Peer mentoring is commonly used in universities for a variety of student services and instructional activities. However, use of mentors in independent instruction is relatively new in engineering education. The student-peer relationship is unique and can capitalize on certain traits such as honesty, approachability, and empathy. This potentially surpasses that of the faculty-student relationship. Capturing these elements and implementing them into the Freshman Engineering experience requires commitment and resources; however, in application to recruitment and retention, the numerous benefits outweigh initial investments.

The Freshman Engineering Seminar at the University of Pittsburgh is a non-credit course required by all freshman engineering students. It traditionally included guest speakers and panel discussions, and lacked involvement by upper-class engineering students. During the 1995-96 academic year, a redesign of the seminar occurred emphasizing small group discussions facilitated by student peer mentors. Content was expanded beyond departmental information to include development of student survival skills. These skills are not only important for the freshman transition but are also elements that lead to success in a changing workplace.

This paper discusses objectives of the mentor program and provides a comprehensive guide for others to follow when developing similar programs. Mentors were selected and trained to manage groups of twenty freshmen, as well as conduct recruitment activities. The paper further discusses how the program evolved from administrative directed to mentor initiated activities. Finally, keys to transporting such a program to another institution and troubleshooting hints are presented. The program has proven to be successful as demonstrated by improved retention and recruitment statistics, and through formal assessment of freshman students and mentor attitudes.

Introduction

Regardless of how strong an institution’s retention and recruitment statistics are, efforts are always directed to further improve enrollment. The University of Pittsburgh is no exception. In the School of Engineering, the freshman seminar was an obvious area providing opportunity for improvement. In previous years, the Freshman Success Seminar was presented in a large auditorium where all 250-300 freshman engineers met for presentations from engineering alumni, departmental faculty, and for discussions with engineering student panels. This style of presenting information was not only chaotic, but also not conducive to students learning valuable information about the engineering field and academic success strategies. In addition, the Freshman Program office lacked a sufficient student pool for involvement in recruitment activities. Given the combination of student boredom and a Freshman Program staff facing burnout, a proactive change was necessary.
A student’s engineering education should consist of more than technical knowledge and skills. In a recent ASEE report, it suggested that students must have skills that prepare an engineer to be successful in the changing workplace. Among these skills are: teamwork, communication skills, leadership abilities, an understanding and appreciation of the diversity of people, and a systems and multi-disciplinary perspective of engineering. These skills are equally important and necessary for the academic success of a freshman engineering student. In transferring these skills to freshman, the report identifies five major themes that should be contained in an Introduction to Engineering course: community building, professional development, academic success strategies, personal development, and orientation. We incorporated each of these areas into the Freshman Engineering Success curriculum with particular emphasis on community building and academic success strategies. Our program is unique in that we moved delivery of course material away from faculty to the use individual student peer mentors as the primary facilitator.

Mentor programs are not new to engineering schools. Many institutions have used upper-classmen in the classroom or as tutors. However, our use of mentors was to intentionally establish a growing relationship, primary to academics, to provide a support structure for all freshman engineering students. We felt it necessary to combine the need for community building and academic success strategies with direct involvement by peer mentors.

Selection of the Leadership Team

The process of screening and selecting mentors was the success of the mentor program. Selection of peer mentors began with interviews in the Spring semester before program implementation. A written application and two interviews were required; a screening interview followed by a secondary interview by the Director of the program. The following criteria were required for mentor selection.

Demographics. We wanted a wide disbursement of academic years among mentors so that there would be experience of graduating seniors and co-oping juniors, as well as mentors continuing in later years. Second, we looked for an equal number of male and female role models. Interestingly, we had a greater number of females than males interested in the program. Third, we were interested in having minority students in leadership roles. We had a difficult time identifying potential male minority students and in the end we hired two female minority students. Finally, we wanted a wide variety of mentors from in-state and out-of-state, as well as commuter, resident, and non-resident students. Geography was an important criteria for use in recruiting prospective students from target markets.

Interpersonal Skills. A written essay was part of the application process. Prospective mentors were asked why they wanted to be involved in the program. Individuals with careless responses were immediately excluded from the process, where candid and reflective essays usually resulted in initial interviews. During the interviews, we looked for substantive students who had examined and understood their experiences on campus, whether positive or negative, and were able to reflect on them in a positive manner. They could identify actions that they should have or did take, that could have or did help them in their academic and their personal lives. Second, we looked for students who had appreciation of differences. These differences could be: academic - recognizing that book smarts aren’t everything, ethnic - obvious but necessary, and individually - some students work well in chaos while others need strict organization and structure. These initial interviews were used to identify obvious mismatches. The applicant might have had a great essay, but in the interview, clearly lacked communication skills. The second interview more directly examined current abilities of the potential mentor.

