

Taking Care of the Land with Traditional Ecological Knowledge (N/A, 2024)

Fire Ecology, The Use of Traditional Ecological Knowledge to Enhance/Sustain the Environment and Ways of Life.

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Author Note:

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Introduction

Fire Ecology is, according to the website, *fireecology.org* (June 24, 2024), “the study of fires and fire regimes in global forests, prairie, shrubland, chaparral, meadow, and savannah ecosystems.” Fire ecology studies how fire affects the different areas mentioned previously and attempts to use those studies in industrious ways to accomplish a variety of goals. The frequency, severity, and extent of fires can positively or negatively affect the ecosystems where they occur. According to the Association for Fire Ecology, fire ecologists also study the effects or “interactions between fires and other ecological processes; how they work together or in conflict, to vary outcomes on the land” (*fireecology.org*, June 24, 2024).

Traditional Ecological Knowledge (TEK) has been defined as, “a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings with one another and with their environment” (Berkes, 2012:7). Bringing Traditional Ecological Knowledge (TEK) into a classroom combined with standard western scientific practices will allow my students to understand the importance of both influences. It is my opinion that my Native American students, even though I work at a public school, which is about 70% Native American, should be able to engage in and apply their TEK to many different problems we face in science today. As an Environmental science high school teacher, it is my responsibility to engage my students in ways that combine their prior knowledge with new concepts, this time being traditional things their ancestors have done to take care of, or manipulate the environment, along with the normalized western science practices.

Fire is a key ecological process influencing the distribution, structure, and function of many biomes worldwide (Bond and Keely, 2005 & Bowman et al., 2009). “Tribes have used fire associated with hunting, crop improvement, pest control, habitat diversity, range management, fireproofing, fuelwood, travel route maintenance, riparian area clearing, growth of basket making materials, communication, and ceremonies” (Stewart, 2002, Williams, 2002, & Trauernicht et al., 2015). With the many uses of fire, the traditional knowledge of Native American tribes does not fit with the paradigm of traditional western models of fire.

Traditionally, the western model for fire ecology has been “fire suppression”, and the practices associated with fire suppression do not necessarily coherently fit into the traditional use we see used by native cultures. Fire suppression, in many cases, is counter intuitive to the traditional uses of fire in native cultures. I’m going to date myself here, if I think back to some of the television shows I watched as a youngster growing up in southeastern Virginia, I remember the only use I saw in those shows was the use of “smoke signals”, that were used to communicate between different communities or even sometimes between different tribes. As a child I thought this was a great idea. My friends and I used to try and replicate those things in our play time outside. Sending smoke signals for whatever reason that we invented in our imagination. I think this was my first use of traditional knowledge ever. Did we get the smoke signals correct? Undoubtedly, we did not!

Context and Rationale

I am Christopher Ervin, my educational journey has been kind of unique, at least to me. I did not start college until I was 28, after 10 years in the Navy, and a year as a police officer. My educational journey started at a community college in North Carolina, and I transferred to a local Historically Black University, Elizabeth City State University. I started in pre-law and switched directions and graduated with a degree in Geology. Moving on to pursue masters in geology, I applied to be a National Science Foundation Fellow (NSFF) and was granted a spot while attending Eastern Kentucky University. In being a NSFF, I was assigned to a middle school classroom in Richmond, KY, to help the teacher and be a “professional Resource” for that teacher. It was in this role, the first time I was able to write lesson plans and take part in teaching young people in a classroom setting. The first year I was in a 7th grade classroom, my second year I split time between an 8th grade class and a 6th grade class. My time as a NSFF was the basis for me becoming an educator.

Beyond that adventure in education, I went on to receive a master’s degree in Secondary Education and then, a master’s degree in administration and supervision in Education. I have taught in Arizona since 2008. My educational journey here in Arizona has been a very diverse journey with many stops along the way. I have settled in northeastern Arizona, and make my home in St. Johns, Arizona. I finished my first year at Holbrook High School this year and thoroughly enjoyed my first year as a teacher at a school with such a diverse population.

Holbrook High School is located in northern Arizona in the town of Holbrook, Arizona. The Holbrook high school community is a diverse and eclectic environment. The student population, according to the Holbrook High School website (<https://www.holbrook.k12.az.us/o/hhs/page/school-profile>), is made up of approximately 700 students. Of those 700 students 68% are Native American, 16% Hispanic, 12% Anglo, and 4% other. There are currently 40 certified teachers on staff at the high school; 21 of those teachers have a bachelor's degree, 15 have master’s degrees, one has a doctorate, there are 3 others that maintain a CTE certificate without having a bachelor’s degree. Holbrook high has a dormitory close to campus that is run by tribal entities, and is capable of housing 128 total students; 64 male and 64 female.

According to the same Holbrook Unified website, there are 64% of students, excluding the students residing in the dormitory, that receive free lunch. Holbrook is a Title 1 school, with more than 40% of its population from low-income families. Holbrook high school offers a variety of extracurricular activities like athletics, fine arts, and clubs of various functions, as well as a great variety of afterschool tutorials.

