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**Designing Our Community (DOC):  
A Program to Recruit and Retain American Indian  
Students in Engineering**

**Heidi M. Sherick, Sheree J. Watson**

**College of Engineering  
Montana State University – Bozeman  
P.O. Box 173820  
Bozeman, MT 59717-3820**

Abstract

Increasing diversity in the workforce remains a formidable challenge for engineering and related professions. The purpose of the Hewlett Designing Our Community (DOC) Program in the College of Engineering at Montana State University is to increase the recruitment and graduation of American Indians in engineering and computer science. The Designing Our Community program seeks to expose potential American Indian students to the challenge and excitement of engineering and hopes to create a model for serving rural, American Indian students in the attainment of their professional goals. The College of Engineering builds on a broad array of campus wide American Indian support programs. These programs collaborate regularly regarding recruitment on reservations, advising students, program promotion, tribal college relations, and funding availability. The collaboration strengthens the DOC program and has provided a boost in American Indian enrollment and graduation rates overall at Montana State University.

This paper focuses on program components of DOC that address specific goals of American Indian recruitment and retention. The first goal is to increase the motivation and pre-entry academic preparation of American Indian students. The second goal is to help shape the engineering, engineering technology, and computer science workforce by increasing the number of students graduating in engineering. The third goal is to improve access to quality engineering and technology for rural and underserved American Indian populations and to return educated professionals to their communities.

Purpose

Several complementary factors come together to give impetus to the COE Designing Our Community (DOC) Program and make the timing compelling: the growing momentum for broadening college level diversity programs, a larger institutional commitment to improve

American Indian recruitment and retention with campus wide support programs, and a heightened level of corporate interest and partnership support for improving American Indian opportunities in this region. Less than a half percent (.5%) of American Indians makes up the engineering workforce nationwide.<sup>1</sup> Multi-faceted barriers to engineering, math, and science education for American Indians, women, and other minorities remain. For American Indians, low levels of enrollment in engineering and closely related programs can be attributed to cultural differences, inadequate support programs, inadequate financial aid, lack of professional role models, minimal academic and peer counseling, limited exposure to the fields of engineering and inadequate math skills. American Indian communities are the most in need of trained engineering professionals as they manage their own natural resources on their lands (hydroelectric dams, coal reserves) and work to develop economic infrastructure within their communities. It is important to recognize the cultural sensitivity that only American Indian engineering professionals can offer to projects within their own reservations. American Indians are a young, rapidly growing population. They make-up over 10% of public school enrollment in Montana and will be seeking secondary education and employment opportunities within range of their reservation communities within the next few years. The DOC program proposes unique and new strategies to dramatically increase the recruitment and graduation of American Indian engineering and computer science professionals.

## Background

The 2000 U.S. Census reported the population of Montana at just under a million people at approximately 902,195.<sup>2</sup> Ninety one percent (91%) of Montana's population is white; however, the largest minority group is American Indian. American Indians make up 6.4% of Montana's population. American Indian nations are distinctive in other respects. Nations are based primarily on ethnic heritage and are distinct from other each other. From a governing standpoint, tribal nations are also unique in that they are members of a sovereign nation, and are legally empowered to govern themselves, manage their land, and determine criteria for enrollment in their tribe.<sup>3</sup> American Indian populations are growing. Statistics show a bigger increase for American Indian populations than the general population. From 1990 to 2000 the U.S. population increased at a rate of 13%, while American Indian populations increased at a rate of greater than 26%.<sup>2</sup> This increase is most notable in K-12 age groups in Montana's Public School systems. Public school enrollment has fallen in Montana since 2000 as the majority (white) student population decreases, however American Indian populations are on the rise. According to the Montana Office of Public Instruction Montana's American Indian population comprise 10.9% of the total student population. At the elementary level they represent 11.7% and at the high school level 9.2% of the population.<sup>4</sup>