Other Criteria. Grade point average (GPA) was not a major criteria; however, potential mentors could not be on probation. Of the twelve mentors, two had GPAs below a 3.0 on a 4.0 scale. Openness to scheduling flexibility was the final criteria. During the interviews, the mentors were informed that they were expected to return to campus
several days early. In addition, mentors were required to be available for early morning, evenings and occasionally Saturdays for recruitment functions.

The resulting mentor leadership team consisted of twelve mentors, of which half were female and two being minorities. Three mentors were out-of-state, two off-campus and one on-campus. Of the in-state students, two students were commuters from the Pittsburgh proper, the other students came from all parts of Pennsylvania, with all but two living on campus.

**Team Training**

A second key to the success of the program was the training of the new leadership team. We identified two half days for the training. Because our work with the mentors involved both recruitment and retention, we devoted one half day session to both.

The first half hour was spent as an ice-breaker, introducing students to each other informally. Although staff knew many of the students, many of the students did not know each other or all of the staff. The first day was spent reviewing the Freshman Program office functions and policies to include: enrollment and retention goals, office etiquette, the admissions process, recruiting events, and how to conduct building tours.

First day reactions of the training was that mentors wanted to know more about the leadership team members. They also expressed concern about the level of responsibility given to them. The students wanted structure while we were encouraging an open environment. Ironically, when we gave them rigid structure, interaction discontinued because it did not allow for the generation of ideas. As a result, the open environment was reinstated. Structure worked well for training, but as mentors took responsibility for their small groups, the structure disappeared. Mentor’s lack of initial confidence was likely to have created this challenge. Additional training should instill this initial confidence (2 full days). Incorporating techniques, such as role playing and experiential learning, may enhance initial levels of confidence.

During the second day of training, the new seminar approach was presented. We reviewed the seminar schedule and workbooks that were developed. We also discussed classroom climate issues and how to facilitate group discussions to include: the small group as a system, stages of group development and group dynamics, and promoting team work. More training should be spent in this area. Mentors were very eager to learn and develop these skills for themselves, and for use in small group discussions. To further build the leadership team’s identity, we concluded the training session by having the students identify a team name and select team T-shirts and sweatshirts. In addition to the initial training sessions, we conduct on-going, in service training is conducted throughout the academic year.

**Recruitment Activities**

Mentors are used as student resources for two major annual engineering recruitment programs. In addition, there are twelve scheduled admissions office programs. The major engineering program dates are mandatory for the mentors to attend. As mentioned previously, all mentors are trained to give engineering building tours, which include engineering laboratories and facilities. A major focus of the tour is the interaction that occurs between the mentor and the prospective engineering student.

**Phone-a-thons** are another recruitment responsibility of the leadership team. Prospective engineering students are contacted following admission into the engineering school to congratulate them and to answer questions. Prospective students are also invited to a “Day-On-Campus,” where students attend classes with a Pitt engineering
student to get a idea of what a typical day at school is like. Students visit the common buildings, resident halls, places to eat and hang-out, etc.

**Student Mentoring Seminar**

The second major *function* of the leadership team is to direct and conduct the weekly Freshman Engineering Success Seminar. The objectives of the seminar session are to:

1. help students *identify* skills and strategies which will lead them to success during their freshman year and throughout their undergraduate *education*,
2. develop an on-going relationship with an upper-class engineering student that the freshman engineer will use as a role model, and
3. educate the students about the various engineering fields and departments, resulting in an informative decision about which field to study.

The first two objectives are interrelated. Simply teaching students *survival* skills is not sufficient. Students need and want someone who can demonstrate by example how these skills can be implemented. For the third objective, students either have a preconceived notion of engineering fields of interest, have no idea what engineering *is*, or have misconceptions about the various fields of engineering and the departments offered. For this reason, students are introduced to three of the six departments through formal department visitations. During these sessions they receive information on career opportunities, curriculum requirements, and in some situations, hands-on demonstrations. In addition, students choose a special lecture to attend exposing them to faculty research.

