# Facilitating the Transfer of Female S & E Students: A University and Community Colleges Coalition

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## INTRODUCTION

The Women in Engineering Initiative (WIE) at the University of Washington was established in 1988 with an overall objective of increasing the numbers of women obtaining degrees in engineering. From the beginning, the presence of female transfer students from community colleges was felt in the programs and services of the WIE Initiative with over 25 percent of engineering department enrollments filled by transfer students (31% in August 1993 with women comprising 23% of these transfer students). With women representing 50 percent of the approximately 44 percent of American college students enrolled in community colleges, it was clear that female students at the community colleges represent a significant pool of talent that was not being adequately tapped (1,2). At the same time the unique issues and problems these students experience in transferring to a four-year institution became increasingly clear. They represent a significant population of science and engineering education - a group whose needs are not being addressed.

Typically, women in science and engineering face barriers such as a lack of role models, isolation, and coping with competition. Women making the transition from community colleges encounter numerous obstacles unique to transfer students in addition to these. In *The Transfer Challenge,* Harold Wechsler summarizes these barriers under the following seven categories: academic and articulation barriers; inadequate support systems; economic barriers; bureaucratic barriers; geographic barriers; age impediments; and racial and ethnic concerns (3). Students experience challenges such as: receiving poor or biased academic counseling; discovering that the courses they completed are not the right ones, or will not transfer; a lack of peer support; and, university faculty who tend to stereotype them, hold low expectations of them, and blame them for being deficient (4,5). In addition, many female transfer students tend to be older, returning to school after having raised a family, or who are preparing for a new career. Many of them are single parents who carry heavy financial responsibilities requiring that they work while attending school. It was in response to seeing the potential pool of talent for science and engineering among female community college students, as well as the barriers they experience in transferring to a four-year institution, that the Community College Bridge Program was initiated. It was also clear that to truly be effective in the long term, a comprehensive and institutionalized approach needed to be taken (6).

Therefore, under the leadership of the WIE Initiative at the University of Washington, a Bridge Program with five community colleges in the Seattle Metropolitan area was established. Math, science and engineering faculty, and the Directors of Women's Programs at all of the institutions were involved in the design and implementation of the program. Two factors were helpful, but not required, in initiating this project. First, legislated statewide articulation agreements between four-year institutions and community colleges make transfer of credit easier to facilitate, and secondly, women's programs are institutionalized at almost every community college in the state. Five Satellite WISE Programs were established at Bellevue Community College, Edmonds Community College, North Seattle Community College, Seattle Central Community College, and Shoreline Community College to form the Bridge Program Coalition.

## GOALS AND OBJECTIVES

The goal of this project is to develop, implement and evaluate a Bridge Program with five community colleges to facilitate the transfer of female students into science and engineering at the University of Washington. The project objectives are:

1) To identify and recruit female students enrolled in the community colleges.

2) To develop a comprehensive Bridge Program at the University of Washington and at each of the five community colleges, to facilitate the transfer of female students to 4-year institutions offering degrees in science and engineering.

3) To track participating students, monitor their progress, and provide a mechanism for accountability.

4) To evaluate the effectiveness of the Bridge Program in increasing the numbers and percentages of women transferring and graduating with a degree in science or engineering.

5) To foster communication and collaboration among the participating institutions by holding quarterly meetings of the Coalition.

## PROJECT IMPLEMENTATION

Under the leadership of the WIE Initiative, certain tasks were assigned to the community colleges and others to the WIE Initiative. Coordination and communication among the institutions have been critical to the success of the project as a whole. The next sections will describe the specific responsibilities of the WIE Initiative and the five community colleges.

### Responsibilities and Tasks of the WIE Initiative

The responsibilities of the WIE Initiative include the following:

1. Conduct the **overall management** of the Bridge Program. The Assistant Director for Community College and Undergraduate Programs at the WIE Initiative

serves as the Program Manager of the Bridge Program. The project management responsibilities include designing, implementing the evaluation plan, and maintaining the student tracking system for the Coalition.

