

Advancing
Science
Excellence in
North
Dakota

Experimental Program to Stimulate Competitive Research

www.ndepscor.nodak.edu

Building Partnerships Between Research Universities and Tribal Colleges

A ND EPSCoR Model

Nurturing American Tribal Undergraduate Research and Education (NATURE)

Carol Davis
North Dakota EPSCoR

ND Collaboration

- ◆ National Science Foundation
 - ◆ State of North Dakota
 - ◆ Two ND Research Universities
 - ◆ Five Tribal Colleges
 - ◆ Reservation High Schools
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Collaboration ND Universities and Tribal Colleges



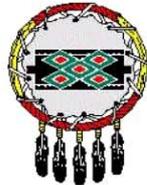
■ Fort Berthold Community College, New Town



■ Turtle Mountain Community College, Belcourt



■ Cankdeska Cikana Community College (Little Hoop), Fort Totten



■ United Tribes Technical College, Bismarck



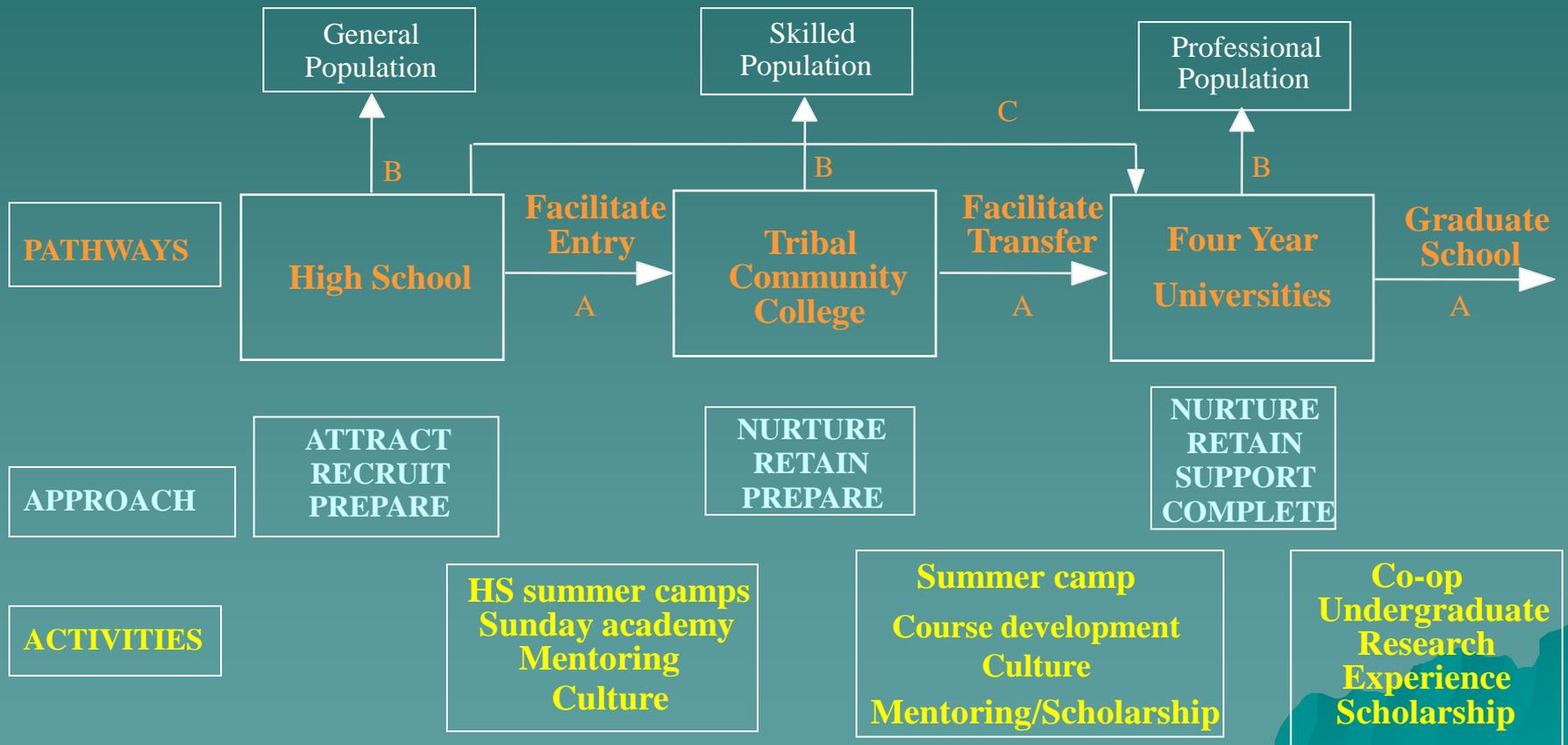
■ Sitting Bull College, Fort Yates

Grand Forks



Fargo
NDSU

NATIVE AMERICAN STUDENT PATHWAYS



Tribal College Participation

- ◆ NATURE is the product of a collaboration that started in 1998 between the ND Tribal Colleges and the North Dakota State University College of Engineering.
- ◆ Dr. Laurel Vermillion, President, Sitting Bull College who was one of its founders, is a member of the ND EPSCoR Advisory committee.

North Dakota EPSCoR

- ◆ Became a NATURE partner in 2000.
- ◆ Funded NATURE in 2004.

Goals of NATURE

- ◆ Attracting North Dakota Native American high school students into STEM disciplines
- ◆ Increasing retention rate of ND Native American students in STEM programs at high school and college levels by incorporating culture into STEM
- ◆ Building research capacity in tribal colleges that will benefit students, faculty, programs, and community
- ◆ Building a STEM pathway for American Indian students that incorporates Native Knowledge.

NATURE Pathway Activities

- ◆ Sunday Academy
 - ◆ High School Summer Camps at Tribal Colleges
 - ◆ Tribal College Summer Camp at Universities
 - ◆ Tribal College Research
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NATURE Annual Objectives

- ◆ Sunday Academy: 125 American Indian high school students
 - ◆ High School Summer Camps: 125 American Indian high school students
 - ◆ Tribal College Summer Camp at NDSU: 15 American Indian tribal college students
 - ◆ 20 American Indian Tribal Colleges students conducting research
- 

American Indian Culture



Tribal Culture

American Indian culture
will form the foundation
on which knowledge is built.

- Karen Swisher-

*Nest Steps: Research and Practice
to Advance Indian Education*

Education and Culture

- ◆ “[It] is culture that provides the tools for organizing and understanding our worlds in communicable ways.”

