

# Strengthening STEM Teaching in Native American Serving Schools Through Long-Term, Culturally Responsive Professional Development



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## **Project Overview**

There is a long-established body of knowledge about effective professional development (PD) for STEM teachers, but very little of it has been applied and studied in Indian Country. This project provides concrete examples and knowledge about the ways culturally responsive approaches to STEM PD, curriculum development, and teacher practice are taken up within two distinct rural, Native Nations in the southwestern U.S.

DINÉ: Diné Institute for Navajo Nation Educators – PD for K12 teachers in school on and bordering the Navajo Nation.

TLSI: Teacher Leadership Shiłgozhóó Institute – PD for K12 teachers in Apache-serving schools

- Both programs are grounded in <u>culturally responsive principles</u> and what we know from the robust scholarly work on Indigenous education and Native Nation Building.
- Both programs are <u>long-term</u> (approx. 8 months) to ensure lasting impact with educators. Both virtual and in person meetings.
- Both programs intentionally cultivate <u>collaborative relationships</u> among preK-12 educators, Elders, and NAU faculty/staff.
- Each teacher <u>produces a practice-oriented document</u>. This makes their learning immediately useful for them, and it contributes to a growing repository of culturally responsive resources for preK-12 schools serving Navajo and Apache students. These are all <u>published</u> online in a free, searchable database.
- Every curriculum unit must align to district, state, national, and either Department of Diné Education <u>standards</u> or CRAIS Tool elements.

"My curriculum unit is trying to make this connection between the mathematical reasoning of geometry and the cultural aspect of Native American artistry. Rug weaving is a complex and ancient craft, which is still part of our Diné society. To most people, rug weaving appears to be a simple form of artistry, but it requires visual thinking and a sophisticated understanding of geometry. By having my students rediscover the abilities of our people in the past, they might be enticed into learning their own abilities for the future." (Middle School Teacher in DINÉ math seminar, 2021)



#### **Research Questions:**

- To what extent and in what ways does a nationally-implemented professional development model for urban teachers translate and operate with teachers from schools in two distinct rural, Indigenous communities?
- To what extent and in what ways does the DINÉ/TLSI professional development model impact teachers' STEM curriculum development and instructional practice in Native-serving schools?
- To what extent and in what ways are culturally responsive approaches to STEM curriculum development and instructional practice engaged by teachers in the DINÉ/TLSI?

#### **Methodology:**

- Collective case study (also called "multiple case design"): Multiple cases are studied in order to better understand an issue or phenomenon (Creswell 2012; Johnson and Christensen 2012; Stake 1995; Yin 2008). Within our case study design, each seminar cohort of each year is a case (i.e., unit of analysis).
- Critical Indigenous Research Methodologies (CIRM): Developed out of a long tradition of Native scholars and communities who have argued that research with Indigenous peoples must adhere to a set of guiding principles. These principles include fore-fronting the inherent sovereignty and self-determination of tribal nations, honoring and building on relationships within and between researchers and community members, and pursuing research questions that will advance community needs and interests (Brayboy, Gough, Leonard, Roehl, and Solyom, 2012; Smith, 1999; Wilson 2008).

### **Data Sources:**

- Pre- and
   Post-program
   surveys with
   teachers.
- Teacher interviews.Faculty PD leader
- interviews.Curriculum units authored by

teachers.

Final
 presentations of
 curriculum units
 integrated into
 teacher
 classrooms.



### Resources to Explore

## Click on the QR code to find:

- CRAIS TOOL
- <u>Teacher-authored</u> <u>curriculum units</u>
- Institute for
   Native-serving
   Educators website
- Links to our related
   publications

## Participation in STEM PD Seminars

Program	Year	Seminar Title/Topic	Number of Teachers
DINÉ	2019	The Human Body: Marvels of Physics, Chemistry and Biology working together!	6
DINÉ	2019	Clean Air and Water on the Navajo Nation	7
DINÉ	2020	Unpacking Place Value	7
DINÉ	2021	Patterns, Relations, and Functions	5
DINÉ	2021	Forests and Climate Change	10
DINÉ	2022	Solving Problems Through Problem Solving	3
DINÉ	2022	Toxic Waste and Indigenous Environmental Justice	2
TLSI	2022	Stewardship of Trees and Forests for Environmental and Human Health	14
DINÉ	2023 (in progress)	Understanding our World through Geometric Reasoning	4
DINÉ	2023 (in progress)	Quantum Technologies: Preparing students for the next technological revolution	10
TLSI	2023 (in progress)	Nature-based Learning	9

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### **Key Lessons Learned**



## Publications

Castagno, A.E., Chischilly, M.\*\*, & Joseph, D. (2022). Strengthening Teaching in Rural, Indigenous-serving Schools: Lessons from the Diné Institute for Navajo Nation Educators. *Journal of Research in Rural Education*, 38(4). <a href="https://doi.org/10.26209/jrre3804">https://doi.org/10.26209/jrre3804</a>

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Dass, P.M. (2021). "Developing and piloting
a tool to assess culturally responsive
principles in schools serving Indigenous
students." *Diaspora, Indigenous, and Minority Education: An International Journal.* 16(2), 133-147
<a href="https://doi.org/10.1080/15595692.2021.1956">https://doi.org/10.1080/15595692.2021.1956</a>

Castagno, A.E. (2021). "From Professional Development to Native Nation Building: Opening Up Space for Leadership, Relationality, and Self-Determination through the Diné Institute for Navajo Nation Educators." *Educational Studies*, 57(3), 322-334.

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