Aside from introducing the students to the various engineering disciplines, the content of the seminar focuses on the survival skills necessary for success in the *freshman* engineering program. These include: goal setting, time management, stress management, and developing campus resources. In introducing goal setting in a time management *function*, students took the Goal Orientation Index, a self-administered instrument, to assist students in focusing on the their strengths and weaknesses in goal setting. The *Myers-Briggs Type Indicator* (MBTI) was also given to the *freshman* in the Summer during freshman orientation sessions for use in their small groups. The leadership team also took the instruments. The experience of learning about themselves proved to be *useful* to the mentors and the leadership *team*, but *failed* in the planned environment. The mentors were not skilled enough to explain and discuss these instruments for it to become a valuable experience for the *freshman*.

The leadership team met with the program director for one hour per week, planning the discussions that would take place as part of a selected seminar session. As multiple approaches to delivering methods were realized, the planning sessions evolved into brainstorming sessions of creative interactive activities designed primarily by the mentors. As a result, the delivery of the content changed from the original structure to one that was more *free-form*. Though teaching survival skills was important, precedence should be given to developing the relationship between mentor and students. Once there was a relationship between the freshman students, and between the mentor and freshman students, exploration of the survival skills and activities was more productive. Development of any group is critical for the content to be perceived as *useful*.

**Evaluation of the Program**

Evaluation of the impact of the Freshman Leadership Team was based on several aspects: recruitment statistics for the forthcoming academic year, retention in the *freshman* engineering program, *freshman* engineering attitudes, and mentor essays.

1996 ASEE Annual Conference Proceedings
Recruitment. As of March 1996, recruitment statistics for the 1996-97 academic year show a dramatic increase from previous years. Freshman applications to the School of Engineering increased by forty percent over last year. Further, matriculation deposits to the school improved by seventy percent over the previous year. Though, increases in recruitment results are not entirely attributed to the leadership team, it is believed that their impact has been a significant contribution. With the advent of the leadership team, the inclusion of students is an understood and consistent part of the preparation and planning for any and all recruitment events.

Retention. Though final retention statistics are not available until the close of the Spring term, at the end of the first semester, student attrition from the freshman engineering program has been at its lowest point in four years. Student attrition during previous years was close to nine percent during the first semester. This year, attrition was 4.4 percent at the close of the first semester. In evaluating cultural and curriculum changes, the new Freshman Success Seminars was the only identifiable and intentional change that occurred. Mentors provided a much needed resource at a critical time for students. They provided early intervention for existing academic and personal obstacles allowing for preventative versus reactive solutions.

Student Response. To determine the effectiveness of the mentors with freshman students and the seminar content, we conducted amid-semester questionnaire. In surveying student opinions about the effectiveness of the mentors, we found that students rated the quality of the interaction with the mentors high, but were mixed as far as the amount of contact outside seminar. Forty percent of the freshman chose to hold any discussion with their mentors until the seminar. The discussion outside the seminar was predominately through electronic mail and seeing/meeting mentors on campus, respectively thirty-one and twenty-four percent. We would like to increase the contact outside the seminar without over-taxing the mentor’s free time. While mentor activities appear to be time intensive, current committed time is only five to six hours per week per mentor. Despite differences in stylistic delivery, we found no significant differences between mentors in how students rated their mentor interaction.

Freshmen were not only pleased with the mentor-student relationship, but the surveys also indicated that students were highly satisfied with the classroom atmosphere. Though students had highly favorable attitudes towards the mentors, they were less satisfied with the seminar content, particularly the MBTI. Initial delivery of the course content material was lost using the ‘traditional’ lecture format. Eventually groups evolved away from the ‘teacher-student lecture’ to more interactive discussions between the mentor and the students. Because the changes in the delivery style started to occur in mid-October, the survey results may not be indicative of the changes that occurred.

Mentor Response. In addition to surveying students about the seminar, mentors were asked to prepare essays about their experiences as a member of the leadership team. Specifically, we asked the mentors to explain why they choose to participate in the program, what they have gained personally from their participation, what they were able to contribute to the team, and would they recommend this experience to other engineering students. From the essays, all students said they would participate in the experience again, but would make changes to the types of interactions and delivery styles with the freshman students. Further, the mentors felt they developed more interpersonal skills and were able to be more introspective about their own abilities. In essence, the experience nourished their own self-esteem.

