

# **Designing Our Community: A Program for Recruiting and Retaining American Indian Students in Engineering**

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## **Abstract**

Increasing diversity in the workforce remains a formidable challenge for engineering and related professions. Native Americans comprise over six percent of Montana's population, but only two percent of the engineering students at Montana State University. The Designing our Community (DOC) program at Montana State University (MSU), which is supported by the William and Flora Hewlett Foundation, has three goals: (1) Increase the motivation and pre-entry academic preparation of Native American students who want to study engineering, (2) Help shape the engineering, engineering technology, and computer science workforce by increasing the number of Native American students graduating from the College of Engineering, and (3) Improve access to quality engineering and technology to rural and underserved populations by returning highly educated professionals to these communities.

In this paper, we talk about how the Designing Our Community program has both used proven strategies from other engineering minority programs and also developed unique strategies. We describe in some detail our retention activities, including (1) our first summer Bridge Program for new engineering students; (2) the contract we developed to help students understand the importance of and to take responsibility for participating in Designing Our Community; (3) the monthly stipends and how they have benefited students so far, and (4) our tutoring and mentoring efforts. We also talk about how we have tried to educate students about other MSU support programs. Finally, we report the early results from evaluation of these activities.

We are confident that the full range of support activities offered by Designing Our Community will encourage and help our new freshman and continuing Native American students to complete engineering degrees.

## **Introduction**

The U.S. must increase and diversify the working population of engineers for the future. At Montana State University (MSU), we believe we can significantly participate in diversifying the engineering workforce by partnering with our Native American communities to educate engineers. Native Americans comprise over six percent of Montana's population, but only slightly above two percent of the engineering students at MSU. The Designing Our Community (DOC) program at MSU, which is supported by the William and Flora Hewlett Foundation, has three goals: (1) Increase the motivation and pre-entry academic preparation of Native American students who want to study engineering, (2) Help shape the engineering, engineering technology, and computer science workforce by increasing the number of Native American students graduating from the College of Engineering, and (3) Improve access to quality engineering and technology to rural and underserved populations by returning highly educated professionals to these communities.

In this paper, we discuss the impetus for the DOC program at MSU, focusing on our retention activities and goals for graduating more Native American students. We describe in some detail retention strategies we employ, including (1) the summer Bridge program, which offers a transition into engineering for new students; (2) the student contract developed to support, guide, and encourage American Indian students to successfully achieve academic and career goals, and develop personal life and leadership skills; (3) the "Learning Community" model we have developed through our DOC seminar for Native students; and finally (4) the financial and academic support that we offer in order to help students succeed academically.

## **Rationale for the DOC Program**

Montana State University (MSU) is in a perfect position to provide higher education opportunities for more Native American people. Montana is a large state with a small population. There are fewer than a million people in the state; however Montana boasts a larger population of Native American tribes than most states in the U.S. Native Americans make up approximately 6 percent of the Montana population. More importantly, the Native Americans in the state of Montana make up 11 percent of the K-12 school population. Native Americans are a young demographic population, with the average age being less than 25 (U.S. Census Bureau 2000 Brief). More of these young Native Americans are enrolling in postsecondary education because more are graduating from high school. Montana is one of only six states in which Native Americans exceed 5 percent of the total postsecondary enrollment (Pavel, 2005). Native Americans have strong cultural ties to their homes, family, and communities; therefore, they will pursue work and education opportunities closer to home. MSU offers ten undergraduate degree programs and options in engineering. There is no other single campus in Montana, Idaho, Wyoming, or the Dakotas that offers comprehensive (B.S. through PhD) degrees in computer science, engineering and mathematics, as well as the B.S. and M.S. degrees in engineering technology. For these reasons, MSU is in a strong position to educate and graduate Native Americans in postsecondary education.

