PROMISING PRACTICES IN STEM EDUCATION AND RESEARCH
AT INSTITUTIONS SUPPORTED THROUGH THE
NATIONAL SCIENCE FOUNDATION’S
TRIBAL COLLEGES AND UNIVERSITIES PROGRAM
OCTOBER 2012

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Foreword

This document is dedicated to the memory of Mr. Robert Madsen, former Instructor at Chief Dull Knife College in Lame Deer, Montana. Mr. Madsen had 23 years of teaching experience at tribal colleges, including 12 years at Little Big Horn College in Crow Agency, MT, and 11 years at Chief Dull Knife. He taught Introductory General Chemistry, Introductory Organic Chemistry and Biochemistry, Anatomy and Physiology, Cellular Biology, Microbiology, Ecology, Astronomy, and Introductory Physics. Mr. Madsen also had extensive experience working with K-12 schools on the Crow and Northern Cheyenne Reservations. This work included over 5,000 classroom visits and the teaching of more than 25 evening science classes to K-8 teachers.

Mr. Madsen was involved in student-based research for the past two decades. His earlier research focused on thermoregulation in honeybee colonies and, more recently, he conducted research in molecular microbiology through grants from the National Institutes of Health and the National Science Foundation. Mr. Madsen and his students at Chief Dull Knife, in collaboration with Montana State University at Bozeman, also assessed the effectiveness of Peace Corps-delivered Integrated Pest Management strategies in Mali, West Africa. Mr. Madsen received the B.Sc. degree in Entomology from Washington State University and the M.Ed. degree in Adult and Higher Education from Montana State University.
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Promising Practices in STEM Education and Research at Institutions Supported through the National Science Foundation (NSF)’s Tribal Colleges and Universities Program (TCUP)

Quality Education For Minorities (QEM) Network
October 2012

Introduction

This report describes promising practices in science, technology, engineering, and mathematics (STEM) education and research at institutions supported through the National Science Foundation’s Tribal Colleges and Universities Program (TCUP). These institutions include Tribal Colleges and Universities (TCUs), Alaska Native-serving Institutions (ANSIs), and Native Hawaiian-serving Institutions (NHSIs). Background information for this report was obtained through survey responses, written communication with Principal Investigators of NSF TCUP projects as well as other faculty and administrators at TCUP institutions, and a review of relevant literature.

TCUs are primarily located in the Northern and Southwestern United States, and collectively serve roughly 30,000 students in full- and part-time programs. While some of the 33 TCUs offer bachelor’s and master’s degrees, most primarily award two-year associate’s degrees as well as certificates in vocational programs. TCUs are typically embedded in their mostly rural communities, often serving as the sole local option for higher education.

Since its inception in FY 2001, TCUP has provided support for competitive STEM education proposals from TCUs, ANSIs, and NHSIs. Projects implemented by TCUP-supported institutions involve a number of promising practices that can be shared with other TCUs and with the higher education community at large. Typical strategies supported through TCUP include course and degree program development; curriculum improvement; collaborative STEM education and research; undergraduate research opportunities; student recruitment and retention; use of information technologies in instruction; and the professional development of faculty.

For the purposes of this report, “Promising Practices” are activities or procedures that have produced outstanding results and thus might be adapted to improve effectiveness, efficiency, and/or innovation at an institution of higher education [1]. The report includes a discussion of promising practices at TCUP institutions in the following key areas of support:

- Reforming STEM Curricula
- Engaging in Faculty Development
- Using Technology in Instruction
- Recruiting and Retaining Students in STEM
- Integrating Research and Education
Applying Native Ways of Knowing

After discussion of promising practices related to these areas, the report concludes with articles on promising practices for Project Implementation and for Project Sustainability from authors with extensive histories of working with TCUs in these areas.

Reforming STEM Curricula

A key purpose of curricular reform in STEM is to effect positive changes in students’ learning experiences. The reform should be designed to help ensure that all students receive an education that prepares them to pursue and obtain a two-year, four-year, or graduate STEM degree. A number of TCUs are engaged in curricular reform efforts through support from NSF’s TCUP and other funding sources. Some of these reforms introduce Native culture into the standard course content; others introduce new programs entirely.

