Abstract

As engineering enrollments across the United States are on the decline, the College of Engineering at the University of Texas at El Paso (UTEP) has shown a 7% increase each year for the past four years. To address this enrollment gap, retention and recruitment programs must exist symbiotically at an institution to attract students and retain them through graduation. The Discover Engineering Day program was developed and implemented in the spring of 2000 as a possible solution to recruiting potential students into engineering.

The goals of Discover Engineering Day are to create awareness among pre-college students about engineering as a challenging and rewarding career choice. A career fair environment that integrates interactive presentations was chosen over a lecture or “talking heads” format. The incorporation of display boards, videos, demonstrations, hands-on activities, and multimedia presentations helped ensure students left with an understanding of engineering. Moreover, interaction with undergraduate and graduate students, professionals/company representatives, student organizations, and professors are also incorporated into the program – leaving all the stronger an impression.

During its pilot year, Discover Engineering Day was implemented at four local high schools. The events impacted over 700 local high school students of whom 400 were juniors and seniors. Information regarding scholarships, research programs, class requirements, engineering disciplines, and admissions was made available. The program also advocated the importance of taking the appropriate math and science courses in high school.

Following the pilot year, Discover Engineering Day was concluded to be a successful program – helping to attract pre-college students into the engineering profession. In its inaugural year, the program has expanded in terms of both its content and its reach. The program now incorporates participants and information from the College of Science – so that the title was appropriately changed to Discover Science and Engineering Day.
I Background

The University of Texas at El Paso (UTEP) is the largest comprehensive university in the continental United States with a majority-Hispanic student population with programs in all branches of science and engineering. These include bachelor’s and master’s degrees in biological sciences, chemistry, geological sciences, mathematical sciences, physics, computer science, and civil, electrical, industrial, mechanical, and metallurgical/materials engineering; master’s degrees in environmental and manufacturing engineering; and doctoral degrees in computer engineering, geological sciences, environmental science and engineering, and materials science and engineering. UTEP has a long, distinguished history of educating regional/ethnic minority students, generally, and in the sciences and engineering, specifically.

Interestingly, at a time when overall enrollments have been dropping at UTEP, the College of Engineering has seen a steady increase in its enrollment. Moreover, the matriculation and retention of young women in engineering programs exceeds the national average. Engineering pre-college outreach efforts are proving effective and innovations in teaching and learning in undergraduate programs are beginning to turn the tide on retention problems. Nationwide minority engineering enrollments have dramatically declined over the last six years, showing only very modest increases over the last two. Additionally, Hispanic enrollments in engineering have remained flat during this same time. Clearly, then, UTEP continues to distinguish itself by countering national trends in employing and scaling up recognized cutting-edge strategies that better serve the needs of engineering graduates in meeting the challenges of the ever-changing workplace.

Established in 1989, the Engineering Programs Office (EPO) resides in the Dean of Engineering Office and is dedicated to invigorating the pool of quality. In view of this charge, the EPO implements numerous outreach activities including summer high school camps on the UTEP campus; recruitment both on and off campus; and Engineering & Science EXPO, a community open house on the UTEP campus with design competitions and demonstrations. EXPO is held each year during National Engineers Week and has an attendance of over 2,500 pre-college students, teachers, and parents.

The coordination of the programs in EPO are done by the undergraduate engineering student staff who undergo a rigorous training to ensure quality, professional program delivery under the careful guidance of the EPO professional staff. As such, the principal author of this paper is one of two undergraduate student coordinators who researched, developed, and implemented Discover Engineering Day.

II Origins

In 1999, Ivan Anchondo, a mechanical engineering undergraduate student and outreach coordinator for the UTEP Mexican-American Engineers and Scientists/Society of Hispanic Professional Engineers (MAES/SHPE) Student Chapter created a novel approach to increase
awareness of engineering as a career choice. He chose a “fair” event at high school sites to introduce students to professional engineers and undergraduate engineering students. At the same time the EPO and the UTEP Department of Metallurgical and Materials Engineering were each involved in other efforts to recruit more students to UTEP. Specifically, these focused on visiting upper-level science and math classes and career day events at area high schools. Toward the end of fall 1999, EPO and Metallurgy joined forces in their efforts and, using the MAES/SHPE model, brought all recruiting resources together: student organizations, professional engineers, professors, and programs focusing on retention.