Native Americans as well as other ethnic minorities are painfully underrepresented in the science, technology, and engineering fields. Participation and graduation of women and ethnic minorities in engineering fields are much lower than those of the general population (Babco, 2001). Ethnic minorities seem to be lost on the educational path that leads to careers in science and engineering. American Indians make up less than 0.5 percent of the engineers in the U.S. labor force (Babco, 2001). Research has pointed to several indicators that may lead to the loss of ethnic minorities in science and engineering fields, including lack of interaction with role models in these fields, need to strengthen K-16 preparation in math and science, and “strong cultural values of group and community that may be at odds with the perceived levels of individualism and competition associated with the sciences” (Chang, 2003, p.2). However, within the last 15 years (1981-1999), freshmen engineering enrollment for American Indians has increased from 0.7 percent to 1.0 percent (Babco, 2001).

Data show that more ethnic minorities enroll in postsecondary education at a community college close to their home (Pavel, 1992). Montana has seven tribal community colleges, one on each of the seven American Indian reservations serving more than twelve different tribal affiliations. Within the last few years, three of these tribal colleges in Montana have developed pre-engineering curriculum programs. Tribal college success can be tied to the belief and practice that students can retain tribal values, and be successful students (Chang, 2003). Tribal colleges do an excellent job of assessing community need and preparing their students academically for future educational and career success, while acknowledging the cultural contributions of their people. DOC, recognizing the importance of these tribal colleges to Native American communities, is partnering with Montana tribal colleges to provide an educational pathway for students in the engineering, engineering technologies, and computer science fields.

Montana State University has done much in the past 10 years to provide and support higher education for Montana’s Native American communities. As the state’s only land grant institution, MSU is dedicated to providing access to education for all Montana’s citizens. The university, “as part of its land grant mission, takes an active interest in enhancing the educational and professional opportunities for all protected classes and has a special dedication to developing progressive options for Montana’s Native American population.” The MSU five-year plan for the student body is to increase diversity, and part of this plan is to increase Native American student enrollment by 50 percent (UPBAC, 2004). The American Indian Support Services (AISS) program at MSU has taken a lead role in coordinating efforts for Indian students on campus. AISS is housed in the Department for Native American Studies and provides personnel support, an Indian club room space, and numerous financial resources. Support programs similar to DOC have also had great success at MSU in the health sciences and nursing programs. These programs have a proven record of graduating Native nurses and sending Native Americans on to medical schools and graduate programs. More importantly, there is a strong community on campus of faculty and staff who meet monthly to discuss issues important to recruiting and retaining more Native American students. This group, the Indian Program Directors, communicates and coordinates programs, outreach, and travel to Native American communities, which in turn strengthens Montana State’s overall efforts.

The Engineering Minority Program (EMPower) has been in place in the College of Engineering (COE) since the early 1990's. Within the last 5 years the EMPower program at MSU has had a major face lift. The college's advisory council and corporate partners have given renewed purpose and direction for diversity efforts in the college. Based upon suggestions by a consultant and task force, the COE has restructured and created a college diversity director at the Assistant Dean level. Most importantly, the COE administration helped to secure minority programs a central location in the engineering complex to coordinate diversity efforts. The EMPower Student Center officially opened up in February 2003 with a program during National Engineering Week. The EMPower Student Center offers important space for diversity efforts including meeting space for student organizations, tutoring, study groups, mentoring, and a computer work space. The DOC program is housed in the EMPower Student Center and coordinates its programs from this central location. The space allocated to the EMPower program has been a major driving force in implementation and early successes in the DOC program.

In summary, several factors come together to make this a propitious time to enhance opportunities for Native Americans in the College of Engineering: the population growth of college-bound Native American students in our state, the great potential for partnering with tribal colleges in setting up a pathway for Native students into the science and engineering fields, a larger institutional commitment to improve American Indian recruitment and retention with campus-wide support programs, the growing momentum for broadening college-level diversity programs, and a heightened level of corporate interest and partnership support for improving American Indian opportunities in this region.