- Jerome Bruner-

The Culture of Education

Culture Teachers Develop Sunday Academy Units



SUNDAY ACADEMY



Sunday Academy Curriculum

- ◆ Curriculum developed by Collaboration Teams
 - ◆ North Dakota STEM Standards Based
 - ◆ Culture infused
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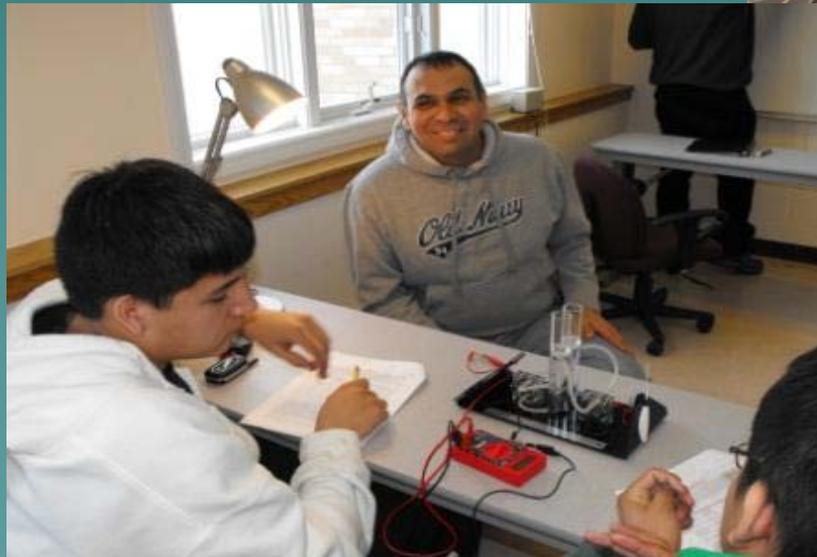
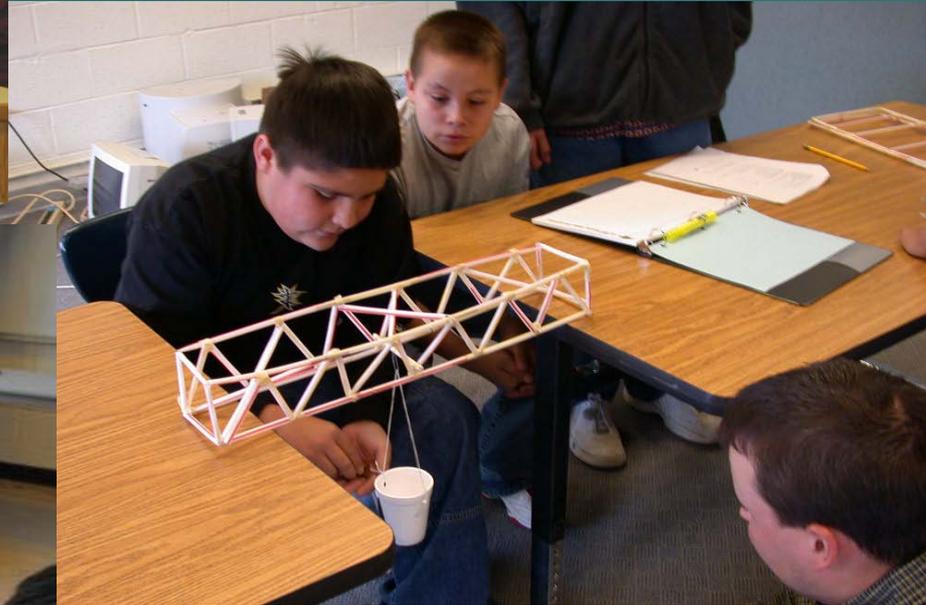
Sunday Academy

- ◆ Objective: 125 High School Students at 5 Tribal Colleges in ND
- ◆ Seven Sunday Academies are offered each academic year
- ◆ Year 1:
92 HS Student @ 4 Tribal Colleges

Sunday Academy



Sunday Academy for high school students



**TRIBAL HIGH
SCHOOL SUMMER
CAMPS AT TRIBAL
COLLEGES**

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Summer Camp

- ◆ The Objective: 125 High School Students @ 5 Tribal Colleges in ND

Year 1:

141 Tribal High School
Students @
5 Tribal Colleges in ND

High School Summer Camp

- ◆ Curriculum is developed by the teaching staff
 - ◆ Curriculum is ND Standards-based.
 - ◆ 10-day Summer Camp
 - ◆ Culture is infused
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CULTURE

- ◆ Native Science continually deals in systems of relationships and their application to the life of the community.

-Gregory Cajete-

*Native Science: Natural Laws
of Interdependence*

Summer Camps for High School Students



UNIVERSITY SUMMER CAMPS

1. Tribal College Student Track
 2. NATURE Teaching Staff Track
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Tribal College Student Camp at Universities: 2 Weeks

- ◆ Week 1: Students visit STEM labs at the two universities (University of ND and North Dakota State University). Students meet successful American Indian engineers who are in workforce
- ◆ Week 2: Student select a lab at either university where they participate in research

Tribal College Student Camp at the two ND Research Universities

- ◆ Objective: 15 Tribal College Students from the 5 ND Tribal Colleges
 - ◆ Year 1: 13 Tribal College Students from 3 ND Tribal Colleges
- 

Summer Camp at the Universities

Tribal College Student Track



Summer Camp at the Universities

Instructor and Teacher Track

Collaboration in Action

- ◆ Week 1. Developing TCC summer camp lesson plans and hands-on activities.
- ◆ Week 2. Developing Sunday Academy lesson plans and hands-on activities



RESEARCH



RESEARCH VISION

- ◆ North Dakota EPSCoR and the North Dakota Tribal Colleges envision that a **research partnership** will evolve where the universities assist the tribal colleges and the tribal colleges assist the universities. The state has a model for the nation that should be shared.

