

# Indigenous students face disparities in STEM

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**Student**

**Dr. Judith Brown Clarke and Dr. Wendy K’ah Skaahluwaa Todd, shed light on the crucial role of cultural identity in native American-Alaskan students’ persistence and success in STEM fields and the Geosciences**

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The fields of Science, Technology, Engineering, and Mathematics (STEM) are crucial for addressing some of the most pressing global challenges, like food security, climate change, and environmental sustainability. STEM education is vital in preparing students with the critical thinking, problem-solving, and analytical skills necessary for addressing these complex and wicked challenges.

Cultivating the next generation of bright and curious minds requires a comprehensive and inclusive education system that fosters curiosity and a love for learning.

This must be achieved through inclusive practices and equitable learning systems that leverage diversity in all forms, including race, ethnicity, gender identity, and knowledge systems, to name a few. Native American/Alaskan Natives (NA/AN) students are disproportionately underrepresented in STEM disciplines, with only 0.6% receiving a bachelor's degree (NSF, 2019).

Enrollment trends indicate that Indigenous students express an early interest in STEM disciplines; however, as they progress through academia, many describe feeling unsupported and disillusioned due to misalignment of cultural ideologies, conflicting worldviews, alienation from their peers and tribal communities, and a myopic lens in course content (Smythe and Peele, 2021).

## **American-Alaskan students' in STEM**

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The National Science Foundation (2019) provided a special report focused on underrepresentation in general; it showed that NA/ANs make up a small proportion of individuals earning degrees in STEM fields. Smith (2004) identified barriers NA/AN students face, including cultural factors, lack of access to resources, underfunded schools, and the importance of culturally responsive STEM education to address these challenges.

Red Shirt (2014) explored building sustainable pathways for future generations of NA/AN in STEM and the need for culturally relevant and inclusive approaches. The role of community partnerships, mentorship programs, and culturally responsive teaching strategies was highlighted in increasing NA/AN's representation in STEM.

To address disparities in STEM, it is vital to recognize and support the cultural identity of NA/AN students, as it plays a central role in their persistence and success. Barriers to student success take a toll on students' mental, emotional, and physical health, causing symptoms of post-traumatic stress disorder and depression, leading to decreasing academic performance (Boone, 2018; Todd et al., 2023).

NA/AN students experiencing stereotype threat (Steele, 1997) result in emotional impacts from negative societal norms and stereotypes, resulting in an adverse effect on students' leading to biased professional has implications on who STEM recognizes as legitimate knowledge bearers and who is permitted to lead the scientific enterprise at an executive level. These effects can be understood through various factors:

### **1. Disconnection from ancestral lands and knowledge:**

The dispossession of Indigenous lands has resulted in a disconnection from knowledge and practices traditionally passed down through generations. This disconnection impacts NA/AN students' sense of identity, belonging, and connection to cultural heritage, which, in turn, affects their motivation and engagement in STEM fields.

## 2. Limited access to resources and opportunities:

The appropriation of Indigenous lands led to socio-economic disparities in NA/AN communities. Many NA/AN students face barriers to educational resources, including quality STEM education, advanced coursework, and well-equipped laboratories. Limited access to these resources hinder their academic progress and limit their opportunities to pursue STEM careers.

## 3. Cultural biases and stereotypes:

The erasure and marginalization of NA/AN cultures throughout history have perpetuated stereotypes and biases against NA/ANs. These biases manifest in educational settings, where NA/AN students face discrimination, microaggressions, or low expectations based on harmful stereotypes. Such experiences negatively impact confidence, self-esteem, and academic performance in STEM fields.

## 4. Lack of representation and role models:

The underrepresentation of NA/AN in STEM fields creates a lack of visibility and role models for NA/AN students. The absence of representation makes it difficult for students to envision themselves pursuing STEM careers and contributes to a sense of isolation or imposter syndrome.

# **STEM: Inclusivity, cultural relevance, and equity**

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Addressing these challenges requires holistic approaches that promote inclusivity, cultural relevance, and equity in STEM education. Some strategies that can support NA/AN students in STEM include:

## 1. Incorporating Indigenous ways of knowing:

Including Indigenous knowledge systems, perspectives, and practices into STEM education helps NA/AN students see the relevance and value of STEM in their own cultural contexts. For example, incorporating Indigenous science concepts such as animacy, beinghood, and relationality while using integrative science teaching incorporating bi-directional knowledge pathways enhances STEM learning for all students (Fig. 1 updated from Todd et al., 2023).

## 2. Culturally responsive teaching:

Educators should strive to create culturally responsive and inclusive learning environments that value and respect NA/AN students' cultural backgrounds, experiences, and knowledge. Culturally responsive mentors recognize and appreciate the unique challenges faced by NA/AN students, while acknowledging the strengths, importance, and value of their diverse cultural backgrounds and knowledge systems (Todd, Towne, Brown Clarke, 2023).

## 3. Mentoring and role models:

Encouraging NA/AN professionals in STEM fields to serve as mentors and role models provides guidance, inspiration, and support to NA/AN students pursuing STEM careers. Community engagement provides opportunities for students to connect cultural knowledge with real-world applications, fostering a sense of belonging and purpose (Todd et al., 2023). Mentorship by successful NA/AN STEM professionals allows students to gain inspiration, confidence, and a sense of possibility for their own future in STEM.

## 4. Increasing access to resources:

Providing equitable access to quality STEM education, scholarships, internships, and research opportunities helps address the disparities in STEM fields faced by NA/AN students.

## Conclusion: Disparities in STEM fields

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Integrating cultural relevance into STEM education, promoting culturally responsive mentoring, engaging communities, and showcasing role models are all crucial strategies for empowering NA/AN students in their STEM pursuits.

Institutions, educators, and policymakers must prioritize preserving and celebrating cultural identity to achieve greater representation and inclusivity in STEM fields. Doing so creates a more equitable and diverse STEM community that benefits from Indigenous students' unique perspectives and contributions.

Ultimately, by embracing cultural identity as a central component of STEM education, we foster the next generation of NA/AN STEM leaders and pave the way for a more inclusive and innovative future in STEM and beyond.

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