### **Minority Engineering Programs**

The main goal of most minority engineering programs is to retain underrepresented students in postsecondary education and to successfully guide these students into entering the engineering profession. The combination of program activities used varies among schools, depending on the specific minority population served. A review of programs that support Native American engineering students reveal similar strategies in use at most institutions. Minority programs are defined as "academically based support programs (whose) primary purpose is to set students on their feet by taking them from where they are.... to where they need to be" (Hermond, 1995, p.396) Furthermore, a "minority engineering program can fulfill its mission only if it focuses on developing a collaborative learning environment. . . . Most programs use a combination of these seven retention strategies including: matriculation (pre-college), orientation (bridge program), academic advising, student organizations, tutoring and academic workshops, personal counseling, and financial aid" (Hermond, 1995, p.396). Not much research has been focused on comparing these minority programs between institutions. Most minority programs tend to evaluate their own strategies and successes within their own programs.

### **The Designing Our Community Program**

DOC program activities are based on addressing the major barriers that keep Native Americans from succeeding in engineering postsecondary education. There is a need to strengthen the

educational pathway to science and engineering fields by enhancing pre-college experiences. DOC addresses this pathway problem by coordinating a high school summer college experience program for Native American students. DOC also offers K-12 engineering outreach to reservation schools to help to strengthen the interest in math and science and increase interaction with current participants in engineering fields. DOC is addressing attitudinal and lack of exposure barriers by partnering with tribal colleges to open the engineering educational path between tribal communities and the College of Engineering. For example, the DOC program is partnering with tribal colleges to provide more introduction courses in computer engineering design courses (AutoCad and Professional Engineering Software). The DOC program is also coordinating outreach to tribal colleges by engineering and computer science faculty in order to expose tribal college student populations to career options in engineering fields. Finally, our retention programs provide an early orientation, strategies to teach students study skills and personal responsibility, development of a learning community, stipends to alleviate financial burdens, and professional development. The following sections describe in detail the program activities and strategies involved in our student retention program.

### **Bridge Program**

One of the main barriers for American Indian students is the transition from a small familiar setting to a large and foreign community. Many of our Indian students are overwhelmed by the size and number of students on campus. The DOC program has created a “super” orientation program for American Indian students entering into the College of Engineering at MSU. This Bridge program is the first step in our retention efforts for students and is designed to provide an easy transition to a four-year engineering program.

The DOC summer Bridge program is designed to (1) provide students with a welcome and an introduction to the Native American community within the College of Engineering and campus; (2) help them begin to build their campus, academic, and community connections; (3) encourage mentoring, support systems, and networking within the academic community of engineering; (4) provide basic tools and brush-up to help overcome common experiential barriers to academic success; (5) give new students a head start to their college experience, infusing them with confidence and foreknowledge of the college engineering experience.

The DOC Bridge program offers programming in topics specific to students majoring in engineering and works to connect new students with the American Indian community in the college. Freshmen and transfer students from tribal and other community colleges are recruited throughout the year to attend the Bridge program the week prior to Fall semester. In the summer of 2004, students arrived a week early on campus and received early entrance into their campus housing. The DOC Bridge program did not replace the campus-wide orientation program, a program which is required for all students attending MSU. Week-long courses were provided to refresh skills in math and writing. Specific mini-courses were offered by college faculty in engineering computer design programs (AUTOCad and Professional Engineering Software) and computer science. Students were guided through an introduction and set-up of their on-line student account, including their personal email account. The maintenance of their student account is often missed by new students but is vital to being a successful student on campus. Speakers from campus were invited to talk about their campus programs such as library research,

financial aid, writing center, and American Indian student support services. Students toured the engineering buildings and administrative buildings on campus. Upper-class students provided a tour and demonstration on how to find and purchase the right textbooks at the bookstore. Study skills were also emphasized in short courses on note-taking skills, reading for understanding, and stress and time management. Students were provided with organizational tools such as a campus calendar and planner as well as a memory jump drive. Finally, current American Indian students participated throughout the week in social events and got together with new students in a final question and answer panel at the end of the program. Current students shared do's and don'ts with new students and offered heartfelt thoughts on their obstacles and struggles. The program ended with a talk from an American Indian alumnae and professional engineer who inspired students with his own story.