Research Team

- ◆ NATURE research happens at the tribal colleges
- ◆ Each Research Team consists of...
 - ◆ 1 or 2 Tribal College Students
 - ◆ 1 Tribal College Faculty Member
 - ◆ 1 University Researcher

Tribal College Student Research

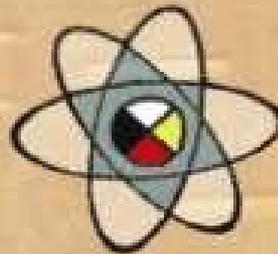
- ◆ Objective: 20 Tribal College Students
10 Tribal College Faculty
10 University Professors

2009: 18 Tribal College Students
10 Tribal College Faculty
10 University Professors

Student Research Data Past Three Years

- ◆ 41 tribal college students have conducted research
- ◆ 12 Tribal college faculty mentored student research
- ◆ 22 University research professors mentored research teams

**North Dakota
Tribal College Faculty
Research Model**



**Guiding Undergraduate Student Research In
Science • Technology • Engineering • Mathematics**

Traditional Knowledge

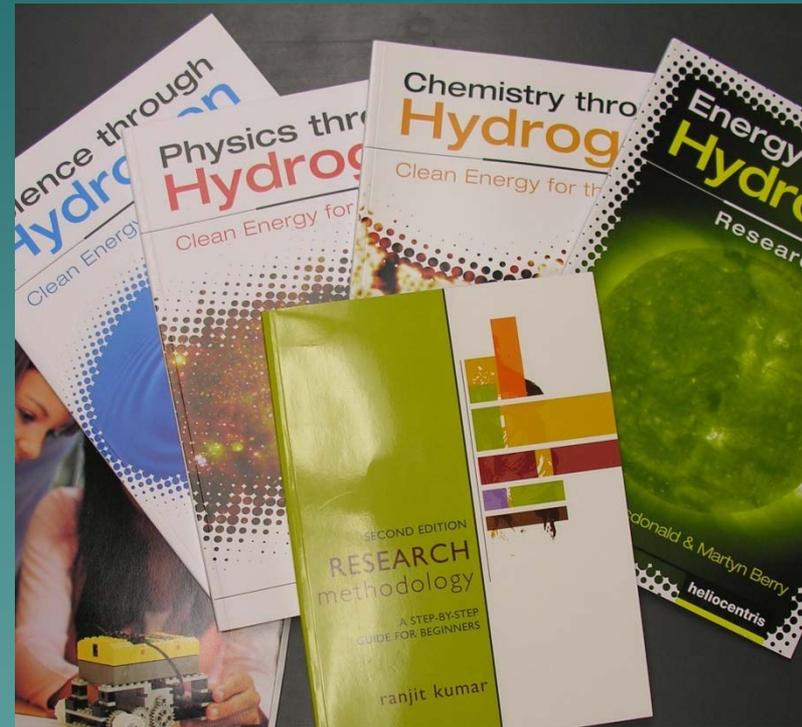
- ◆ "Every act, element, plant, animal, and natural process is considered to have a moving spirit with which humans continually communicate.

-Dr. Gregory Cajete-

Native Science: Natural Laws of Interdependence (2000)

Building Research Capacity

Though discovery research is desirable and could be the first choice, research methodology and skills are the primary focus



NATURE Research Initiative

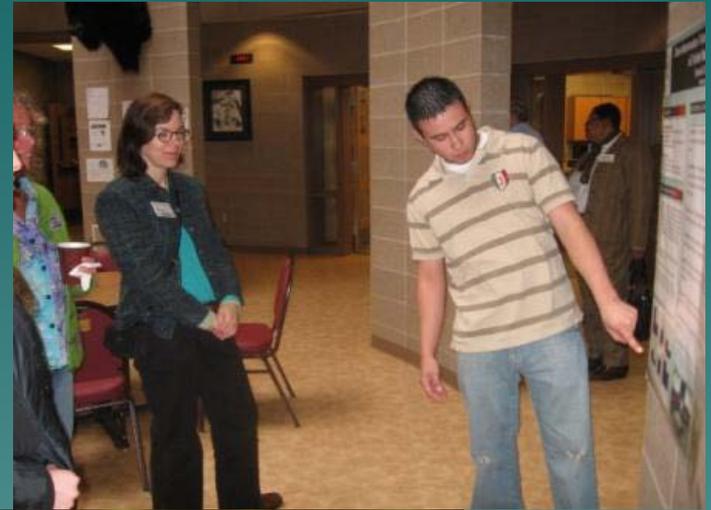
The "R" in NATURE

- ◆ Having students participate in research projects has been shown to improve retention of undergraduate students in STEM
- ◆ Involvement in research and instruction using research projects helps faculty to engage students in the STEM learning process
- ◆ Engaging tribal college faculty in research activities is an important part of building research capacity at tribal colleges

