

Session 2148 – Building Bridges with Community Colleges

Building Bridges to Engineering Careers for Underserved Students

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abstract

A project with Waukesha County Technical College, Marquette University, and other partners, funded by a Congressional Award, increases the number of underserved individuals completing a degree to enter rewarding engineering careers. This model program removes barriers through collaborative linkages with secondary and post-secondary institutions, businesses, and community, minority, and professional organizations to recruit, support, and retain underserved students. It integrates program curricula and creates detailed plans to replicate this program at other institutions.

introduction

There is a need to increase the number of women and minority engineers and the number of women and minorities in engineering education. Women accounted for approximately 35 percent of employed engineers between 1993 and 1999, Asians made up about 11 percent, African-Americans and Hispanics each made up about 3 percent and American Indians made up less than 0.5 percent [1]. Although engineering is “gaining in popularity at all degree levels” [2], according to the results of ASEE’s 2001-2002 survey, women and minorities are underrepresented in engineering with women earning engineering degrees at between 17 and 22 percent, and African-American and Hispanic students both represented at less than 5.5 percent at the undergraduate level [2].

United States Bureau of the Census data is useful to compare relative percentages of groups including gender, race/ethnicity, and disability. That data shows that the demographic composition of the population in 1999 included approximately half women, African-Americans and Hispanics each were 12 percent of the population, Asians were 4 percent of the population, and American Indians were less than 1 percent of the population [3]. The U.S. Census Bureau estimates that in 1997, about 20 percent of the population had a disability [4].

background

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In Fall 2002, Waukesha County Technical College (WCTC) received a \$700,000 congressional award for the development of a joint curriculum and transfer program with Marquette University for the fields of engineering and nursing to benefit underserved populations [5]. Underserved populations who may benefit include members of minority groups, the financially disadvantaged, people with disabilities and those who consider careers in engineering and nursing non-traditional occupations.

Individuals may be underserved for a variety of reasons including financial condition, home and family situation, academic setting and cultural/lifestyle obstacles. In addition, engineering can be a rigorous and competitive academic program. These challenges contribute to potential students finding it difficult to realize success. Individuals among underserved populations often find it helpful to study in an educational environment where additional support services are readily available. This program is designed to provide a nurturing environment to assist students to achieve successful outcomes. The congressional award program will help underserved students start their engineering education at WCTC and progress seamlessly through a bachelors degree program at Marquette University.

The process of transferring degree credit course work from a two-year technical or community college to a four-year institution has historically been difficult for students. Engineering courses with high levels of mathematics (Calculus) and science preparation often result in denial of course credit transfers resulting in extended times to complete a baccalaureate degree. Individuals transferring from two-year to four-year institutions may be required to start their engineering education over from the beginning.

Transfer agreements designed to make it easy for students to transfer credits have existed between WCTC and Marquette University since 1995. The current agreement allows students to complete their first two years of electrical or mechanical engineering technology at WCTC and then transfer to Marquette University to complete their bachelors degree. Since 1995, over 50 engineering-related students have already successfully transferred from WCTC to Marquette University to complete their bachelors degrees in engineering.

project objectives

The project goal is to increase the number of underserved individuals who persist to completion of an engineering degree. Capitalizing on the existing relationship between WCTC and Marquette University, the following objectives were developed:

1. Establish Advisory Committees to advise and develop strategies and resources to assist with recruitment, support, and retention of underserved students for transfer engineering programs.
2. Integrate program curricula to optimize opportunities for multiple entry and exit points and for students' success and degree completion.

3. Establish collaborative linkages with secondary and post-secondary institutions, business and industry representatives, and community, minority, and professional organizations to recruit, support, and retain students.
4. Enroll 12-15 underserved students to begin a pre-engineering program at WCTC in Fall 2003.
5. Create a detailed plan to replicate this program at other institutions.

project plan

A comprehensive plan involving collaboration within and between WCTC and Marquette University personnel was developed. The plan includes services and activities to develop the relationships necessary for breaking down barriers and building bridges to engineering careers for underserved students.

Successful implementation of the plan requires collaboration of individuals at both institutions and the input of an advisory committee consisting of school administrators, teachers, and counselors, as well as representatives from business, professional organizations, and community groups. An abbreviated list of activities planned includes:

- Recruit advisory committee members
- Convene Advisory Committee, begin establishment of collaborative linkages
- Begin program curricula integration
- Begin recruitment of engineering students for program
- Purchase and begin distribution of promotional items
- Convene Advisory Committee to review work to-date and obtain feedback
- Enroll students to begin pre-engineering education
- Hire student mentors
- Construct project website
- Evaluate student progress and success
- Evaluate program success using quantitative and qualitative measures
- Develop and disseminate program replication plan

As part of the plan, a shared program tasks matrix was developed including over 125 tasks. Individuals with primary and support responsibilities at both institutions were identified for each of the tasks. Target dates and tangible outcomes were identified.

project implementation and successes

With the support of top administrators at both institutions, stakeholders held monthly, weekly, and sometimes daily meetings implementing the plan. The project goal, objectives, tasks, and timeline were continuously reviewed and compared to progress made.

Successes include the identification of 16 students from underserved populations to engage in the engineering congressional award program, some who began pre-engineering classes at

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WCTC in Fall 2003. An active, diverse advisory committee provided insights and helped develop strategies to recruit, support, and retain underserved students for transfer engineering programs. Collaborative linkages with business and community organizations were established while enhanced collaboration both within and between WCTC and Marquette University were realized. WCTC and Marquette University program curricula were aligned to maximize opportunities for multiple entry and exit points and for student success and degree completion. As an added benefit, institutional processes were improved which benefit not only underserved students but all students.

summary

There is a clear need to increase underserved population representation in engineering education programs and occupations. A clear plan developed through collaboration within and between two-year and four-year educational institutions, and other partners, can optimize progress toward that goal. WCTC and Marquette University are effectively addressing the need.

recommendations

It is recommended that two-year and four-year institutions' engineering educators who wish to improve underserved population representation in engineering education programs and engineering occupations begin dialog about collaboration to achieve their individual missions and shared visions. All levels of administration and faculty should be involved in identifying resources, objectives, plans, timelines, and all the activities necessary for breaking down barriers and building bridges to engineering careers for underserved students.

acknowledgments

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author's biography

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