mind when we think about information shared by Native Americans, which we call traditional knowledge. I'll give you some background information. People often refer to traditional knowledge as information passed down from one generation to another. Think about facts you have learned from people older than you. Raise your hand if you know people who are at least two generations older than you. These people could either be your grandparents or other people in your community of the same generation or older.

Provide the students with a real-life example. Tell a personal story of something you learned from a person of an older generation or make up a story that students can relate to.

Example story:
*My grandfather loved to fish. He knew how to identify many different species of fish and which tasted the best. He taught me to be patient when catching fish, since he knew that the fish wouldn't always be easy to find and trap. He never got frustrated when he didn't catch fish and he was confident that he would come back another day to fish and be successful then.*

**Optional Enrichment**
If students identify as Native American or indigenous of another culture, ask if anyone in the class has an example to share of something they learned about their people and culture from someone who is older than them, like a grandparent or tribal elder.

Traditional knowledge can be expressed in many ways through storytelling, rituals, songs, crafts, or gathering food. Traditional knowledge can be another way of learning or knowing and can be just as a valuable as learning facts in a more scientific way. **Now that you have a little background, what comes to mind when you think of traditional knowledge?** Possible answers: *cultural traditions, storytelling, dancing, woodworking, harvesting food, animals, hunting, where to find food, plants, medicine, witnessing climate change, etc.*

See the Resources section below for reading more on traditional knowledge (often referred to as Traditional Ecological Knowledge).

We are now going to watch a couple of videos about environmental and cultural restoration projects using both science and traditional knowledge to help restore the environment and Native culture. After the videos, I'll assign you to groups of 2–3 students and you'll create a poster board about a restoration project that is either happening around our local community or is highlighted on a museum website.

**Optional Enrichment**
If students have the chance to visit the *Roots of Wisdom* exhibition, review the content in the exhibition and relate it to the conversation. See optional extensions section for more information.

**INSTRUCTOR-LED DISCUSSION**

## Videos

5 – 10 minutes

Both the Roots of Wisdom[3] and American Indian Responses to Environmental Challenges[4] websites have videos telling stories of environmental and cultural restoration projects happening in Native communities around North America. The *Roots of Wisdom* website has four short 2–3 minute videos that focus more on traditional knowledge. The American Indian Responses to Environmental Challenges website has several longer videos on four other restoration projects. These videos are good to show if there is more time to complete this activity. Instructors are encouraged to start with the video referenced below and explore both websites to get an idea of how science and traditional knowledge are being used in a variety of situations.

The first film we are going to watch is about restoring a native bamboo plant in North Carolina called Re-establishing a Native Plant[5]. It was filmed for an exhibition created by the Oregon Museum of Science and Industry (OMSI) in Portland, Oregon. This film is about how the Eastern Band Cherokee are working to restore habitat for river cane, a type of bamboo. The film also discusses the cultural traditions that the plant is used for.

After the film, ask students what they saw in the film that relates to science and traditional knowledge.

[3] http://omsi.edu/exhibits/row/
[4] http://www.nmai.si.edu/environment/
[5] http://omsi.edu/exhibits/row/meet-the-communities/cherokee

GROUP ACTIVITY

## Creating Poster Boards

30 – 40 minutes

Now that you have seen an example of how a museum highlighted a restoration project that uses both science and traditional knowledge, it's your turn to create a poster board to tell the story of a different project.

Assign the students to groups of 2–3 students and hand out all of the materials needed to complete the project.

You should have all the materials needed to complete the project. Here is a handout with your directions.

Provide each group with a handout of directions.

The poster boards can go on display in either the classroom, somewhere else in a school or ideally in a museum hosting the *Roots of Wisdom* exhibition. Museums can use the poster boards to supplement the exhibit and highlight restoration projects happening in their local community.

## *Handout*

*(Available for download as a Microsoft Word document at: http://omsi.edu/exhibits/row/education-resources/)*

## Restoration Poster Board Activity

Work in small groups to research a restoration project and create a poster board collage to tell the story of how traditional knowledge and science are used for environmental and cultural restoration. After creating the poster boards, each group will present their board and talk about their project.

