Engineering Education in the Nation's
Tribal Colleges and Universities

Directorate for Engineering Advisory
Committee Meeting
National Science Foundation
May 3-4, 2006

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Presentation of Workshop Findings

Hosted by the NSF's Division of Engineering Education and Centers
With assistance from HRD's
Tribal Colleges and Universities Program
December 14-16, 2005
Arlington, VA

Historic Challenges of STEM implementation at TCUs

- Lack of STEM Degree Programs
- Low numbers of STEM Faculty
- Instructional Infrastructure
- K-12 partner/feeder schools score 35 percentage points below the SD average on standardized SAT9 tests in math and science.
- At OLC 90% of Entering students at test into remedial math

Tribal Colleges and Universities (TCU)

- Tribal Colleges were created to increase access to higher education for American Indians growing up on reservations and generally serve geographically isolated populations that have no other means of accessing education beyond high school.
- Tribal Colleges are unique institutions that combine personal attention with cultural relevance, to encourage American Indians to overcome barriers to higher education.
- Tribal College are chartered and established to meet to the educational needs of Federally recognized Indian tribes.
- Tribal colleges have a dual mission
  - (1) Provide excellence in education and to prepare their students for employment in the 21st century
  - (2) Provide a place where American Indian language, culture, and the traditional wisdom of the Elders are infused into the curricula
- Currently there are 36 AIHEC recognized tribal colleges and universities and all have open admission policy

Tribal Colleges and Universities Continued

- In 2004, 13 percent of all American Indian/Alaska Native college students were enrolled in TCUs.
- Enrollment in TCUs increased faster compared to mainstream colleges and universities (32% vs. 16%).
- Enrollments of all students at TCUs have increased 110 percent since 1990.
- Except for a few currently in candidate status, all TCUs are fully accredited by regional accrediting agencies.
- Most TCUs are two-year institutions that offer associate level degrees and/or certificates programs.
- In 2004–2005, nine TCUs offered bachelor's degrees, and two offered master's degrees (AIHEC, 2005).
- Currently there are no four-year engineering degree programs at a TCU.

Tribal College and University Students

- Most tribal college students are first-generation students.
- The average age of tribal college students is 31.5
- Two-thirds (67 percent) are women
- Over half of all tribal college students are single parents
- Only about 20 percent of entering students at TCUs would be considered college ready especially in regards to math preparations

Workshop Goal

- Define issues and challenges to accelerate pre-engineering and engineering activities at Tribal Colleges and Universities (TCUs) in order to graduate more Native American engineers

Workshop Intent

- Stimulate meaningful discussions among the TCU faculty and to develop comprehensive recommendations for implementing and enhancing pre-engineering and engineering programs at their institutions

Workshop Discussion Topics

- Baseline information on pre-engineering and engineering programs at TCUs (faculty, students, facilities, and other resources)

- The level of interest in pre-engineering and engineering activities at TCUs;

- The level of preparedness related to implementing pre-engineering and engineering programs; and

- A framework of key strategic elements and recommendations related to the implementation and acceleration of pre-engineering and engineering activities at TCUs.

Workshop Recommendations

National Science Foundation

- Incorporate a funding structure similar to that used by the Tribal Colleges and University (TCUP) Program that accounts for the unique needs and differences in preparation of the individual TCUs.

- Improve the physical infrastructure for supporting NSF pre-engineering and engineering degree programs including teaching and research labs and some technology infrastructure to support common distance based efforts.

- Establish "Centers of Excellence" or "Collaborative Centers" that capitalize on the strengths of individual TCUs with the intention of disseminating and sharing expertise and best practices, related to STEM student retention, developmental education, and engineering programs.

- Encourage collaboration between TCUs and NSF to better define the broader impact statement in solicitations that encourage mutually beneficial partnerships between TCUs and mainstream institutions.

Workshop Recommendations

Tribal Colleges & Universities

- Develop a strategy for recruiting and retaining faculty with experience in engineering.
- With NSF's support, organize SWAT or technical assistance teams to coordinate activities such as: curriculum alignment between TCUs and mainstream institutions; common distance based course development and delivery; navigating the ABET accreditation process; and to find common solutions related to engineering programs at TCUs.
- Support faculty professional development, and provide release time for faculty research in order to improve faculty retention.
- Develop mutually beneficial matriculation programs to transfer students completing pre-engineering programs at TCUs to mainstreams institutions that offer four year engineering degrees
- Build bridges and understanding of engineering between tribal governing bodies and TCUs.

