

## **Working with Community Organizations to Improve the Pipeline of Minorities in Engineering**

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### **Abstract**

The Program for the Retention of Engineering and Science Students (PRESS) is designed to improve the recruitment and retention of underrepresented minorities and women in the College of Science and Engineering at Loyola Marymount University (LMU). Finding ways to recruit students is normally the job of the admissions office. The admissions office mission is to recruit students to apply to the university without targeted majors. It is often up to the each department to find the best and brightest students.

The College of Science and Engineering at LMU wanted to do more to improve our chances of recruiting underrepresented students. In order to accomplish this goal we started a high school outreach program in the summer of 2001. We found funding from private corporations and foundations that shared our goal of increasing the pipeline of students in engineering majors by improving the representation of African American, Latino, Native American, and female students. This article discusses the methods the PRESS Office used to develop a very valuable and meaningful program that supports our community and benefits the University.

### **I. Introduction**

Working with local high schools to improve the pipeline of minorities entering engineering and other technical fields can prove to be very challenging. Immediately many questions arise such as: Who do you speak with at the high school: the principal, counselors, or individual teachers? How do you recruit for students? Do you visit during science and math classes, or have an assembly or invite parents for a career night discussion? The barriers to working with several high schools can be overwhelmingly complex for an engineering department at a typical university.

One solution to improving your odds of reaching highly motivated students who have a strong aptitude for science and mathematics is to work with community organizations that provide academic enrichment to minority students. Many communities around the United States have church organizations, or high school outreach organizations such as Young Black Scholars or Upward Bound that work with minority students on Saturdays or after school during the academic school year. These organizations are a valuable source of inspired students who are tailor-made for recruitment into a science, engineering or mathematics department.

The benefits of working with community organizations include saving time, consistency of access, inspired students, and family involvement. If you have tried to call a high school and reach the principal or faculty members, you are aware of how hard it is to develop a line of communication. High schools often times just do not have the infrastructure to support extra phone calls, or community outreach partnerships. Many times you will have to call a teacher at home in the evenings to discuss a project or program.

All of the academic enrichment programs I have worked with have staff members that answer the phone. The organizations are easily accessible to anyone in an engineering department because they can be located in the phone book or on the web. One is able to work directly with the organization's president or director in a timely fashion. I find working with community organizations much easier than trying to work with individual high schools.

Academic enrichment programs are very interested in creating a partnership with a university to help encourage and inspire their students. They will want to use the partnership to help advertise their program to perspective families. The partnership creates a win-win situation. The partnership can develop rapidly and run smoothly over many years.

Families that drive their children to Saturday Programs are very motivated. They value the added academic and emotional support that community groups provide for their children. Since they are already sold on the benefits of enrichment programs, they are eager to find other supportive programs that will provide further enrichment. The same parents that enroll their children into academic enrichment programs are often times willing to have their children attend programs at the local university such as a summer school program or an engineering career day event during Engineering Week.

A family's motivation to improving their child's chances of being accepted into college and receiving scholarships is often the compelling force that drives them to be a taxi driver on Saturday mornings. A university that is willing to provide focused enrichment on topic areas not discussed by the high schools such as engineering or computer science will be doing a service and recruiting students.

"I'm so pleased my daughter had the opportunity to participate in the LMU's summer program. She needed the first hand experience to gain an understanding of the types of issues/problems she'll be asked to solve as an engineering student/engineer. She really enjoyed the friendships she made and worked very hard to tackle the assignments. You are providing an invaluable service for both LMU and the underserved segments of the community." Mother of 2001 participant

## II. Benefits of University/Community Organization Partnerships

What are the ways that a university can work with a community organization? The American Association for the Advancement of Science (AAAS) report, Investing in Human Potential: Science and Engineering at the Crossroads, recommends providing residential campus experiences such as overnights, summer programs, and bridge programs as a means to improve the pipeline of underrepresented minorities and women into science, technology, engineering, and mathematics (STEM) fields (Matyas, and Malcom,1991).

Each university will have to make a choice as to how they will develop the partnership. A few important factors to keep in mind that may help provide direction while designing a program

include: improving content knowledge for students, providing information on engineering and technical careers, having students spending valuable time on the university campus, and involving family members as much as possible. Studies have shown that underrepresented minority students and females do not receive adequate information about the myriad of jobs available to engineering and technology majors.

Through gender role stereotyping, girls and boys learn early which occupations are suitable for them, with the result of limiting career choices and planning. In addition, girls suffer from limited career awareness because they lack information on nontraditional career choices, particularly those related to mathematics, science, and engineering (Bailey 1992).

One of the goals of the Loyola Marymount University Science and Engineering Community Outreach Program is to improve students' knowledge of the different civil, mechanical, electrical and computer engineers careers. When the students first arrive and take a pretest, most can not list the basic engineering fields and what jobs are available in each. After having completed the summer program that included a Career Day and several field trips to engineering companies, the posttest results show a dramatic improvement in the students' knowledge of what they would do if they become an electrical or mechanical engineer.

Due to the high volume of commercial time that for profit technical institutions like DeVry Institute of Technology, or ITT Technical Institute, have on television, many students are more familiar with these institutions than the universities in their own city. It takes a conscious effort by a university's engineering department to advertise their majors in order to expand the communities awareness of the possibilities for degrees and careers.

