TRIBAL COLLEGES AND UNIVERSITIES PROGRAM

2014 LEADERS' FORUM

BY PAUL BOYER

Introduction

Conference photo by Scott Morgan.

THE TRIBAL COLLEGES AND UNIVERSITIES PROGRAM (TCUP) is the largest and oldest effort by a federal agency to provide direct support to the nation's tribal and Native-serving colleges and universities. Established by the National Science Foundation in 2001, it has dedicated over $146 million to more than three-dozen colleges that serve some of the poorest, most isolated, and most neglected communities in the United States.

The value of TCUP is not solely measured by the number of grants awarded, however. Its impact is also felt in the National Science Foundation's commitment to work closely with tribal college leaders and tribal communities. Foundation staff—at the highest levels of administration—routinely visit colleges and also encourage collaboration between grantees through an annual "Leaders' Forum." This gathering is an opportunity for tribal college faculty, principal investigators, and project directors to meet with key NSF staff where they present findings and plan for the future.

The 2014 Leaders' Forum, held January 2–5 in San Antonio, Texas, represented a special milestone in the history of TCUP. Focusing on the theme of undergraduate research, college leaders were invited to showcase how, through National Science Foundation support, they have developed research agendas that strengthen the quality of undergraduate instruction and, increasingly, respond to the needs of reservation and Native communities. With more than a decade of work, it was a rich and productive conversation.

In addition, the gathering was an opportunity for NSF staff to propose emerging themes for research, particularly in the areas of student outcomes and community impacts. Arguing that tribal colleges are at the forefront of efforts to strengthen math and science education for Native students, TCUP-eligible institutions were invited to apply for funding to investigate how their work is making a difference in student learning and, more broadly, how they are supporting the social and economic development of underserved Native communities. This broadens the research agenda for the colleges and, for STEM faculty, represents the less familiar world of education research. However, it also provides new avenues for funding and, of special importance, allows the colleges to document and further strengthen their academic work.

Native-Serving Colleges and the National Science Foundation

Brief History of a Rewarding Partnership

TRIBAL COLLEGES ARE INSTITUTIONS OF HIGHER LEARNING founded by Indians and chartered by tribes. Most are located on reservations and all serve a predominately Native student body. The first Indian-controlled college was established by the Navajo Nation in 1969, but it was, from the beginning, a national movement. More than a dozen colleges were operating by the end of the 1970s, and over two dozen existed a decade later. There are now thirty-four Indian controlled colleges in ten states—from Alaska to Wisconsin—eligible for funding through TCUP.

Most colleges began with small enrollments and shoestring budgets. In their early days, many operated out of old trailers, rented storefronts, or surplus government buildings. Relying on a small number of part time faculty, they typically provided a

Conference photo by Scott Morgan.

limited range of introductory courses and one or two-year degree programs in fields ranging from secretarial science and nursing to carpentry and welding. Most also offered courses and degree programs in the language and cultural heritage of the tribe.

Despite these limitations, the colleges proved their value by offering training for work that was available locally and building skills needed for continued study at mainstream colleges. Focusing on these practical needs, they attracted students long overlooked by mainstream colleges and universities, especially adult learners with children and other family obligations. For them, a local tribal college was the only realistic option for higher education. Early research confirmed that most graduates were able to find work and those who continued their studies at mainstream colleges were more likely to earn a four-year degree.

Group shot from Mali where Chief Dull Knife College students worked with community members to develop storage systems capable of protecting chickpeas from weevils. Partial funding provided by the National Science Foundation TCUP program.

However, the colleges have also struggled to survive. All operate with limited funding and most receive little or no financial support from the tribes they serve. To fulfill their potential, tribal colleges have turned to the private sector and various federal agencies in order to build and equip campuses, provide community services, strengthen faculty, broaden academic programs, and conduct research. Within the private sector, the Ford, Lannan, W.K. Kellogg, Gates, and Bush Foundations—among several others—have contributed significantly to this effort. Within the federal government, the Department of Education and the Department of Agriculture are among those that have provided much-needed aid.

However, no foundation or agency matches the early commitment made by the National Science Foundation. Initial awards made to several colleges in the 1970s helped the oldest institutions build and equip lab space needed for core science

Carty Monette, past president, Turtle Mountain College. Conference photo by Scott Morgan.

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> —CARTY MONETTE

courses. Broader and more sustained support began in the mid 1990s when NSF developed a comprehensive program to strengthen K–12 STEM education in the poorest regions of the nation. Called the Rural Systemic Initiatives Program, it engaged with more than a dozen tribal colleges to provide training and resources to local schools serving Indian children.