As the American Indian population in the state of Montana grows, poverty status, high school and post-secondary dropout rates, and unemployment are all increasing on Montana's reservations. Ten percent (10%) of Montana families lived below the poverty level in 1999 as compared to an average 30.6% for American Indian families living on Montana reservations. The mean income for families on reservations is \$10,000 dollars less than those of families living off reservations in Montana (average \$31,793 on reservations, \$42,471 off reservations).<sup>5</sup> Free and Reduced Lunch participation in Montana Public Schools, as an indicator of socioeconomic status, has on average a 74% participation in reservation high schools compared with Montana

high schools within 30 miles of reservation schools, which average only 22% participation. The rural nature of Montana's reservations presents problems in terms of access to good teachers, public schools, and to post-secondary institutions. American Indian students account for 24.4% of the total dropouts from Montana Public Schools even though they make up only 10% of the total school population. American Indian students drop out of high school at a rate more than three times that of white students. Eighty seven percent (87.2%) of Montana's 25 year and older population has finished high school as compared with 78% of reservation populations. Even more dramatically, 24.4% of Montanan's have a bachelor's degree or higher as compared to 14.3% of Montana's American Indian population living on reservations.<sup>5</sup> According to the 2000 Census, American Indian reservations in Montana suffered on average 19.4% unemployment as compared to Montana's 6.3% unemployment status.

### Montana State University

As the state's only land grant institution, MSU is dedicated to providing access to education for all of Montana's citizens. The land grant mission gives reason and importance to programs that support American Indian students at MSU. The university's role and scope statement "Montana State 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 American Indian population." Training American Indian students in engineering and technologies meets this mission. Students trained in technological fields can provide reservation communities with much needed expertise. According to Dave Anderson, the Director of the Bureau of Indian Affairs, many successful American Indian communities are placing a high priority on education of their members in order to improve self-governance and develop economic infrastructure. MSU COE seeks to develop programs that provide a pathway for American Indian students to achieve training in engineering and technology and provide a network of opportunities to return to their reservations. Diversity initiatives at MSU College of Engineering build on the unique strengths of the university, including its size and broad array of minority support programs. The COE has had active collaboration with a campus wide American Indian Program Directors group. The Indian Program Directors (IPD) committee meets on a regular basis and discusses initiatives in American Indian recruitment and program retention on campus. Campus wide American Indian support programs collaborate regularly in regard to recruitment on reservations, student advising, program promotion, tribal college relations, and funding availability. The collaboration between programs on campus has provided a boost in American Indian enrollment and graduation rates. Below are brief descriptions of minority support programs that COE has partnered with in offering programs for American Indians.

- **Center for Native American Studies (CNAS):** CNAS offers a strong academic program in Native American studies, provides scholarships and works cooperatively with MSU programs serving Native Americans. CNAS programs include: American Indian Council, a student organization for all Indian students and families, which hosts social functions, performs community service activities, and hosts the annual MSU Pow Wow; Native American Peer Advisors (NAPA), mentors committed to easing students transition to college; Native American Awareness Week; and the Student Advisor/Counselor who assists Native American students with academic advising, and personal counseling. Along with

programming, the CNAS has established a student center on campus known as the American Indian Council Room.

- **New Student Services Minority Recruitment:** The University has had a minority recruiter position for over a decade, supported in part by the College of Engineering. This position provides a crucial link in recruitment, disseminates scholarship information and promotes programs on campus for American Indian students.
- **American Indian Research Opportunities (AIRO):** AIRO is a consortium of Montana's seven tribal colleges and MSU-Bozeman dedicated to providing undergraduate research and scholarship opportunities for American Indian students in career fields of science, math and engineering.
- **Montana Apprenticeship Program (MAP):** MAP is a summer academic enhancement program designed for American Indian juniors and seniors in high school. MAP has been running for 22 years and has hosted over 300 students from all over the U.S. MAP is a six-week program that provides pre-college academic preparation, and offers students experience in a scientific-research laboratory. Eighty percent of students from MAP enter college.
- **American Indian Science and Engineering Society (AISES):** The AISES student chapter at MSU was chartered in 1983 and is guided by the principles of learning, leadership and excellence in science and engineering careers. The MSU chapter has been consistently recognized as an outstanding chapter by the national AISES foundation, including National Chapter of the Year Awards. The MSU chapter of AISES has had several students who have received scholarships and regularly attend AISES national conventions.