Lessons Learned

From the evaluation of the program, the leadership team has been a success. However, we have identified two major categories that lend themselves to change, Administration and Content and Delivery.
Administration. To reiterate the importance of training the mentors, more focus should be placed on team building and small group intervention. If mentors are more equipped, weekly planning meetings can concentrate on the student-mentor relationship rather than on mentor skill training. Also, in the future we will include the current mentors in the interviewing and hiring of new mentors. This is important for maintaining continuity among the entire leadership team. Mentors will conduct the initial interviews, with the final interviews and selection conducted by the program director and staff.

Content and Delivery. Much energy was put into designing a Seminar Success Manual for the freshman. The manual included detailed units on individual survival skill development, specifically: self-esteem, time management, and resource development. We quickly learned that while the information was valuable, the ‘traditional’ teacher-student format in which it was delivered was not conducive to the intended environment of the seminar. As a result, the manual was only occasionally used as a reference as the seminar activities were designed by mentors. We plan to discontinue the student manual and replace it with a resource guide for the mentors. This will give the mentors an opportunity to implement their own interactive style while keeping the necessary agenda requirements for the seminar.

In the future, we intend to spend the first few weeks focusing on the developing relationships of the group members. This will include team building exercises that incorporate valuable departmental information. Further information about the departments will be given intermittently with individual skill development activities. These decisions are made with the assumption that before students are receptive to learning survival skills and departmental information, students need to bond with each other and with the mentor as a team. As with the training of the leadership team itself, the value of developing group identity is equally important to the team as to the individual.

Conclusions - Keys to Success

In developing a leadership team, it is important not only to invest the time involved in planning such a program, but also to spend quality time in selecting students for the program. Specifically, time must be spent investigating individual student attributes: how well the students know themselves and how they are able to communicate with others. Secondly, it is important to investigate potential student conflicts. This includes conflicts that might arise between mentors themselves, as well as with incoming freshman engineering students. Because the relationship between the mentors and the students is so crucial to content delivery, an inappropriate mentor could create a weak link with the students. In establishing communication with the mentors, administrators must intentionally take actions to address initial structure knowing that their role with the mentors will eventually change from a formal instructor to a facilitator position. The rate at which this change takes place depends on the speed at which the mentors gain confidence in their abilities and skills to manage their own group.

This type of mentoring program can be transferable to any size of institution. Though approval and fiscal commitment must be sought initially, fiscal investment is nominal compared with other types of recruitment and retention efforts. At five dollars per hour per mentor, this fiscal investment is low compared to the use of professional staff in comparable positions. Whether the institution is large or small, a program director must have the commitment and training to carry out the program’s mission. This program works particularly well for small schools; however administrative planning might require a shift in responsibility. A larger school would require more mentors to keep the groups small, as well as building space. In addition, the more mentors one hires, the more this effects program costs. To rectify these potential problems, mentors could manage two different groups per week. For schools without a common freshman year, this type of program could be organized departmentally. Content for the seminar may vary depending upon the strengths of each school, however the need for basic survival skills is clearly documented as universal.
In laying a meaningful foundation of survival skills for the freshmen, the mentor team must demonstrate similar skills and abilities. While many of the mentors had these skills, they were not necessarily cognizant of their ability and confidence to convert them into tangible skills for the freshmen. To encourage this behavior, mentors were given training on small group skills. The leadership team was used as an example of a dynamic small group system. Mentors experienced first hand how these skills helped develop their own team, which they then demonstrated for their own freshman group. Time spent on training not only draws out these individual abilities and skills, but also builds interdependence among team members. From the individual confidence and group interdependence, mentors were then willing to take risks, take ownership of their work, and create their own style of delivery within their groups. This initiative brings the program’s mission to life and, in turn, motivates the freshman to commit to the group and eventually to the seminar content.

References


SANDRA L. BISHOP is the Director of Freshman Engineering at the University of Pittsburgh. She received her M.A. in Counselor Education from Indiana University of Pennsylvania and has been with the School of Engineering for the past six years. The Freshman Program includes academic advising, registration, outreach and recruitment of prospective students, including freshman and transfer students.

MARY BESTERFIELD-SACRE is currently a Ph.D. candidate in Industrial Engineering at the University of Pittsburgh. She previously served as an Industrial Engineer with the U. S. Army Human Engineering Laboratory, Aberdeen, MD, and at ALCOA, Lafayette, IN. Her research interests include modeling applications for quality improvement and engineering education.