III Brainstorming and Program Development

Once the concept of Discover Engineering Day was established, ideas were brainstormed on an effective implementation plan. From the perspective of the high school student, the following questions were developed by the EPO student coordinators to assist them in establishing a plan:

- What type of information would be beneficial for us once we’re in college?
- What financial aid is available for us?
- What do engineers do?
- What can I do in high school to prepare for college and engineering?
- What opportunities are available for me as a high school student?
- Why choose UTEP over another university?
- How does engineering compare to other careers?
- How does UTEP prepare its engineers?
- What could I do with an engineering degree from UTEP?

The final product was a listing of the basic expectations of Discover Engineering Day. The main task was to define the program’s goals. A well-defined set of goals, then, provided the cornerstone for building and developing the rest of the program components. The goals of Discover Engineering Day are:

- To prepare students for the college selection process
- To create awareness among high school students about engineering as a challenging and rewarding career choice
- To provide information about various engineering disciplines
- To inform students about the diversity of engineering disciplines and opportunities that UTEP has to offer

To accomplish these goals, Discover Engineering Day was designed as an event similar to career fairs – where students would be able to roam freely from table to table and interact with representatives. A Discover Engineering Day proposal was created as a tool for approaching other UTEP groups also interested in recruiting – including, for example, student organizations, working/professional engineers, and department chairmen.
IV Planning and Preparation

Invitations were extended to El Paso area high schools explaining the basics of Discover Engineering Day outlining expectations for the designated high school contact. Following the initial contact, a formal packet containing the Discover Engineering Day proposal was mailed to the schools. Moreover, UTEP student organizations were briefed on the program with a presentation and information packets distributed to the Engineering Student Leadership Council (ESLC), whose membership represent all active engineering student organizations on campus. Moreover, each organization was asked to identify an individual who would be their representative at the various high school fairs. Finally, on another occasion, student organization contacts were briefed to ensure that they understood their role. As a way of facilitating their understanding they were asked:

Knowing what you know now about college, if you were a high school student about to attend this event, what type of information would you like to know about and what type of stuff would you like to see?

Discussions on this question were conducted in small groups so that a variety of views could be incorporated and understood.

Contact with other pertinent University programs and departments was made including calls and correspondence with the coordinators for the UTEP Academic Center for Engineers and Scientists (ACES), the Circles of Learning for Entering Engineering and Science Students (CircLES) program, the UTEP Office of Undergraduate Recruitment, and the Department of Metallurgical and Materials Engineering. Through the Texas Instruments (TI) UTEP Student Ambassador, TI supported the effort as well.

V Implementation

After weeks of planning, the Discover Engineering Day program was finally implemented. On the day of any given event, the EPO student coordinator ensures that any last-minute details are overseen.
Each event is held in the afternoon with high school student groups of 30 to 100 typically attending. Any given event session lasts under an hour and up to two to three sessions are held during the course of the afternoon at the school site. Each session includes:

- Welcome and Introduction (2 minutes) – Undergraduate Student Keynote Speaker (3 minutes) – UTEP Engineering Faculty Visit with Representatives (40 minutes)

The welcome and keynote speaker set the tone for the visit – but most of the time is dedicated to allowing the high school students to visit with the people from UTEP and working professionals.

VI Success: University Collaborations

Cooperation among different university programs and organizations is the most important factor contributing to the success of this innovative program with the work across member organizations in the ESLC serving as the cornerstone.

Initially 25% of the student organizations in the ESLC signed on – each developing their own recruitment team. Indeed, the Association for Computing Machinery went so far as to appoint a Recruitment Chairperson whose sole task was to handle recruitment-related efforts.

