

Tribal Colleges & Universities Project (TCUP)
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PROJECT DESCRIPTION

NASA's Tribal Colleges and Universities Project (TCUP) is a science, technology, engineering and mathematics (STEM) educational grant and mentoring program that specifically targets Tribal Colleges and Universities. The overall goal of the project is to expand opportunities for the nation's STEM workforce through capacity building, infrastructure development, research and engineering experience, outreach, and information exchange.

Historically, the TCUP has supported a variety of activities for students, teachers, faculty, staff and researchers from the tribal college and university community in NASA-related STEM fields within the tribal college context of culture and traditions. The project represents one of the headquarters and center activities under the Minority University Research and Education Program (MUREP) to engage, educate, and employ underrepresented and underserved communities in NASA-related STEM fields through the tribal college and universities, as part of NASA's effort to ensure that we can meet future workforce needs in STEM.

Starting in FY 2010, NASA's TCUP has been implementing its activities through several on-going activities plus 3 new awards to proposers to a NASA announcement of opportunity released in the summer of 2010. The three awards – selected through a peer-reviewed competition - were made to a tribal college, a Native American-owned consulting firm, and a not-for-profit education organization, all of whom will be helping NASA over the next three years to strengthen research and mentoring relationships between NASA scientists and engineers and the TCUs that will lead to longer-term research and engineering collaborations, increased research program capacity building at the TCUs, and potential additions to the NASA workforce.

There are four primary elements of the TCUP: 1) NASA TCUP "externship" opportunities or Research Experiences for Undergraduates (REUs), which provide NASA expertise and training in research, engineering, and education opportunities to Tribal College and University faculty and students out in Indian country – bringing NASA to the TCUs; 2) NASA TCUP Center Summer Research Experience (SRE) internships which provide NASA Center expertise, experiences, and mentoring; (3) a special tribal college engineering initiative to participate in a NASA flight mission and enhance TCU engineering training; and (4) A TCUP STEM outreach and network activity which provides a venue for increased STEM planning, collaboration, and information exchange as well as an enrichment grant program to build capacity in climate change research and education.

PROJECT GOALS

1. Focus the Agency's attention on identifying and removing barriers to TCU participation in NASA programs that support Science, Technology, Engineering, and Mathematics (STEM) education and achievement toward future workforce potential by providing NASA Research Experiences for TCU faculty and undergraduates out in Indian Country

at tribal colleges or at NASA Centers. (Supports HE objectives 1.1, 1.2, and 1.3 for Outcome 1)

2. Expand outreach activities to attract and retain students in STEM and to increase the interactions between TCUs and NASA, with particular attention paid to activities designed to increase TCU familiarity with the Agency. Strengthen collaboration between NASA and tribal colleges to improve high quality NASA education and research opportunities at the 36 Tribal Colleges. (Supports HE objectives 1.1, 1.2, and 1.3 for Outcome 1)
3. Enhance TCU STEM infrastructure and help engage TCU students in NASA's missions, such as through creation of pre-engineering or engineering courses to establish an Engineering degree-granting program that will enable TCUs to expand research for Science and Exploration Systems and to participate in the engineering and implementation of a NASA flight mission. (Supports HE objectives 1.1, 1.2, 1.3, 1.4, for Outcome 1)

PROJECT BENEFIT TO OUTCOME (1, 2 OR 3)

The Tribal College and University Project (TCUP) supports:

Objective 1.1 Faculty and Research Support: TCUP provides NASA competency-building education and research opportunities for faculty and researchers through the 2010 Summer Research Experience Internship/Externship Program which provided research opportunities for faculty members at tribal colleges and NASA centers.

Objective 1.2 Student Support: TCUP provides NASA competency-building education and research opportunities to individuals to develop qualified undergraduate & graduate students who are prepared for employment in STEM disciplines at NASA, industry, & higher education.

Objective 1.3 Student Involvement Higher Education: TCUP provides opportunities for groups of post-secondary students to engage in authentic NASA-related, mission-based R & D activities through the 2010 Summer Research Internship/Externship Program in which students carry out NASA-related scientific projects in cooperation with a NASA/science or engineering mentor at a Tribal College or NASA center.