#### College of Engineering (COE)

MSU offers ten undergraduate degree programs and options in engineering. The program that attracts the largest percentage of American Indian students at MSU is civil engineering. Enrollment data for American Indian students shows that they comprise 1.5 to 2.0% of the total enrollment in the COE for the past ten years (Figure 2). Data provided by "Engineering Trends" reports average undergraduate enrollment of American Indians in engineering programs in the U.S at 0.5% for periods 1975 – 2002.<sup>1</sup> American Indians graduate from MSU in engineering at a rate between 0.5 to 2.0%, closely mirroring that of enrollment data (Figure 3). Montana ranks in the top 15 states in graduating American Indians earning bachelor degrees in engineering and ranks in the top 5 states graduating American Indians with associate degrees in engineering curricula. The College of Engineering looks to capitalize on the close geographical proximity between MSU and many of the state's American Indian population centers. Furthermore, 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. The COE at MSU has targeted the enhancement of American Indian education as a top priority over the next five years.

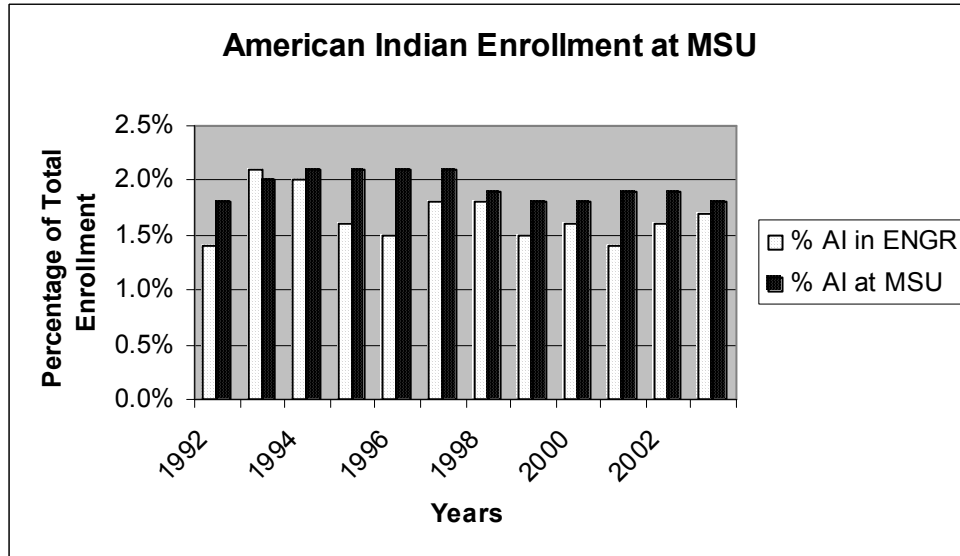


Figure 2. Enrollment data for American Indian students at MSU and in the COE for 1992-2003.

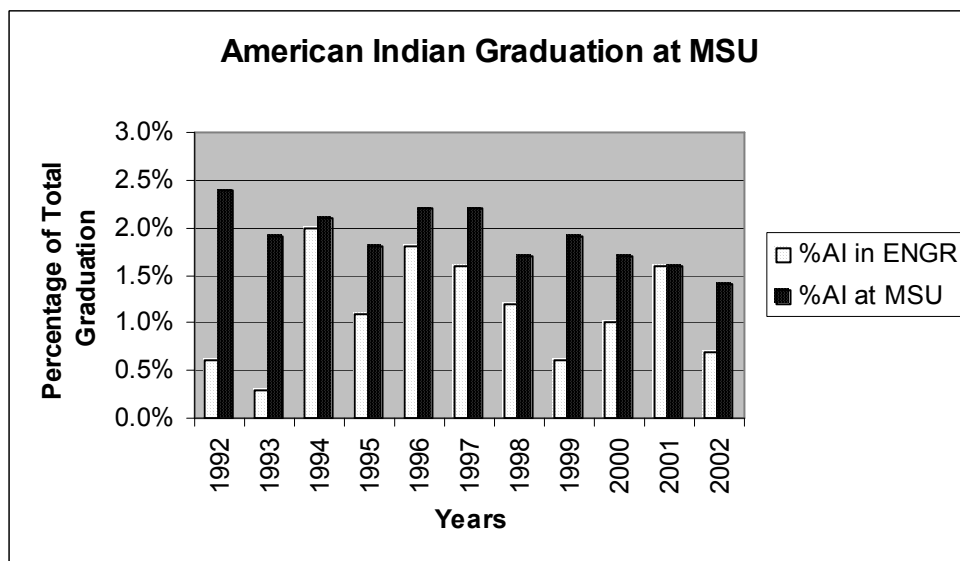


Figure 3. Graduation data for American Indian students at MSU and in the COE for 1992-2002.

