

Industry Involvement in the Women in Applied Science and Engineering (WISE) Recruiting and Retention Programs

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Abstract - Industry has recognized that the employment of women and minorities is critical in maintaining a diverse and progressive engineering environment. Concurrently, the increasing need for universities to produce engineers from diverse backgrounds has brought about the need for special programs that encourage the retention and development of underrepresented groups. Usually, only minimal funding is provided at an institutional level. However, the financial need of these programs has rapidly increased causing university diversity programs to seek external support. The coupling of industry and university programs has brought about a mutually beneficial relationship that maximizes the educational experience for both the present and the prospective engineering student.

Industry has played a significant role in the Women in Applied Science and Engineering (WISE) recruitment programs. For example, industry has offered financial support, sponsored company tours, and initiated the participation of engineers to serve as educators and speakers for both middle school and high school summer programs. In addition, industry has played a significant role in WISE retention programs including the multi-tiered Mentor Program and on-site Shadow Program. These programs foster relationships between students and engineers and help bridge the gap between education and employment. Finally, industry members have further strengthened collaborative efforts by serving on the WISE industry advisory committee and participating as industry panel members at various events.

An overview of WISE programs that involve industry support will be presented as well as a discussion of the impact industry has made on these particular programs. In addition, the mutual benefits of industry supported pre-college recruitment and college retention programs will be discussed.

Introduction

According to recent reports, rapid growth in the Phoenix metropolitan area has sparked an economic boom that has attracted a variety of high-tech companies. The Phoenix area population currently supercedes 2.7 million and has contributed to the relocation of many large corporations as well as aided in the expansion of existing facilities. The Phoenix metropolitan area alone accounted for approximately 85 percent of Arizona's new employment opportunities last year [1]. Future projections indicate that by the year 2000,

the population in Arizona may increase to nearly 5 million citizens. Therefore, the ever increasing labor force will continue to attract and contribute to future growth of industry in this area.

Due to the unstable financial climate in the 1980's and early 1990's, many colleges and universities have experienced reduced funding at the Federal and State level. Since academic institutions have continued to face financial pressures, such as increased enrollment and increased tax expenditures, they have begun to explore alternate funding options. Universities are faced with the issue of how to provide better educational opportunities at a minimal cost to the student [2]. Concurrently, industry is faced with the issue of presenting a more diverse engineering workforce to their national and global business partners. Therefore, it is increasingly beneficial for industry partners to offer monetary support or their expertise in the development of university engineering recruitment and retention programs.

A continuing concern for many engineering colleges is the lack of professional training within the curriculum. Since the demands of the engineering course curricula are high, universities are systematically unable to provide a method for educating the student about the profession they are entering [3]. However, employers and universities conclude that additional exposure to an industry environment is fundamental to the student's professional development. By fostering relationships between students and industry, it becomes increasingly favorable that engineering graduates will be able to quickly adapt to a business environment [2]. A closer interaction between professional training and engineering education is therefore seen as a beneficial tool.

The Women in Applied Science and Engineering (WISE) program at Arizona State University was founded in 1993 to support the needs of women in the College of Engineering and Applied Sciences (CEAS). The goal of the WISE program is to recruit, retain, and graduate female engineering students. WISE is dedicated to serving the needs of these students by improving the CEAS environment and ensuring the future representation of women in our college and the engineering workforce.

Due to the proximity of companies situated around Arizona State University, a unique relationship has developed between WISE and local industry. Industry involvement in WISE programs is instituted on several different levels including offering financial support to existing programs, providing students with company and career-related information, and offering support and networking

opportunities from individual engineering professionals. Industry has begun to invest their resources at a fundamental level by providing both direct and in-kind support. This type of support has become an integral part in the maintenance and development of WISE programs.