Initial evaluation results from the first DOC Summer Bridge program are promising. Students rated all sessions on a Likert scale, and the three most useful sessions were math sessions, information about American Indian support services and their community, and the tutoring provided on their student computer accounts. A majority of the students were made more aware of campus resources and planned to use those resources for the Fall semester. The Bridge program appears to be meeting its objectives of providing some academic preparation and brush-up on science and math topics, introduction to the American Indian community in the College of Engineering and campus-wide, and making them aware of student campus resources. Students seemed to be instilled with a little more self confidence in their academic abilities and finding comfort within a community. Anecdotally, a math instructor from the summer program commented that the students he had in class who had attended the Bridge program offered by DOC seemed to have an advantage in his Calculus II class.

### **Student Contract**

The DOC program has created a student contract designed to support, guide, and encourage American Indian students to successfully achieve academic and career goals and develop personal life and leadership skills (Brown, 2003). Students who are engaged in the DOC program sign a contract outlining expectations and responsibilities for each semester. All students are required to enroll in at least 12 credits per semester and must maintain a minimum 2.5 GPA. Students agree to meet one-on-one with DOC staff at least twice per semester for additional academic and professional advising. Each student must document at least four hours in the EMPower Student Center, which includes space for meeting with study groups, individual studying, and a computer work center. In regard to professional development, students are required to attend one workshop per semester focused on personal life skills, academic enrichment, career development, or information about a professional student chapter. Students are also asked to attend a social, cultural, or special presentation event on campus during the semester. In addition, students must participate in a mentoring program, which includes new students meeting with an upper-class student once a week. Students are matched according to interests and majors and meet throughout the semester.

In addition to enhanced advising from DOC staff, students are required to meet one-on-one with their instructors and their academic advisors prior to mid-term of each semester. Academic

advisor visits include discussions with students on their current courses, academic progress, career goals and interests, and a discussion of a tentative schedule for the next term. These visits take place prior to mid-term and are in addition to the visit required later in the term to register for the next semester. Additional academic advisor visits help students connect with faculty. Students must also meet with instructors for each of their lecture classes and labs. Instructors fill out a visit form with students; the form allows instructors to evaluate students on attendance, class participation, completed homework, quality of work, comprehension of material, and overall performance at midterm. Mid-term academic checks allow DOC students and staff to make adjustments to students' study plan. One of the most positive results from our initial evaluation of the program in 2004 was the amount of contact students were getting with faculty and advisors. All but two students reported meeting with faculty (other than their advisor) during the semester, and the average frequency of meetings was once per week. Most of the students met with their advisor two or three times during the semester. Because of this frequent contact with faculty, a number of students could identify someone in the college or on campus whom they could ask for a reference.

### **DOC Seminar**

In order to connect American Indian students with each other in the College of Engineering and to provide programming on successful student skills and professional development, DOC developed a seminar for students. DOC used a "Learning Community" model to develop a seminar to enhance the persistence of our American Indian students in the college. The primary objectives of the DOC seminar are:

- Increase awareness of academic and campus support, and further develop skills for college success.
- Provide an arena for peer networking, social support, mentoring opportunities and contact with the COE and DOC programs.
- Expose students to successful Native American engineers to discuss barriers in education, social and professional environments.
- Help students discover and evaluate career options and choices, and develop a network of professional opportunities

Freshmen and sophomore students are required to enroll in the one-credit seminar course each semester. Upper-division students (juniors and seniors) do not take the course; rather, they speak during the sessions and plan sessions in the seminar throughout the year. Fall semester topics were an extension of the student skills programming that began in the summer Bridge Program. Speakers from campus resource programs were invited to speak, covering topics on counseling services, financial management, and using the library for research. Study skills programming included tips on note taking, writing, reading skills, test taking, organization and planning, and stress and time management. Upper-division students presented on their individual engineering programs, coursework, internships, employment opportunities in their major, and their participation in professional student organizations. Many of our students participate in the American Indian Science and Engineering Society (AISES). AISES student chapter participants talked about their experiences at National Conferences and internships awarded through companies associated with AISES.

