The San Diego State University Computer Science, Engineering and Mathematics Scholars Program

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Abstract - Studies show that there will be over 200,000 additional job openings in the areas of computer science and computer engineering in the next few years. These projections emphasize the need to provide more opportunities to a more diverse group of students who can contribute to our nation's social, cultural and professional growth. The objective of this effort is to create an environment for success for academically talented, yet disadvantaged engineering, mathematics, and computer science students at San Diego State University (SDSU) by providing a CSEM Scholars Program. Each scholar is matched with an engineer or scientist at SDSU and works side by side with this engineering or science faculty member on a research project as well as actively participates in academic and professional development activities. Further, the CSEM Scholar has an industrial mentor who works with the scholar in professional development as well as help with the academic success of the student. The CSEM Scholars Program, funded by the National Science Foundation, attracts qualified students from disadvantaged groups, assists the student in reducing the length of time to graduate, and enhances the Scholar's opportunity to complete a technical undergraduate degree or move from one level to the next. These accomplishments foster experience and confidence in each recipient providing more qualified and well-rounded graduates to enter the workforce or graduate school. An evaluation team made up of faculty and industry members will assess the effectiveness of the Scholars Program based on measurable outcomes including retention, student academic performance and graduation rates.

Overview

San Diego State University (SDSU) is conveniently located 20 minutes from downtown San Diego and the Tijuana, Mexico/San Diego, CA International Border. Founded on March 13, 1897, San Diego State University is one of the largest western universities with nearly 33,000 students enrolled. According to the May 2004 issue of the national magazine *Hispanic Outlook in Higher Education* (López-Isa, May 2004), San Diego State University ranked 7th in the nation in the number of Hispanics receiving bachelor's degrees.

As a center for cultural, educational and scientific institutions, San Diego State University offers a vast array of learning experiences. Students will have the opportunity to work closely with faculty and become involved in over 19 professional and student organizations for Computer Science, Engineering and Mathematics majors by participating in team building, community service and academic activities on campus.

Need

Unfortunately, many educationally disadvantaged students will not be able to benefit from the services offered by the campus and will not attain the degree necessary to work for the many technical companies in the San Diego area. Given this situation, potential students lose the opportunity for future financial and personal improvement and the technical community loses those potential employees who would have contributed to the region's and nation's technical expertise and success.

Existing student problems affecting successful completion of undergraduate degrees in Computer Science, Engineering and Mathematics for disadvantaged students include:

- 1. *Financial Burden*: Our disadvantaged students, though receiving financial aid, are not often able to cover all educational expenses. Including tuition, room and board, student fees and books, students face an annual financial burden that averages \$12,480 to attend SDSU. Many students are first generation college students whose families are unable to provide financial assistance. Therefore, our disadvantaged students are forced to work additional hours compared to peers who have additional time to study.
- 2. Academic Skills: Many of our disadvantaged students are ill prepared for the rigors of a Computer Science, Engineering, or Mathematics curriculum. These students spend additional semesters enrolled in foundation courses in comparison to their peers. Not only are Computer Science, Engineering and Mathematics curricula difficult, they also typically involve more unit requirements and therefore, additional study. With heavy work schedules, time management becomes a difficult task and academics suffer.
- 3. *Experience:* Many students are also first generation engineers or scientists. They do not have the role models in their families or friends to help them with their goal of becoming an engineer. Whether it is the ability to see first hand what an engineer does or how to handle the company environment, these students have not experienced engineering or scientific work and do not have someone they can turn to for advice.

Description

San Diego State University is committed to resolve the difficulties mentioned above. An award from the National Science Foundation for CSEM scholarships enhances this effort by:

- 1. Eliminating some financial burden including fees/tuition, books and supplies from our disadvantaged students. Students have the opportunity to reduce or even eliminate outside work hours. Focus returns to academic coursework, improving overall academic performance and increasing probability of degree attainment and;
- 2. Helping to attract more qualified students from disadvantage groups to continue their education and eventually become contributors to the community as well as their profession.

Further, the Scholars Program:

- 1. Allows the recipient to work side by side with an engineering or science faculty member on a research project to gain educational experience outside the classroom. This experience and confidence enables them to seek internships related to their majors, pursue further research work, and encourage an interest in graduate school;
- 2. Provide the Scholar with a mentor who is an engineer or scientist currently working in industry who can help the student with not only academic success but with professional development.