Recruiting Programs

TEAMS

The WISE TEAMS (Teaming Engineering Advocates with Middle School Students) is a three-day summer commuter program held annually since 1996. This program was designed to encourage middle school girls to consider engineering as a potential career choice and to increase enrollment of females in higher level math and science courses. During the three days of programming, participants take an active role in scientific problem solving by exploring principals in several different engineering fields including bioengineering, chemical engineering, materials science, and construction. Each laboratory presented offers hands-on activities that are educational to the middle school student and foster an interest in engineering.

WISE-Up

WISE-Up is a summer program held annually since 1994. In 1997, this program was offered in two, one-week residential sessions and accommodated over 80 participants. WISE-Up was instituted to provide information about engineering to high school aged girls and to facilitate the recruitment of women into the CEAS. Like the WISE TEAMS program, participants are exposed to several different areas in engineering by conducting hands-on activities and laboratory experiments. Due to the relative ages of participants, laboratory activities in this program promote more in-depth discussions and require an increased knowledge of problem solving techniques. In addition, by establishing WISE-Up as a residential program, participants are exposed to activities centered around engineering during the day and activities directed toward team building and group interaction at night. Because of the dual nature of the program, participants are able to obtain a well-rounded college experience that includes both educational and social factors.

Industry Connection

During the past few years, industry has played an integral part in the maintenance and evolution of WISE pre-college summer programs. Not only have local industries provided direct funding for both TEAMS and WISE-Up but, they have been involved at a fundamental level by providing support through company tours, networking opportunities, and in-kind contributions.

The WISE TEAMS program was first funded in 1996 as a pilot program to introduce middle school students to opportunities in engineering. Because funding obtained was only intended to support the program for one year, external funding was sought to continue TEAMS on an annual basis. Direct funding provided by local industry has allowed WISE to continue this program for both 1997 and 1998 summer sessions. Because company contributions have grown with the expansion of the program, TEAMS will include two sessions in 1998.

WISE-Up began as an internally funded program to introduce high school students to career opportunities in engineering and recruit female students to the CEAS at Arizona State University. Since this program has expanded from a three-day commuter program in 1994 to a five-day residential program in 1997, funding needs of the program have changed. In addition, the program has grown to accommodate twice the number of participants since the first few years the program was offered. Therefore, finding company sponsorship is a primary concern and a necessary factor in the continuation of WISE-Up. Because local industry has recognized the importance of these types of opportunities for young women and recognized the investment they are making in their future workforce, they have also provided funding for the 1998 WISE-Up summer program.

In addition to providing direct sponsorship of the WISE pre-college programs, several other local industries have provided company tours for these programs. Last year, TEAMS participants were able to visit several different engineering companies and directly relate their laboratory activities with real-world applications. Because of the young age of participants, tours were scheduled at several local companies that could offer both informational and visual appeal to the students. Tours included visiting a helicopter manufacturing facility, a waste-water treatment facility, and a bioengineering company. In addition, representatives from the education department of a local company visited the campus and conducted a laboratory on silicon wafer production. The hands-on experiment for the laboratory included simulating silicon wafer production using familiar food products (salami and cheese). A comparable laboratory was also conducted for WISE-Up participants however, these students were introduced to silicon wafer production at a higher level and were able to explore the process in-depth.

Participants in WISE-Up were also given the opportunity to tour local companies during the five-day program. Company tours for these students were geared toward introducing engineering professionals, profiling the company, and guiding their academic and professional development. Participants were divided into three groups of sixteen students and allowed to choose two tours from six local companies. Students were able to tour facilities that manufacture satellites, helicopters, silicon wafers, a local electric company, and the company that sponsored WISE-Up. Company tours included many in-kind contributions such as lunch for the students, company posters, T-shirts and group photos. During one particular tour, high school

students were able to directly interact with engineering professionals in an informal setting by discussing their future career plans during lunch.

In addition to company tours, two industry professionals were invited to speak at luncheons held at the end of each of the one-week WISE-Up sessions. These keynote speakers were invited to speak about their company, why they chose the field of engineering and their individual career backgrounds and paths. By speaking in a formal setting, these professionals not only provided information concerning engineering but, were able to serve as role models for the participants.

