Planting Hope:
Sustaining Indigenous Knowledge of Plants of the Colorado Plateau

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Project Goal: To empower students to become knowledgeable advocates for native plants by developing skills in identification, understanding ecological benefits, cultivating native species, and engaging with their local community to preserve traditional ecological knowledge (TEK)

Topic & Context

The connection between plants and human history is not robustly investigated within most modern high school curricula. Yet, education forms the basis upon which the future is built. Because sustaining plant knowledge will benefit students and the communities in which they live, with the potential to create lifelong changes to individual and community health, this unit uses school and local garden spaces to engage students with local plants, to explore important aspects like soil building and degradation, water scarcity, and distances foods travel as a way to strengthen youth involvement.

The Colorado Plateau is unique in its botanical diversity created by the equally diverse climes - water is at the heart of a plant's survival, of mankind's too, but also are soil, seeds, and traditional knowledge. Plants can be used to re-educate, reconnect people to the place. The intent of this curriculum is to access traditional knowledge our students already hold and to increase their knowledge by encouraging them to access plant knowledge from their family and local communities.

The *Planting Hope- Sustaining Indigenous Knowledge of Plants of the Colorado Plateau* Curriculum is developed for secondary level students, grades 9-12, at Summit High School (SHS) - FUSD. Students enrolled in Service Learning, a nine-week elective course offered in the spring and fall quarters work through this unit in series of lessons designed to encourage participants in the course to engage with the native plants that are currently found in the areas near Flagstaff, Arizona as well as species commonly planted as food crops and able to be grown in the SHS gardens such as corn, squash, beans, herbs.

Summit High School, Flagstaff Unified School District's alternative high school's enrollment is capped at 120 students with 57% Native American (ADE. 2024) many students are Diné, while Hopi, Apache, Havasupai, and other tribes are represented in our student body. In an effort to re-educate Flagstaff youth about the uses of native botanical species from the Colorado Plateau, as well as food species adapted to this region, lessons will focus on assessing prior plant knowledge, developing interest in

plants and implementing opportunities to plant, to tend, to harvest, use, and to spread plant knowledge with language standards embedded in the final project.

Plants create cultural traditions of the people of any given region. In an effort to affirm the power of relationships to plants and food, students will use school garden space to cultivate and care for their species of choice. By cultivating and tending the school gardens (pollinator, food, and medicine), visiting, and working at other local gardens & greenhouses, getting knowledge from guests, family and community members, Summit students, will in turn, contribute to the body of knowledge of plants in their spaces. Summit students choose a plant of their interest to investigate and research, to become knowledge keepers of their individual relationships with that plant and its traditional uses, then share with the class and community that knowledge.

Rationale

More and more research confirms that spending time outdoors has health benefits. Students given opportunities to learn from working with plants will have improved outcomes in the school setting and emotional well being. The need to tend plants regularly, adds to movement and exercise while also providing a sense of purpose. Recent systematic reviews of hundreds of studies of thousands of participants confirm that gardening improves physiological and psychological well-being, improves quality of life (including life satisfaction and social connectedness) and mental health, with reduced depression, anxiety, and stress (Sternberg, 2025).

Current U.S., and to a large extent, global food systems are so industrialized they no longer resemble Indigenous, sustainable farming practices. For millennia, education for tribal people was learned through intergenerational lessons taught with the family. This provided younger generations with the skills and knowledge needed to thrive in their environments, for the younger generation over time, to become the knowledge keepers of the natural world. Over the past centuries, tribal education has undergone numerous transitions with negative outcomes for dissemination of cultural knowledge (Cannon, 2018).

Congress passed the Appropriations Act in 1892, thereby making Indian education compulsory, the time when Native families lost their children who were rounded up, forced to attend Indian boarding schools away from their families where they learned reading, writing, arithmetic, and trade skills in the English language in order to make them “productive Americans” (Canon, 2018). These government schools used education as a means to strip children of their culture and heritage, to acculturate them

into white society. These unfortunate historical educational practices have created the need for many tribal members to be reeducated with their cultural botanical knowledge. The practice of making English mandatory, and forbidding native languages to be spoken, contributed to, in some cases, the loss of specific knowledge of plants - names and uses. Since translations from Indigenous languages to English are not capable of transmitting complete information, botanical knowledge is sometimes difficult to preserve.

