This article may be used for personal, educational, and non-commercial uses. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. © Ed Galindo et al. 2022.



# Beaver as Educator: A Summer Program for Native American Youth

By: Ed Galindo<sup>1</sup>, Sky Pete, Chris Cleveland, Barb Pete, Casey Bartrem, Tod Shockey, and Lori Lambert

Native Sciences Research Published online: May 24, 2022



<sup>1</sup> Dr. Ed Galindo is a Yaqui American Indian and faculty member at the University of Idaho, Associate Director for Education and Diversity for the NASA Idaho Space Grant Consortium, Affiliate faculty member at Idaho State University (Biology Department) and Affiliate faculty member at Utah State University (Physics Department).

Journal of Native Sciences. Vol. 2, No. 2 (May 2022), pp. 1-19

# Artwork

The cover art of the beavers was the winner of a t-shirt art contest held by the North American Native Research and Education Foundation (NANREF). The goal of the contest was to pay honor to the Paiute language through printed media. Additionally, the contest was designed to develop students' excitement in learning live-trapping techniques, as well as motivating students in beaver relocation. The words on the entrance rainbow are in the Paiute language which was developed with help from the Elders of the Shoshone-Paiute School in Duck Valley, Nevada, the words translate to "Beavers take care of us." The two beavers are holding a test tube with clean water samples. The students say that the "fat beaver" is Dr. Ed Galindo and the "skinny beaver" is Casey Bartrem, from TerraGraphics International Foundation (TFIO) Moscow, Idaho. **Student artwork of this contest is spread throughout the article, and it is not to be reproduced, redistributed, sold, loaned or sub-licensed, or distributed in any form without express written permission from the copyright owner(s).** 

# Abstract

This essay seeks to understand the many "ways" or modalities that American Indian students and the community learns and understand new concepts. We provide insights into the reasons of "why" and "how" American Indian people gain new knowledge. We provide an examination of four days of instruction to American Indian students on the Duck Valley reservation in Southern Idaho and Northern Nevada. The first educational objective was to understand the process to capture some "problem" beavers in live traps and move them to a more suitable stream on the mountains of the reservation. Our second educational objective introduced students to the methods of measuring water quality and reporting these findings. To build these American Indian students understanding of water analysis, students investigated the water quality of the beaver habitat and compared these results to the water quality in their homes. Inherent in these objectives was the appropriate and safe handling of the beavers, both for the sake of the beaver as well as the safety of the students. We provide evidence that learning can occur both outside and inside a classroom. Through the learning process of "Two-Eyed Seeing" developed by Mi'kmaq Elder Albert Marshall, it becomes clear that the consideration of Indigenous World Views and Western Science methods can lead to richer understandings.

# Keywords: Two-Eyed Seeing, STEM, Native Education, beaver, Indigenous world view, American Indian students,

# Introduction

This essay explores the many ways that American Indian students and community members explore and deepen their conceptual understandings of beaver habitat. We examine a four-day experience for American Indian students in Southern Idaho and Northern Nevada as these students participate in the capture and relocation of beaver. During the live capture of a group of beavers, students are introduced to Western science techniques of gathering data on each animal. As this process occurs students are also listening to the wisdom of their Elders in attendance of living with the beaver. We engage the lens developed by Mi'kmaq Elder Albert Marshall of "Two-Eyed Seeing" (Guiding Principles (Two Eyed Seeing) Integrative Science, n.d.) as our theoretical framework.

Many researchers (e.g. Battiste, 2005; Fixico, 2003; Kovach, 2009; Lambert, 2014; Wilson, 2008) discussing Indigenous knowledge bring to the forefront the importance of relationships. We consider relationships from the perspective of youth and Elder, between family members, between the land and the community, between humans and animals, and between those with voice and those without. At the center of this project was the relationship between this community and some of their local beaver.

![](_page_2_Picture_3.jpeg)

Figure 1. Artwork of students from the Shoshone-Paiute School in Duck Valley.

#### Problem

In the summer of 2021, the Shoshone-Paiute (Sho-Pai) community were forced to address problematic beavers that plugged up irrigation outlets, however they did not want to kill the animals. Dr. Ed Galindo proposed that perhaps the students could help the Tribe solve this problem. He suggested that the animals could be live trapped and relocated.