The depth of NSF's commitment to tribal colleges grew significantly after President Clinton signed an executive order in 1996 directing all federal agencies to increase support to the tribal colleges. The National Science Foundation responded by creating a new program dedicated to building capacity within the tribal college movement. Called the Tribal Colleges and Universities Program, it supports development of STEM education within the nation's tribal colleges, as well as several public universities with significant Native student enrollment, most notably the community colleges of the University of Alaska, Fairbanks and the University of Hawaii system.

The impact of TCUP cannot be overestimated. "Without TCUP our TCUs would be struggling to offer quality STEM academics and would lack the resources to recruit and retain qualified faculty and support staffs," asserted Dr. Carty Monette, past president of Turtle Mountain Community College, which was one of the first colleges to receive NSF support in the 1970s. "TCUs would not be enjoying the level of STEM equipment, technology, and labs they currently have. There would not be the number of Indian students in STEM degree tracks and professions."

This support has fundamentally transformed STEM education within these colleges. Prior to TCUP, many tribal colleges lacked the classrooms and equipment needed to teach even basic science courses. Math instruction focused on remedial and introductory classes. STEM-related degree programs were, in general, limited to entry level positions in health care, forestry, business and related fields. With large teaching loads, most instructors were unable to support a research agenda.

Today—as a direct result of TCUP funding—many tribal colleges now have facilities on par with public two-year or four-year colleges and nearly all have developed more academically-focused STEM programs. Within the past decade most colleges have added courses and whole new degree options, including associate degrees in mathematics and four-year degrees in information technology, environmental science, and science education. Meanwhile, a recent initiative is now leading to the development

Chief Dull Knife College students taking sediment samples from the Tongue River in southeastern Montana as part of a metagenomics research project lead by Sean Gibbons of Argonne National Labs (publication pending). Funding provided by the National Science Foundation TCUP program, the Nuclear Regulatory Commission MSIP, and the Department of Defense. Students are Joaquin Small-Rodriguez, Angelita Bearquiver, and Abe Salois.

of two-year pre-engineering degrees at over a dozen tribal colleges, including some of the nation's smallest and most isolated campuses.

With TCUP support, tribal colleges have also become leaders in a growing movement to promote undergraduate research. This approach to STEM education emphasizes the value of experiential learning and encourages even first year students to work side by side with faculty on original research. Typically, tribal college students show a special interest in work that serves the needs of tribal communities. Research projects range from documenting contamination of reservation water supplies to designing affordable and sustainable housing for tribal members.

These programs benefit all of Indian Country. Tribal colleges are small, but most also serve small communities, which means they have an outsize impact on local communities and economies. Tribal college graduates work as teachers, nurses, foresters, computer engineers, administrators, and other professions that, until recently, were dominated by non-Indians simply because tribal members lacked necessary credentials. And the growth of research has allowed colleges to provide information necessary for the development of sound environmental and economic policy.

Leaders' Forum: From Capacity Building to Research

IN THE EARLY YEARS OF TCUP, the National Science Foundation recognized that tribal colleges lacked resources most colleges take for granted. The first priority of the program was, appropriately, to focus on capacity building—to establish a foundation upon which strong STEM programs can be built. Many of the early grants focused on upgrading technology, purchasing lab equipment, strengthening core courses, building partnerships with mainstream universities, and promoting K–12 outreach.

The success of TCUP is reflected in the degree to which the colleges have, in fact, significantly strengthened their capacity to attract Indian students into STEM programs and provide a rich and relevant academic program. However, it is clear that much more needs to be done. While the percentage of Indians entering STEM degree programs is growing, it still lags far behind the nation as a whole. And while the tribal colleges are bringing economic opportunity to their tribal communities, reservations remain among the very poorest regions of the country by wide margins.

In this context, it is clear that the National Science Foundation must remain a strong partner as tribal colleges continue to grow and mature. Building on this proposition, the 2014 Leaders' Forum focused on examining the impact of TCUP over the past decade and, especially, identifying opportunities for the future, particularly for colleges that have seen the greatest development in their STEM programs since the first TCUP awards were made in 2001.

Conference photo by Scott Morgan.

Four key themes were discussed:

1. The continuing need for capacity building;
2. The emerging research role within tribal colleges, including the role of culturally-based research;
3. Overcoming barriers to research;
4. Promoting the future growth and sustainability of tribal college STEM programs.