Although local farmers markets, school yard and community gardens, Indigenous gardens have maintained some level of food sovereignty. Industrialization of food in the last century in the United States has drastically changed the relationship of man and food. Individuals and communities have changed important practices needed to seed save, plant, harvest, and store healthy traditional food sources. Cultural fractures such as displacement from traditional homelands, have caused many youths to underestimate and misunderstand the importance of foods from traditional sources. Their reliance on large agrobusinesses food production to sustain their lives has further complicated their relationships with plants. Many youths, both Indigenous and nonindigenous have limited experience with growing food from seed and limited knowledge of how to use plants for food, medicine and other uses. Major changes in food systems have, in many cases, changed food from medicine to poison, chronic diseases - diabetes, hypertension - illustrate this point.

In my 20 years of teaching, few students have had a depth of knowledge necessary to grow food crops let alone at a subsistence level. For instance, most students can not explain the reason for a flower and are sad to find one faded on their plants, then, equally amazed to find the flower gave way to a bean or squash days later there, where the flower once was. I have also discovered students often underestimate their knowledge of plants. Many students have collected from uncultivated or wild food sources - examples are pinyon seed, or plant stems and leaves used for teas. Many students have never experienced or may have forgotten the joy, interest and fulfillment received while learning to grow and care for plants. As a teacher, one of my most important roles is to create opportunities for students and their larger community to reconnect and build upon their relationships with plants, seasons, and Earth's cycles.

Looking at regions around the globe, the plant species endemic to specific regions, and human uses of local plants can provide an intriguing view of humankind’s connection to the land through botanical provisions. Ceremonies include plants as food, plants as medicine, plants as instruments. Many knowledge keepers are willing to share their relationships and understandings of plants with others.

An important aspect is engagement with local community members who are saving ecosystems and lifestyles while sustaining and or reviving traditional agricultural practices and techniques, by integrating them into the contemporary world. Experiences gained during the Service Learning course will get students reconnecting with plants and may lead to food and sovereignty and reducing reliance on large agribusinesses.

Instructional Guide

This curriculum is designed to become an ongoing project as an intergenerational learning program encouraging youth at Summit H.S., FUSD's alternative school offered to 20-24 students from a total 120 students enrolled. Designed to seek out information from elders and community members. The idea is for the youth to gain knowledge and become knowledge keepers of centuries old cultural botanical knowledge before more of it is lost. In this process, students will gain reading, writing, speaking, listening, researching, and presentation skills and learn about a specific type of plant or tree that is local to the Colorado Plateau. We are left to create contemporary ways of teaching the old ways in an effort to maintain the continuity of knowledge. I want to use culture to teach my students. By including field trips where students will visit natural habitats, local gardens and greenhouses (Colton, NAU). The goal of trips is to expose students to plants in their natural habitats. It can be as simple as walking behind the school grounds, trips to higher or lower elevations with areas of undisturbed natural areas containing local plant species. Increased exposure to multiple cultivated and natural areas, lends to students' abilities to build experiences and have chances to experience the species fully. I want students to start this course off with drawing upon their own knowledge of plants. This process will start by having students identify and discuss their gardening background and experiences, relationships they have with plants - food investigations, leading them to choose one species to further research - *who, what, why, when, and how* of their chosen plant species. Students will be encouraged to think of plants as food, drink, medicine, and textile.

For this curriculum, students use collaboration to engage with materials including but not limited to, plant identification keys, specific websites which will include information and facts about the plants in the western world, botanical databases such as SEINet (The Arizona - New Mexico Chapter). Student-centered learning is at the heart of this project where students are allowed to investigate and gain knowledge and skills for topics that are challenging. The reliability of resources students use in their research will be evaluated. Another component requires students to seek out knowledge keepers, to collect consent from the keepers to collect and use information on the plant species during discussions/interviews. Students will be provided with reference reading

materials, as well as some knowledge found through plant walks, visits to gardens and talking with community members. Students will be required to use APA style citations.