2. Initiate and sustain **open communication** and on-going **collaboration** among the Coalition members. The WIE Initiative conducts regular meetings with the Bridge Program Board of Directors, composed of faculty and administrators from each of the community colleges and the University. On-going communication with the assigned community college coordinators is maintained by conducting monthly/quarterly meetings, sending regular mailings, and making weekly telephone calls.

3. Provide **technical assistance** to the community colleges. This includes how to set up a satellite program, how to identify and recruit students, and how to track their progress. The WIE Staff design the registration and evaluation forms and provide information on various program resources including: speakers, films, books, lectures, seminars and conferences. In addition, the Program Manager advises the Satellite Coordinators on the design and promotion of events and services.

4. Provide **advising and counseling services** to the community college students prior to their admittance to the university. Students are referred to the appropriate campus offices, and they are assisted with the application process to both the University and the science and engineering departments. They are provided with information on scholarships and financial aid, and they are linked with the appropriate WIE programs and services.

5. Finally, the WIE Initiative was responsible for **sponsoring events** on the UW campus, including the following:

> The WIE staff organized an ***Introduction to Engineering*** event at each of the five institutions, which included female engineers, female faculty and female engineering students serving as the speakers and role models. These events were highly successful in recruiting students to register for the Bridge Program and in connecting them with other students, both on their campus and at the UW. Each event was unique, reflecting the interests and needs of the students on the individual campuses. Over 200 female students from the community colleges attended these events during the first two years of the project.
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> During April of every year, a ***Women in Engineering Conference*** sponsored by the WIE Initiative is offered at the University of Washington. It is attended by about 250 students, faculty and professional engineers from 14 states, including about 100 students from the community colleges. The conference features informative and motivational speakers on topics such as: career options in engineering; issues women face in non-traditional careers; how to transfer to the UW from a community college; opportunities for careers in academia; coping with competition; and balancing career and personal time.

Both the *Introduction to Engineering* and the *Women in Engineering Conference* are critical in: 1) inspiring female students to pursue engineering studies and careers; 2) promoting the programs and services of the Community College Bridge Program; and 3) recruiting community college Bridge Program participants. Solid relationships with many future transfer students are established at these events.

In addition to these events, a ***Women in Engineering Open House*** at the University of Washington is held twice a year. UW engineering students lead community college students on tours of the engineering buildings and the UW campus, returning to the WIE Study Center for refreshments and a discussion period with the UW students. This program has proved to be very significant in preparing the community college students for the different environment at the university and in orienting them to the resources available on the campus. They express feeling confident and reassured about transferring to the university following these tours.

Finally, the Community College Satellite Programs organized groups of community college students to attend the bi-annual ***College of Engineering Open House***, to which the WIE Initiative is a key contributor.

## Responsibilities and Tasks of the Community Colleges

The Satellite Bridge Programs at each institution are managed by the Women's Programs. Every year, each community college sets specific program objectives which are unique to their institution. However, the common elements on each campus include: 1) identifying and recruiting students; 2) interviewing and registering students in the Bridge Program; 3) implementing Bridge Program events; 4) implementing a tracking system, including profiles of students, demographic variables, and academic records; and 5) evaluating the Bridge Program at each community college.

The next section provides a profile of each community college, and describes the recruitment and registration efforts and the Bridge Program activities of each satellite program.

## Satellite Program Profiles:

### 1. Bellevue Community College:

Bellevue, located in the suburbs, is the third largest community college in Washington State with an enrollment of approximately 15,000 students. About 60% of the students are female, 40% are male, and 15% are minorities. Forty-five percent of the students are 25 years or older. Bellevue Community College has a quality engineering program with strong support from both the chair of the engineering department and the chair of the math/science department.