The community decided to relocate the animals and this opportunity became an educational activity. Everyone who was available and wanted to participate from the Duck Valley community was welcome. One of the authors of this paper has been working with beavers for "about a century now" and is locally recognized as a resource for relocating animals. As an educator for over 30 years, he always accepts opportunities to turn activities into learning moments.

# Methods/Results

#### **Outdoor Sessions**

During a four-day summer session students and community members engage in the live capture and relocation of a group of "problem" beavers. The overarching educational objectives included:

- 1. Create an understanding of the process for live capture of beaver;
- 2. Engage in community discussion of living with beavers;
- 3. Engage in Western science data collection techniques for each captured animal;
- 4. Engage in community discussion on the importance of water;
- 5. Engage in Western science techniques of water analysis from the beaver's habitat;
- 6. Examine how Traditional *Environmental* Knowledge (TEK) & Native Science and Western Science complement one another;
- 7. Introduce and carry out safe transportation protocols for transporting beavers to a new home.

Inherent in these objectives was appropriate and safe handling of the beavers, both for the sake of the beaver and the safety of the participating students. Once the lead scientist arrived and learned there was a broader community interest in the relocation efforts, many more objectives emerged through the shared wisdom of the local Elders.

#### **Respecting the Beavers**

The first sign of respect and "Beaver knowledge" is keeping fingers away from the beaver's mouth. Not only is this a safety measure, but a respectful relationship for the beaver and the student. According to Dr. Shawn Wilson (2008, 121), "[Beaver] knowledge is part of the relationship between us [Elders, students, community members] and cannot be individually owned." Wilson (2008, 128) also states that "knowledge come[s] from lifelong participant observation with Indigenous scholars and Elders". Figure 2. The lead scientists Dr. Ed Galindo

(blue shirt leaning over trap) discusses how to respect the captured beaver below depicts an example of how students observe as well as listen to instruction. What is important in this image is the recognition that the educational stage is shared between community Elders and the scientist. This interaction, "two-eyed seeing", fits this concept as coined by Mi'kmaq Elder Albert Marshall (Guiding Principles (Two Eyed Seeing) Integrative Science, n.d.). Marshall shared that through the Indigenous view and the western view, we can bring forth a richer understanding and opportunities for learning for all. It is also important to recognize that the "classroom" is not always confined within four walls but can also be the bed of a pickup truck in the natural environment of the beavers.

![](_page_4_Picture_1.jpeg)

Figure 2. The lead scientists Dr. Ed Galindo (blue shirt leaning over trap) discusses how to respect the captured beaver while students watch and learn.

#### Data Collection

Through a western lens, data collection is systematic. It is one thing to tell a student that a beaver weighs about 24.4 kilograms (about 54 pounds), it is quite another idea to have students weigh a beaver on a handheld, spring scale, see Figure 3. The expression on the young man's face in Figure 3 is convincing that he appreciates the feeling of 24.4 kilograms. Handling a beaver for data collection takes great care. The beaver must feel secure, respected, and the handler must do everything s/he can do to maintain this care.

![](_page_5_Picture_0.jpeg)

Figure 3. Feeling the weight of the beaver. Photograph by Dr. Casey Bartrem.

![](_page_5_Picture_2.jpeg)

Figure 4. Keeping the beaver and the handlers safe. Photography by Dr. Casey Bartrem.

In Figure 4, using his forearm, a student is able to secure the beaver, maintaining its safety, while more data is collected. The reader needs to know that during the discussion of the activities with these live creatures, the lead scientist maintained a tone of calm in his voice. Understanding this strategy of calm tone, allows the students to know this is one more tactic for keeping the animal safe. Through the data collection process, everyone was reminded of the importance of relationships. Relationships is captured by Wilson (2008, 119) when he writes:

So analysis from a western perspective breaks everything down to look at it. So you are breaking it down into its smallest pieces and then looking at those small pieces. [We call this compartmentalization.] And if we are saying that an Indigenous methodology includes all of these relationships, if you are breaking things down into their smallest pieces, you are destroying all the relationships around it. So an Indigenous style of analysis has to look at all those relations as a whole instead of breaking it down, because it just won't work. So it has to be more of an intuitive logic, rather than a linear logic, because you can't just break everything down into small parts and use linear logic to bring them back together to a whole. You have to use an intuitive logic, where you are looking at the whole thing at once and coming up with your answers through analysis that way. So it's mostly innate within us. So there are different ways of doing that.

![](_page_6_Picture_2.jpeg)

Figure 5. Measuring the beaver's tail. Photograph by Dr. Casey Bartrem.