Reasons for Fire Ecology

Some of the reasons I am committed to doing a fire ecology unit along with the traditional uses of fire in Navajo and Hopi cultures are because there are many uses for fire in Native American cultures. Uses may include, but are not limited to, clearing land, pest management, and traditional ceremonies. A major reason for picking and constructing a fire ecology unit for me is

I can learn something new while developing my unit, while making a connection to traditional knowledge that can also help build relationships in my classroom with students, and the students developing relationships with their tribes, traditional knowledge/practices and, each other.

Traditional Ecological Knowledge (TEK) about fire and its numerous uses on the reservations that my school serves seems like an interesting topic to me and is a great way of learning the culture of the Indigenous communities I serve, while also helping to keep those traditions alive and to share them with my students, both native and nonnative alike.

As a teacher, and a former police officer, I have been associated with some of the western science associated with fire, which is rooted in the idea of fire suppression. This unit offers me another opportunity to learn more about fire and its uses, while exploring the Indigenous uses based on their traditional knowledge that is passed down generation to generation.

Fire ecology caught my attention during one of the first seminar group, in person meetings, which was held at the Northern Arizona University, Flagstaff, Arizona campus in April of 2024. Pete Fulé and Jon Martin are the NAU Institute for Native-serving Educators (INE) staff members associated with my seminar, and they are both involved with and in forestry, either through the university and/or through the Arizona Department of Forestry and Fire Management/The United States Department of Agriculture Forest Service.

Content Objectives/Standards

The number one objective for this unit is not necessarily content, yes, I know, we all have to ensure our content is delivered with haste in order to make it through all of our standards that are necessary for “real learning”, and for the rich education that we are empowered to bestow. However, bringing a lesson that supports integrating traditional ecological knowledge in a classroom, you may want to consider your priorities, I know I did.

As mentioned above, my number one objective for this unit is to ensure the students are aware that we are using traditional ecological knowledge in both cultural respects, and from an educational perspective as well.

Students will be able to:

- Identify traditional ecological uses for fire in various cultural settings from local tribes.
- Identify and explain what fire ecology is.
- Compare and contrast conventional western methods/uses of fire with their traditional counterparts.
- Explain the importance of incorporating cultural traditional ecological knowledge in a science classroom setting.
- Write a summary/explanation of the unit in terms of meaning and substance to themselves.

Diné Content Standards

High School - Diné History Standards

- Concept 3, PO 2, I will research how American government affected the Diné way of life and that of surrounding tribes.

- Concept 4, PO 3, I will interview and research the reasons for changes in living environments.

Arizona State High School standards associated with and/or fulfilled with this unit are:

- Essential HS.E1U1.12 Develop and use models of the Earth that explains the role of energy and matter in Earth's constantly changing internal and external systems (geosphere, hydrosphere, atmosphere, biosphere).
- Plus HS+E.E1U1.4 Analyze and interpret geoscience data to make the claim that dynamic interactions with Earth's surface can create feedbacks that cause changes to other Earth systems.
- Essential HS.E1U3.14 Engage in argument from evidence about the availability of natural resources, occurrence of natural hazards, changes in climate, and human activity and how they influence each other.
- Plus HS+E.E1U3.9 Construct an explanation, based on evidence, for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- Plus HS+E.E1U3.10 Ask questions, define problems, and evaluate a solution to a complex problem, based on prioritized criteria and tradeoffs, that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Teaching Strategies

Guided note taking will be the delivery method for the information presented in this unit. My environmental science class consists of 10th grade students. The norm for this class and those students at Holbrook High School is to take guided notes and do activities according to the notes they record for any of the units presented in science class.

One of the activities will be a think-pair-share (TPS) adaptation. The TPS adaptation activity will group native students with nonnative students with the native students sharing their knowledge about a word - "Hózhó"; in this activity the native kids will lead the discussion about the meaning/s of the word and then fill in a worksheet that will be provided. Hózhó's accepted meaning is, "Hozho is said to be the most important word in the Navajo language and is loosely translated as peace, balance, beauty and harmony" (Drake, R.S., 2004). After discussing meanings, the group should pick the 4 most "important" and place them in the 4 corners of the paper. After selecting the 4 most important the students will represent those 4 things with either words and/or pictures.

The next part of this activity will be to introduce the 4 natural elements that make up our environment; fire, earth, air, and water. The kids will place these in the 4 corners of a different handout and do their word/picture representations. After going over these with the class, I will introduce fire as our topic.

The students will participate in taking guided notes. At various points through the notes delivery process, there will be different activities to enforce the notes and concepts presented in the notes. About every 10 minutes worth of notes will equal a 2-minute activity of some sort, known as "pit stops" in my school. I believe this concept comes from the premise as put forth by the book

Teach like a Champion. Those activities can be anything you want to build into your unit, I will use a variety of things to check for understanding during those times. Things that might include white boarding the answer to a question or two based on the part of the lecture I am in at the time. There may also be a, turn to your partner and discuss, or summarize, activities like these can be put in your unit however you see fit for your students.