**2. Edmonds Community College:**

Edmonds Community College is a suburban, fast-growing institution of about 8,800 students. About 56% are female, 44% are male, and 18% are minorities. Forty-five percent of the students are over 30 years old. Edmonds has always taught the required math and science courses needed to transfer into engineering at the UW, but its engineering department is relatively new.

**3. North Seattle Community College:**

North Seattle Community College is an urban campus of about 9,000 students, and serves as one of the largest feeders to the UW. Approximately 56% of the students are female, 44% are male, and 25% are minorities. Seventy-three percent of the students are 25 years and over. The Bridge Program is actively supported by the math, science and engineering faculty. A Women in Technology Program established prior to this grant has provided a foundation for participation and leadership.

**4. Seattle Central Community College:**

Seattle Central Community College is an urban institution with a population of almost 10,000. Of these students, 58% are females, 42% are male and 40% are minorities. Seattle Central has the highest percentage of minority students among the community colleges in the state. Sixty-two percent of the students are 25 years and over. There is strong institutional support for encouraging women to pursue non-traditional career paths.

**5. Shoreline Community College:**

Shoreline Community College is a suburban institution of about 8,000 students. About 61% of the students are female, 39% are male, and 14% are minorities. Forty-five percent are 25 years and over. Math/Science is the second largest department in the institution, and most students transfer to the UW.

**Recruitment and Registration Activities:** Community College students are identified and recruited to participate in the Bridge Program in a number of ways including the following:

1) Announcements are made to all math, science, and engineering classes by both faculty and the Bridge Program Coordinators promoting the services provided and the events which are sponsored. In two cases, the coordinators have been students who are highly visible among their fellow students and among the faculty. This has enhanced their impact on their institution.

2) An interest survey questionnaire has been sent to all female math, science, and engineering students at the beginning of the year.

3) Flyers, posters, mailings and newsletters promote the many programs and services throughout the year.

4) Students are encouraged to register when they seek individual advising and when they attend any Bridge Program event. In all five schools, an official student organization referred to as the Women in Science and Engineering (WISE) Program has been established to which students are invited to join.

**Bridge Program Activities:** Students have had the opportunity to participate in a variety of activities and events offered by the Satellite WISE Programs including seminars on topics such as *Math Anxiety*, classroom presentations by professional female engineers and scientists, academic advising, and field trips to local companies. In addition, the students have participated in numerous events sponsored by the WIE Initiative and the University of Washington including the WIE Annual Conference, an *Introduction to Engineering* event held at each community college, and the UW Transfer Advising Day which was followed by a WIE Open House with tours of the engineering departments. The table on the following page lists the main Bridge Program activities and indicates the participation of each school, reflecting the uniqueness of each institution and the interests of their students.

# BRIDGE PROGRAM ACTIVITIES

| SATELLITE PROGRAM EVENTS | BCC | ECC | NSCC | SCCC | SCC |
|---|---|---|---|---|---|
| Panel Presentations by S&E Professionals | X | | X | X | X |
| Focus Group Meetings to Identify Key Issues | X | | | X | |
| Luncheon Support Group Meetings | X | | X | X | X |
| Individual Advising and Counseling | X | X | X | X | X |
| Professional Engineers Speak to Math Classes | | X | | | X |
| Field Trips to Local Companies | | X | X | | X |
| WISE Meetings & Math/Science Club Meetings | X | X | X | X | |
| Tutoring/Study Groups | | | X | X | |
| Weekly Speaker Series | | X | | X | |

| WIE/UW-SPONSORED EVENTS | BCC | ECC | NSCC | SCCC | SCC |
|---|---|---|---|---|---|
| "Introduction to Engineering" Event | X | X | X | X | X |
| WIE Annual Conference | X | X | X | X | X |
| WIE Open House | X | X | X | | X |
| UW Transfer Advising Day | X | X | X | X | X |
| UW Engineering Awareness Reception | X | | X | X | X |
| College of Engineering Open House | X | X | X | X | X |
| "Discover Engineering" Presentations | | X | X | | |
| WIE Mentoring Events | X | X | X | | X |
| Guest Lectures Science/Engineering | | | X | X | |

BCC = Bellevue Community College
ECC = Edmonds Community College
NSCC = North Seattle Community College
SCCC = Seattle Central Community College
SCC = Shoreline Community College

## EVALUATION

An evaluation plan was designed during the initial planning stages in the Community College Bridge Program. Both process and outcome evaluation are an integral part of the program design. The components of the evaluation plan include the following:

1) Student questionnaires have been designed to measure both student satisfaction and the impact the project has had on facilitating their transfer process, and to gather suggestions for improving the project.