**Directions**

Create a poster board highlighting the following information:

1. Name of the project
2. Name of the Native community working on the project *(There may be more than one)*
3. What the project is about
4. Examples of how science is being used
5. Examples of how traditional knowledge is being used
6. Why this project is important
7. Pictures of the restoration project (at least 3-4)

**PARTICIPANT-LED GROUP**

## Group Presentations

10 – 20 minutes

Ask each group of students to make a short presentation of their poster board. Students can use their direction sheet as a guide for their presentation. Have each group share the following:

1. Name of the project
2. Name of the tribe or Native community working on the project
3. What the project is about
4. Examples of how science is used
5. Examples of how traditional knowledge is used
6. Why the project is important

**OPTIONAL EXTENSIONS**

- Take a field trip to a museum hosting the *Roots of Wisdom* exhibition and challenge students to find examples of science and traditional knowledge as they move through the exhibit components. Lead a group discussion near the exhibit afterward and have students share what they learned about science and traditional knowledge.
- Talk with museum staff about displaying the poster boards in the museum to highlight restoration projects happening in the local community.

## RESOURCES

Links to videos:

- Roots of Wisdom[6]
- American Indian Responses to Environmental Challenges[7]

Links and resources for cultural guides:

- Alaska Native Knowledge Network[8]
- Guide to Implementing the Alaska Cultural Standards for Educators[9]
- Indian Education for All - Montana Office of Public Instruction[10]
- Navajo Culture[11]

## GLOSSARY

| Vocabulary | Definition |
|---|---|
| **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 in danger of being forgotten by younger generations |
| **Ways of knowing** | Information gained by patient observations, life wisdom, and accumulated knowledge |
| **Western science** | The observations and actions practiced by Western countries |

[6] http://omsi.edu/exhibits/row/
[7] http://www.nmai.si.edu/environment/
[8] http://ankn.uaf.edu/Publications/Knowledge.html
[9] https://education.alaska.gov/standards/pdf/cultural_standards.pdf
[10] http://opi.mt.gov/programs/indianed/IEFA.html
[11] http://serc.carleton.edu/research_education/nativelands/navajo/culture.html

## NEXT GENERATION SCIENCE STANDARDS

**Practices**

- Asking questions and defining problems
- Planning and carrying out investigations
- Analyzing and interpreting data
- Obtaining, evaluating, and communicating information

**Crosscutting Concepts**

- Patterns
- Cause and effect
- Scale, proportion, and quantity
- 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 | | | | | | | | |

# Voices from our Community

| | |
|---|---|
| ***Program Type:*** Classroom, afterschool or community center program | ***Audience Type:*** Grades 6–8, ages 11–14 (emphasis on Native youth) |
| ***Program Length:*** 1–2 Hours | ***Class Size:*** Up to 30 students |

**Description:** Students interview a Native American elder and a Native or non-Native scientist to gather different perspectives about the natural world.

**Topics**: Traditional knowledge, history, environmental science, generational learning, careers in science

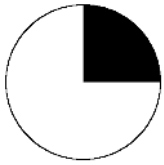
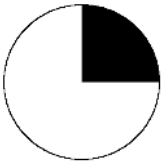
**Process Skills Focus**: Critical thinking, listening, inquiry, writing, observing

## LEARNING OBJECTIVES

*For Next Generation Science Standards alignment, see end of outline.*

- Students will learn about traditional knowledge and careers in science from Native American elders and a Native or non-Native scientist in their local community
- Students will experience how cultural identity can impact career choices and knowledge about the environment
- Students will learn basic interviewing skills

## TIME REQUIRED

| Advance Prep | Set Up | Activity | Wrap-Up |
|---|---|---|---|
|  |  |  |  |
| **60 minutes** | **15 minutes** | **60+ minutes** | **15 minutes** |

## PROGRAM FORMAT

| Segment | Format | Time |
|---|---|---|
| Introduction | Instructor-led Activity | 30 min |
| Native Elder Interview | Participant-led Activity | 30–60 min |
| Native or non-Native Scientist Interview | Participant-led Activity | 30 min |
| Wrap-up | Instructor-led Activity | 5 min |

## SITE REQUIREMENTS

Most any space can work for this activity as long as people can hear each other and the space is comfortable for guest speakers (e.g., a chair).