Because the scientific name is universal and is used by scientists. Scientific terms in latin, binomial nomenclature- *Genus species,* will be useful for the students to learn and use during conventional research. A minimum of three languages will be required for the project. Botanical names in Navajo, Hopi, other Indigenous languages, Spanish or common names in English must be included. Each plant's name is also a description which identifies something significant associated with the species. In addition to plant names in multiple languages, photographs and illustrations (which can be student-made drawings called a botanical illustration).

The final product will be individual submissions, a mix of digital and paper, and hopefully permanent garden signage when applicable. In this process, students will gain reading, writing, speaking, listening, researching, and presentation skills and learn much about specific plant species that are native, endemic to the Colorado Plateau. Students will share a final product presentation with the school.

Teaching Plan

LESSONS

Week 1: Plants and Humans

What relationships do I have with plants? As food? As medicine? What stories do I know- plants in my culture?

Team discussions/activities

- *Relationships with Plants* worksheet
- My gardening experiences worksheet/discussion
- Traditional vs. contemporary foods (nutrition, additives, preparation, ceremonies)
- Evaluate needs of plants (soil, fertilizer, water, environmental factors, NPK)
- Venn Diagram - Examine/comparison of plant and human characteristics
- Garden Scavenger Hunt
- 6 word memoirs (Garden, food, plant, human)

Week 2: Seeds and Soil

Discuss purpose of seeds, uses of seeds. seed saving. Differences in soil/dirt/compost.

- Seed in a bag activity
- What seeds are these?
- Importance of seeds as food for many species
- Seed Diversity - evolution, GMO, heirloom, hybrid
- Seed guardians - cultural kinship, seed banks

- Introduce *Plant Knowledge Keeper* Project- importance of knowledge sharing
- Importance of soil for planting - compost, winter crop cover, nutrients, water, seed, plant care

Week 3: Garden Cultivation (Spring & Fall Curricula vary)

- Explore existing gardens- field-trips to local gardens
- Sitting in place - observing listening to land
- Compare gardening, farming, wildcrafting, gathering - garden job assignments
- Choose a plant - Research it- websites, books, plant experts (interviews) & knowledge keepers. What **stories** are associated with this species?

Week 4: Colorado Plateau

- What makes a weed? Invasive local examples - tamarisk, diffuse knapweed
- What makes a plant native?
- Students will photograph their chosen species in multiple spaces.
- Plant press and collection, ethnobotanical principles
- Research and interviewing knowledge keepers for information, stories, uses

Week 5: Harvesting and Eating (Fall curriculum)

- Students share recipes for the chosen species
- Project work time - choose their mode of knowledge sharing. Suggestions include, not limited to: digital presentation, brochure, bulletin n site board, video clips and description of plant area in the garden, classroom representation.

Embedded in lessons are English Language Standards

9-10.W.2. Writing is a process that involves prewriting, drafting, revising and editing, rewriting, and publication. The students will be able to divide writing into small portions and concentrate on producing high-quality content

For the majority of people nowadays, a combination of modern and traditional cuisine is typical. tends to be important source of many nutrients without some of the drawbacks from modern production (transportation, carbon footprint, additives, chemical fertilizers, fewer nutrients)

Week 4: Get to know the plants/Plants I have relationship with/Plant ID
Students will be able to learn about the native plants common to Colorado Plateau (wildcrafted) and food species (vegetable garden)

Students will learn when and how to properly harvest, especially the plants around the SHS gardens, as well as learn how to store and preserve their harvest.

Lesson 6: Fieldtrips - Visit local farm/garden/greenhouse

Students will explore in person local facilities, learning about and experiencing first-hand the challenges of growing on the Colorado Plateau.

Standards:

9th-12th Diné Culture Standards
Concept 2: I will apply and practice the Diné way of life with confidence.
PO3. I will practice respect for nature in my daily life. ()
ADE Life Science
HS.L2U3.18 Obtain, evaluate, and communicate about the positive and negative ethical, social, economic, and political implications of human activity on the biodiversity of an ecosystem. (Agrobusiness vs. slow food movement)
HS.L3U1.24 Construct an explanation of how the process of sexual reproduction contributes to genetic variation. (DNA in seed discussion)
ADE ELA
9-10.R1.10 By the end of the year, proficiently and independently read and comprehend informational texts and nonfiction in a text complexity range determined by qualitative and quantitative measures appropriate to grade 10.
(Research plant species, plant ID, plant uses)
9-10.W.2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.