Workshop Recommendations

Tribal Colleges & Universities Continued

- Develop mutually beneficial programs with K-12 schools with the intention of improving the math and science background of students entering TCUs.
- Develop common standards for coursework among regional TCUs and four-year engineering degree granting institutions by aligning STEM course descriptions to aid in articulation and transfers and to encourage the sharing of TCU faculty and resources for common distance based curriculum.
- Offer culturally appropriate curriculum that capitalizes on the incorporation of indigenous knowledge in engineering programs.
- Form an *ad hoc* committee related to pre-engineering and engineering activities and an accompanying website that will be used as a portal for disseminating ideas, opportunities and facilitating collaboration.
- Refine and disseminate successful models of adult recruitment, remediation, and retention in math, science, and engineering courses and degree programs.
- Stimulate the interest of K-12 students in the areas of engineering by developing culturally relevant applications of engineering that are offered using informal methodologies of instruction as well as locations.

Example of OLC Pre-engineering Students and Graduates

- 80% of all Pre-engineering graduates from OLC have either graduated or are still enrolled
- 12 Baccalaureate Graduates to date
  - 5 are in Engineering
  - 7 are in other science or technology areas
- 10 Transfer Students are still enrolled in Baccalaureate programs
  - 5 are in engineering
  - 5 are in other science or technology areas.

Bridges to Success
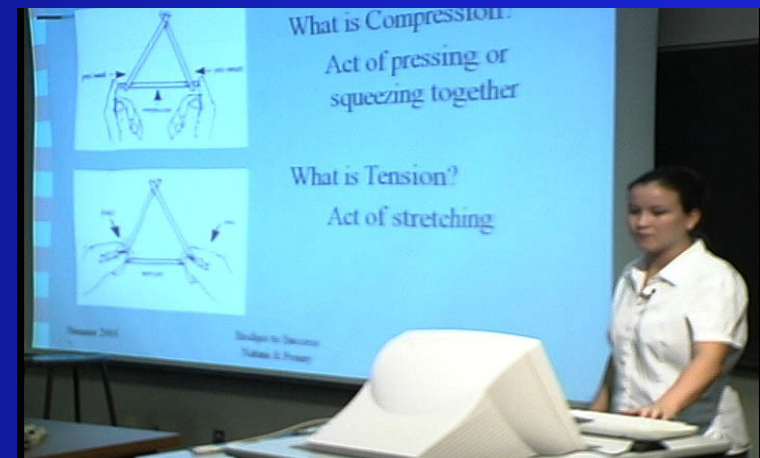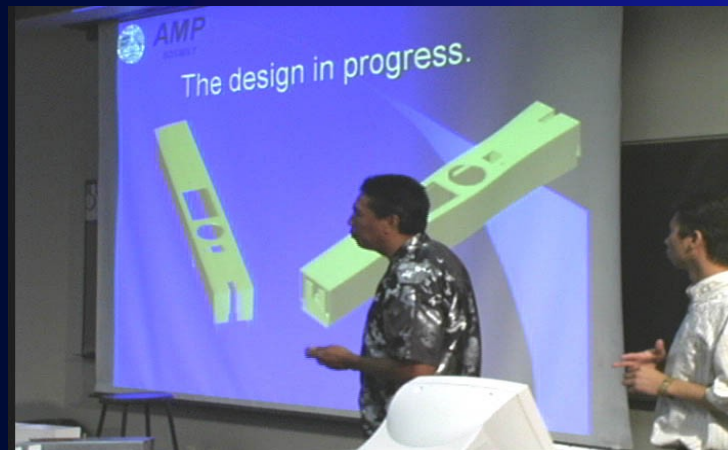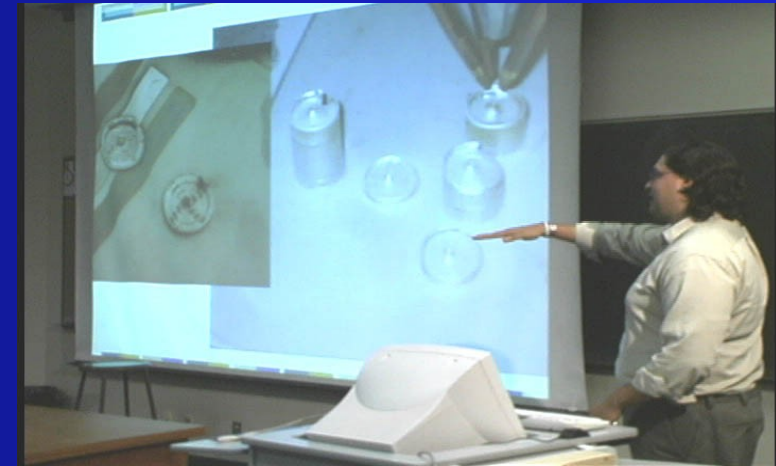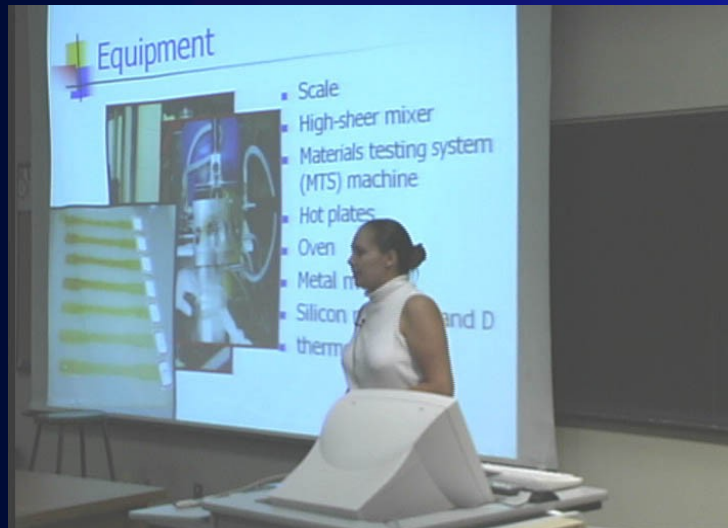
Bridges to Success Program