## SUPPLIES

| Supplies | Amount |
|---|---|
| 8.5”×11” paper | 1 per student |
| Pen or pencil | 1 per student |

## ADVANCE PREPARATION

- Locate a Native American elder and a Native or non-Native scientist who are interested in being interviewed by a group of youth.
    - Suggestions for where to find a Native American elder:
        - Family members of youth
        - Tribal or cultural center
        - Retirement or assisted living center
        - Local Native-owned companies and businesses
    - Suggestions for where to find a Native or non-Native scientist:
        - Family members of youth
        - Natural resources department
        - Medical facilities
        - A local Native American department or association of a college or university such as the American Indian Science and Engineering Society[1]
        - Local companies that employ scientists
- Cultural sensitivity should be taken into consideration when reaching out to an elder and asking for an interview. The facilitator is encouraged to speak with people in the Native community and learn protocol for asking an elder to present. This protocol may vary among different communities.
- An honorarium is often appropriate to offer in return for someone sharing cultural knowledge.
- **Always** have a gift to present a guest from the Native community. This gift can be flowers, food, a card signed by the students, or even a gift made by the students.
- Provide the interviewees with information about the type of questions students will be asking and ask them if they feel comfortable answering the questions.

## SET UP

An interview can take place in a variety of settings. Students sitting in a semi-circle with an elder or scientist in front can work well. Facilitators are encouraged to create an informal atmosphere and not have students sit in their desk in a traditional classroom layout. Non-traditional learning environments like sitting in a circle outside or in a communal space can foster more conversation and create a more comfortable atmosphere for guest speakers and students.

[1] http://www.aises.org/

INTRODUCTION

# Interview Process

30 minutes

Suggested script is shaded. Important points or questions are in **bold**. Feel free to improvise as needed.

**Introduction**
The facilitator introduces students to the interview activity and leads a conversation about how different experiences can shape people's perceptions about science and the environment. Although conversations can vary, an example dialog is provided below.

Today we will be interviewing a Native elder and a scientist from our local area to learn about their lives and what they think of nature, science and the environment. Interviewing different types of people can create different types of experiences and our interview with an elder may be different than our interview with a scientist. For example, elders might like to share information by telling stories about their life while a scientist might like to answer a list of questions about their work.

Our first interview will be with _____ (name). An elder is a person of an older generation who has a great deal of knowledge, lived experience and information about their family, community, culture and local environment. Elders are traditionally very well respected in Native communities. How many of you know elders in your family or community? Do you look up to them and treat them with a great deal of respect? I hope so.

Give students some basic information about the person they will be interviewing and how they should act during the interviews and in the presence of a Native elder. Students should:

- Be polite and attentive
- Not speak out of turn or without raising a hand first
- Be patient in waiting for the speaker to answer a question
- Speak loudly and clearly when asking a question
- Be mindful of not asking questions that are too personal

Before we meet with each of our presenters, we need to create a list of questions that you as a class will ask these presenters during the interviews. To get an idea of what type of questions we want to ask, let's think about what these people might want to share with us. **Many of you have grandparents and know other people of the same generation as _____ (guest speaker). What do you think _____ (guest speaker) might like to share with us?**

Since we are focusing on learning about science and the environment, let's also think about how older generations may have interacted with nature and the environment when they were your age. **What experiences might they have had that could be different from your own? For example, would the way their family acquired food have been different? Would they have spent more time playing outside without modern technologies? Who can think of a question they would like to ask?**

Have students take 3–5 minutes to work on their own or with the person next to them to come up with 2–3 questions each. Go around the room and ask each student/group what they came up with and make a list of questions on the board for students to ask during the interview. See the list below for examples of good interview questions.

Now that we have a list of questions for our Native elder, let's think about what we want to ask our scientist.

Our next interview will be with _____ (name). He/she is a _____ scientist and works for _____. Let's now come up with a list of mostly new interview questions.

Give students enough time to repeat the process of either working alone or in pairs to come up with a list of new questions. Try to encourage the students to come up with questions related to being a scientist, what type of education scientists need for their jobs, and how working with the Native community has influenced scientists' perceptions of science and the natural world (if applicable). See the list of example questions below.

Teachers can ask students to take notes on each question asked during the interviews or take a moment after each interview to write down 3–5 facts they learned about each interviewee.

**GROUP ACTIVITY**

## Native Elder Interview

30–60 minutes

**Example questions for a Native elder:**

1. Could you share some information about your family with us?
2. What was life like when you were between 11 and 14 years old?
3. From your perspective as a Native elder, what do you think is important for youth to know about the environment and why?
4. How can I best take care of myself, my community, and the Earth?
5. What inspired you as a child? What continues to inspire you now?
6. What are your concerns with respect to our community?
7. What are your concerns with respect to our Earth?
8. What advice do you have for us?