The Continuing Need for Capacity Building

Although the Leaders' Forum celebrated the growth of the tribal colleges, one key point was emphasized: The need for capacity building remains. Tribal colleges have made great strides, all agreed, but they continue to lack the resources taken for granted at most mainstream colleges. The smallest and youngest, especially, do not yet have adequate facilities for advanced coursework or research. In most cases, a small cadre of STEM faculty (as few as two or three full time instructors) carry heavy teaching loads and cannot take advantage of release time for research. In addition, all tribal and Native serving colleges are still working to increase enrollment and retention of Native students in STEM fields, which many Indian students view as difficult and "non-Indian" areas of study.

The successes and challenges of tribal colleges were summed up in the opening remarks of Dr. Carty Monette, who served as one of the gathering's facilitators. He recalled learning in the 1990s that the number of Indian STEM graduates was so small nationwide that it could not be counted in government data. The good news is that Indians are now showing up in the data, he said; however, the bad news is that the percentage of Indians with STEM degrees is lower than any other major group. Visibility is progress, he suggested, but it also highlights the disparity.

This need is fully understood by the National Science Foundation. Dr. Sylvia James, division director within the National Science Foundation's Division of Human Resource Development, praised the work of TCUP and celebrated its attention to supporting the growth of the movement. "TCUP has done a great job building capacity," she said. In addition, TCUP Program Director Dr. Jody Chase emphasized that this focus on institutional development will remain. The "commitment to capacity building has not

Sylvia James, National Science Foundation. Conference photo by Scott Morgan.

Jody Chase, National Science Foundation. Conference photo by Scott Morgan.

Harvey DuMarce, president of Sisseton Wahpeton College. Conference photo by Scott Morgan.

changed," she stressed. The goal was to reassure tribal colleges that the historic role of TCUP is being maintained.

The Growth and Impact of Research

Tribal colleges are primarily teaching institutions. Like two-year and four-year colleges nationwide, their first priority is to guide the education of undergraduate students. However, research is playing a growing role within many tribal colleges precisely because it can support the academic success of Native students. Indeed, tribal colleges have become leaders in the growing movement to integrate research into undergraduate learning and make field experiences a part of even introductory science courses.

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TCUP has actively supported the development of this research role. Numerous grants have supported projects that integrate field work, laboratory experiences, and collaboration with mainstream research universities. Reporting on the impact of this work was a key part of the 2014 Leaders' Forum agenda. From these conversations, presenters highlighted the benefits to students and tribal communities. For example:

- At Fort Berthold College in New Town, North Dakota, research on groundwater quality commissioned by the tribal council resulted in federal funding for a $9 million rural water program, according to Kerry Hartman, a member of the college's faculty.
- In Alaska, Todd Radenbaugh from the Bristol Bay Campus of the University of Alaska Fairbanks discussed TCUP-funded projects that support student-led research investigating the environmental impact of a local mining operation, as well as the construction of a low energy use house.
- At Northwest Indian College in Bellingham, Washington, Marcos Hatch, director of the college's National Indian Center for Marine Environmental Research and Education, reported on studies investigating the ecological role of eelgrass in coastal ecosystems. Findings suggest that regions denuded of eelgrass are more susceptible to algae that causes red tide. Additional research examined the beneficial role played by traditional Native Alaskan societies in supporting clam beds.

Todd Radenbaugh, Bristol Bay Campus, Dillingham, Alaska. Conference photo by Scott Morgan.

Undergraduate research is being incorporated into colleges nationwide, but it has particular value in tribal communities where science is often viewed as an irrelevant and "non-Indian" concept. Conventional approaches to science instruction—which focus on abstract concepts, unfamiliar vocabulary, and textbook readings—only work to dampen interest and alienate Native students. In contract, the kind of hands-on work supported by TCUP allows students to immediately appreciate the practical value of science in their local communities. The "ultimate goal of research" in a tribal college setting is, in fact, "student engagement," argued Jeff Hooker, director of information systems at Chief Dull Knife College in Lame Deer, Montana, adding that the reward for faculty is not professional development, but the ability to offer a tool for student success.

Supporting culturally-relevant research is another strategy for student success. Native peoples thrived for centuries by studying and learning from the world around them, according to Shandin Pete, an instructor from Salish Kootenai College in Pablo, Montana, who is both a graduate of the college and a member of the tribe. This deep knowledge of ecosystems and the cosmos is part of every tribe's intellectual heritage. By respecting and building upon this scholarship, tribal colleges are enriching the curriculum and reminding students that science is part of their tradition. "You have role models in your own communities," Pete tells his students. "You need to follow the path of your ancestors."