Rich cultural traditions infuse Native life, and many TCUP-supported institutions have made special efforts to infuse culture into their respective curricula. At Lac Courte Oreilles Ojibwa Community College in Hayward, Wisconsin, a model called “Webs of Learning” creates a sense of community in learning through interdisciplinary student cohorts, access to tribal elders, experiential learning, and research opportunities for students [2]. According to Jason Sanders, former “Webs of Learning” Project Director, all courses included in the project had to compare the Ojibwa perspective to Western perspectives as well as integrate cultural knowledge with scientific understanding.

Northwest Indian College (NWIC) in Bellingham, Washington, instituted a Marine Geoscience Education Project that integrates Western scientific rigor with the humanity and connectedness of Native science [3]. After collecting oral histories related to the coastal area where the college is located, as well as collecting relevant marine geoscience data, NWIC developed resources that could be usefully integrated into both college and high school curricula.

In addition to augmenting courses and programs with cultural content, some TCUs have created new programs to better serve their students. Kapi‘olani Community College in Honolulu, Hawaii, instituted the Associate of Science in Natural Sciences degree program, which offers concentrations in Life Science, Physical Science, and Pre-Engineering [4]. The STEM program now enrolls a larger percentage of Native Hawaiian students than their percentage of the overall campus student population.

At Fond du Lac Tribal and Community College in Cloquet, Minnesota, the available programs were expanded to include clean energy technology, geospatial technology, and nursing [5]. The college also allowed students to design Associate of Science or Bachelor of Science degree programs in several areas, all built around an information technology core curriculum.
Southwestern Indian Polytechnic Institute (SIPI) in Albuquerque, New Mexico, has restructured its engineering and engineering technology programs [6]. Students are advised to complete one year of study in mathematics, science, English, computer science, and communications. They also are advised to enroll in a one-year certificate program to gain practical and hands-on skills that both prepare them for entry-level engineering technology jobs and help with their retention and transition into pre-engineering. This approach ensures that students who do not make the transition into engineering programs have a base of skills with which contribute to the STEM workforce.

Engaging in Faculty Development

Faculty development is especially necessary in higher education, as instructors and professors at this level generally have deep content knowledge, but often less pedagogical training. It is important that teachers be prepared to address the diverse learning needs of students and provide effective instruction, especially in STEM fields that are so vital to America’s global competitiveness [7]. Through incorporation of relevant instructional and cultural practices as well as thorough self-evaluation and improvement, tribal colleges are increasing their ability to produce well-prepared STEM students who can effectively pursue further education or careers in science.

In 2007, faculty members at Lac Courte Oreilles Ojibwa College met every other Friday during the spring in collaborative workshops, facilitated by an expert in a STEM field [2]. Each workshop included a session on some aspect of Ojibwa Environmental Knowledge (OEK), defined as “the cultural knowledge, understanding, and techniques of traditional Ojibwa people, especially as they relate to the natural world.” One session was devoted entirely to integrating OEK into the STEM curricula. The faculty wrote reflective papers on what they had learned and how it would help their students.

Kapi‘olani Community College is increasing the number of STEM faculty engaged in producing more Native Hawaiian STEM graduates [4]. Faculty development opportunities have been provided to increase place-based learning and civic engagement and to enhance the use of innovative and culturally appropriate pedagogies.

A program offered at the University of Montana-Missoula, directed by Dr. Michael Ceballos, a former participant in the QEM TCUP Leadership Development Institute and Director of the Native American Research Laboratories (NARL) at the University, provided strong support for STEM faculty at Tribal Colleges and Universities (TCUs) [8]. Dr. Ceballos recruited TCU faculty to pursue master’s and doctoral degrees in STEM through this program. NARL programs provide research experiences for these faculty in biological sciences, biomedical sciences, and interdisciplinary subjects. Faculty also participate in domestic and international projects at institutions of higher education as well as at government facilities.
Using Technology in Instruction

Effective use of technology in instruction does not introduce technology for its own sake, but rather seeks to enhance specific aspects of the curriculum already in place. Computing and Internet tools can extend instruction beyond allotted class time and beyond the physical bounds of the classroom as well as enable students to accelerate or reinforce their learning on an individual basis. Instructors must ensure that technology is accessible to all students and that diverse tools remain effective when used together. The following examples describe how TCUP-supported institutions are augmenting traditional instruction through the infusion of software and online tools.

