

## Session F3D

# Work in Progress - Utah's Engineering Initiative

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**Abstract** - In response to a shortage of engineers in Utah an interdisciplinary team at the University of Utah developed an outreach program intended to increase the number of students recruited into the College of Engineering and who complete engineering degrees. An innovative mix of service learning, outreach, and peer mentoring comprises the program. Recruitment efforts include outreach, integration with teachers and public relations. In outreach, college students work with high school teachers and engineering faculty to prepare and present engineering-based teaching modules that meet requirements of the state core science curriculum. Education and public relations materials aimed at students, parents, teachers, and counselors also contribute to outreach. Retention efforts include academic advising, tutoring, peer mentoring, and service learning. Retention programs are based on college student retention research, and focus on engaging students both academically and socially. This paper reports on the first year of the initiative, including the creation of outreach teams and the development of high school teaching. We also discuss how participation in the outreach team impacted current students.

*Index Terms* – Outreach, Recruitment, Retention, Students.

## INTRODUCTION

The state of Utah faces an increasing shortage of engineers. According to the 2007 Utah Engineering Workforce Data Survey, there are currently over 400 open engineering positions statewide that require at least a Bachelors degree, and another 575 anticipated positions will need to be filled in 2008. In response to this shortage, an interdisciplinary team of faculty at the University of Utah developed an outreach program intended to increase the number of students recruited into the College of Engineering, and raise the number of students who complete engineering degrees. In addition to University of Utah faculty and staff, faculty from Salt Lake Community College (a main feeder school for the University of Utah) and local high school faculty and MESA/STEP advisors participated in the development of the program. An innovative mix of service learning, outreach, and peer mentoring comprises the program.

The goal of the project is to establish a sustainable high school/two-year college/University transition program that nurtures students and increases the number of engineering/computer science graduates at the University by at least 180 per year. The program is funded in part by the National Science Foundation. This paper describes the recruitment and retention efforts of the program's first year in detail.

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## PROGRAM OVERVIEW

In 2000, Utah's governor challenged the state's higher education system to double the number of engineering and computer science graduates. Utah's Engineering Initiative supports this vision through a university/community college/high school partnership that captivates the imaginations of high school students, mentors them through a pre-engineering curriculum, and seamlessly transitions them to successful college graduation in their selected engineering discipline. Once they enter the University, this program helps them gain confidence as tutors/mentors, collaborating in curriculum module development and team engineering projects, and participating in service learning community engineering projects. The focus of the program is on recruiting students and retaining them to graduation.

Essential to the program is an interdisciplinary approach. Grant team members include: faculty representing each discipline in the College of Engineering who coordinate and lead outreach team efforts; faculty from Nursing and Educational Leadership and Policy involved in program assessment; staff from the University's Bennion Community Service Center, assisting in the development and implementation of the service learning component; academic advisors both at the University and College levels; faculty from Salt Lake Community college, who participate in outreach teams as well as endeavors to smooth students' transition between the College and the University; teachers and MESA/STEP advisors from local high schools; and an advisory board comprised of local businesses supporting engineering initiatives. This energetic and diverse team ensures that multiple angles to the issue of recruitment and retention are addressed in the program's efforts.

## RECRUITMENT PROGRAMS

One goal of this program is to increase awareness of engineering as a college major and career field. Programs developed to reach this goal include high school outreach, targeted public relations materials, and improved advising both at the University and College levels. Assessment and evaluation of each of these components is ongoing.

High school outreach is the most developed aspect of the grant. Outreach teams in each of the Departments within the College of Engineering have been established and include: current University of Utah students and faculty, Salt Lake Community College students, and high school teachers. Outreach teams developed hands-on demonstration projects to present in local high school classes and MESA/STEP meetings. The teams showcase their

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demonstration and talk about engineering generally in sessions lasting from 15 minutes to an hour. At the end of each presentation, high school students and their teachers are asked to complete a short evaluation form, which provides feedback to the grant team regarding the effectiveness of the presentations. Initial data show that the presentations are effective in educating students about engineering as a career field. Outreach teams also develop teaching modules in both written and video formats, which high school teachers can easily incorporate into their course materials. Teachers also provide feedback regarding the effectiveness of the modules.

Another aspect of recruitment has been the systematic updating of all College of Engineering public relations materials. Students from the University of Utah's "Public Relations Cases and Campaigns" course developed a new concept and campaign for the College of Engineering's student recruitment efforts. Teams of communications students developed public relations materials targeted at: middle and high school students, Latino students, women students, transfer students and parents. Teams created strategic plans for marketing the College, media kits (including fact sheets, news releases, features, brochures, newsletters, and direct mail pieces), and client presentations that were presented to the grant team. Materials developed by the communications students have been incorporated into both College and departmental public relations materials.

Another aspect of recruitment is improved academic advising. In fall 2008, the University will implement mandatory advising for all students. Every student will be required to meet with an academic advisor prior to registering for classes. The grant team is working with advisors who counsel undecided students, to increase awareness of Engineering options. Additionally, the College of Engineering's advising team is apprised of opportunities available for current students to participate in grant activities. Increasing awareness of the College and its unique opportunities will draw students into engineering majors.

Finally, the grant team is in the process of developing a summer camp for high school students. Realizing that summer camps for pre-engineering students abound, the camp is proposed as a "summit" at which students will meet to solve a problem of interest. The 2008 topic is Bio-Innovation. High school students will utilize different engineering concentrations to address the issue and will work with University faculty and students, local industry representatives, and entrepreneurs to develop action plans, which will be presented to state-level officials at the end of the three-day camp. The camp emphasizes hands-on learning opportunities that enhance high school students' understandings of what a career in engineering entails.

### RETENTION EFFORTS

Retention of University of Utah students is another focus of the grant team. In addition to retaining current students, programs focused on college student persistence emphasize

smoothing the transition between Salt Lake Community College and the University for those students who transfer. Improved academic advising, tutoring, peer mentoring, and service learning are all part of the grant's retention efforts.

Academic advising plays a role in the retention of students as well as their recruitment. Advisors at both the University and College of Engineering levels are receiving additional information regarding the many options that dwell within the engineering umbrella. Armed with this information, advisors are better able to inform students of the opportunities and counsel them towards specific engineering programs. Our belief that students who find a "fit" in their major will persist and attain their degrees is supported by persistence research.

The College of Engineering has improved its tutoring efforts, providing a service that is available during both days and evenings. Walk-in tutoring is available, or students can sign up for specific emphases. Peer tutoring allows students to meet others who have progressed further in their program of study, thus acting as a peer mentoring program as well. Peer mentoring is also a component of the outreach teams mentioned above. In these teams, students who are earlier in their programs, or who are considering transferring from the community college have the opportunity to work with advanced engineering students, which allows for mentoring relationships to develop. Students who transfer to the University come with pre-established relationships as well as knowledge of the programs and people within them. Students on the outreach teams are reporting an increased commitment to engineering as a major, a heightened understanding of what engineering is about, and improved relationships with other students as well as engineering faculty as a result of their participation on these teams. All of these factors contribute to the retention of students.

Finally, a College of Engineering service learning course is approved and will be offered to students in any engineering specialty, focusing on creating hands on projects for in-school and after-school K-12 programs. As part of the course, students will be asked to consider how community issues can be addressed through engineering solutions, and present these problems and solutions to a non-technical audience. Service learning can increase retention of students by allowing them to apply complex classroom concepts to daily life, thus enhancing their understanding of the significance of their work in the larger world. In addition, the presentation of these projects contributes to the grant's recruitment efforts by further expanding the understanding of the College of Engineering and its specific departments with K-12 students.

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