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Another benefit of undergraduate research is that it helps prepare students for local employment. At Northwest Indian College, for example, graduates have moved directly from the college's four-year degree programs into positions with the Lummi Tribe; others take advantage of post-baccalaureate research positions at the college. Faculty at other colleges, meanwhile, described how their students draw on research experience when they find work as teachers, biologists, and engineers.

Beyond academic relevance and employability, research also offers students a sense of pride and empowerment. Those who engage in research and, especially, have an opportunity to share their research with other professionals at conferences are "totally transformed" by the experience, asserted Herve Collin from Kapiolani Community College in Hawaii. Students learn to see themselves a scholars, and this builds the kind of engagement and self confidence necessary for academic success.

The late Bob Madsen and Chief Dull Knife College students studying thermoregulation in beehives at a summer research experience on the University of Montana campus. Funding for this project was provided by the National Science Foundation TCUP program, Montana EPSCoRP (NSF), and Bridges to Baccalaureate (NIH) program.

Overcoming Barriers to Research

At the same time, tribal college faculty and administrators also identified barriers to research—financial, administrative, and cultural—that need to be overcome. These hurdles were candidly acknowledged.

Many participants, for example, emphasized the overreliance on a small number of overworked instructors. In some cases, instructors are expected to teach as many as five different subjects every term, which limits the amount of time available for out of class engagement with students and impedes their own professional development. In addition, tribal colleges do not have tenure and do not link promotion to research, which means there are few external incentives for research not directly related to the teaching role. Finally, many tribal college instructors do not have terminal degrees, do not think of themselves as researchers, and are not experienced with grant writing or writing for publication.

Solutions to these barriers were also discussed, although quick fixes are elusive. For example, hiring more instructors would lower teaching loads and allow faculty to make research a priority. However, tight budgets prevent this kind of "magic wand" response. Instead, most colleges have relied on temporary "soft money" solutions. In the past, grant money has allowed colleges to offer summer research opportunities for faculty, provide release time for research, and support collaboration with mainstream universities.

Finally, numerous barriers also exist to more complete development of culturally-based research and instruction, particularly in STEM. The greatest challenge is a reliance on non-Indian faculty. While these instructors are respectful of tribal cultures, many do not feel qualified to incorporate cultural knowledge into their coursework or take the more radical next step, which is use indigenous forms of scholarship as the centerpiece of science education, rather than as an "add-on."

The ideal solution is to hire more Native instructors. However, there are very few American Indian scholars in the doctoral pipeline, and not all want to work at a tribal

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college. Instead, tribal colleges are focusing on efforts to "grow their own" future faculty from among the current student body. The presence of Shandin Pete from Salish Kootenai College demonstrates that this approach can work. In addition, some colleges also provide culturally-based professional development opportunities for non-Indian faculty and encourage mentoring relationships with tribal elders.

Another strategy—easily applied by non-Indian faculty—is to encourage students to identify their own research interests, suggested Jeff Hooker. When given this opportunity, Indian students usually gravitate to culturally-based research questions. At his college student research often focuses on environmental issues— such as contamination of water supplies from mining and gas drilling operations—that impact the health and well-being of tribal homelands. Small tethered blimps with infrared cameras have also been used to identify archeological sites. This focus on student-led research "assures that it will be culturally relevant," Hooker observed, and does not put the responsibility for cultural expertise on faculty.

Joan Ferrini-Mundy, National Science Foundation. Conference photo by Scott Morgan.

Looking to the Future: Building Sustainability, Documenting Outcomes, and Pursuing New Research Questions

Finally, the Leaders' Forum looked to the future and, in particular, examined ways to extend and strengthen the relationship between TCUP-eligible colleges and the National Science Foundation. "The focus is on being a partner," said Joan Ferrini-Mundy, assistant director of the National Science Foundation's Directorate for Education and Human Resources. Helping the colleges fulfill their community and culturally-centered goals, she asserted, is the continuing priority of the Foundation—and an important part of the Leaders' Forum conversation.

This discussion reflected, in part, a desire to maintain all that the colleges have gained—to assure that new STEM degree programs will remain in course catalogs, that experienced faculty will be able to stay on payrolls, and that their hard-won knowledge of effective teaching practices will be documented and shared. The goal, simply put, is to move beyond mere survival or even the immediate task of capacity building in order to grow as institutions of higher education.

Chief Dull Knife College student Lawrence Spang makes extractions from Tongue River samples for DNA analysis. Funding provided by the National Science Foundation TCUP program, the Nuclear Regulatory Commission MSIP, and the Department of Defense.