A student who participated in our Outreach Program in 2001 has the following comment:

"This Program has given me the opportunity to experience science and engineering on a first hand basis. I think it is a very challenging and rewarding career, and I feel that it is something I'd want to do." Sacred Heart High School Student

Inviting students to a summer program is going to make a much stronger and lasting impression than the commercials on television. When a high school student sleeps in a dormitory, eats in the dining hall and attends classes in college buildings, he/she is being given a prelude to the life they will lead as a college student.

"Having an opportunity to be independent for two-weeks prepared me for what college life will be like. I was able to experience a college atmosphere and learn about a college curriculum." Marantha High School Student

First generation college students often times are intimidated by the atmosphere of a university. They can feel overwhelmed and uncomfortable in the unfamiliar setting. When a university offers a summer program or Engineering Week Event and invites first generation students to participate, they are doing a great service. The students have an opportunity to familiarize

themselves to the university setting and culture prior to applying to college. The development of a comfort zone can be an essential ingredient in their decision to take the SAT Exam, apply to college, fill out FAFSA forms, and choose a science, engineering, mathematics or other technical degree.

### III. Results of the Outreach Program at Loyola Marymount University

Over the past two summers fifty students from twenty-six high schools in Southern California have participated in our summer program. We have a partnership with five community organizations in the Los Angeles Area. We have expanded the two-week summer program to include a Saturday engineering enrichment class from September to May known as the Boeing Engineering Academy.

We have had excellent results in the percentage of student participants who have decided to enter universities as science or engineering students. Twenty-one of the alumni of the Outreach Program are graduating in June of 2003, four graduated in 2002. Of these twenty-five past participants, 100% have applied to two or more four-year colleges or universities. All have been accepted to at least one of their top choices. Eighty percent have applied to five or more universities and have been accepted to at least three of those choices. The public universities they have received admissions to include: University of California, Los Angeles (5 students), University of California, Riverside (6 students), University of California, Davis (4), University of California, Irvine (8), California Polytechnic University, Pomona (4) and California State University, Los Angeles (3). The private universities they have received admissions to include Loyola Marymount University (12 students), University of San Diego (2), Xavier University (2), University of the Pacific (2), and Howard University (4). Students are still waiting to hear from University of California, Berkeley (6), New York University (2), Cornell (2), and University of Southern California (3).

As a recruitment tool, the Outreach Program has proven successful as far as applications are concerned. Depending on their funding, eight students hope to enter Loyola Marymount University in the fall of 2003. All eight have made it very clear to me that LMU is their top choice. Of those eight students, six will be members of the College of Science and Engineering (3 as engineering students and 3 as science students). The following comment expresses the sentiment of the students who wish to be part of LMU's Class of 2007:

“When I visited LMU during the Open House, it felt like home to me. I feel like I can be successful at LMU because I already know some of the engineering and math faculty and I know the campus.” Chino High School Student

As a tool to help increase representation of underrepresented minority students, the Outreach Program has also proven successful. Of the twenty-five past participants who have received acceptance into four-year colleges and universities, three have entered their colleges in the science or engineering disciplines, and eleven have been accepted into at least one university as science or engineering majors. Of these fourteen students, six have chosen engineering or computer science majors. Our College feels that having 24% of our participants selecting engineering as a major is a great accomplishment.

#### IV. Finding Community Organizations

Some of the ways to find community organizations in your area include: a web search under college preparatory programs, calling your local school district offices and ask for a list of Saturday or after school programs, and calling ethnic/racial support programs such as League of United Latin American Citizens.

Boys and Girls Clubs: <http://www.bgca> 1-800-854-club

College Bound: <http://www.collegebound.org/> Washington D.C. area

YMCA: <http://www.ymca.net/index.jsp>

#### IV. Conclusion

The students were given exit evaluations after completing the Outreach Program. The chart below represents some of their responses:

The following are four of the responses from the student evaluation:

(1 strongly disagree, 2 disagree, 3 average, 4 agree, 5 strongly agree)

	1	2	3	4	5
The instructors improved my understanding of what engineers do.	0 0%	0 0%	5 10%	17 34%	28 56%
SECOP helped improve my mathematics skills.	0 0%	0 0%	10 20%	28 56%	12 24%
I would recommend this Program to a friend.	0 0%	0 0%	3 6%	9 18%	38 76%
The computer class helped improve my understanding of computers and their capabilities.	0 0%	0 0%	8 16%	18 36%	24 48%

The scores of the mathematics pre and post-tests showed that 65% of the students increased their scores by 10% or more. The other 35% of the participants were within 10% of their original pre-test scores. These scores are encouraging and indicate that LMU's Science and Engineering Community Outreach Program helped improve the participants' mathematics achievement.

Universities can take advantage of different resource in their communities to improve the representation of African American, Latino and Native American students. Working with well-established community organizations is a creative and efficient method by which universities can establish collaborative partnerships. With proper management, these partnerships can provide a short-term and a long-term solution to improving the pipeline of underrepresented students in STEM fields.

## References

Bailey, S. (1992). Shortchanging girls, shortchanging America: A call to action. Washington, DC: Women's Educational Foundation, American Association of University Women.

Hsiao, Karin Peterson (Nov. 1992). First-generation college students. ERIC Digest. ED351079

Matyas, M. L. & Malcom, S.(1992). Investing in human potential: Science and engineering at the crossroads. American Association for the Advancement of Science. Washington, DC.