Objective 1.4 Course Development: (NASA-related course resources for integration into STEM disciplines) in several ways: (1) provided NASA engineering expertise to help establish an accredited B.S. in Computer Engineering degree program, the first four-year engineering program offered by any of the 36 tribal colleges in the United States at Salish Kootenai College, and (2) the 2010 SRE Externship created special course material for the 3-weeks teaching experience at United Tribes Technical College Externship for the 22 students and 14 faculty in attendance in such areas as climate change, GIS, GPS, remote sensing, and scientific methods.

Objective 1.5 Targeted Institution Research and Academic Infrastructure: TCUP provided individual climate change research and education Mini-Grants to TCUs through the American Indian Alaska Native Climate Change Working Group (AI AN CCWG). Mini-Grants build TCU capacity in climate-change related research activities and fund unique projects involving undergraduate students in hands-on research conducted on tribal lands and focused on issues relevant to Native peoples.

PROJECT ACCOMPLISHMENTS (CONNECTION BACK TO ANNUAL PERFORMANCE GOALS AND PLANS)

1. **Removing barriers to TCU participation through NASA Research Experience for Faculty & Students.** For those students reluctant or unable to leave their homes, children, families, and jobs, NASA continued to improve its “externship” program in which the initial 3-week NASA portion of the program was held at a tribal college (within driving distance for many of the participants) rather than a NASA Center and then the remaining 7 weeks of research was conducted at their home institutions, resulting in a minimum amount of time away from families. Result of this externship program was 100% success in enthusiastic completion of research.
2. **Outreach.** NASA increased communications to TCUs through active support of TCU student and faculty participation in meetings such as the American Indian/Alaska Native Climate Change Working Group (AIAN CCWG), and through portals/websites such as the American Indian/Alaska Native Climate Change Working Group and AIHEC. As part of a special outreach effort, NASA TCUP supported the American Indian Alaska Native Climate Change Working Group (AI AN CCWG). The AI AN CCWG was formed in response to the need for education and research programs in climate change at Tribal Colleges and Universities (TCUs). Its overarching goals are: to prepare future generations of American Indian and Alaska Native earth science professionals; to ensure that indigenous tribal knowledge of landscapes and climates are valued and incorporated into the tribal exercise of earth science education and research; and to promote communication and partnerships among the TCUs, federal partners, colleges and universities, and NGOs. The AI AN CCWG is housed and coordinated by Haskell Indian Nations University and has working group membership among all of the TCUs.
3. **Enhance TCU STEM infrastructure such as through creation of pre-engineering or engineering courses program.** Provided NASA engineering expertise and support to help establish an accredited B.S. in Computer Engineering degree program, the first four-year engineering program offered by any of the 36 tribal colleges in the United States.

PROJECT CONTRIBUTIONS TO PART MEASURES (INCLUDE DATA PLUS EXPLANATION)

1. Continue TCU STEM faculty and students summer research experience programs at the NASA TCUP “externship” at Tribal Colleges in Indian Country or at NASA Center internships during FY 10 (*Maps to APG 1 and Outcome 1: 1.1, 1.2, 1.3*)

1.1: Faculty received training in GIS and remote sensing that prepared them to conduct earth surface dynamics research activities locally.

1.2: Students worked with their faculty mentors on research teams that were given research methods training at a tribal college, after which they returned to their home institutions to conduct research in such areas as the environmental impact of abandoned uranium mines on local vegetation.

1.3: NASA Centers worked with all students on a variety of projects under the SRE internship program. This provided all participants valuable exposure to the reality of working with NASA and other scientists and engineers at a tribal college training session with NASA, USGS, and university scientists/instructors.

The 2010 NASA/AIHEC SRE internship program involved 36 faculty and students from 9 TCUs: Blackfeet Community College, Chief Dull Knife College, Dine College, Fort Berthold Community College, Keweenaw Bay Ojibwa Community College, Leech Lake Tribal College, Navajo Technical College, Salish Kootenai College, and United Tribes Technical College.

GSFC “Externship” Student Project Summaries for the 2010 SRE:

1. Blackfeet Community College in Browning, MT: 2 faculty members, 3 students

Students studied the extent of Red Eagle Fire damage that occurred on the Blackfeet Reservation in 2006, and why, after four years, many areas show little or no regeneration of vegetation and herbaceous plants.