The SDSU/CSEM Scholars Program has served over 50 students during the three-year period from 2002 to present. Scholars have participated in several activities as part of their educational experience (the details for the scholars selection are provided in Section VI). The Program has run two periods; the 2nd to be completed spring 05. Each scholar attends an orientation which established the goals of the program, paired Scholars with their faculty mentors, introduced the Scholars to their industrial partners, and set the time schedule and milestones for each year.

Each Scholar meets with his/her faculty mentor to set up the research plans for the year and meet with members of the faculty's research team. At the end of each semester, scholars submit a project summary depicting their current research. At the end of each spring semester scholars compete in the Annual Undergraduate Research Symposium sponsored by the colleges of Engineering and Sciences. Attendees at the seminar include the Scholars, the faculty mentors, industry partners as well as other guests from the university and industry.

Besides the research activities, each Scholar participates in the following academic assistance and professional development activities:

- 1. *Academic/Personal Advising* help each student to develop a plan of study and select appropriate courses; in addition students can discuss milestones that can affect academic performance.
- 2. *Mid-semester Progress Evaluations* sent to professors to report students' performance in the course.
- 3. *On-going advising appointments* throughout the two-year period while the student is receiving a CSEMS scholarship.
- 4. *Career Exploration and Orientation Course* several faculty members from the College of Engineering and from the College of Sciences will present their areas of specialty to the students to provide exposure to the various disciplines available for study.
- 5. *Resume Writing/Mock Interview Workshops* facilitated by members of the industry advisory board. Students obtain a better knowledge of general and technical interview questions as well as have the experience of their first interview.
- 6. *Technology Career Fair* the annual fair hosts 80 engineering and technology companies. Students can use this opportunity to inquire about jobs, internships, new technologies developed at the company and share their experiences and resumes.

7. *Shadow Day* - students spend the day with an engineer or scientist partner at his/her company site, which allows each participant one on one interaction with an engineer or scientist partner, to ask questions, and view real world projects.

Support Infrastructure

The planned infrastructure for this Scholars program was the College of Engineering's MESA Engineering Program (MEP) that provides support to educationally disadvantaged students majoring in Computer Science or Engineering. In addition, the College of Sciences maintains an Office of Student Research and Support Programs (OSRSP) in which the Minority Science Program (MSP), in conjunction with MEP, serves Physical Science majors, including mathematics.

SDSU MEP, no longer an endowed member of MESA California Statewide, continues to implement many of the statewide components and best practices. Non – MEP students selected to receive a scholarship will be equired to participate in the program's retention and other activities as a condition of the scholarship. This will ensure proper tracking and participation in academic and professional development activities. However due to limited funding in academic year 03-04 and no statewide funding in academic year 04-05 it has been difficult to facilitate this program to its full potential.

Management and Administrative Plan

Dr. Karen May-Newman, Chair of the Mechanical Engineering Department, leads the management team for the SDSU/CSEM Scholars Program. MEP Director Theresa M. Garcia and other faculty members also serve on the management team. The management team oversees the selection of the students and coordination of the placement of students with faculty. The MEP Director facilitates the partnership between Scholars and industry mentors, the professional development activities and advising. Dr. Karen May-Newman is the third Lead Pi for this program and has recently been named chair to the Mechanical Engineering Department and is on sabbatical for spring 05. These events have contributed to the difficulty in facilitating this program to its fullest potential.

Student Eligibility

To be eligible, an applicant must:

- 1. be enrolled in or accepted for enrollment in an undergraduate degree program in Computer Science, Engineering or Mathematics at SDSU.
- 2. be United States citizens, nationals, refugee aliens, or permanent resident aliens at the time of application.
- 3. submit official transcript with a GPA of 2.5 or higher from current institution.
- 4. provide a resume of any work experience, including duties.
- 5. submit a narrative on why he/she wants to be a CSEM Scholar and how the experience will benefit the career objectives and impact both the future profession and society.

6. demonstrate financial need, as defined for undergraduate students by the US Department of Education rules for Federal financial aid

Students from educationally or financially disadvantaged backgrounds or from historically underrepresented groups in CSEM fields such as Native American, African American, or Mexican American (or other Latino) will be strongly encouraged to apply.