In addition to its traditional course offerings, the Mathematics Department at Blackfeet Community College in Browning, Montana, offers what it refers to as “hybrid courses” [9]. Most of these courses are delivered through an online mathematics system that allows students to progress through course content at a pace that best serves their individual learning needs. In addition, students attend class once per week so an instructor can provide assistance as needed. Students may proceed as their content understanding allows, thus enabling some students to complete more than one mathematics subject within a given semester.

An E-Learning program at Salish Kootenai College in Pablo, Montana, uses a variety of technologies, including podcasts and blended learning courses, to enhance student learning [10]. Salish Kootenai, in 1996, offered its first online courses, becoming the first tribal college to make such an offering. Today, the college serves more than 200 new online students a year. The student retention rates for online and hybrid classes match those of the on-campus classes.

Southwestern Indian Polytechnic Institute (SIPI) heavily emphasizes the use of Computer-Aided Design and Drafting (CADD) tools in its pre-engineering curriculum [6]. Students are trained in the use of tools for circuit design and simulation (NI Multisim); measurement and control system design (NI LabVIEW); device fabrication (SUMMiT IV); automated micro-electromechanical systems (MEMS) design (Coventor); and hybrid renewable power system design (HOMER). Faculty at SIPI design assignments and tests to ensure that students make frequent use of these tools and build mastery over time.

Recruiting and Retaining Students in STEM

Sustaining America’s global competitiveness requires that more students be attracted into STEM fields. Those students who show interest should find an environment that encourages their growth in STEM and keeps them on the pathway to a STEM career so that they can contribute to this important national focus. Rapid growth in outsourcing jobs in the technology and engineering sectors and growing disparity in the doctoral STEM degrees awarded to citizens versus non-citizens demand greater efforts to produce competent American STEM workers, teachers, and leaders to guide the technological
innovation and policy decisions required to maintain parity with global advancement in science and engineering.

According to *Beating the Odds: What It Means and Why It’s Important*, a national report published in 2011 by HCM Strategists with support from the Bill and Melinda Gates Foundation, four principal strategies are necessary for improving student success at institutions that primarily serve low-income, minority, and/or mobile student populations [11]. Such institutions must:

- prepare students for college through summer-bridge and college-ready programs;
- provide targeted student support services to increase retention;
- innovate in providing increased access to higher education; and
- institute a shared cultural responsibility for degree completion.

The following efforts at TCUP-supported institutions incorporate these strategies to ensure that tribal students lend their talents and leadership to a resurgent U.S. STEM workforce.

*Kapi’olani Community College* employs a STEM Outreach Coordinator whose responsibilities are to: conduct school and family outreach; nurture and support Native Hawaiian learners; and provide cultural leadership for a STEM Center at the campus [4]. Peer mentors at the STEM Center at Kapi’olani advise and tutor students as well as provide friendship and shared experiences. The predominately Native Hawaiian staff maintains the constant academic and personal presence necessary to retain students and transfer them to four-year colleges in STEM.

*Leech Lake Tribal College* in Cass Lake, Minnesota, instituted a five-week Summer Bridge Program that gives incoming students early exposure to campus life and to skills they will need to excel in STEM fields [12]. In addition to mini-courses in mathematics and computer science, students complete stand-alone three-hour lecture/laboratory modules in biology and chemistry. Outdoor laboratory excursions enhance students’ understanding of the relationship between Native culture and science. Students are offered college credit for their participation. For some, the Summer Bridge Program is the catalyst that convinces them to enroll at Leech Lake.