In receiving direct sponsorship from local industry for both programs, providing educational laboratories taught by engineering professionals, participating in industry panel discussions and providing company tours, local industry has given much support for WISE pre-college programs. The benefit is that continuous educational programming (provided from middle school through high school and to college level) can be fostered by industry and expanded to accommodate programming needs.

Explorathon

Explorathon is a one-day program held in conjunction with the American Association of University Women (AAUW) and dedicated to providing both middle school and high school female students with career related information in the sciences. In 1997, over 500 girls and 100 parents/teachers attended seminars, campus tours and various events. Local industry has played a significant role by providing funding, recruiting professional engineers to serve as educators and seminar lecturers, and participating in presenting company information during the Explorathon career fair.

Retention Programs

Mentor Program

The WISE Mentor program was established to provide support for women in the college and promote the linking of resources between students and professionals at various stages in their careers. Mentors provide their mentees with career related information and offer guidance by answering questions regarding resume writing, interviewing, and how to approach industry for employment opportunities.

The WISE mentor program is a multi-tiered program that facilitates the relationship between students and industry. This program benefits students at several stages in their academic career and involves women in high school through graduate school. Each student is paired with a mentor who is presently at the next higher level. High school students are introduced to lower division undergraduates that are able to offer advice concerning making the transition into college. In return, lower division undergraduates are paired with upper division undergraduates who are able to answer questions regarding course instructor preferences and undergraduate programs of study. Upper-

division undergraduates then have an opportunity to be paired with either a female graduate student or an industry professional, depending upon her particular career path. Finally, graduate women are also paired with engineering professionals who are able to ease the transition from education to employment by offering advice about resumes, interviewing, job opportunities and balancing career and family. WISE acts as a catalyst for introducing these students and facilitates the growth of a network of support for female engineering students and professionals.

Presently, industry involvement in the WISE mentor program is ever expanding. Not only have individual professionals been involved in our program but, several local companies have advertised and recruited their female engineers to offer their experience and expertise. These women share a common interest in engineering and are able to provide college and graduate students with an invaluable resource. In addition, industry involvement provides a continuing support system that establishes a pipeline for women and creates an opportunity for professionals to return their support and experience to other women.

Shadow Program

The WISE Shadow Program is a relatively new concept that developed from interested female engineering students and industry members involved in WISE. This program facilitates an active learning environment while providing the student with career related information by an industry professional. Job shadowing is a process through which an established engineer provides information about a particular engineering field by allowing a female CEAS student to observe them during their daily work practices.

Recently, WISE has developed a relationship with the Industrial Engineering (IE) division of a helicopter manufacturing company. A small group of interested students are invited to shadow engineers on a monthly basis within this particular division. Areas of the company and the manufacturing process observed include production, final assembly, composite materials, machine shop, and electrical shop. This on-site program is important in educating students about their possible career choices. WISE is continuing to expand this pilot program to other companies and engineering disciplines.

Special Programs & Resources

In addition to establishing mentoring and job shadowing programs, WISE has also developed various special programs and provided resources that have aided in the retention of female engineering students. Industry involvement has continued to increase in these programs as well.

The WISE Scholars Program is a one-year pilot program sponsored by the National Science Foundation (NSF) and local industry to encourage female undergraduate students to pursue graduate school. In 1997, 20 students and 7 alternates participated in the program. These students were

paired with graduate women and industry mentors as they participated in research projects under the supervision of a faculty member. Students were also required to attend seminars and industry panel discussions. Industry support for the program also included additional financial support for banquets and receptions.

The WISE-Post is a quarterly newsletter published by WISE and distributed to current female graduate and undergraduate students within the CEAS. In addition, the WISE-Post is distributed to former participants in WISE pre-college programs, CEAS faculty, and over 800 industry partners. WISE-Post editions are sponsored by industry. In return, the front-page article profiles the company that sponsored the edition. An article that features a female engineer employed with the company is also published.