NATURE Research



RESEARCH POSTERS



Sustainability



Expected NATURE Outcomes

1. Impact on students
2. Impact on TCC faculty
3. Impact on HS teachers
4. Impact on Univ. faculty



Academic Impact

- ◆ High School Teachers apply learning strategies to high school classrooms
- ◆ Tribal culture is built into every teaching unit
- ◆ Tribal College Faculty learn to use new labs and conduct research
- ◆ University Professors learn about American Indian culture
- ◆ Students retained in STEM

Anticipated Outcomes

- ◆ In ten years...

...the Tribal Colleges and ND Universities will advance culturally infused research on TCC campuses as **partners**

...Tribal Colleges will **expand** their research initiatives on their campuses

...significant movement of American Indian students along the STEM educational pathway will result leading to their **graduation with STEM degrees**

Reservation Impact

- ◆ Successful students will become role models for future generations
- ◆ Tribes will be able to fill STEM jobs on the reservation with tribal members
- ◆ Tribes will be able to study their STEM issues utilizing tribal college researchers
- ◆ Families will have role models

So What?



So What?

- ◆ Tribal College and High School Student surveys show interest in STEM careers is improving

TMCC: **31** AS majors in 1998
187 AS majors in 2008

So What?

- ◆ **Sally** from TMCC earned a double major: Mathematics/civil Engineering
- ◆ **Jon** from FBCC is enrolled in a MS Program in Transportation Engineering
- ◆ **James** and **Charles** are juniors majoring in civil engineering at NDSU
- ◆ **Robert** earned a PhD in Physical Therapy

So What?

- ◆ **Don** is at Montana State University enrolled in MS in Environmental Science
- ◆ **Karla** and **Nell** are juniors at an out-of-state university majoring in science.
- ◆ **Shirley** earned a bachelor's degree in Secondary Science and is teaching at a high school on the Turtle Mountain Reservation.

So What?

- ◆ **Albert** won a \$15,000 scholarship at an Intel International Science Fair. He is a junior in Civil Engineering.
- ◆ **Don, Sam** and **Linus** are college seniors majoring in High School Science Teacher Education.
- ◆ **Allen** and **William** are college seniors majoring in Environmental Science

So What?

- ◆ **Joe** is teaching science at a reservation middle school
- ◆ **Eleven Sunday Academy students** participated in 2009 National American Indian Science Fair

So What?

- ◆ **Virgil** and **Linus** are college seniors majoring in High School Science Teacher Education.
- ◆ **Allen** and **Wally** are college seniors majoring in Environmental Science
- ◆ **Nat** earned a bachelor's degree in clinical lab science

How We Addressed Barriers

- ◆ NATURE purposely addressed, supported, and incorporated the American Indian culture of participants in all teaching units
 - ◆ NATURE purposely provided stipends for everyone
- 

How We Addressed Barriers

- ◆ NATURE brought university engineers and other STEM faculty to the Tribal Colleges where they met with parents, faculty, and high school teachers. This demonstrated University commitment and brought status for parents and students who wanted a worthwhile experience



Who Supports NATURE

- ◆ National Science Foundation

Experimental Program to Stimulate
Competitive Research – EPSCoR

\$500,000 per year for NATURE

- ◆ North Dakota State University

Research Infrastructure Improvement
Award #0814442

Who Supports Nature?

- ◆ North Dakota Legislature!
- ◆ North Dakota is one of the states with a budget surplus, so we have enjoyed support from our legislators.

PARTNERSHIP

- ◆ To build our vision will require many partners including Funding Agencies. Initiatives such as NATURE require resources. But, the investment will reap rewards when Tribal College graduates enter the workforce in STEM careers.

MIIGWECH (Thank You)

<http://www.ndsu.edu/epscor/NATURE/index.html>