The *Beating the Odds* report highlights Oglala Lakota College (OLC) in Kyle, South Dakota, among more than 30 exemplary postsecondary institutions, for its success in attracting and nurturing students through completion of their degrees and into successful careers [11]. OLC’s mission of tribal self-determination motivates its focus on graduating well-trained students who can contribute service to the needs of the Sioux reservations they inhabit. In 2011, OLC awarded 204 diplomas and certificates. This represents 53 percent growth over the 133 awards made in 2009 and a 94 percent increase over the 105 awards in 2010. The college also is recruiting more students than ever before, enrolling over 1,800 full- and part-time students in the 2009 and 2010 fall semesters. Coordinated remedial education, waivers of Native students’ tuition balances
at graduation, and quality-reviewed distance education programs contribute to the
college’s steady increase in degrees awarded.

**Integrating Research and Education**

As STEM higher education practitioners make new discoveries through their research
activities, they uncover a parallel need to be able to make their results relevant to
beginning student scientists, who have the desire and enthusiasm to pursue STEM, but
initially lack the depth of content understanding that comes with effort and maturity.
STEM learning is strengthened when students can engage in hands-on research activities
as part of their education experiences. Such integration also gives students an
understanding of the responsibilities of a scientist, beyond the necessary content
knowledge. The following examples describe some of the initiatives that give students
early exposure to research at TCUP-supported institutions.

Dr. Kerry Hartman and students at *Fort Berthold Community College* in New Town,
North Dakota, conducted research on stream quality using a problem-based learning
module [13]. Students learned about water quality standards, participated in field
sampling, and collected and analyzed relevant data. Faculty also collected data and
discussed their methods with students as well as compared their analyses with those
completed by the students.

Dr. Scott Hanson and his students at *Turtle Mountain Community College* in Belcourt,
North Dakota, conducted research on the prevalence of West Nile virus in the mosquito
population around the Turtle Mountain Reservation [14]. The purpose of the research was
to identify which mosquito species are on the reservation and to find out how many of
them are carrying West Nile virus. The carriers they identified were tested at a virus
laboratory at the University of Illinois to determine how much of the virus the mosquitoes
carry.

**Applying Native Ways of Knowing**

In the January 2012 article, *Effective Practices for Creating Transformative Informal
Science Education Programs Grounded in Native Ways of Knowing*, Elizabeth Mack,
Helen Augare, Linda Different Cloud-Jones, et al., suggested several practices for
effectively delivering science education with a basis in traditional Native understanding
[15]. Among them were recommendations to:

- align the values of the programs with those of the respective tribes;
- enlist the contributions of community members with cultural perspective on
  Native science; and
- emphasize inquiry and hands-on activities in the delivery of science content.

The article underscores that science and culture are inseparable, and that instructors
should give the concepts equal emphasis in science education.
At Leech Lake Tribal College and Turtle Mountain Community College, many science courses include simultaneous study of Native culture. The ethnobiology class at Leech Lake, which was created as a deliverable from the college’s TCUP award, directly serves the institutional mission to infuse culture throughout the curriculum [12]. Turtle Mountain trains students in the core content areas of Physics, Chemistry, Biology, and Earth Sciences, while incorporating a Native perspective into the acquisition of scientific knowledge [16]. The program’s focus is to define and implement significant change in how science is understood and taught in schools on the Turtle Mountain Reservation.

Faculty at Sitting Bull College in Fort Yates, North Dakota, have focused on efforts to demonstrate the relevance of STEM content to indigenous people by showing how it can be used to improve their health and lands through a combination of traditional ecological knowledge and Western science [17]. For instance, many lessons focused on the biological properties of local plants that made them useful for medicinal, dietary, and cleaning purposes in Native cultures. The faculty also have developed culturally relevant high school science curricula for Bozeman, Montana Schools and Native science courses for tribal colleges.

At Lac Courte Oreilles Ojibwa Community College, tribal elders have been involved as guest speakers in STEM courses [2]. The program at the College, titled Elders in Residence, was developed to enhance and supplement the teachings in Ojibwa Environmental Knowledge the college instructors received while attending bi-monthly faculty development sessions. Although the elders were available to students and visited classrooms, their primary function was to assist faculty in developing teaching methodologies and syllabi that reflect Ojibwa cultural and environmental knowledge. Elders sometimes assumed the role of guest instructors, instructing students on the traditional Ojibwa use of medicinal plants and providing hands-on training outside the classroom to students in traditional tracking and trapping techniques.