Criteria - Each applicant will be reviewed based on the following:		Total Points
Grade Point Av 2.50-2.74 (6), 4.00 (15)	e rage 2.75-2.99 (9), 3.00-3.49 (12), 3.5	0-
Financial Need Verification of n Aid Office	eed will be provided by the Financi	1-15 al
Letter of Record One recommend detailing future p	nmendation lation from Faculty or Industry perso promise	1-10 on
Personal State A letter or essa decision to study	ment y written by the applicant explainir [,] engineering	1-10 ופו
Student Organ, List participation PASE, SWE, IEE organizations	ization Participation in organizations such as NSBE, SHP E, ASCE, ASME and other communi	2E, ty
Parent's Level No formal educa Community Coll Post Bac degree	of Education ation (10), Pre-college education (8 ege education (6), 4-year degree (4 (2)	3), 4),
Current Job Sta Non-major relat current job (1)	a tus ed job (5), major related job (3), r	1-5 no
Current Number of Weekly Work Hours More than 20 hours per week (5), 10-20 hours per week (3), less than 10 hours per week (1)		er 1-5

Application/Selection Timeline (the same timeline was used for both applicant periods):

January - Scholarship applications were advertised by MEP Newsletter, email, flyers, and directly to the Computer Science, Engineering and Mathematics departments. Applications were made available at the MEP office, Student Organization meetings and mailed to incoming students accepted to San Diego State University with declared majors in CSEM fields.

March - Application Deadlines: included (1) personal statement detailing interest in CSEM majors, and (1) letter of recommendation estimating future performance as an engineer, official transcripts will be required from incoming students.

Information for current students was collected from the Student Information Management System (SIMS).

April - Selection committee reviewed applications and selected recipients.

May - Recipients were notified of acceptance or denial

June - Students submitted spring semester grades to the MEP office for verification and met with the MEP Advisor to verify completion of university entrance requirements. New student recipients were then enrolled into MEP where each student attended an advising appointment to ensure proper course enrollment.

July - A report of recipients, SSN, and dollar amounts was sent to the University Scholarship Office for the preparation and distribution checks in the Fall and Spring semesters.

August - A final confirmation of incoming students took place by the Scholarship Office to finalize distribution of checks. Students were matched with faculty advisors and schedules were agreed upon for research activity.

Academic year – meetings were held to bring scholars together for informational and workshop purposes. Group industry mentoring occurred. Tutoring also occurred where needed.

April – students competed in symposium.

May – Fall schedules were set.

Assessment

An Assessment Team consisting of representatives from industry, faculty members from the colleges of sciences and engineering, and staff members from the scholarship office as well as the MEP office. This team is in the process of evaluating the success of the Scholars Program based on the following:

- 1. Retention of students in Computer Science, Engineering and Mathematics
- 2. Graduation rates or progress towards graduation
- 3. Employment/internship rates
- 4. An improvement in GPA
- 5. Retention of students in research beyond scholarship program

Program Success will be determined by the percentage of completion of each criterion set forth above. For example, 90% of the recipients were retained in Computer Science, Engineering, and Mathematics, which represents a high level of success. A combined percentage rate of the above will determine overall success.

Due to the lack of budget and resources compounded by the changes in leadership results are not yet available.

Accomplishments and Future Plans

The CSEM Scholars Program provides assistance to over 50 qualified and well-rounded students to enter the workforce or graduate school by fostering experience and confidence in each scholar while improving his/her GPA and professional development. Participants in the Scholars Program, after gaduation, were able to contribute to our nation's social, cultural and professional growth by either becoming candidates to fill industry positions or move on into graduate school, in so doing decreasing the vast need in CSEM fields. The involvement of both current faculty and professionals in the workforce is helping the scholars to combine theory, research, and practice. Each scholar presents his/her research to faculty and industry representatives, among others at the annual symposium. Scholars have disseminated their research findings at academic research competitions and conferences such as CSU Research Competition. In the near future we plan to have the date available to show the success of the program.

Program Enrollment







References Cited

1. López-Isa, José (May 2004). From the Publisher's Desk: Top 100. Hispanic Outlook in Higher Education.

Contact Information

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