To fulfill this goal, TCUP Program Director Jody Chase urged tribal and Native serving colleges to take advantage of funding available for research that examines the impact and outcomes of their work. "What I am trying to do is encourage people who have had significant capacity building to now think in terms of addressing the research questions around what they do," she said.

Some of the possible research questions are already identified in the TCUP program solicitation (see sidebar). However, colleges are not limited to these questions and, in fact, many areas of investigation were discussed at the Leaders' Forum, including:

- Examining the impact of tribal colleges on tribal economic development;
- Studying how tribal colleges can support students making the transition to four-year schools and employment;
- Evaluating approaches to academic remediation.

Representatives of the National Science Foundation candidly explained that the Foundation's mission is not to indefinitely sustain core operations of a college or university. Once capacity has been built or a program has been developed, project-specific funding ends. However, research into educational outcomes offers new options for continued engagement with the NSF, Chase proposed. "When they get to the point where they no longer need to implement a new degree program then this is an area they might want to look into," she said. "I view it as a kind of graduate degree." It is an opportunity for colleges that are ready to move into the next phase of their development.

Regina Sievert, Salish Kootenai College. Conference photo by Scott Morgan.

Chase acknowledged that this research into educational outcomes is a new area of investigation for many tribal colleges. However, several institutions are showing how these studies can strengthen their academic programs. At Salish Kootenai College, for example, Regina Sievert, director of the Bachelor of Science in Secondary Science Education degree program, and Shandin Pete, who in an instructor in hydrology, are working to more fully integrate cultural knowledge into science courses. Sievert's ongoing work in "culturally congruent instruction" has led to development of an assessment instrument used by educators around the nation, supported efforts to

integrate culture into the curriculum of tribal schools, and offered opportunities to both publish and present her findings.

In addition, other TCUP project leaders are already gathering sophisticated data on student outcomes that could become part of a larger research project. Jen Janecek-Hartman of United Tribes Technical College discussed development of a student evaluation model that examines not only student completion rates, but also student learning, student satisfaction, and community impacts. All of this yields insight into how efficiently "the project is using its resources and what it will take for the college to sustain the program after the project funding expires."

Jen Janecek-Hartman, United Tribes Technical College. Conference photo by Scott Morgan.

ALL OF THIS WORK ILLUSTRATES THE DETERMINATION of tribal college staff and faculty to meet the complex needs of students and tribal communities, despite severe financial limitations. The challenge ahead is to document their successes, share what they have learned with each other, and address barriers to institutional development, including full development of their research potential. In each of these areas, the National Science Foundation has pledged its continuing support through funding of capacity building and research that is both rigorous and relevant.

Some Research Questions

The TCUP program solicitation notes that it is "particularly interested in building knowledge" in these areas:

- How does cultural integration with the STEM curriculum affect student success?
- How does the engagement of discipline-specific undergraduate research affect student success?
- How does the increasing level of rigor affect student success?
- What are the critical support services and how do they affect student success?
- How does faculty development affect sustainability of institutional transformation?

http://www.nsf.gov/pubs/2013/nsf13572/nsf13572.htm

On the Cover

An aerial photo taken of the "Grand Entry" at the Fourth of July Powwow in Lame Deer, Montana in 2011. The photo was taken from Chief Dull Knife College's "Tethered Blimp" at approximately 300 feet above the arena by Ed Jones (a Chief Dull Knife College TCUP paraprofessional student). CDKC students organized and did the shoot completely on their own; the faculty mentor was not in town during the powwow. The tethered blimp project is part of a NASA funded collaboration with the Montana Space Grant Consortium located at Montana State University in Bozeman.

Photos throughout the publication feature research conducted by Chief Dull Knife College, located on the Northern Cheyenne Reservation of eastern Montana. The diversity of NSF-funded projects at this one college illustrates the impact of TCUP funding at tribal and Native-serving colleges nationwide.

About the Author

Paul Boyer authored two reports on the tribal college movement for the Carnegie Foundation for the Advancement of Teaching and is founding editor of the Tribal College Journal. Recent books and policy reports include *Building Community: Reforming Math and Science Education in Rural Schools* (University of Alaska Press, 2006) and *Ancient Wisdom, Modern Science: The Integration of Native Knowledge in Math and Science at Tribally Controlled Colleges and Universities* (Salish Kootenai College Press, 2010). He holds a doctorate in Educational Theory and Policy from The Pennsylvania State University.

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