The preceding examples show the wealth of activities undertaken by TCUP grantee institutions that initiate or incorporate promising practices into curriculum, research, and professional development. While they represent only a portion of the total efforts at these and other TCUP-funded colleges and universities, the selected examples suggest the breadth and depth of efforts to increase the effectiveness of faculty and to broaden the participation in STEM of the targeted students. Strategies including curriculum enhancement; infusion of Native culture; technology-enhanced instruction; innovative student recruitment; integration of research; and faculty development combine to create an environment of immersive STEM learning connected with the cultural priorities and values of the populations served by TCUP institutions.
Contributed Articles on Best Practices for Project Implementation and Sustainability

The following articles stand out for their clarity and completeness in conveying the mindset and practices that result in successful, lasting projects. In preparing this report, QEM solicited relevant articles on project management from those with extensive experience helping Tribal Colleges and Universities effectively carry out the activities outlined in their funded projects as well as sustain projects beyond the completion dates of their funding.

About the Authors

Wannetta Bennett is Former President of White Earth Tribal and Community College in Mahnomen, Minnesota, and Former Sponsored Programs Officer at Turtle Mountain Community College in Belcourt, North Dakota. As Sponsored Programs Officer, Ms. Bennett oversaw grant-funded programs, coordinated grant proposal submissions, and managed new programs. In 2003, she spent a year as a Kellogg Fellow in a Presidential Leadership Program designed to prepare college and university presidential candidates. She also was a member of the first cohort of the QEM TCUP Leadership Development Institute. Ms. Bennett received an Associate of Arts degree from Turtle Mountain Community College, a Bachelor of Science degree from Minot State University, and a Master’s degree in Business Administration from the University of Mary in Bismarck, North Dakota.

Costello L. Brown is Emeritus Professor of Chemistry at California State University, Los Angeles (CSULA). He is a former Associate Dean and Acting Dean of Graduate Studies and Research at CSULA. Dr. Brown also has worked as a Senior Associate and consultant with the Quality Education for Minorities Network (QEM) for the past several years. He has served at the National Science Foundation as Division Director, Education System Reform, making systemic awards to large urban and high poverty rural K-12 school districts as well as tribal colleges under the Rural Systemic Initiative Program. He has served as a QEM consultant/mentor for two Leadership Development Programs focusing on faculty and staff at tribal colleges with NSF/TCUP awards. He has extensive experience as an NSF reviewer and has made numerous site visits to TCUP institutions.

Dr. Brown received the Ph.D. degree in Organic Chemistry from Iowa State University of Science and Technology and a bachelor’s degree in chemistry from Hampton University. Throughout his career, he has worked to increase the participation of underrepresented groups in science, engineering and mathematics. He has served on a wide array of review panels and study sections, at both the National Science Foundation and the National Institutes of Health.
Promising Practices for Successful Project Implementation
by
Wannetta Bennett, Former President, White Earth Tribal and Community College, and Former Sponsored Programs Officer at Turtle Mountain Community College

Given below is a summary of the key directives that can be applied to successful project implementation.

Read the Proposal Thoroughly

The first step in successfully implementing a project is to read the proposal thoroughly and answer any questions that may arise. It is better to address items that are not clear or may not be feasible at the beginning of project implementation. Your sponsored programs office (if available) can assist with the implementation process. When reading the documents, make sure that the regulations governing the project are fully understood. Begin with a clear understanding of the project, including the goals, objectives, and task requirements. Meet with the author of the proposal to gain a better understanding of the intent of the proposal and why the project is important to the success of your institution. Don’t merely know what is in the proposed project, but understand how the project fits into the plans of the institution. This will help you design the work to maximize the impact of the project activities on the success of both the project and the institution.

Plan What Data Are to Be Collected

The second step in the process is to plan what data need to be collected. This can be done as a part of planning for evaluation of the project. Data collection and analysis are key to a successful project. Issues that need to be considered include: what data need to be collected to demonstrate the impact of the project; where the data are to be stored; how the data are to be analyzed; and how to make adjustments to the project as a result of data analysis. Always keep in mind the audience that will receive the data and/or results of the data analysis.