### Engineering Schools of the West Initiative (ESWI)

In December 2001 the Montana State University College of Engineering was acknowledged as an Engineering School of the West and was awarded a three-year grant from the William and Flora Hewlett Foundation to support the “Designing Our Community” Program (DOC). Nine public colleges and universities from nine western states are participants in ESWI, with special programs designed to improve the quality of undergraduate education in engineering and to increase the student numbers in engineering. These institutions, selected for a commitment to rigorous assessment and ability to sustain long term outcomes, collaborate to tackle such broad issues as best practices in recruitment and retention, faculty development and program sustainability. Members from the nine institutions meet on a regular basis in subcommittees

designed to foster collaboration in topics including: sustainability, assessment, recruitment and retention, modules and courselets, and faculty development. The public colleges and universities who are part of the Hewlett ESWI hope to build upon success and create models to improve engineering education throughout the United States.

### DOC Goals and Program Activities

The following briefly outlines the DOC program components designed to meet these goals and assessment plans to obtain baseline data in order to measure success of the program.

**Goal I: Increase the motivation and pre-entry academic preparation of American Indian students.** The DOC Program contacts students, teachers, counselors, tribal college faculty and transfer counselors to establish an engineering network via promotional letters, e-mail, phone calls, and on site visits. Motivational presentations will be made to schools on and near reservations to stimulate interest in engineering, technology, and computer science careers promote school completion and reinforce development of basic science and math skills. Presentations will be hosted by MSU program coordinators, in participation with our industry partners, faculty and MSU COE American Indian alumni. These presentations will build participants' awareness of engineering career opportunities. The plan will also utilize engineering professionals, provide tours of local engineering facilities and engage students in problem solving engineering activities. DOC is partnering with a successful program at MSU, the Montana Apprenticeship Program (MAP), to provide ten to twenty junior and senior high school students per year opportunities to experience engineering careers. MAP provides high achieving American Indian students a meaningful work-related experience in an engineering research laboratory as well as basic pre-college preparation in math, writing, reading and science. The program goals for MAP are to promote an interest in research, provide campus familiarity and comfort, and foster the development and interest in basic academic skills.

Finally, DOC will design and implement a "bridge" program to provide a successful transition for American Indian students from high school and tribal colleges to engineering at MSU. The one week bridge program will be offered prior to the beginning of fall semester. The bridge program is designed to provide an orientation, build campus and community connections, encourage networking, and educate students about American Indian support programs. This will provide basic academic tools, and allow new students on campus to start their college experience with confidence, community, and familiarity. Course work will include facility lab tours and activities, preparation courses for pre-calculus, basic writing, computer, communications and library research skills. Orientation to financial aid programs, finances and budgeting, time management, study skills, and career services will also be provided. Current American Indian students in the COE will facilitate sessions and serve as mentors and role models providing a peer perspective and advice for incoming students.

**Goal II: Help shape the engineering, engineering technology, and computer science workforce by increasing the number of American Indian students graduating in engineering.** DOC offers a seminar course to enhance student retention patterned after the concept of "learning communities." Our approach is to create a place where individuals (and diversity) are honored and celebrated and where American Indian students can find a safe place

to be and learn. The weekly seminar is coordinated by DOC staff and is a vehicle for regular contact. The seminar establishes a positive, fluid, learning environment to encourage students to provide academic and social support for each other. Additionally, students learn how to seek out and benefit from faculty assistance and form study groups to prepare for classes and exams. The format of the seminar will evolve, depending on the identified needs of the group, and will build upon basic skills covered in the bridge program.

The student stipend provides a “living allowance” to help alleviate the financial burden associated with attending college. Financial aid counseling and budgeting training is offered to ensure students are able to maximize available resources during the bridge program and throughout the year. DOC students are required to meet eligibility guidelines, maintain a minimum G.P.A., must attend the seminar and help to facilitate the bridge program. Finally, the DOC program will provide diversity training to improve the academic environment for minority engineering students. A COE Diversity Committee will be developed with a representative from each department to address diversity issues and relay information throughout the college. DOC enlists the cooperation of American Indian support programs on campus to assist with guest lectures and to bring in professional diversity trainers to facilitate college wide sessions to all students, staff and faculty.