The students were asked the following questions: 1) how old are the beavers? [by acquiring hair samples, we can do genetic DNA analysis of the beaver's hair to determine their age and gender] 2) How closely are they related to one another? [Through DNA analysis that takes place on the campus of Idaho State University (ISU) students can determine relationships

by helping to complete the analysis). This creates a further opportunity for students to learn. The elements of weight, tail length, and tail width are additional three variables that allow students to age the beaver. Through years of data collection, the Idaho Department of Fish and Game (IDF&G) have determined a model that uses these three data points to approximate the age of a beaver. Students also collected hair samples for DNA analysis by a state laboratory. During the project, students were collecting and analyzing data on site as well as contributing to larger data analysis projects, through the collection of hair samples. The hair sample will also reveal the gender, approximate age and how "related" the beaver is within a particular colony. An important element to relationship is community.

![](_page_7_Picture_1.jpeg)

Figure 6. Community engagement and participation. Photography by Dr. Casey Bartrem.

Figure 6 shows an important part of the story on how the program was implemented; we have a young family all watching and learning with the students, Elders, and community showing that this learning opportunity is of interest to the wider community. Intergeneration learning and observation is an important and natural part of instruction.

The students learn with the community about the data of the beaver and why we need it. With the data of tail length/width and animal weight, one can use a chart from IDF&G to estimate the age of the beaver. Students are also shown how to collect a sample of hair from the beaver in a safe and sterile manner for DNA analysis in a biology laboratory at a later date. This will also give the sex/estimated age of the beaver (a student check) and helps answer an important reach question: How related are the beavers in the colony? The subsequent laboratory work is also done by students with college mentors.

## Water Quality

Students were given colorimetric water quality test strips for 30 chemical parameters (Figure 7). Students were given instruction on how to use the strips and read the results, and then asked to record their results in notebooks in order to compare different results between student groups between different sites. This highlighted variability in testing methods and result interpretation, as well as the difference in water quality in the downstream irrigation canals versus the upstream riparian area.

![](_page_8_Picture_2.jpeg)

Figure 7. Students read and record water quality tests. Photograph by Dr. Casey Bartrem.

Figure 8 captures a student working in our outdoor classroom gathering notes. This reinforces for the participants the importance of gathering notes from the field and the role these note can play in the scientific exploration.

![](_page_9_Picture_0.jpeg)

Figure 8. Our outdoor classroom. Photograph by Dr. Casey Bartrem.

One of the most important elements of the camp, taking time to get to know each other, see Figure 9. Developing relationships and understandings. Photograph by Dr. Casey Bartrem.. Taking the time to find out about each other's story is as important as the beaver data itself, and these relationships support healthy learning and growing together. One of the most important parts of the camp was getting to know each other as people. This can only be done by spending time together, learning together, and working together. Asking questions about each other is an important part of instruction. This takes place organically as the program continues and we learn as a group.

![](_page_9_Picture_3.jpeg)

Figure 9. Developing relationships and understandings. Photograph by Dr. Casey Bartrem.

![](_page_10_Picture_0.jpeg)

Figure 10. Field notes drawn by a student at the Duck Valley school.

# Indoor Learning

Once the students gathered water samples from the home of the beavers, they moved inside to conduct their analysis. Working in small groups, asking questions in a calm encouraging voice, learning by doing, can work in the classroom as well (Figure 11). Here we can see that students are learning what water chemistry means and how to perform the steps to get a quantitative value through color change indicating what is present in the water and at what concentration.

![](_page_11_Picture_0.jpeg)

Figure 11. Indoor water analysis. Photograph by Dr. Casey Bartrem.

Figure 12 highlights that in the traditional classroom setting, instruction is given and received. A water quality Tribal employee (standing in yellow) is sharing the water quality results students had acquired. Students were told from the water quality Tribal employee that the students results were in the correct range, and the employee explained why certain areas had different results than others.

![](_page_12_Picture_0.jpeg)

Figure 12. Tribal water analyst. Photograph by Dr. Casey Bartrem.

## Moving the Beavers

On day three of the camp, the students and community are ready to transport the beaver family to their new home (when transporting beaver, it is best to transport them as a whole family if possible). Beavers were trapped in lowland irrigation canals to a riparian area in high mountain country (both on the reservation). Students have now completed the task of trapping a live beaver family, safely containing them, collecting data, and now are learning how to transport the beaver family across the reservation to another location.