## GROUP ACTIVITY — Native or non-Native Scientist Interview

30 minutes

**Example questions *for a Native or non-Native scientist*:**

1. What are your hobbies?
2. Where are you from?
3. What is your current job/position?
4. What education and/or experience did you need to get your job?
5. As a child, did you have any hobbies, interests, or experiences that helped prepare you for success in _____ (interviewee's field)?
6. When did you realize that you wanted to be a _____ (interviewee's profession)?
7. Did you have a mentor or teacher who inspired your interest in your current career or expertise?
8. What do you think was the most important thing you learned growing up?
9. What is your dream? What do you most hope to accomplish in your life?
10. Did you have to overcome any obstacles on your path to becoming an expert in your field?
11. Who do you look up to as heroes in your field? In your community?
12. Do you have any advice for students who are interested in pursuing a career in_____ (interviewee's field)?
13. What projects are you working on now?
14. How does the research / work you do affect people's lives?
15. How does the research / work you do affect us here in our community?
16. What do you like most about your work?
17. What inspired you as a child? What continues to inspire you now?

## WRAP-UP

5 minutes

- **It's very important to present a gift to any guest speaker from the Native American community.** Have a student or two present a gift to the interviewees at the end of the interviews and thank them for visiting.
- After both guest speakers have left the classroom, engage students in a conversation around how the interviews were different and what they learned about how each speaker engages with nature and science. Talking about how differences in age, careers, culture, etc. can encourage students to think about how different people experience science and nature in different ways.
- Ask students to turn in their notes or 3–5 facts they learned about each interviewee to get credit for participating.
- Either have the class make one large thank-you card or have students each make individual thank-you cards to send to the guest speakers.

## OPTIONAL EXTENSIONS

- Students can conduct a one-on-one interview with a community or family member. A brief summary of the interview and answers to their interview questions can then be shared with their class and/or turned into their teacher. This activity could be completed to earn extra credit.

## BACKGROUND INFORMATION

Guidelines[2] for interviewing a Native elder:

1. Cordial greeting of the elders. Inquire if they had a good sleep. Inquire if they have anything of importance to communicate right then.
2. Give reason(s) for meeting.
3. Consider presenting a release form for the elder to sign.
4. Try to approach the subject from all angles. Remember that most students don't know much about Native stuff, but they love it.
5. Take breaks at appropriate times.

Tips[3] for students for conducting interviews:

**STEP 1: Research, research, research**. Then research some more. The only way to come up with good questions is to know everything there is to know about your subject.
**STEP 2: Contact the person you wish to interview**. Ask when a good time would be to do the interview. Be polite! Say "please" and "thank you." Try to set up the interview in person. If this isn't possible, then set up a phone interview.
**STEP 3: Read over your research and brainstorm a list of 15 questions**. The more specific your questions are, the better! And never ask questions that can be answered with a simple yes or no. Make your interviewee talk!

**STEP 4: Come prepared with:**
A pencil
A notebook
A list of good questions
A recording device (always ask permission before recording an interview)
**STEP 5: Be on time!** Arrive at your interview with plenty of time to spare. If you've never been to the place where your interview is taking place, go early and scout it out. There is nothing more unprofessional than a reporter who is late.
**STEP 6**: Conduct your interview in an organized, timely manner**.**
**STEP 7**: Even if you are recording an interview, take notes**. Don't try to write every word said. It will slow down the interview. Just take down the highlights.**
**STEP 8**: Review your research and your interview notes**. Circle or highlight quotations that you think will be good for your article. Now you're ready to begin writing!**

[2] http://ankn.uaf.edu/NPE/CulturalAtlases/interview.html
[3] http://www.scholastic.com/teachers/lesson-plan/how-conduct-interview

## RESOURCES

Links and resources for cultural guides:

Alaska Native Knowledge Network[4]
Guide to Implementing the Alaska Cultural Standards for Educators[5]
Indian Education for All - Montana Office of Public Instruction[6]
Navajo Culture[7]

## GLOSSARY

| Vocabulary | Definition |
|---|---|
| **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 in danger of being forgotten by younger generations |
| **Ways of knowing** | Information gained by patient observations, life wisdom, and accumulated knowledge |
| **Western science** | The observations and actions practiced by Western countries |