**Goal III: Improve access to quality engineering and technology to rural and underserved populations by returning highly educated professionals to these communities.** In regard to the final goal, DOC provides opportunities for American Indian students to network with American Indian professional engineers in Montana and the Rocky Mountain region. DOC helps to develop organizational and leadership skills by encouraging interaction between the students and professional organizations. American Indian COE alumni serve as mentors, giving presentations during the bridge program and the seminar. DOC will:

- develop an e-mail list serve to encourage networking between students, alumni and professionals,
- provide opportunity for students to interact and present to the College of Engineering Advisory Council, and departmental advisory boards,
- provides opportunities at the national level for American Indian engineering students to gain exposure to career opportunities and meet professional role models by attending national conferences such as the annual American Indian Science and Engineering Society (AISES) meeting,
- introduce students to several professional organizations that have student chapters on campus to encourage participation in those organizations.

## Evaluation

Assessment of DOC program goals will be accomplished by summative evaluation of metrics established for each program activity. Assessment will include descriptive statistical information such as demographics, academic background, selected majors regarding program participants compared with non-participating peers. The mechanism for much of the baseline data collection is under the control of the University Planning and Analysis Office. Data will be collected and assessed in context of the scope of each activity. Regular analysis will determine those factors that more readily facilitate successful achievement of program goals. This can help determine

activities and elements within activities that are not as beneficial as desired. Data collection and analysis will be communicated annually with the ESWI assessment committee in order to share and learn best practices among schools in the west with similar programs. A database and template for data collection has been designed to format data from each participating institution. Finally, it is anticipated that findings will be shared with engineering education communities through publications in peer journals, conference presentations, reservation and tribal college settings, and web site promotion.

## Conclusion

Montana State University is in a unique position to provide American Indians a quality education in engineering, engineering technologies, and computer science. The purpose of the Hewlett Designing Our Community (DOC) Program in the College of Engineering at Montana State University is to increase the recruitment and graduation of American Indians in engineering and computer science. DOC is in the first year of program implementation. DOC offers a wide variety of program components delivered at several levels such as outreach in formal K-12 education, high school summer enrichment experience, transition programs between high school and college, college retention programming including developing learning communities and providing financial assistance, as well as continued networking for professional development following college. By offering a wide spectrum of intervention programs at many different levels we will be more effective than programs that employ single strategies. The DOC program is strengthened by diversity initiatives at MSU and builds on the unique collaboration of minority support programs on campus. DOC will help create a model for serving rural, American Indian populations in the attainment of individual goals and ultimately will provide professionally trained engineers to tribal nations and their reservation communities.

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<sup>2</sup> The American Indian and Alaska Native Population: 2000, U.S. Census Bureau 2000 Brief, C2KBR/01-15, February 2002, available on the U.S. Census Bureau's Internet site at [www.census.gov/population/www/cen2000/briefs.html](http://www.census.gov/population/www/cen2000/briefs.html).

<sup>3</sup> "The Tribal Nations of Montana – A Handbook for Legislators," 1995, prepared by The Committee on Indian Affairs and published by the Montana Legislative Council, Helena, MT.

<sup>4</sup> Montana Office of Public Instruction, Enrollment Data for Racial/Ethnic Origin 2002-2003, October 2002, available on the site at <http://www.opi.state.mt.us/>.

<sup>5</sup> Montana Department of Commerce, Census & Economic Information Center, May 2002, available on the site at <http://ceic.commerce.state.mt.us/>



## Biography

Heidi M. Sherick, M.Ed., is Assistant Dean for Undergraduate Programs and Diversity in the College of Engineering at Montana State University. She is in charge of efforts to increase diversity in the College of Engineering by recruiting, advising and supporting minorities. She is the Director of EMPower and the Project Director of the DOC program. She has over 5 years of experience in teaching middle school science.

Sheree J. Watson, M.S., is Assistant Project Director for the DOC Program in the College of Engineering at Montana State University. Sheree has over 5 years of experience in teaching and mentoring Native American students and over 5 years experience in 7-12 grade science education. As assistant director she has primary responsibility for the implementation of DOC program components.