![](_page_13_Picture_0.jpeg)

Figure 13. Transporting beavers to new home. Photograph by Dr. Casey Bartrem

Once the beavers were relocated, a community discussion of the initial problem and our solution was held at the new home for the beavers. A verbal explanation is given to students and community of why and how we are going to release the beavers. The why is explained in that the beavers' work (building dams) was in conflict with the human work (building irrigation canals) at that particular reservation location. An important point is stressed that in solving a human conflict with animals in the environment, killing the animal is not the only way to solve a problem. Perhaps, other ideas can be used if we collectively think about a different solution.

![](_page_14_Picture_0.jpeg)

Figure 14. Discussing the problem and the solution. Photograph by Dr. Casey Bartrem.

### Problem Solved

Releasing the beavers was an exciting part of the camp for the students and community, see Figure 14. Many smiles and offers of congratulations were offered as a result of the students' work.

![](_page_15_Picture_0.jpeg)

Figure 15. Drawn by students at Duck Valley School.

![](_page_15_Picture_2.jpeg)

Figure 16. Releasing the beavers. Photograph by Dr. Casey Bartrem.

# Discussion/Conclusion

This program highlighted good work by good students. All instruction was done in a calm voice; at no time were voices raised in anger. All questions were asked and answered in a respectful manner. All students passed, no one failed during the four days of the camp, no one was "sent to the office" because of discipline problems. The skills of setting a live beaver trap, reading the land for where to place the trap, capturing the animal, collecting data, and assessing water quality were repeated until the students could do the task safely and correctly.

Some students had to repeat the exercise several times (with mentor help) in order to complete the task safely and correctly. This is an encouraged practice. They saw that it is ok to make mistakes and that it is a part of learning. We didn't catch any beavers after the first night of trapping, so they replaced their traps and tried again. For water quality testing, some students held the test strips upside down so that the colors didn't match the results key – that was ok, too. It was also a chance for the instructors to see that even though we verbally told them how to hold it a certain way, sometimes you must physically complete the task in order to really learn it. This event catered to all types of learners: tactile, auditory, visual, etc. all part of the "two-eyed seeing" methodology.

The instructors noticed that students were hesitant to answer questions posed to them during the program, even if they clearly knew the correct answer. Despite this reluctance to engage verbally, all students were eager to participate in the activities. This is a different way to facilitate learning and proves to be especially important when students are "shy" about engaging verbally with adults and Elders, not an uncommon response.

Students can now do all of these tasks by themselves in a safe manner. The student team knows how to complete the task of trapping live beavers and transporting them to a new home, how to assess water quality, and how these things are related to each other and important to the health of the entire community – plant, animal, and human.

![](_page_17_Picture_0.jpeg)

Figure 17. The "Beaver as Educator" Group. Photograph by Dr. Casey Bartrem.

![](_page_17_Picture_2.jpeg)

Figure 18. A teacher. Designed by Duck Valley School students.

# Acknowledgements

Thank you to all the students and community members of the Shoshone- Paiute Nation for being such a great host and helping us and beavers learn. Thank you to Terra Graphics International Foundation for the opportunity to work with your great organization. Special thank you to teacher Barb Pete and students of the Sho-Pai School. Your patience and smiles with all of us are indeed endless. Special thank you to Dr. Casey Bartrem who took all the pictures in this paper. Special thank you to all the mentors that took time out of their day to be with students and share their knowledge. Special thank you to all the beavers who were our teachers. Your lessons are valuable.

## References

- Fixico, Donald L, and Proquest Firm. 2009. *The American Indian Mind in a Linear World: American Indian Studies and Traditional Knowledge*. New York: Routledge.
- Institute for Integrative Science & Health. n.d. *Two-Eyed Seeing*. Accessed May 6, 2022. http://www.integrativescience.ca/Principles/TwoEyedSeeing.
- Kovach, Margeret. 2021. *Indigenous Methodologies: Characteristics, Conversations, and Contexts.* Toronto Buffalo London: University of Toronto Press.
- Lambert, Lorelei. 2014. Research for Indigenous Survival: Indigenous Research Methodologies in the Behavior Sciences. Pablo, Montana: Salish Kootenai College Press.
- Wilson, Shawn. 2008. *Research is Ceremony: Indigenous Research Methods*. Black Point, Nova Scotia: Fernwood Publishing.