WISE has also created an email network for current undergraduate and graduate female CEAS students. Along with posting WISE events, companies are able to submit email notices for internships, job opportunities and dates for on-campus company recruiting and interviewing. These notices are then forwarded to the email network and allow companies to reach a broad range of students.

Industry also supports many WISE special events. This semester, a local company is hosting a dinner for fifty electrical engineering and computer science juniors and seniors. These students will be able to network with engineers and receive company-related information. This type of opportunity is beneficial not only for company recruiting purposes but, also for student internship/co-op and employment opportunities.

Finally, WISE has encouraged the establishment of an industry advisory committee. Members from industry and CEAS administrators meet several times per year to discuss industry needs and discern future directions of certain engineering special programs. This type of dialogue ensures excellent communication between parties and creates a direct link between industry and academia.

Program Impacts

Although results are preliminary, data acquired through participant surveys and university student tracking systems show a positive impact from WISE recruiting and retention programs. Overall percentages of women enrolled in the CEAS increased from 18.7% in 1996 to 19.3% in 1997. In comparison, the 1996 national average for women's undergraduate enrollment in engineering programs was 19.0%. In addition, the percentage of women enrolled in CEAS graduate programs increased over 7%, from 19.8% to 21.0% in 1997. However, graduate enrollment figures for women increased nearly 12% and women graduate students accounted for 17.9% of the national enrollment in 1996. Retention rates for female students new to the CEAS after one year remained roughly constant at 71% in 1997 [4].

Although it is difficult to determine the direct impact of WISE retention programs, retention rates for students who participated in at least one WISE program have dramatically increased. From data acquired through university tracking

systems on 300 (+) students that participated in WISE retention programs in 1995-1996, 93.6% have either graduated or are still enrolled in the CEAS [4]. Data acquired from WISE recruitment programs are not yet available however, preliminary data suggest positive increases in CEAS enrollment from program participants within the next few years.

Academic Benefits

By creating partnerships with industry, academic institutions and diversity programs are provided with alternative funding options. Industry partners provide a steady, reliable flow of revenue over time that can outweigh revenue provided by state funding [5]. Local industry has helped not only to provide direct funding and in-kind support but, has incorporated additional resources that have benefited the evolution of WISE recruiting and retention programs. Both companies and engineers have invested themselves in the future engineering workforce by maintaining these programs.

Because companies are willing to give university programs financial backing, students involved in these programs are able to establish a first-hand relationship with industry. This simple interaction benefits engineering colleges and leads to better recruitment and retention. Because the demand for engineers is growing faster than the universities can produce graduates, high-tech companies are trying to develop mutually beneficial relationships at a fundamental level [6]. Students are able to see that industry is investing in their educational careers. They become aware that companies are targeting specific majors and that engineering is a lucrative and attainable career choice.

Industry Benefits

There are also numerous advantages to industry by supporting these partnerships. Many companies are now realizing that diversity in their workforce is an integral part of competitive business practices. The globalization of business has necessitated that industry provides a diverse and inclusive representation of its workforce. Internally, industry has found that an inclusive and diverse workforce inevitably provides better and unique solutions to problems [7]. Therefore, by supporting university diversity programs industry is directly ensuring that minorities and women will be available to meet future engineering demands.

Another advantage is that companies are able to gain a competitive edge by sponsoring WISE recruitment and retention programs. Program sponsorships serve as an effective means of advertising. In addition, by sponsoring retention programs, they are able to gain competitive recruiting advantage over companies who are uninvolved with the university. Local companies that have minimal contact with students or ineffective means of developing relationships with students are less likely to recruit outstanding graduates. Industry has a vested interest in producing engineering graduates that are marketable and are

targeted as potential future employees. Therefore, it is increasingly beneficial for industry partners to offer monetary support or their expertise in the development of university recruitment and retention programs.

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