2. Chief Dull Knife College (CDKC) in Lame Deer, MT: 2 faculty members, 3 students

Student projects involved identifying, inventorying and mapping public and private dump sites on the Northern Cheyenne Reservation and studying its impact on surface water. The team plans to complete its maps to benefit the Northern Cheyenne Tribe.

3. Dine College in Tsale, AZ: 1 faculty member; 4 students

Students used ArcGIS and MultiSpec software to map several collaborative research project areas, including well contamination and water quality, mining operations, organization of remedial actions, ant species and prairie dog density

4. Fort Berthold Community College (FBCC) in New Town, ND: 1 faculty member, 1 student

This project studied the current surge in development of oil and gas wells in the Baakan Formation, a geological reserve on and near the Fort Berthold Indian Reservation, and its impact on the environment.

5. Keweenaw Bay Ojibwa Community College (KBOCC) in Baraga, MI; 1 faculty member, 2 students

Students conducted extensive field sampling to study plants and soil along the ancient L’Anse-Lac View Desert Trail, to map and identify natural resources along this culturally significant path.

6. Leech Lake Tribal College (LLTC) in Cass Lake, MN: 1 faculty member, 3 students

This project is part of an ongoing Burial Preservation Program which aims to document all burials on Leech Lake tribal lands in order to protect these heritage sites from disturbances.

7. Navajo Technical College (NTC) in Crownpoint, NM: 1 faculty member, 2 students

Student projects involved analyzing the environmental impact on Piñon Pine (*Pinus edulis*) near abandoned uranium mines on the Navajo Reservation. The piñon is an important food source, cash crop and cultural symbol for the Navajo people.

8. Salish Kootenai College (SKC) in Pablo, MT: 1 faculty member, 2 students

Students tracked ice field movements and changes in tree line dynamics in the Mission Mountains on the Flathead Reservation as an indicator of climate change on a local level.

9. United Tribes Technical College (UTTC) in Bismarck, ND: 3 faculty members; 2 students

Students examined plant health near the Mandan Tesoro Refinery and the Heskett Power Station located in Mandan, North Dakota to determine if nitrous oxide and carbon dioxide causes a reduction in growth of Cottonwood trees (*Populus deltoids*)”.

2. Initiate an enrichment grant program to build capacity in climate change research and education at TCUs through mini-grants coordinated by the AI AN CCWG (*Maps to APG 1 and Outcome 1: 1.1, 1.2, 1.4, 1.5*)

1.1: Faculty received funding to conduct research projects related to climate change impacts, adaptation and mitigation that are relevant to their degree programs, course structure, or needs identified by their tribal entity .

1.2: Students were provided research opportunities and internship funding support.

1.4: Research projects were used to enhance or develop new course curriculum and laboratories in earth science classes.

1.5 Through a competitive proposal and review process 4 mini-grants have been awarded; 3 additional mini-grant awards are currently under review.

Four colleges were selected for Mini-Grant funding from the fall 2010 AI AN CCWG call for proposals.

1. "From Glacier to Coastline: The Impact of Climate Change on Salmon Habitat in the Salish Sea". Northwest Indian College
2. "Salish Kootenai College's Solar Array Implementation and Research Project". Salish Kootenai College
3. "What About our Grandchildren: Menominee Community Gathering on Climate Change". College of the Menominee Nation
4. "Creating 'Hands-On' Activities for College Students Studying Climate Change". Dine College

3. NASA-AIHEC Video Documentation Project – “Where Words Touch the Earth”

In 2010, NASA continued the NASA-AIHEC Video documentation project that began in 2009. The “Where Words Touch the Earth” video project involved faculty and students from three TCUs in 2009: Haskell Indian Nations University, Northwest Indian College and United Tribes Technical College. In 2010, two additional TCU teams developed video projects: College of Menominee Nation and Navajo Technical College. These TCU teams each created a 15-minute broadcast quality documentary that focused on local climate change issues. This videography project was designed to teach STEM topics such as climate and environmental change, while learning videography skills. The goal for each TCU team was to develop short documentaries that would be compiled into a single documentary that could be broadcast on Public Television or disseminated in DVD and online formats. The projects are described below:

Haskell Indian Nations University: This video project records the words of traditional elders speaking about changes in landscapes, land cover and animal populations they have observed on their ancestral homelands.