Materials for this unit are included in the appendices at the end of the paper.

Materials include:

- Google slideshow

 - Pit Stops within the presentation (Meant to reinforce material and check for understanding along the way).

- Worksheets

- Possible activities and/or Labs

 - Include a demonstration called “The Matchbox Forest”. This demonstrates how a healthy forest burns compared to a fire conservation model, or unhealthy forest.

- Summative Assessment

- Suggestions for finding other materials

Student Assessment Plan

The student assessment plan I intend to use, because I added this as a mini-unit to an already established ecology unit, is not one of a formal test but more of an informal assessment based on the worksheet and discussion on “pros” and “cons” for western science and TEK. In this worksheet, students have to give opinions and evidence for their rationale in regard to the western science, and the TEK covered in the lesson. As I taught this lesson, I found myself striving to ensure that the students knew that I felt it important to combine both methods, TEK and Western science, while also establishing the importance of not leaving out the very valuable information that we can gain from tribal elders and their descendants concerning fire ecology.

References

- Bond, W. J., & Keely, J. E. (2005). Fire as a global ‘herbivore’: the ecology and evolution of flammable ecosystems. *Trends in Ecology & Evolution*, 20(7), 387-394.
<https://www.sciencedirect.com/science/article/pii/S0169534705001321>
- Drake, RS. Hozho: Dine’ Concept of Balance and Beauty. University of Arizona, American Indian Graduate Studies Program, Native American Religions and Spirituality. 2004.
<https://bluffutah.org/what-is-hozo-2/>
- N/A. (2022, June 13). What is fire ecology? [Online]. Association for Fire Ecology. Retrieved June 22, 2024, from fireecology.org
- N/A. (2024, June 1). Holbrook High School. Holbrook High School. Retrieved June 23, 2024, from <https://www.holbrook.k12.az.us/o/hhs/page/school-profile>
- Youngblood, M. (2023, April 13). Old Practices Are New Again: TEK And Cultural Burning. T&DWorld. Retrieved July 17, 2024, from <https://www.tdworld.com/vegetation-management/article/21262576/old-practices-are-new-again-tek-and-cultural-burning>

Appendix A

Worksheets

Worksheet 1 - Before you start your presentation

Name: _____

Date: _____

Class Hour: _____

Fire Ecology - Opening Activity

In this activity you and your group will discuss the Dinè word “Hózhó”.

Steps

1. In your groups brainstorm/come up with as many ways to describe or define this word.
2. After you complete the step one procedure, you and your group will decide on the 4 words that you agree on that have the most meaning in describing this word.
3. Place these 4 words around the word in the middle of the page.
4. You can now relate these words to the Native word “Hózhó”, either by defining or by drawing pictures. **BE PREPARED TO SHARE!**

Brainstorm here:

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Worksheet 2 -

This worksheet is to be used to check for understanding and identify any misconceptions, after your initial introduction of the unit material.

Name: _____

Date: _____

Class Hour: _____

Western Science and/or Traditional Ecological Knowledge
You Decide - Activity

You and a partner will get together to discuss and write down the pros and cons of the fire suppression idea from Smokey the Bear and then repeat the same process for the use of traditional knowledge and decide which allows for a more healthy environment for the trees, and a safer environment for us to live in. Make a determination as to which method you consider the best practice and be prepared to defend your position.

Smokey the Bear idea of Fire Suppression

Pros

Cons

Traditional Ecological Knowledge, Using Fire Responsibly

Pros

Cons

Your decision as to which is better and why.

Be sure to use complete sentences and back up your ideas with facts or ideas from what we have covered in class to this point.

Reading Assignment - *Old Practices Are New Again - TEK and Cultural Burning*

Use this assignment to extend the lesson. It can be done individually or as a group reading activity.

Individually - Have the students read and take notes on the article. Upon completion of their reading you may have them try a few different things like; summarize in their own words, create a worksheet with questions and turn it into a guided reading activity, or have the students write questions (quantity of questions depends on you) and then trade questions with a random person, have each student answer the other's questions and then report to the class on their understanding of the article.

Group - Assign each member of the group a different part of the article. Once they have completed reading their part, have them go over it again and write important facts or aspects of their part to teach it to the others in their group. Each group member should pay attention and take notes about the information their group mates are presenting. After completing their sections, have each member of the group report/share with the other members of the group. **Accountability** - To keep them honest, you may tell them that everyone will have to answer questions about the article based on what they have learned from the others. This ensures an honest effort on their part to get the information correct when they give it to the other students.

You may modify this assignment any way you see fit. Enjoy!

Example of worksheet used - https://docs.google.com/document/d/1iaU-hkroRXxHVXjMFChcqRptOMErK-_MXT8ciCb2Mms/edit

Other Possible Activities

There are some other activities that you may want to incorporate into your lessons with this unit, for example; "A Matchstick Forest is a good activity to reinforce the concept of thinning and

separating trees for a more healthy forest environment, and being a more likely place where a wildfire can be easier to manage.

Link to presentation

[Fire Ecology through the use of Traditional Ecological Knowledge \(TEK\)](#)