Hire the Right Staff

The third step in successful implementation is to hire the right staff. It is better to spend extra time in selecting the appropriate staff than having to spend that additional time training and/or replacing employees. The staff of the project also should have a keen understanding of what is the purpose of the project and what are the expected outcomes. Staff should be committed to the success of the project.

Develop a Strategic Plan for the Project

Now the project work begins. Develop a strategic plan for the project. This will assist in keeping the project focused and on schedule. The plan should have a timeline and benchmarks built in. All project staff should be involved in the development of the plan. This ensures staff commitment and provides a communication tool so that all of the staff
members know what is or is not happening with the project. Taking the time to develop this plan will greatly enhance the success of the project. Staff should fully understand the plan and be aware of their responsibilities as outlined in the plan. Make sure that individuals outside the project staff are aware of the plans, especially regarding administration and financial matters, since they will be key players in the success of the project.

**Fiscal Management (Develop a Cuff Account)**

Another key component of the project is fiscal management. It is important for the project director to develop and maintain a cuff account based on the approved budget. The cuff account allows the project staff to know at any given time where they are with respect to the tasks of the project. The project’s cuff account should be reconciled with the records of the business office on a monthly basis. This tool will be useful for reporting and planning purposes. Project staff should work closely with the business office and the sponsored programs office (if available) in monitoring the budget.

**Document the Work**

As the project is implemented, it is important to document the work. This can be done by daily logs, a checklist that is developed prior to implementation based on the data that are needed for evaluation, development of files required, electronic portfolios, or others, depending on the project. Monthly or quarterly reports should be done. These can be used when preparing required annual reports to NSF. The monthly or quarterly reports should be designed in a manner that builds upon prior reports. This will ensure that you do not overlook details when completing your annual report. The reports are the road map of the project and should be reviewed by staff, administration, and the finance office. They may reveal pitfalls that can be avoided in subsequent years of the project. They also may reveal successful strategies that need to be continued. A good idea is to have someone outside the project review the reports. They might identify items that staff may have overlooked.

**Disseminate the Results**

The final step to a successful project is to disseminate the results and impact of the project. The impact of the project will reach beyond the institution. Therefore, the lessons learned from the project also need to be projected beyond the institution or NSF. Staff members need to consider what media are most appropriate to use in disseminating the information.

In conclusion, read and understand your proposal, determine data collection strategies, hire the right staff, document everything, disseminate the information broadly, but most important of all, enjoy and be proud of the work.
**Sustainability of TCUP Project Activities**
by
Costello Brown, Professor Emeritus, Department of Chemistry, and
Former Associate Dean of Graduate Studies and Research,
California State University-Los Angeles

**Institutionalization**

Almost all funding agencies, including the National Science Foundation (NSF), are very interested in what will remain at an institution from a given project once the funding has ceased. Funded projects that implement polices, activities, procedures, innovations or educational reforms that become part of the normal everyday operations of that institution are said to have been *institutionalized*. The degree to which the particular aspects of the projects remain after the funding has ceased reflects their *sustainability*. A three-year project that helps students or faculty for only three years and then ceases to exist when the funds run out pales in comparison to a three-year project with activities that become institutionalized and help students and faculty for the next 20 or more years.

**Factors Determining Institutionalization**

It is, therefore, very important to consider the element of sustainability in the very early creative stages of developing a grant proposal. Several factors help determine whether the elements of a given project will be institutionalized. They are:

1. Has the project met its objectives?
2. Is it cost effective? Will the college or university be able to continue the operation of the project with its own resources? If the answer to this question is “no,” then it is very unlikely that the project will be institutionalized or sustained.
3. Is there substantial support on campus at all levels for the project? If the answer to this question is “yes,” then the probability of sustaining the project is much greater. If STEM faculty support it, if the Dean of Science supports it, and if the Provost is aware and supportive of the project, then the project has a greater probability of being sustained.