A Mutually Beneficial Partnership NSF ENG-TCUs

- Success rates of Native students at mainstream, four-year educational institutions have historically been very low.

- American Indian students have the lowest retention and graduation rates of any ethnic minority group in the country only 11 percent of the cohort of Native twelfth graders in 1992 who were likely participants in post-secondary education had completed bachelor's degrees as their highest degree by 2000

- In all of Higher Education the face of typical college student is changing-resembling a nontraditional student

- Remediation and retention at tribal colleges is more successful for adult learners than in mainstream institutions

- Demonstrated examples of successful STEM Programs and Pre-Engineering Efforts at TCUs

Community Service
Tribal Policy Reform
Career Opportunities
Service Learning Projects
Community Needs Analysis
Industry Certification Training
Sustainable Employment Development
Infrastructure Development & Enhancement

K–12 Partnerships
Family Involvement
Educational Reform
Student Recruitment
Pre College Enrichment
In–Service Teacher Training
Pre-Service Teacher Training
K–12 Curriculum Development

Community Development

College Readiness

Graduate Degree Implementation
Graduate School Linkages
Professional Development
Leadership Development
Workforce Development
Articulation Agreements
Industry Collaboration

Curriculum Development & Enhancement
Inter-Departmental Collaboration
Institutional Resource Leveraging
Infrastructure Development
Undergraduate Research
Institutional Partnership
Internships / Mentoring
Faculty Development
Student Retention

Systemic Community Reform

Transition to Graduate School/Workplace

opportunities for the Oyate   Utilizing applications of Science and technology in education and research to develop sustainable employment

Workshop Recommendation Priorities

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- Offer culturally appropriate curriculum that capitalizes on the incorporation of indigenous knowledge in engineering programs.

- Establish "Centers of Excellence" or "Collaborative Centers" that capitalize on the strengths of individual TCUs with the intention of disseminating and sharing expertise and best practices, related to STEM student retention, developmental education, and engineering programs.

- Encourage collaboration between TCUs and NSF to better define the broader impact statement in solicitations that encourage mutually beneficial matriculation programs to transfer students completing pre-engineering programs at TCUs to mainstreams institutions that offer four year engineering degrees

- Develop sound high quality, easily accessible Pre-Engineering programs and grow into TCU operated four year engineering programs in the future.