[4] http://ankn.uaf.edu/Publications/Knowledge.html
[5] https://education.alaska.gov/standards/pdf/cultural_standards.pdf
[6] http://opi.mt.gov/programs/indianed/IEFA.html
[7] http://serc.carleton.edu/research_education/nativelands/navajo/culture.html

## NEXT GENERATION SCIENCE STANDARDS

**Practices**

- Planning and carrying out investigations
- Obtaining, evaluating, and communicating information

**Crosscutting Concepts**

- Patterns
- Cause and effect

| | 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 | | | | | | | | |

# Weaving Activity Directions

- Create a small handmade loom by cutting a piece of cardboard into a small rectangle (about 5 inches wide by 7 inches long is a good size for starters).

- Using a ruler, draw six to eight ¼ inch long lines along the top and bottom of the loom. The lines should be around ¼ inch apart and should line up with one another from top to bottom.

- Use a pair of scissors to cut along the ¼ inch long lines on both the top and bottom of the loom (See Image 1).

- Cut a long section of white string (about 16 times the length of your loom). Tape the string down on the left side of the loom. This will be the back side of the loom. Using Image 1 as a guide, pull the string up through slot one, down through slot two, up and over slot 3, down through slot 4, etc. Follow this pattern until the string has crossed through all slots. Tape the end of the string to the back of the loom.

- Draw a pattern on a piece of graph paper that is the same size as the loom. Use three to five colored pencils to represent the colors of yarn that will be used in the weave. The pattern will serve as a guide for weaving.

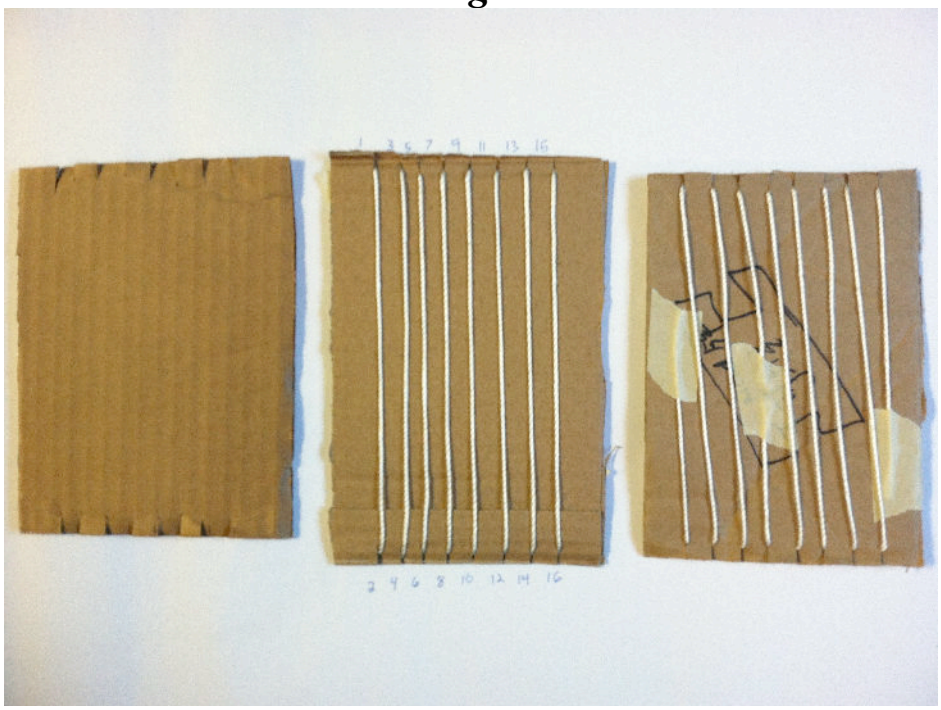
- Choose a color of yarn to begin with. Moving from left to right, place the yarn over one string and under the next string. Repeat this over/under pattern until you cross all strings. Then wrap the yarn around the last string and move back in the opposite direction (right to left) using the same over/under pattern. Repeat for as many lines as you would like with that color of yarn.

- When changing the color of the yarn, finish an entire row and then switch to a different color. Do not tie a knot at the end of the yarn to start a new color. Each piece can be simply left hanging off to the side.

- Complete the weave by following the pattern drawn out on the graph paper. Weave until the loom is completely full.

- Either cut the weave off the loom to make a wall hanging or frame the weave on the loom by making a cardboard frame.

## *Image 1*



## *Image 2*