**Promising Practices for Institutionalization**

Several best practices to bring about institutionalization of engineering education innovations were summarized by Swart (http://www.nsf.gov/pubs/1998/nsf9892/inst.htm) over a decade ago and remain relevant today. A few of Swart’s best practices and lessons learned that can help bring about sustainability through institutionalization are given below:

1. Involve and motivate all stakeholders, and do so at an early stage.
2. Find internal and external "champions."
3. Formulate a step-by-step plan for implementing change, including the identification of required resources.
4. Communicate through all possible and reasonable means.
5. Develop flexible strategies to deal with resistance.
7. Reward innovation and all who achieve it, promulgate it, manage it, and accept it.

Probability for Sustainability

It is also extremely important to involve all stakeholders (#1 above) in any projects that have elements that one wishes to sustain at a college or university. It is much more difficult to cease support for a project in which there is a sense of ownership by both faculty and administrators and where terminologies such as “our project” or the “provost’s project” are being used in connection with the project. If there are influential champions for the project, both on and off campus (#2 above), who are always ready to articulate the merits of the project and to counter any resistance (#3 above) that may arise, then the project’s probability for sustainability increases.

Some resistance always exists to sustaining any project that brings about “change on campus” and has budget implications. In the current climate of level or decreasing university budgets, funds to sustain any new project often must be taken from an existing program, and clearly this factor can generate major resistance. In addition, some projects exist that the institution would probably never be able to sustain due to cost factors.

Alignment of the Project Goals with the Institution’s Strategic Plan

An effective way to ensure some degree of sustainability for elements of a project is to align the goals and objectives of the project with the strategic plan for the college or university. Strategic plans for educational institutions are often developed for a five (5) or 10-year time period and usually represent a consensus of students, faculty and administrative personnel who have been reached through a detailed and labor-intensive process of committee meetings and strict review protocols. It is, therefore, quite obvious that any project that is aligned with or promotes and/or catalyzes elements in the strategic plan has an enhanced probability of being sustained with university funds, once the external grant support has ended.

Positive Evaluation Reports and Supporting Data

On what grounds does the provost or president make the decision as to which projects will be sustained with college/university support and which projects will be terminated when the external grant ends? The answer to this question is quite simple: data, data, and more data. A strong positive evaluation report supported by baseline and annual data that demonstrate the undisputed effectiveness of the project and the resulting benefit to the institution is an essential attribute of a project that will be sustained. It is not enough merely to send a good evaluation report to the provost or president. The overall effectiveness of the project must be communicated to the decision makers from participating students, faculty, and other stakeholders through a wide range of strategies. In summary, external grants usually provide three to five years of project funding. This enables the Principal Investigator (PI) at a college/university to demonstrate the
effectiveness of the specific strategies or concepts articulated in the proposal. The grant also provides the opportunity for the PI to demonstrate the overall value of the project to the college/university during a three to five-year time period. In some instances, the grant may be renewed for another three to five years, which provides an even greater opportunity for the value of the project (or at least some of the elements of the project) to the institution to be ascertained. Sustainability may be achieved for a given project if the above strategies are used effectively.

There is a normal expected pathway from an initial idea to a proposal to a grant that is then implemented, leading ultimately to outcomes. This process normally takes from three to five years. It is to everyone’s advantage if the projects that achieve the desired outcomes and are deemed successful can then be sustained or institutionalized. Several factors that influence sustainability and some of the best/promising practices that have been shown to be associated with successful institutionalization have been discussed.
Roster of TCUP-funded Colleges and Universities

<table>
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<th>Year Established</th>
<th>Fall 2010 Enrollment</th>
<th>President / Chancellor / Director</th>
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<td>Harlem, MT</td>
<td>1984</td>
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<tr>
<td>Bay Mills Community College</td>
<td>Brimley, MI</td>
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<td>607</td>
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<td>Blackfeet Community College</td>
<td>Browning, MT</td>
<td>1976</td>
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<td>Cankdeska Cikana Community College</td>
<td>Fort Totten, ND</td>
<td>1974</td>
<td>252</td>
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<td>Chief Dull Knife College</td>
<td>Lame Deer, MT</td>
<td>1975</td>
<td>433</td>
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<td>College of Menominee Nation</td>
<td>Keshena, WI</td>
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SOURCES: AIHEC TCU Roster; 2012 Higher Education Directory; School websites
References


