

Developing and piloting a tool to assess culturally responsive principles in STEM instruction in schools serving Indigenous students

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Diné Institute for Navajo Nation Educators (DINÉ)

A partnership between schools on and bordering
the Navajo Nation and Northern Arizona University

The DINÉ strengthens teaching in schools serving Navajo students by engaging all teachers in long-term professional development seminars to increase content knowledge, curriculum development skills, capacity to deliver culturally responsive lessons, and leadership ability.



Why focus on strengthening teaching in schools serving Navajo youth?

- ❖ Significant, long-term, patterns of inequities between Indigenous students and their peers
- ❖ Schools have been the sites of assimilatory practices and trauma for Indigenous communities
- ❖ Education is a key component of Native Nation (Re)Building
- ❖ Teacher quality is the most impactful school-based factor on student learning and engagement
- ❖ Building teacher capacity increases opportunities to engage students' funds of knowledge about their heritage languages, histories, connection to land, and ceremonies/culture in a meaningful way

Local Partnership & Planning



- ❖ 2011: Marilyn Dempsey and Jolene Smith attend YNI as the first Fellows from the Navajo Nation
- ❖ 2016: NAU becomes a partner to develop a local Institute
- ❖ 2018 DINÉ cohort = 10 teachers from Navajo schools; 6 Yale National Initiative (YNI) Fellows
- ❖ 2019 DINÉ cohort = 23 teachers from Navajo schools; 6 YNI Fellows
- ❖ 2020 DINÉ cohort = 22 teachers from Navajo schools; 2 YNI Fellows
- ❖ 2021 DINÉ cohort = 24 teachers from Navajo schools; 3 YNI Fellows

What is the DINÉ?

- ★ Teachers participate in an 8-month seminar designed to increase their:
 - Content knowledge
 - Curriculum-development skills
 - Capacity to deliver culturally responsive lessons
 - Leadership ability
- ★ Seminar is led by an NAU faculty member with relevant expertise
- ★ Teachers conduct research to deepen their content knowledge
- ★ Each teacher creates and writes a culturally responsive curriculum unit for use in their classroom
- ★ Curriculum units must align to district, state, national, and Diné standards
- ★ Curriculum units are published online and widely available

DINÉ Goals

Watch our 2 ½ minute video:

https://www.youtube.com/watch?v=cwuYVKcd4sc&feature=emb_logo

- ★ Establish sustainable partnerships between Navajo schools and NAU that empower teacher growth and foster mutually beneficial cultural and content knowledge between the partners.
- ★ Build capacity for culturally responsive, academically rigorous curriculum development and delivery among all teachers in Navajo schools.
- ★ Enhance and promote teacher leadership and student success within Navajo schools.

The Braided Essay and New Mexico History

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Seminar: Writing and the Specificity of Place

Created by DeLyssa Begay
Rehoboth Christian High School

Relationality, relationships, and communities (n=4)

14. Encourages students to understand themselves within broader communities
15. Relationships within and among local/regional Indigenous community are understood and/or reflected
16. Encourages students to build and sustain relationships
17. Relationships within the classroom are strong

Representation of Indigenous peoples (n=5)

2. Indigenous people are represented as contemporary (not only historical)
3. Indigenous people are represented as diverse (not a monolithic "they")
12. Local/regional Indigenous community is reflected
18. Clear reference and/or integration of local/regional Indigenous context
20. Recognition that local/regional Indigenous context is specific and unique, as are other contexts

Critical understandings of diversity, and specifically race (n=4)

1. Actively works to counter stereotypes of Indigenous people and/or communities

9. Models critical thinking about historical narratives and contemporary status quo
10. Encourages asking critically-oriented questions about historical narratives and contemporary status quo
11. Diverse narratives and perspectives are integrated

Indigenous knowledge systems and language (n=6)

4. Traditional and/or cultural knowledge is included
13. Norms, values, traditions, interests of local/regional Indigenous community are leveraged for learning opportunities
19. Local/regional context is leveraged for learning opportunities
21. Local Indigenous language(s) is valued
22. Local Indigenous language(s) is integrated
23. Academic language is built, but not at the expense of local Indigenous language(s)

Sociopolitical context and concepts, and specifically sovereignty, self-determination, and nationhood (n=4)

5. Recognition of Native Nations as governmental agencies
6. Recognition of treaty rights and/or federal Indian law
7. Students are encouraged to exercise self-determination and agency
8. Communities are encouraged to exercise self-determination and agency



Applying the CRAIS Tool to teacher-authored curriculum units

- ❖ Each curriculum unit from all DINÉ seminars in each year are being analyzed for elements of culturally responsive schooling, using the CRAIS Tool.
- ❖ 19 teacher-authored curriculum units have been analyzed to date using the CRAIS Tool. Of these, 6 are STEM units, 7 are STEM-related units, and 6 are non-STEM units.
- ❖ The score on each item in the CRAIS Tool across all 19 curriculum units analyzed so far was averaged and is presented in Table 1.