<table>
<thead>
<tr>
<th>High School</th>
<th>No. of UTEP Orgs/Programs</th>
<th>Total No. of UTEP Reps.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burges</td>
<td>7</td>
<td>19</td>
</tr>
<tr>
<td>Del Valle</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Irvin</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td>Socorro</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>AVERAGE</td>
<td>7</td>
<td>18</td>
</tr>
</tbody>
</table>

The average number of people representing UTEP was eighteen with an average of seven groups/UTEP organizations per event. The organizations were held accountable because they were compensated for their efforts. For each event they attended, they would receive $50 with a $50 bonus if they attended at least three schools. If they did not meet the expectations and requirements as outlined, their compensation would be decreased.

The number of students the Discover Engineering Day program came in contact with showed success at the high school level. Many students expressed interest in UTEP and said they had a better understanding of what it is engineers do. In addition, many students also expressed interest in

Students watch as Gabriel Bujanda casts molten pewter into a lion mold.
participating in the EPO summer engineering camps.

One of the key points of these fairs was to emphasize the importance of math and science classes during high school. Students were advised to take as much math and science. Course enrollment for the high school students in attendance ranged from Algebra I to Calculus, Physical Science to AP Physics. Many of the teachers said they welcomed the event and were glad that the students were being encouraged to look into many different fields. The attendance for each fair broken up by grade level is as follows:

<table>
<thead>
<tr>
<th>High School</th>
<th>Grade Level</th>
<th>12th</th>
<th>11th</th>
<th>10th</th>
<th>9th</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Del Valle</td>
<td>12th</td>
<td>15</td>
<td>50</td>
<td>25</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>11th</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10th</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9th</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Socorro</td>
<td></td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>300</td>
</tr>
<tr>
<td>Irvin</td>
<td></td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>0</td>
<td>150</td>
</tr>
<tr>
<td>Burges</td>
<td></td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>160</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>180</td>
<td>215</td>
<td>190</td>
<td>125</td>
<td>710</td>
</tr>
</tbody>
</table>

Grade Level Distribution of Discover Engineering Day Participants

VII Improving Innovation

With the overwhelming participation of area high schools, Discover Engineering Day is no doubt a successful program that will attract pre-college students into the engineering profession. The refinement of this program will be key to ensuring its continued success. In its inaugural year, with participation by student organizations in both science and engineering, the program has expanded and taken on the title of Discover Science and Engineering Day with an increase of
over 100% high school participation and an expected impact on roughly 2000 pre-college students.

VIII Acknowledgements

Funding for *Discover Engineering Day* has been provided by grants from the General Motors Foundation, Raytheon, The Boeing Company and the Agilent Technologies Foundation through its *Diversity in Education Initiative*. This work is also partially funded by the National Science Foundation through the *Model Institutions for Excellence*, cooperative agreement #HRD9550502.

WILLIAM C. DAVIS
Willam Davis is an undergraduate Metallurgical and Materials Engineering major at the University of Texas at El Paso (UTEP). While at UTEP, Mr. Davis has been involved in a variety of professional organizations and is an officer for Engineering Student Leadership Council. He developed the *Discover Engineering Day* program while part of the undergraduate staff of the Engineering Programs Office at the UTEP College of Engineering.

S. W. STAFFORD
Dr. Steve W. Stafford serves the College of Engineering as Associate Dean and Professor of Metallurgical and Materials Engineering. Dr. Stafford has over twenty-five years of experience in recruitment and retention activities.

ELSA Q. VILLA
As Director of Engineering Programs for the College of Engineering at The University of Texas at El Paso (UTEP) since 1994, Ms. Villa develops and implements a variety of pre-college and college recruitment, outreach and retention activities. She is certified as a secondary mathematics and science teacher in Texas. Ms. Villa received her Bachelor of Science in Mathematics and Master of Science in Computer Science from UTEP.