

Two-way Mentoring

How to increase participation of Indigenous/First Nations students in Physics, STEM.

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A Brief History



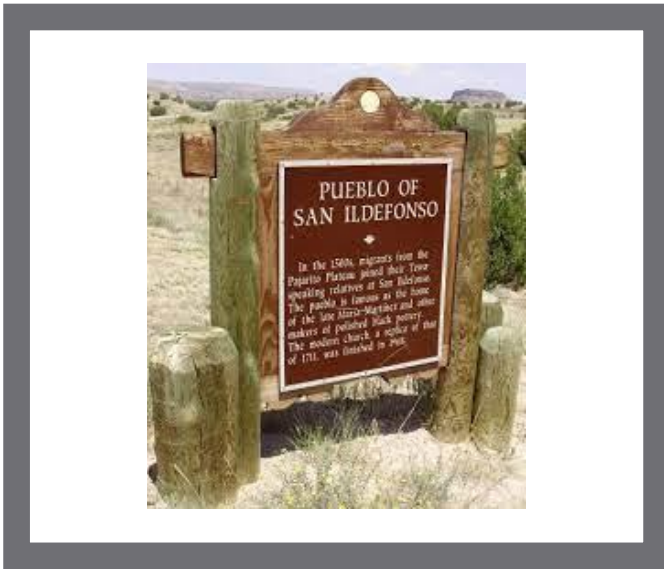
The Carlisle Indian Industrial School in Pennsylvania around 1890. Photo from the Library of Congress.

- Starting in the 19th century, Indigenous and Native American children were forcibly placed in schools operated by the government and churches.
- They were made to assimilate to the government's preferred way of life, often through violence.
- In [Canada](#) and [United States](#) mass children grave sites found from these Federal and religious boarding schools
- Due to the troubled legacy that ended only in the 60's. many tend to mistrust non-indigenous organizations when it comes to education.

Grew up in a reservation

Grew up in a rural , urban or suburban setting

- Do your research, find an ally that can serve as a point of contact.
- This requires dedication and persistence... it may take years.



A word of caution

Claiming that one or someone is indigenous can be a complex subject and can come with consequences. Do not make assumptions unless you understand and are sure of your assertions.

In the context of education, federally recognized tribes are independent from one another and have their unique traditions and laws that favor principally tribe members.



Affiliated to a tribe

Non-affiliated to any tribe

In labs at times when students pick multiple ethnic groups in forms (Hispanic, Native) they are no longer part of the indigenous category for counting purposes. You may be undercounting.

Asian should not be within the same category as Pacific Islanders and Native Hawaiians.

Teaming up with
MSI serving
Indigenous
students.
A selection

TCU – 32 accredited Tribal Colleges and Universities

- Mainly in Midwest and Southwest
- Community colleges or one-year colleges.
- Navajo technical college: largest tribal college in the USA, Bachelor of Science. Large engineering focus, limited in natural sciences courses.

Four-year public colleges serving Native Americans

Fort Lewis College (FLC), in Durango, Colorado.



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Fort Lewis College (FLC), in Durango, Colorado.

It sits in the ancestral lands and territories of Nuchu (Ute), Apache, the Pueblos, Hopi, Zuni, and the Diné/Navajo Nation.

In 2008, Fort Lewis was designated as one of six Native American-serving, non-tribal colleges by the U.S. Department of Education.

Today it awards more degrees to Native American students than any other four-year, baccalaureate-granting institution in the nation - **about 26% of all degrees awarded.**

Some Numbers

- Indigenous students comprise less than 1% of both the U.S. undergraduate and graduate student population,
- At FLC 41% of students are Native American or Alaska Native, representing 177 Tribes and Native Alaskan villages.
- Three majors offered FLC : computing engineering, engineering and physics and two minors: engineering and physics.
- Year 2016 out of 31 declared physics majors/minors, 11 were granted the degree in physics.
- In Year 2020 out of 21 total enrolled majors/minors, **only two undergraduates were awarded the degree.**
- While the engineering major/minor numbers are better in terms of initial enrollment, the relative success rates are similar.
- Numbers for indigenous women obtaining a physics degree are below the sub-percent level (relative)

So why are these numbers so low

K-12: inadequate STEM instruction and resources, less likely to have access to Advanced Placement or college prep courses in high school.

These accumulate over time and arrive at college age with course deficits.

TCU's often do not offer natural science courses/degrees. Astronomy, physics, math

Native American students are often excluded from postsecondary data and research due to their small sample size. It is currently considered a barrier to study solutions.