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Esther Sternberg M.D. *(*May 23, 2025)**.** 6 ways gardening reduces stress and enhances well-being. *Psychology Today.* *https://www.psychologytoday.com/us/blog/creating-wellbeing-wherever-you-are/202505/6-ways-gardening-reduces-stress-and-enhances-well*

Arizona Department of Education. ADE. https://azreportcards.azed.gov/schools/detail/4803

Vocabulary needed to understand this plant
Marker in garden - QR code with student created page
Recipe, harvesting, preparing
Nutrients - Uses
Genetic value - where did these seeds come from? Were they massed produced?

cultivation, teaching peers and community (family night garden tour) . Use videos to show your plant, explain what you did. **Create** 5 questions (or a game) to test the knowledge of folks you have taught about your plant (harvesting/prepared/washed, when is it available? uses, names, can they draw it? How is it used? What nutrients does it have?)

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SHS PLANT PROJECT
Service Learning

Project Goal: To empower students to become knowledgeable advocates for native plants by developing skills in identification, understanding ecological benefits, cultivating native species, and engaging with their local community to preserve traditional ecological knowledge (TEK).

Learning Objectives:

Develop a deeper knowledge of 1 native plant species found on the Colorado Plateau.

Identify & Document: Be able to ID native plants and the habitats different plants grow.

Ecological Roles: Understand interactions between native plants, people, local wildlife.

Conservation & Restoration: Plan & implement appropriate area within SHS garden to plant or propagate the native species.

Preservation of traditional knowledge: create a resource used by SHS & local community to share the plant's uses, including a recipe the plant is used in.

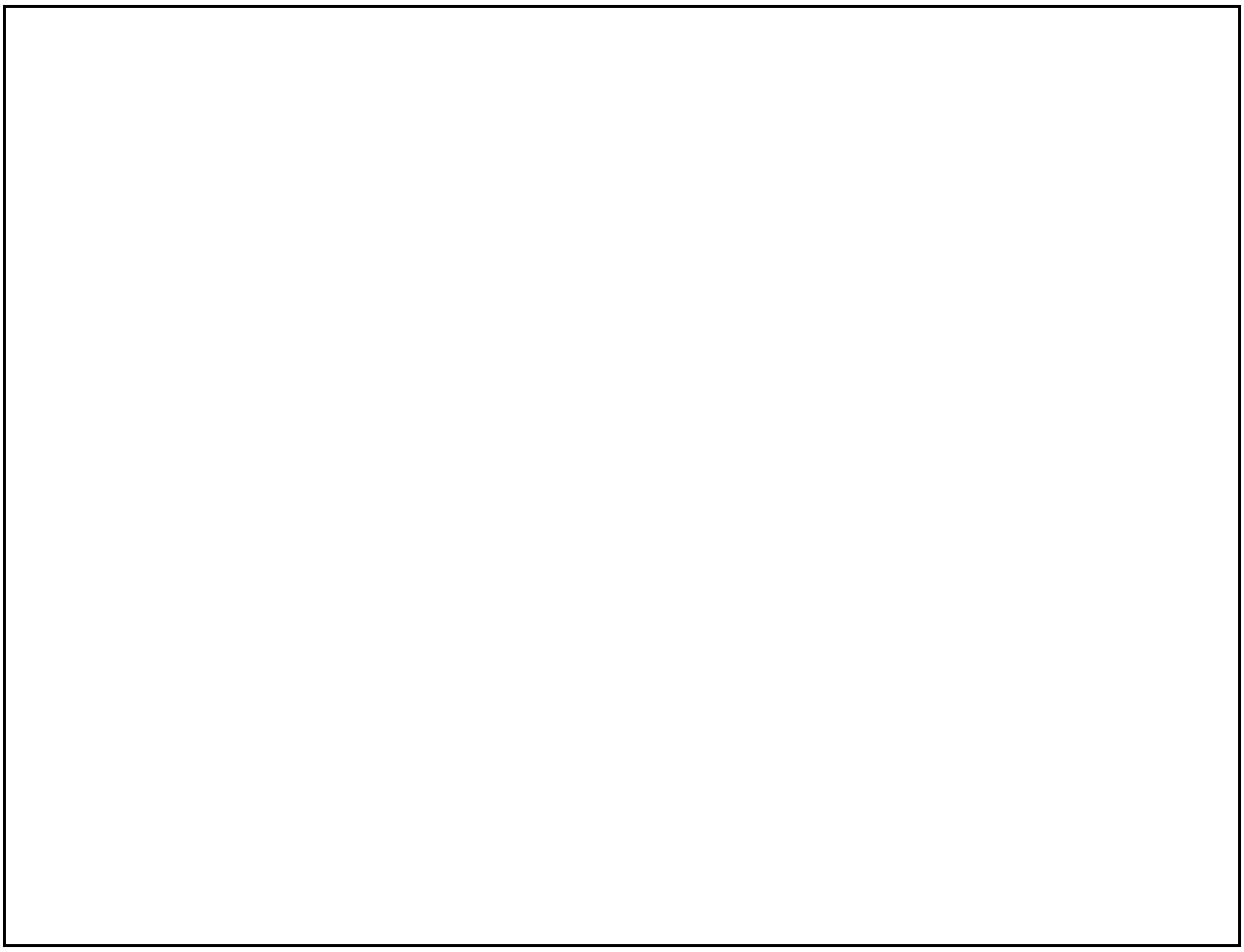
Ethnobotany: Interview plant knowledge keepers (family, community, use guidebooks).
Incorporate the knowledge to understand the traditional/cultural/historical uses of native plants. (Use appropriate cultural sensitivity and obtain permissions to share information shared with you from knowledge keepers).