Table 1: CRAIS Tool Item Average Scores

Average across all units	Tool Item
2.39	Traditional and/or cultural knowledge is included.
2.32	Local and/or regional community is reflected.
2.26	Encourages students to understand themselves within broader communities.
2.21	Indigenous people are represented as contemporary (not only historical).
2.21	Relationships within the classroom are strong.
2.18	Models critical thinking about historical narratives and contemporary status quo.
2.16	Norms, values, traditions, interests of community are leveraged.
2.11	Local context is leveraged for learning opportunities.
2.08	Students are encouraged to exercise self-determination and agency.
1.95	Clear reference and/or integration of local context.
1.92	Diverse narratives and perspectives are integrated.
1.92	Recognition that local context is specific and unique, as are other local contexts.
1.89	Encourages asking critically-oriented questions about historical narratives and contemporary status quo.
1.84	Encourages students to build and sustain relationships.
1.82	Indigenous people are represented as diverse (not a monolithic "they").
1.66	Relationships within and among local community are understood and/or reflected.
1.39	Local language is integrated.
1.39	Academic language is built, but not at the expense of home language.
1.34	Local language is valued.
1.32	Recognition of Native Nations as governmental agencies.
1.24	The pedagogy/curriculum actively works to counter stereotypes.
1.11	Recognition of treaty rights and federal Indian law.
1.08	Communities are encouraged to exercise self-determination and agency.




Observations from Table 1

- ❖ The average score of each item is above 0, indicating that overall, the curriculum units incorporated all of the elements of cultural responsiveness represented in the tool.
- ❖ None of the average scores reached a value of 3, implying that excellence was not attained on any component of cultural relevance represented in the tool.
- ❖ The average score of approximately 60% of the items was less than 2, indicating that there is ample room for growth in teachers' ability to incorporate cultural relevance in instructional design.



Observations from Table 1

- ❖ Lowest scoring items relate to:
 - ❖ Integration and application of language;
 - ❖ Socio-political contexts of self-determination and sovereignty.
- ❖ Highest scoring items relate to:
 - ❖ Incorporation of local knowledge;
 - ❖ Community contexts; and
 - ❖ Building critical awareness about relationships to local and broader contexts.



The Human Digestive System (a high school curriculum unit relating diet and diabetes in Native American populations)

The following example is the analysis of a DINÉ curriculum unit designed by a high school teacher on the human digestive system, with emphasis on a comparison of pre-Columbian and post-Columbian diets in Native Americans and their correlation with the incidence of diabetes.

The Human Digestive System:

Unit analysis with CRAIS Tool

Average across all units	Tool Item
3	Traditional and/or cultural knowledge is included.
2	Local and/or regional community is reflected.
2	Encourages students to understand themselves within broader communities.
3	Indigenous people are represented as contemporary (not only historical).
1	Relationships within the classroom are strong.
2	Models critical thinking about historical narratives and contemporary status quo.
1	Norms, values, traditions, interests of community are leveraged.
2	Local context is leveraged for learning opportunities.
3	Students are encouraged to exercise self-determination and agency.
1	Clear reference and/or integration of local context.
1	Diverse narratives and perspectives are integrated.
0	Recognition that local context is specific and unique, as are other local contexts.
2	Encourages asking critically-oriented questions about historical narratives and contemporary status quo.
1	Encourages students to build and sustain relationships.
2	Indigenous people are represented as diverse (not a monolithic "they").
1	Relationships within and among local community are understood and/or reflected.
NA	Local language is integrated.
0	Academic language is built, but not at the expense of home language.
NA	Local language is valued.
NA	Recognition of Native Nations as governmental agencies.
0	The pedagogy/curriculum actively works to counter stereotypes.
NA	Recognition of treaty rights and federal Indian law.
0	Communities are encouraged to exercise self-determination and agency.



For further reading:

Journal Article:

Castagno, A.E.; Joseph, D.H.; Kretzmann, H.; Dass, P.M. (2021). Developing and piloting a tool to assess culturally responsive principles in schools serving indigenous students. *Diaspora, Indigenous, and Minority Education*.

<https://doi.org/10.1080/15595692.2021.1956455>

Teacher-authored Curriculum Units:

<https://in.nau.edu/dine/dine-fellows-curriculum-units>



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