2) Staff and faculty questionnaires have been designed to measure faculty support, involvement and perception of the impact of the project on classroom climate issues.

3) A structured focus group is scheduled at the end of each year with the UW project manager and the community college program administrators to review their goals and objectives, assess their accomplishments, share their ideas and experiences, and propose any needed program modifications for the next year.

4) A tracking system has been designed at the WIE Initiative, coupled with information from the Registrar's Office, to measure changes in percent of female transfer students each year, admission rates into the departments, retention rates, and percent of degrees obtained by transfer students.

5) Student evaluations of events, as well as the participation rates, are gathered as a measure of interest in the topics of the events and in the overall Bridge Program.

6) An external evaluation is conducted annually by a consultant hired by the funding agency. The two-site visit includes: in-depth interviews with the UW program manager, the community college program administrators, students, faculty and other participants; attendance at events; feedback to the UW program manager at the end of the visit; and a written report to the funding agency.

There are some distinct limitations in the implementation of the evaluation plan. For the internal evaluation, questionnaires are designed by the WIE Staff, administered by the community college staff, and analyzed by the WIE Staff. After the project's first year, the community college coordinators administered the questionnaires, but were unable to adequately follow up with the students and faculty. As a result, the response rate was low. Steps are being taken to insure a greater return rate following the second year. In addition, the community colleges do not have access to computer-based systems, requiring that they implement and maintain manual tracking systems. Because the consistency and reliability of this data collection has been a concern, the WIE Staff have modified and improved the tracking procedures to assist the community colleges in this critical task. Once the student has been admitted to the University of Washington, it becomes much easier to track the student.

In conclusion, the evaluation plan has been designed to include formative evaluation, which provides useful information for monitoring and revising the programs. An example of one of the modifications was the development of new and more effective marketing methods. Summative evaluation has been designed to measure the outcomes of the project as they relate to the objectives, such as student satisfaction, student perceptions of the impact of the program on facilitating their transfer to the UW, participation rates, retention rates, increases in enrollments, admissions to departments, and degrees granted.

## CONCLUSION

The Community College Bridge Program is drawing near to the completion of its second year. Due to the success of the project, strong relationships among the University of Washington and the five community colleges have been established. Significant numbers of community college students have participated in the various events and services sponsored by the Bridge Program, many of whom have expressed more confidence in choosing a science or engineering major. At the community colleges, increased faculty and administrative support has been demonstrated. In addition, because of the visibility and increasing interest in the project, a statewide coalition of Bridge Programs with at least ten community colleges is being explored.

But most significantly, this program serves as a unique model for a critical national need: to open the pipeline for educating future scientists and engineers, to which the community colleges serve as a critical link. The Bridge Program is the first *comprehensive* project of its kind in the U.S. addressing needs of female transfer students in science and engineering. Respected associations such as the National Science Foundation, ASEE, and AAAS, have called for new and innovative approaches to engineering education that address a changing global economy, that recognize the need for, and actively work to increase, diversity in student populations. This project has addressed issues of recruitment, retention, facilitation of transfer, and the *climate* for women in science and engineering. It has demonstrated success in facilitating the transfer and retention of female students pursuing careers in science and engineering. And finally, the Community College Bridge Program has the potential to serve as a transferable model for other institutions to use in recruiting and facilitating the transfer of female science and engineering students to four-year institutions.

## REFERENCES


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