

**NASA/Minority University Research and Education Program (MUREP)
Tribal Colleges & Universities Project (TCUP)
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FY2012 Annual Report

PROJECT DESCRIPTION

NASA's **Tribal Colleges and Universities Project (TCUP)** is an activity element within the Minority University Research and Education Project (MUREP). MUREP enhances the research, academic, and technology capabilities of Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), Tribal Colleges and Universities (TCUs), Asian American and Native American Pacific Islander-Serving Institutions (AANAPISIs), and other Minority Serving Institutions (MSIs). Multiyear grants awarded to MSIs assist faculty and students in research pertinent to NASA missions.

TCUP is a science, technology, engineering and mathematics (STEM) educational grant and mentoring program that specifically targets TCUs as well as supporting American Indian and Alaska Native (AI/AN) students. 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.

NASA's goals for TCUs are to enhance their technical expertise; increase the participation of underrepresented and underserved students in science, technology, engineering and mathematics (STEM) disciplines; and to provide opportunities to participate in NASA-related education and research projects. The NASA TCUP is guided by Executive Order 13592: "Improving American Indian and Alaska Native Educational Opportunities and Strengthening Tribal Colleges and Universities." NASA is highly committed to ensuring the broadest participation of TCUs in the Agency's research and education programs as well as its overall mission.

This past year represents the 2nd year of a 3-year NASA announcement of opportunity released in the summer of 2010 by the NASA Office of Education, MUREP. While the TCUP effort is comprised predominately of three cooperative agreements totaling approximately \$1.1M annually, the overall NASA investment in TCUs for FY2011 was \$2M¹. The TUCP activities contribute over 50% of the agency's support to TCUs.

¹ FY2011 data is reflected as final, while the FY2012 data is still being added and is therefore preliminary at this time.

TCUP consists of three primary elements:

- 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; and
- (3) A tribal college engineering internship program to participate in a NASA flight mission and enhance TCU engineering training.

PROJECT GOALS

The goals of TCUP are to utilize NASA’s unique contributions in collaboration with tribal colleges and universities and tribal-serving institutions to improve the overall quality of the Nation’s STEM education.

To achieve these goals, TCUP seeks to:

1. Focus the Agency’s attention on identifying and removing barriers to TCU participation in NASA programs that support 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.
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.
3. Enhance TCU STEM infrastructure and help engage TCU students in NASA’s missions, such as through development of local climate change research programs with faculty and students at TCUs or engineering flight mission internships which actively involve students in the engineering and implementation of NASA flight missions.

PROJECT BENEFIT TO 2011 NASA STRATEGIC GOALS

TUCP focuses on two specific NASA Strategic Goals in order to strengthen tribal college and universities to provide quality learning experiences. The targeted NASA Strategic Goals are:

- Strategic Goal 5: Enable program and institutional capabilities to conduct NASA’s aeronautics and space activities.
- Strategic Goal 6: Share NASA with the public, educators, and students to provide opportunities to participate in our Mission, foster innovation, and contribute to a strong national economy.

TCUP achieves these goals through the following efforts:

Faculty and Research Support: TCUP provides NASA competency-building education and research opportunities for faculty through the Summer Research Experience Internship/Externship Programs as well as the AIAN CCWG program. Faculty received training in science, engineering, GIS and remote sensing at NASA Centers as well as during training sessions out in tribal colleges and universities that prepared them to conduct earth surface dynamics research activities locally. Through these facets of TCUP, faculty members had the opportunity to not only engage with NASA personnel, but also shared ideas and present research in a collegial environment.

Student Support & Student Involvement Higher Education: TCUP provides NASA competency-building education and research opportunities to individuals to develop qualified undergraduate students who are prepared for employment in STEM disciplines at NASA, industry, & higher education. This support is provided through both the Academic Year Research Experience for Undergrads (REU) as well as the Summer REU. Approximately 45 TCU students had the opportunity to engage in authentic NASA-related, mission-based R& D activities through the 2012 Summer Research Internship/Externship Programs in which students carry out NASA-related scientific projects in cooperation with NASA/science or engineering mentors at a Tribal College or NASA center.

Targeted Institution Research and Academic Infrastructure: TCUP provided individual climate change research and education to TCUs through the Academic Research Experience for Undergraduates (REU). By providing direct financial support and mentoring to White Earth Community College and Tohono O’Odham Community College this past year, these two colleges were able to develop an institutional research agenda on climate change as well as build their Earth Science curriculum. These activities 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.