Northwest Indian College: This video project examines impacts of climate changes on the fish and waters central to tribes in the Northwest, and the resulting impacts on their culture, ceremonies and entire way of life.

United Tribes Technical College: This video project examines climate change from the Elders’ perspective, conveyed through traditional storytelling, describing how climate change has affected the Standing Rock Reservation.

College of Menominee Nation: This video project examined the changing American Indian habitat as seen through the eyes of the Menominee Nation community.

Navajo Technical College: This video project examined the consequences of climate change on the landscape of the Navajo Nation.

4. **Convene one Tribal College Conference (Maps to APG 2 and Outcome 1: 1.1, 1.2).**

NASA provided support for the spring 2010 meeting of the American Indian Alaska Native Climate Change Working Group. The convening was held June 2, 3 and 4th in Kansas City, KS at the National Weather Service Training Center. The agenda focused on collaboration opportunities with NOAA and the NWS, on sustainability initiatives in housing and LEED building on tribal lands and TCU campuses, and on Missouri River climate change impact projects conducted by the Corps of Engineers that effect tribal lands. Approximately 60 participants from tribal colleges, federal agencies, and universities attended.

In addition to the spring meeting, the AI AN CCWG lead, Dr. Daniel Wildcat, Haskell Indian Nations University, worked with the National Museum of the American Indian to feature the first-ever TCU student poster display at the museum. Twenty NASA funded SRE and NSF-EPSCoR research posters were displayed as a part of the NMAI's *Living Earth/Living Waters Symposium* August 7, 2010.

5. **Continue and enhance engineering classes**, both distance and on-site, to be taught at a Tribal College in order to enhance engineering education at the TCUs. (*Maps to APG 3 and Outcome 1: 1.1, 1.2, 1.4*) NASA delivered five courses by Goddard engineers: Computer Organization, Computer Architecture, Operating Systems, Signals and Systems, and Embedded Systems. The instructors have delivered the courses via videoconferencing augmented by short stays at SKC.

IMPROVEMENTS (e.g. project management, efficiencies, etc.) MADE IN THE PAST YEAR

- Implemented third and improved iteration of experimental “externship” program to accommodate participants who have family or personal obligations which would otherwise prevent them from participating in the standard NASA internship (such as single parents, parents of young children and/or heads of households). Number of students and faculty participating in the externship was doubled. The initial 3-week training was held at a tribal college in Indian Country to make it possible for students to travel home if necessary on weekends, after which they spent 7 weeks conducting project research at their home institutions. This arrangement minimized the need to be away from home for a significant length of time (often a barrier for many TCU students), while providing valuable research methods training and experience.
- Externship also provided hosting/organizational experience to the host tribal college (United Tribes Technical College) for the 3-week NASA introduction to STEM principles & NASA remote sensing providing the host institution valuable project management training and experience.
- Increased participation by students (now more familiar with STEM-related issues and Earth sciences issues about their own local region or tribe) in STEM-related TCU events/activities – e.g., AIHEC Conference, American Indian/Alaska Native Climate Change Working Group.

- Most NASA Externship program students gave power point presentations and presented a poster about their student project at the American Indian/Alaska Native Climate Change Working Group meeting held at Northwest Indian College in Bellingham, Washington and/or at the National Museum of the American Indian, Washington, D.C. at a special “Living Earth/Living Waters” Symposium..
- Closer coordination in the TCUP planning through more frequent and regularly scheduled conference calls among partners in the SRE externship and internship program and the AIAN CCWG.

PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION (THIS IS WHERE FURTHER FOLLOW-UP TO OCCUR FOR COLLECTING 2010 GRANTEE PERFORMANCE SUMMARIES FOR PUBLISHING TO OUR EDUCATION HOME PAGE)

The following partners were instrumental in project execution: American Indian Higher Education Consortium (AIHEC), The American Indian/Alaska Native Climate Change Working Group (AI/AN CCWG), American Indian Science and Engineering Society (AISES), United States Geological Survey (USGS), U.S. Environmental Protection Agency (EPA), North Dakota Tribal College Association, University Corporation for Atmospheric Research (UCAR) and National Center for Atmospheric Research (NCAR), The Climate Institute, Native View Project, the Center for Remote Sensing of Ice Sheets (CReSIS) of the University of Kansas.