



Native STEM Education Summit Kalispell, Montana, September 27-29 2018

Summary Report

Representatives from eight NSF EPSCoR jurisdictions convened at the Native STEM Education Summit (NSES) in Kalispell, Montana in September of 2018. We addressed challenges that face Native American student engagement in science, technology, engineering, and math (STEM). Attendees included K-12 educators, Tribal College faculty, Higher Education faculty, and EPSCoR staff from Alaska, Idaho, Montana, New Mexico, North Dakota, Oklahoma, South Dakota, and Wyoming. These jurisdictions represent 53% of the total population of Native Americans/American Indians and Alaska Natives (AI/AN) in the United States.

Working groups were formed to identify challenges associated with AI/AN students in STEM. The groups included educators at all levels and were alternated throughout the workshop to provide unique sharing opportunities. These groups then reported on their discussions to all the other participants to identify themes and opportunities.

NSES participants identified primary barriers they see facing AI/AN students in STEM at the university, Tribal College, and K-12 level. These challenges are:

- Integrating Traditional Ecological Knowledge (TEK) and Western STEM
- Improving Recruitment and Retention

NSES participants also identified critical needs to meet these challenges:

- Mentorship and Native STEM Identity
- Increased Resources

Challenge: Integrating Traditional Ecological Knowledge (TEK) and Western STEM

TEK is specific to each Indigenous peoples group and tribal member, and is often referred to as 'Indigenous knowledge' or 'Native ways of knowing.' For the purpose of this report, TEK refers to the knowledge, practice, and belief concerning the relationships of living beings to one another and to the physical environment. It is this knowledge and practice that informs Native people in their relationship to the Western disciplines of Science, Technology, Engineering and Math (STEM). (Berkes, 1993, p. 1-9).

Participants at the NSES identified the integration of TEK and STEM as one of the main challenges in engaging Native students and Tribal communities in STEM education and research. This challenge exists at all education levels and within research programs in all jurisdictions present at the Summit. At the K-12 level, teachers are trained in and provided curriculum resources from a Western STEM perspective. Integration of TEK and STEM occurs only through the initiative of individual teachers and coupled with the high turnover rate of K-12 teachers in predominately Native schools, these efforts are difficult to sustain. Similarly, at state institutions of higher education, educators are trained in Western STEM backgrounds and there are very few science classes presenting an integrated view of TEK and STEM as there are very few Native scientists serving as faculty. Tribal Colleges also have low numbers of Native

science faculty to guide students through an integration of STEM and TEK, and this is further complicated in that faculty who are not from the local Tribe may not be able to represent TEK for the Tribes from the region. While Tribal Colleges are a source of great expertise in both TEK and STEM, faculty work-load is typically very high and there is little time to devote to the expansion of TEK and STEM integration beyond their own classroom.

Challenge: Recruitment and Retention

Increasing the number of AI/AN students graduating with STEM degrees requires meeting challenges in recruitment of students and helping them succeed once they are in the university or Tribal College setting. Recruiting Native students into STEM fields begins long before they enter college. Similarly, the preparation they receive before college is critical to their success.

K-12 educators of primarily Native students identify barriers in preparing their students for STEM due to inadequate curriculum resources, insufficient instruction time for STEM subjects, and remedial education expectations for other subjects. Science is not prioritized as much as reading and math and students are often pulled from science to do remedial work in these other subjects. High teacher turnover in rural areas compound these issues. The result is that many Native students that pursue STEM fields at the college level are underprepared which requires them to take remedial classes, and thus negatively impacts retention.

Of the AI/AN students who pursue higher education at a tribal college or university, many have misconceptions of opportunity and relevance of STEM fields, and choose to pursue other fields associated with tribal sovereignty, history, or other fields that they perceive as more culturally aligned with their Tribe and heritage. Developing a STEM identity among Native youth is crucial for building their interest in pursuing STEM and begins in Tribal communities and at the K-12 level.

NSES faculty participants from Tribal Colleges and state institutions and universities both identify the lack of preparation in STEM subjects and need for remediation as a critical issue for retention and success. At state institutions, the general anecdotal approximation among NSES participants is that 50% of first year AI/AN students are not retained. This is attributed to poor advising, a lack of financial aid education, lack of role models, perceived lack of jobs in STEM on reservations, and racism. Advisors at higher education institutes will rarely understand Native American culture and the unique needs of AI/AN students, ranging from academic to cultural to navigation of the financial aid system. While Tribal Colleges generally provide a better support network for students and are aware of the unique needs of Native students, faculty and resources are often 'stretched thin' and do not provide the opportunities available at larger state institutions.

Need: Mentorship and Native STEM Identity

Participants at the Native STEM Education Summit (NSES) identified mentorship as a critical need at all levels for meeting the aforementioned challenges and advancing Native American participation in the STEM enterprise.

Mentorship is essential for development of a STEM identity for Native students and also a key element in the integration of TEK and STEM. Many studies outside the Native American group cite both development of a STEM identity and mentorship as critical to persistence in STEM (Windchief & Brown,

2017, p. 329 - 345). Many Native students are not aware of opportunities that exist in STEM fields at home or on their reservation. The general perception is that an individual must move away in order to pursue a STEM field. Because there are few Native STEM teachers, community or family members in a STEM field, Native youth often do not consider a future in STEM or STEM-related fields.

The mentorship relationship between an elder or an older family member and children is how the Native American community has traditionally passed along knowledge. A STEM mentor from a Native individual or a Tribal member broadens a young student's perspective on opportunity, and can make STEM more relevant to them as an individual. Native STEM mentors can also help interpret and provide a link between TEK and STEM, helping young learners navigate the different perspectives. Incorporating an Indigenous perspective in STEM education and utilizing Elder knowledge and TEK in STEM mentorship presents an opportunity to show Tribal youth that STEM is important to the welfare of the community and innately part of Native American identity.

Need: Increased Resources

Increased resources are essential to support education, training, and mentorship at all levels and meet the challenge of increasing Native engagement in STEM. Summit participants identified a need for curriculum development and infrastructure, as well as increased support for faculty and teachers.

At the K-12 level, improved culturally-relevant STEM curricula and adequate instruction time are resource needs that are critical to preparing students for STEM pursuits. Turnover rates for K-12 teachers in Native communities are typically 1-3 years and due in part to the level of compensation, available housing, and other resource-related support. Many Tribal Colleges do not have lab facilities for instruction or research. Tribal College faculty typically have a very large teaching load and must obtain external funding in order to conduct research. These constraints leave little time for supporting students. At state higher institutions, resources are needed to help Native students navigate the different aspects of the university environment and promote their success.

Future Directions

At the conclusion of the Native STEM Education Summit, participants nominated a Leadership Team to continue the discussion and develop a coordinated approach to meeting the challenges and needs presented in this report. For questions and further information, contact Dr. Aaron Thomas at the University of Montana (aaron.thomas@mso.umt.edu).

References

Berkes, F. (1993). Traditional ecological knowledge in perspective. In J.T. Inglis (Ed.) *Traditional Ecological Knowledge: Concepts and Cases*. Canadian Museum of Nature/International Development Research Centre, 1-9.

Windchief, S. & Brown, B. (2017). Conceptualizing a mentoring program for American Indian/Alaska Native students in the STEM fields: a review of the literature. *Mentoring & Tutoring: Partnership in Learning*, 25(3), 329-345. DOI:10.1080/13611267.2017.1364815