Course Development: Extensive special course materials designed for the 3-weeks teaching experience (summer REU) at Haskell Indian Nations University aided TCU faculty and students in understanding climate change, vulnerability assessment, GIS, GPS, remote sensing, and the scientific method.

PROJECT ACCOMPLISHMENTS

TCUP seeks to contribute to the Agency’s efforts in broadening participation of underrepresented groups in STEM. This accomplished through attracting and retention of tribal college students. TCUP programs provide mentoring support, academic development and enhancements, social and professional networks and have helped students complete undergraduate degrees.

These accomplishments are reflected in the following highlights:

1. NASA TCUP provided support for two workshops of the American Indian Alaska Native Climate Change Working Group. The meetings afford TCU students and faculty the opportunity to participate in professional meetings and present posters of their research. The Fall 2011 meeting was held on the campus of the College of the Menominee Nation (TCU) and had 93 participants. Among the participants were 29 TCU students and nine faculty. The spring 2012 meeting was held in Tucson, AZ and was hosted by TCU- Tohono O'odham Community College. This meeting of the working group furthered the efforts to recognize that the life-ways of Indigenous people hold tremendous lessons for all of humankind to consider, and to ensuring tribal Peoples have the expertise within their own communities to make good policy decisions. More than 120 persons participated, of which 23 students and seven faculty were from TCUs.
2. The 2012 NASA REU summer externship program involved 19 students and 11 faculty from 12 TCUs: College of Menominee Nation, Haskell Indian Nations University, Navajo Technical College, Northwest Indian College, Oglala Lakota College, Saginaw Chippewa Tribal College, Salish Kootenai College, Sinte Gleska University, Southwestern Polytechnic Institute, Tohono O'odham Community College, and White Earth Tribal and Community College.

Sample student projects from the NASA REU included:

Tohono O'odham Community College, "Emergency Services & Transportation for Cababi Village: use of GIS to show impacts of monsoon season"

Navajo Technical College, "Charge it to Nature: Renewable Energy for the Navajo Nation"

White Earth Tribal and Community College, "The Importance of land-use/land-cover surrounding the freshwater lakes of the White Earth reservation"

Haskell Indian Nations University, "Climate Change and the Great Lakes 'Waganakising Odawak'"

3. NASA Field Centers worked with students on a variety of projects under the 2012 TCUP NASA-AIHEC SRE Center internship program. This provided all 17 participants (15 student and two faculty) valuable exposure to the realities of working with NASA and other scientists and engineers at tribal college training sessions.

Sample summer internship activities at a NASA Field Center included:

- Johnson Space Center, two students, Southwestern Indian Polytechnic Institute, "Robotics Technology" and "Robotic Rack-top Simulator"
- Marshall Space Flight Center, one student, Navajo Technical College, "Automated Manufacture and Inspection of Parts in Space"
- Kennedy Space Center, seven students, two faculty, Southwestern Indian Polytechnic Institute, Institute of American Indian Arts, Navajo Tech College, Northwest Indian College. "Modeling and Simulation: Exploring educational applications of NASA 3D simulation system."
- Ames Research Center, four students, Northwest Indian College, Southwestern Indian Polytechnic Institute, Lac Courte Oreilles Ojibwa Community College, Navajo Technical College, "Native American Research Project pilot project focusing on engineering-based problem solving"

- Jet Propulsion Lab (JPL), one student, Navajo Tech College, “Investigating the North Slope of Alaska to better understand terrestrial climate change and to advance astrobiology.”

4. Six tribal college students (out of 100 high-performing interns) were selected into the 2012 NASA Student Ambassadors Virtual Community. Their selection is part of the agency's effort to engage undergraduate and graduate students in science, engineering, mathematics and technology, or STEM, research and interactive opportunities. Students were nominated by NASA mentors and managers primarily as a result of their summer research experiences as part of the NASA TCUP. This fourth group of student ambassadors, known as Cohort IV, included interns from four different TCUs, representing Minnesota, Montana, Kansas and South Dakota. Members of this virtual community will interact with NASA personnel, share information, make vital professional connections, collaborate with peers, represent NASA in a variety of venues in addition to helping inspire and engage future interns.

5. There was significant increase in the participation of tribal college engineering and science students and faculty in NASA flight missions through Salish Kootenai College (SKC)'s engagement with CubeSat. Eight undergraduate tribal college students worked as student research interns and performed comprehensive design of the SKC CubeSat. Two of these students joined the Mars Science Laboratory Science Team, and will participate in landing operations at JPL in the 1st quarter of FY2013. Four SKC faculty members mentored these students and assisted in this research. The SKC CubeSat was selected for a NASA-provided launch through the 2012-2014 NASA CubeSat Launch Initiative.