During spring semester, upper-division students organized a seminar by inviting role models who influenced them to become engineers or speakers whom they would like to hear from on topics in engineering. Guest speakers in the seminar included faculty and researchers from the College of Engineering talking about broad applications of engineering in all disciplines. Career Services provided seminars on internship planning, resumes, and interviewing skills. One of the most important influences of the DOC seminar is provided by the Native American role model engineering professionals who are invited to speak to the students. Each semester, two or three Native American role models from corporations, tribal communities, and MSU alumnae are invited to speak to the DOC seminar. Many of our Native American College of Engineering alumnae speak about their struggles and obstacles in coming to MSU from their home tribal community with little support. Engineering alumnae shared their experiences in starting out in 100-level math classes and repeating courses they didn't complete.

Students are surveyed at the end of each semester to help DOC staff adjust future seminars and evaluate program objectives. Results from the seminar survey have been positive in regard to meeting DOC program objectives. Many different topics were mentioned as Most Favorite Topic, which indicates that the selection of topics is meeting the varied interests and curricula of students. Students reported that they were more aware, as a result of the seminar, about internship possibilities, the COE community, faculty, and administration. They also reported that the seminar exposed them to Native American engineering professionals. An indirect result of the seminar is progress toward the objective of "Enhancing the sense of community for Native American students in the College of Engineering."

### **Financial and Academic Support**

DOC strives to help American Indian students focus on their academics in order to develop into successful professional engineers. One of the barriers to postsecondary engineering education that the DOC program seeks to alleviate is the need for students to work a part-time job. Native American students are more likely to be single parents, part-time workers, part-time students, and receiving less aid from family (Pavel, 2005). Minority students often rely heavily on federal and student loan programs to finance school. For most minority students, financial aid does not meet all costs associated with postsecondary education. One of the policy recommendations based on data gained from minority students in higher education suggests targeted financial assistant programs for students whose need is not met by financial aid. Students who do not have to worry about paying for school do better academically, socially integrate into college, and increase their likelihood of graduating (Pavel, 2005).

Based on research from other minority engineering programs and data on financial barriers to higher education for Native American students, the DOC program offers financial support for participating students. The support is not a scholarship and is not based on students meeting a financial need. Students receive a \$250 monthly stipend for participation in the program for each academic semester. The student stipend is designed to be financial relief from having to work a part-time job or take out student loans for living expenses. The spring 2004 program survey

showed that stipends allowed students more time to study and allowed them to not work at all or work less.

The DOC program strives to help students meet their personal academic goals and grade requirements for participation in the program. A quick evaluation of students in the DOC program in any given semester shows that students are enrolled in ten different math courses from pre-algebra to differential equations. Because of the breadth of the classes students are taking, DOC facilitates students participating in study groups of 2-3 people. During the DOC Seminar, students coordinate their schedules and find common times to meet and study courses they have in common. Tutoring is also provided by upper-division students in math and science courses during study group sessions in the EMPOWER Student Center. Under DOC staff advisement, students are also made aware of campus resources such as the writing center, the math learning center and the physics and chemistry help centers. In 2004, following the first semester of implementation in regard to raising awareness of on campus resources, close to half of the DOC students took advantage of tutoring, while three quarters took advantage of some type of campus resources.

## Conclusion

We believe we are in a unique position to partner with Native Americans in providing education and employment opportunities in the fields of engineering, engineering technologies, and computer science. We have modeled our retention programs after minority engineering programs that have seen success in the past with graduating students in engineering. Our combinations of programs and partnerships with tribal colleges, however, are unique strategies for recruiting and retaining students through to completion. We hope our efforts will increase the number of Native Americans participating in the engineering workforce in the future.

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