My plant is: _____ _____
Latin name: Genus species

Other names for this plant are:

Common name	Spanish	indigenous language

During _____ (spring winter fall summer) It looks like this.



Drawing or printed image (cite the source of image)

My relationship to this plant is:

I learned about this plant from:
Cite your sources of information.
A story & or recipe associated with this plant is: (insert link to story)
Proficiency scale **CREATE A WAY TO TRANSMIT THE KNOWLEDGE** (*Canva, iClip, coloring book, children's book, Poster, etc.)*

category	4 exceeds	3 proficient	2 developing	1 emerging	resource used: cite sources
Name	Binomial nomenclature (latin) and at least 3 or more names used to identify the species	Binomial nomenclature (latin) and at least 2 other names are given (Indigenous,	Binomial nomenclature (latin) and 1 other name used to identify the species (Indigenous,	1 name used to identify the species (common, Indigenous, latin)	

	(Indigenous, Spanish, common English etc.)	Spanish, common English etc.)	spanish, common english etc.)		
Plant image	Detailed, clear, image illustration or photo. Includes 4 + plant parts (flower, root, petal, stem fruit)	Plant drawing or illustration is clear & includes 3 plant parts than can be identifiable	Plant image is clear with 2 plant parts identifiable	Plant image is clear with 1 plant part or unclear w/multiple parts	
recipe	In depth Rationale & background of recipe Clear ingredient list & steps included	Rationale & background of recipe ingredient list & steps included	Recipe w/ingredients and steps	Missing or incomplete recipe	
Other related plant information	Includes 3-4 interesting facts (elevation, habitat details,etc.)	Includes 2 interesting facts (elevation, habitat details)	Includes 1 interesting fact (elevation, habitat details, etc.)	Missing interesting facts (elevation, habitat details)	Ideas : Is this plant threatened or endangered by humans climate change? What historical uses?
Knowledge keeper	Demonstrates passage of deep knowledge from one living person to another	Demonstrates passage of knowledge from one living person to another	Demonstrates passage of some knowledge from one living person to another	Passage of deep knowledge from one living person to another is weak	
Known uses	2-3 Parts of plant and specific uses of each part of plant (root, stem, flower, etc.) explained. Used as medicine, poison, food		Specific use for at least 2 plant part	Missing uses of plant and its specific parts	

In teams (2 or more), finish these sentences with at least 1 answer from each group member.

Medicine is….

Food is ….
Vanishing Ancestral Foods With Miss Navajo

Indigenous science is…

Resources:
USDA Indigenous Food: https://www.usda.gov/about-usda/general-information/staff-offices/office-tribal-relations/programs-and-services/usda-indigenous-food-sovereignty-initiative