So why are these numbers so low

Lack of representation, sense of purpose, lack of family friendly infrastructures

Offensive environment: ethnic and cultural discrimination

Non-MSI institutes home grown roadblocks. GPA, Per-diem, dependent or housing allowances options.

Are there any indigenous physicists?

- YES!
 - Many had a non-linear physics career.
 - Engaged and full of insight, outstanding achievement records
 - Comments from our allies and mentors
1. “What I missed the most was talking to people that were raised in a reservation, understood and actually laughed at my jokes” Indigenous PhD Physics engineer for NASA
 2. “Family is the most important aspect of my research; my students are part of my family” Indigenous Nationally recognized-priced PhD Mathematician
 3. “I loved looking at the sky and one day I realized, why don’t I make a living of it” Indigenous Anthropologist turned PhD theorist-Astrophysicist.
 4. “Learn how to ask questions, lots and lots of questions, class, conferences, workshops” PhD Physics project leader Institute of National Standards



[Indigenous Physicists](#) at SACNAS 2017 Courtesy of APS Gazette

Professional organizations

APS. American Physical Society

- Bridge program
- National mentoring Program, career mentoring fellows

AISES. American Indian Science and Engineering Society (AISES)

- No bridge programs but they do provide conferences for its members.
- List of chapters (indigenous schools by region) .
- It can be useful when you are trying to reach out certain communities in your region.

- **Bridge program**
- Helps students with a course deficit apply to physics graduate school, university must be part of the program. Mentoring part of the program .
- Core physics coursework required.
- Large success rates, excellent postdocs coming from this program.

National mentoring Community

- Scientists with skills in mentoring, career, life, successes and learn from failures approach.
- Meet with trainees several times a year (virtual) also during the APS meetings.
- Students ask lots of questions, a very rewarding experience.

APS Gazette

- Published in the [Fall of 2020](#) pages 4 -9
- 1. “Take conference planning a step further by creating a cultural advisory committee at inception... to create a meaningful relationship with the local population. Conference organizers should invite Indigenous peoples to participate in any capacity from serving on a panel or provide free or discounted registration for local residents”
- 1. “We, as Indigenous People, are not ancient peoples. We are alive, living, working and growing. When we talk about core physics concepts, we keep physicists like Newton, Fourier, Gauss, Compton, etc. alive by using their names and do not refer to them as ancient people, even though their time periods coexist with thriving Indigenous cultures”

Sense of purpose, inclusivity:

Public Outreach, mentoring experiences, workshop participation, resource groups (indigenous groups, student organizations, professional organizations)

Allow them to keep engaged.

**Networking
Networking
Networking**

Family is first: we cannot decouple this if we want to be successful, need to be flexible. In a way the pandemic has helped us see this more clearly

Clear communication and goals. This requires work. Vague projects only lead to demotivation

Constructive criticism that motivates, does not demotivate. Acknowledges the work of the student, give credit and recognize their work. Mistakes are also part of the learning experience.

GPA is not a universally accepted reflection on one's capabilities, do not let them discouraged.

Mentoring

Benefits to us



- Students with these backgrounds tend to see on the longer term, beyond their project
- They have excellent management and leadership skills.
- To the point, often they are not verbose.
- They do not inflate their work or the work of others. Honest responses, excellent peer reviewers.
- A quicker grasp of subjects, they tend to see the global picture and consequences faster
- Grounded, realist expectations of results.
- They provide an excellent pipeline to contribute back to the Pueblos themselves as mentors.
- Finally, indigenous physicists we have researched and met were far above the average in achievements.



[Summer physics camp for young women](#) hosted by the [New Mexico Consortium](#)

Young women from Northern new Mexico including several from pueblos and Hawaii participate yearly. Students receive a stipend, lots of mentoring and follow up opportunities for higher education grants that will enable them to pursue a physics degree education.

Final words

- Do your research and try to learn about the local indigenous communities and schools
- Make a first contact and maintain it, be patient and persistent
- Contact established indigenous physicists and ask them for help mentoring
- Make use of existing professional societies, take a mentoring course from APS NMC.
- Mentoring K-12, start out with STEM festivals or institute initiatives that benefit reservations or nearby communities next to them.
- Mentoring higher education: clarity, outreach experiences, role models, networking
- Help lower the barriers at institutes.
- Try to learn from your students, they do bring a new perspective in research.