Creating a positive space to train American Indians / Alaskan Natives in genomics

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Formal introduction – Dine, Navajo


Hello. I am called Joslynn Lee. I am of the Laguna Pueblo, born for the Salt Water Clan. And the Acoma Pueblo are my maternal grandfather’s people and the Salt Clan are my paternal grandfather’s clan.

In the Navajo way, this is how Navajos know where you come from and not marry within clans for preservation purposes.

Formal introduction - Kerese

Guwadzii Joslynn Lee, shawiiti hanu stah `che. Joslynn Lee is of the Parrot Clan of my people. Laguna Pueblo and Acoma Pueblo

Present talking points on AI/AN

One voice, of many stories that come before me
• Underrepresented of the URMs
• History of western education research and Native communities
• How to engage Native populations

Terminology

• Native vs Native American vs American Indian and Alaskan Native Indigenous vs First Nation
• Federally recognized tribe: 522 in US
• Reservation
• Elder
• Western Education

Less growth of bachelors degrees in STEM for AI/AN

Where are these students going?

Workforce demographics for AI/AN in 2013

<table>
<thead>
<tr>
<th>Employed scientists and engineers, by bachelors degree total</th>
<th>46,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science occupations</td>
<td>6,000</td>
</tr>
<tr>
<td>Engineering occupations</td>
<td>2,000</td>
</tr>
<tr>
<td>S&amp;E-related occupations (health, teachers, technicians)</td>
<td>22,000</td>
</tr>
<tr>
<td>Non-S&amp;E occupations (art, sales/marketing, teachers)</td>
<td>17,000</td>
</tr>
</tbody>
</table>

80% of workforce is not in STEM

What can explain this?

• Assimilation of Native Americans in Western education
  – 1892 Army Officer Richard Pratt
  – Boarding schools
  – Pratt’s motto: “Save the man, kill the Indian”
  – Teach Indian children the skills necessary to function effectively in American society

How to engage AI/AN populations?

• Identify the Native students
  – Not stereotypical “brown” person
  – Last names are not relevant
  – Intermarriage
  – Rural vs urban

• Beginning of semester:
  “I invite those who would like to discuss any religious or cultural beliefs that may arise during our course. If you are unsure, my office is a safe space to discuss this.”
  – Student need to reciprocate in their own way

Education was valued

Sequoyah
Cherokee Indian
Perfected the Cherokee alphabet and syllabary in 1821
90% of Cherokees became literate within 10 years

Charles A. Eastman, Ohiyesa
Santee Sioux
1858-1939
Santee Normal Training School
Medical doctor
Read and write Dakota Sioux language

Opened a can of worms

- Are you really trained?
- Know your on-campus resources
  - American Indian resource centers
  - Multicultural center
  - Department of American Indian studies
- Professional organizations
  - American Indian Science and Engineering Society (AISES)
  - Society for Advancing Chicanos and Native Americans in Science (SACNAS)
- Government entities

How to engage AI/AN populations?

- Understand traditional ecological knowledge (TEK) perspective
  - learn how to read the environment
  - values and skills comes from elders
  - knowledge, is passed down through the generations (oral language)
  - interconnectedness (land, water, air, space, beings)
  - harmony

How to engage AI/AN populations?

- Understand what sample collection may overstep
  - Plants are sacred, protocol
  - Animals are relatives, we do not harm
  - Blood and tissues are our own, keep track
- Culturally appropriate manner (i.e. Model organisms)

Plants are sacred

- Corn - *Zea mays subsp*
- Genetics and domestication
- Creation stories, gift to people
- Example: Tádidiín (corn pollen) is a fundamental aspect of Navajo traditional culture
  - it comes from the tassels of a mature corn plant
  - can only be collected by a female
  - communicating with the Navajo Holy People

Response to long-term storage of gene banks

“Seeds are living beings that exist within a web of relationships, they are connected to the human who plants the seed, the microbes that live in the soil alongside the seed, the soil itself, the harvester, and those who use and/or consume the plant. These relationships are reciprocal and constitutive, which means that both seeds and humans are entities formed by and simultaneously forming life’s actions around themselves.”

According to this perspective, humans must recognize and protect those relationships through prayers or other signs of respect and connection.

Animal specimens

- Lizards
- Example: “shicheii” maternal grandfather or horned toad
  - do not kill or harm our grandfathers nor horned toad
- Rational for organisms will vary between tribes
  - they helped in creation stories
  - are relatives
Take away points sample handling

- My perspective
  - Respect any specimen you handle
    - As a TA in labs
    - If you see something, say something approach
  - Understanding where they came from
    - American Type Culture Collection (ATCC)
    - repository
- What about data?
  - Treat just like a real sample

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How to engage AI/AN populations?

- Understand we value technology and culture, even with language barrier
  - no Navajo words for computer or keyboard or Internet
  - technology without cultural relevance was meaningless to the Navajo elders

Examples of Science and Culture

- 1965-1975: Fairchild Corporation’s Semiconductor Division on Navajo Reservation
  - female Navajo workers produced were used in devices such as calculators, missile guidance systems, and other early computing devices
  - Weaving, like all Navajo arts, is done with unique imagination and craftsmanship
- 2009: Navajo librarian Jeannie Whitehorse
  - information technology could change their lives
  - group of women how to design their rugs — an art form for which Navajo are renowned — using an online paint program

How to engage AI/AN populations?

- Integrate science into their culture
  - Make a long-lasting and genuine commitment
  - Get involved with public community events
    - STEM outreach
    - career workshop (powwows, flea markets)
  - Meet the tribal council / liaison, elder
    - the natural world (land/water/air)
    - tribal concerns (environment/health disparity)
    - giving back to community
  - Curriculum integration
    - water quality, microbial genomics
    - evolutionary relationships

Conclusion

- Need to train more Native students
  - Biological sciences
  - Computer science
  - Mathematics and statistics
- Maintain a safe and inclusive space
- Culturally appropriate approach to genomics
Acknowledgements

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How did I get interested in science?

I explored nature on the Navajo and Pueblo reservations, filled with plants and animals.

Oral stories from my grandparents explained how nature works.