OTHER TCU-RELATED ACTIVITIES

- *November 10-12, 2011, Minneapolis, MN.* NASA supported the 33rd Annual American Indian Science and Engineering Society (AISES) National Conference. The conference centered on “Food for Thought” and explored biodiversity and innovation, geopolitics and ethics, food policy, and preservation of traditional food ways. The highlight of the conference is a Career Fair, where NASA was able to recruit TCU students for summer internships as well as employment opportunities.
- *April 28-29, 2012, Milwaukee, WI.* Kennedy Space Center (KSC), in conjunction with the College of Menominee Nation, built upon partnering activities grown out of the WSGC Student Satellite Program and the Tribal College Rocketry Consortium. A total of 29 students (three teams), representing seven tribes were recruited for this event (in its second year). The teams were from Washington, Minnesota and California. Native American science and engineering majors who are members of American Indian Science and Engineering Society (AISES) chapters, as well as students at Tribal Colleges, were recruited to participate in a *First Nations Rocket Competition*. The purpose of the competition is to provide science and engineering students of every experience level with the skills needed to successfully build and launch a model rocket with “inflight-autostability”. The winning team was the Sky Walkers from Northwest Indian College.

- *August 7-10, 2012, Moffett Field, CA.* The NASA AMES Research Center (ARC) hosted Navajo Technical College (TCU) for a site visit and review of NASA E/PO activities and facilities. There were 12 students and five faculty visiting from Navajo Technical College. During the visit there were also meeting with the ARC Center Director and a presentation by the 2012 American Indian Higher Education Consortium (AIHEC) Native American Research Team.

PROJECT CONTRIBUTIONS TO ANNUAL PERFORMANCE GOAL (APG) MEASURES

APG 5.1.2.1: ED-12-1: Achieve 40% participation of underserved and underrepresented (in race and/or ethnicity) students in NASA higher education projects.

TCUP targets recruitment and retention of underrepresented and underserved students, including women and girls, and persons with disabilities into the STEM fields. Based on the nature of the TCUP activity and its focus on students and faculty attending tribal colleges and university, NASA TCUP exceeded the 40% goal with 100% participation of underserved and underrepresented students in FY2012.

With respect to Ethnicity and Race, all participants in the NASA TCUP self identified as *Not Hispanic or Latino* (100%) and *American Indian, Alaskan Native, or Native Hawaiian/Pacific Islander* (100%).

APG 5.1.2.1: ED-12-2: Achieve 45% participation of women in NASA higher education projects.

FY2011²: Female – 25% Male – 75%

APG 6.1.2.1: ED-12-4: 20,000 undergraduate and graduate students participate in NASA education opportunities.

FY2011²: 119 undergraduate students participated in TCUP related activities

APG 6.1.1.1: ED-12-3, APG 6.1.1.1: ED-12-5 and APG 6.1.2.2: ED-12-6

The following APGs focus on elementary and secondary education. TCUP targets higher education students and faculty. In FY11, there is no contribution by the TCUP activities specifically. However please refer to the Science, Engineering, Mathematics, and Aerospace Academy (SEMAA) activity to see more information on the SEMAA site at Oglala Lakota College.

² Only represents reported data by participant

IMPROVEMENTS MADE DURING THE PAST YEAR

TCUP continues to improve its competitive strategy to be more responsive to the rapidly changing demographics and issues experienced by TCU students and faculty. This is accomplished through:

- Development of Interagency partners, in an effort to discuss best practices and share strategies for achieving White House goals for serving American Indian/Alaskan Native students
- Working to engage more Tribal College & University students in participating in NASA opportunities at the NASA Centers. This effort was bolstered utilizing the American Indian Higher Education Consortium (AIHEC) as a broker-facilitator.
- Increasing the NASA presence at regional/national conferences aimed at serving American Indian/Alaskan Native students (i.e.- AISES, SACNAS)

PROJECT PARTNERS

The following partners were instrumental in project execution: The American Indian/Alaska Native Climate Change Working Group (AI/AN CCWG), American Indian Higher Education Consortium (AIHEC), American Indian Science and Engineering Society (AISES), Kiksapa Consulting LLC, National Center for Atmospheric Research (NCAR), Salish Kootenai College, the University Corporation for Atmospheric Research (UCAR), and the United States Geological Survey (USGS).