Developing a Tohono O’odham Weather and Climate Curriculum

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Tohono O’odham Community College (TOCC)

**TOCC’s vision:** to become the Tohono O’odham Nation’s center for higher education, and to enhance student participation in the local, state, national, and global communities.

**TOCC’s mission:** to enhance our unique Tohono O’odham Himdag (‘culture”) by strengthening individuals, families, and communities through holistic, quality higher education services.
The Tohono O’odham Nation
The Tohono O’odham Nation
Motivation
Teaching Geo 101 “An Introduction to Weather and Climate” at TOCC 2008-2012
Culturally Responsive Education

High Context: “Learning that is interwoven within the situation and the environment of the learner.”

- Cajete 1999

In other words “time appropriate” and “place-based”

Culturally Responsive: “Learning that reinforces the integrity of the cultural knowledge that students bring with them, recognizes cultural knowledge as part of a living and constantly adapting system that is grounded in the past, but continues to grow through the present and into the future. Culturally responsive uses the **local language** and **cultural knowledge** as a foundation for the rest of the curriculum and fosters a complimentary relationship across knowledge derived from diverse knowledge systems. (e.g., Western and Indigenous).”

- Alaska Native Knowledge Network 1998
Research Question

How can a culturally responsive weather and climate curriculum be developed for instructors of Tohono O’odham college and high school students that draws both from Tohono O’odham knowledge and Western science knowledge of the climate?
The Challenges in Culturally Responsive Climate Science Curricula

1. It was the official U.S. policy to eradicate American Indian languages and cultures in formal schooling of Native students for 60 years (1870s-1930s).

2. In the U.S. 80%< of K-12 teachers serving Native communities are not of the community-culture where they teach (similar situation in tribal colleges).

Strengths in STEM education in schools in Native communities
- More teachers emphasize and practiced “place-based” learning
- Emphasize and practice of “out-door observation”
- Practice group-collaborative problem solving activities

Challenges in culturally responsive STEM
- Teachers still often have little contact (or consultation) with the local tribal community
- Local tribal languages often remain lacking in the curriculum and the instruction
- Local tribal histories, traditional stories and knowledge also continue to be lacking
- **Not enough American Indian science teachers (K-12 and tribal colleges)**
Methods

- Literature Review
- Pre-Assessment Survey
- Informal Interviews
- Design of Curriculum Activities
- Climate Science Workshops
- Workshop Evaluations

Part 4: Learning about Weather & Climate

So if you were learning about weather and climate, what are some of the things you think are important to learn about?

<table>
<thead>
<tr>
<th>How interested would you be in learning more about these topics? PLEASE CIRCLE: 1, 2, 3, 4, or 5.</th>
<th>Absolutely not interested</th>
<th>Not really interested</th>
<th>A little interested</th>
<th>Interested</th>
<th>Really Interested</th>
</tr>
</thead>
<tbody>
<tr>
<td>q20</td>
<td>The sky or atmosphere: How big is it? What are its levels?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>changing and why is it changing?</td>
<td></td>
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</tbody>
</table>

q45. Are there other things that you feel are important to learn about related to weather and climate?

*If yes, please describe.*
Results: Surveys, N = 47

What are (or were) your favorite subjects in school?

• Art & History (45% each), Native American Studies & Science (43% each)

• Lit./Poetry & Math (36% each), Music (34%), Tohono O’odham History/Culture & Physical Education (32% each), & Social Studies (26%)

• **Note:** For older respondents, Tohono O’odham history, culture, & language classes were not available in the past.

• Agriculture may also not be available for many as a class.

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**Comments on school subjects**

1. "We did not have Native history, Tohono O'odham history, or Tohono O'odham studies as subjects in school in the past."

2. "I did not have Tohono O'odham history and culture classes, but would have liked to take the subject."

3. "I did not have Native American studies and history, Tohono O'odham history and culture, Tohono O'odham language when going to school, but wish we did so I can learn more about my heritage and American Indians."

4. "Science was fascinating, we studied the respiratory system and used cows' lungs to see how they worked."
Results: Surveys
What are the most interesting or relevant topics?

![Weather & Climate Interests](image)

- O'odham stories & legends
- Climate change (incl. Global Warming)
- How O'odham observe & predict
- O'odham cultural teachings
- How thunderstorms form
- O'odham language & weather/climate
- O'odham calendar & the seasons
- O'odham knowledge of wind, clouds & rain
Results: Surveys
What are the most interesting or relevant topics?

Adults & Elders: Comments on interests relating to weather and climate

1. "I think it is important to include the following: a) geography of the Earth and how it determines the climate in different countries, b) movement and location of the Sun in different seasons, and c) the issue of global warming and reduction of the ozone layer and what may be some solutions to this dilemma."

2. "Learning how to keep records (of temperatures, rain, and other data) to compare to last year and years before."

3. "Only the rain"

4. "Is global warming caused by man?"

5. "We do certain live (power) line work on days when the weather is the driest. Working on energized lines and knowing about the weather is very important to us."

6. "How about fog and cold weather?"

7. "What about plans during flooding and other weather events such as microbursts? All communities should have a plan on what to do when this happens."

8. "The severity of a storm coming. What makes it rain a little or a lot?"

9. "Lightning strikes"
Tohono O’odham Knowledge of Weather and Climate

A picture of the time it was said the Hohokam walked the southern Arizona desert.

Benefits of Northern American Monsoon for the Tohono O’odham Nation

- Cultural ceremonies using saguaro fruit
- Animal life
- Plant life
TOCC Student Internship and
Weather and Climate Workshops
A:cim ac O’odham kaj ḋeņeok:  We’re Talking in O’odham

click on a lesson to begin:

Unit 8 - Weather

1. Ḡa’ o ma:s am jekgeŋ - I
2. Ḡa’ o ma:s am jekgeŋ - II
3. “too” and “enough”
4. “feel like”
5. Talking About Events to Come
6. The forms of -ma
7. How to say “to like”

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Summary

• Focusing in on high context and culturally relevant weather and climate subject matter/activities as well as community participation improves student interest and learning of weather and climate and in STEM.

• Through this project we (i.e., educators, community members, interns, and I) were able to:
  • Support **higher education** and a **multidisciplinary course development** for Geo 101 at TOCC
  • Support **informal education** with TOCC student interns facilitating hands-on workshop activities in Tohono O’odham communities
  • Meet NASA’s education priorities:
    • Hands-on student experiences in science
    • Outreach to an underrepresented-underserved community
    • Strengthen a relationship with a community (tribal) college
Acknowledgements

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Why is Climate Education important in American Indian communities?

“Despite a keen awareness of climate change, Indigenous Peoples have had limited participation in climate-change science due to limited access, power imbalances, and differences in worldview. A Western science emphasis on facts and an Indigenous emphasis on relationships to spiritual and biophysical components indicate important but distinct contributions that each knowledge system can make.”

“Over the longer term, educational reforms are necessary that acknowledge both knowledge systems and recognize the value of hands-on outdoor learning in an Indigenous context, such as in culture camps and involvement of youth in subsistence harvests.”

- Patricia Cochran et al. (2013)