

A fresh look at the strategies for recruiting students of color in engineering graduate schools

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I. Introduction

Unfortunately, over the past 10 years there has only been a slight increase in the number of minority students pursuing graduate degrees in sciences and engineering. Of all masters degrees awarded between 1989 and 1997, African Americans increased from 5.2 to 7.4%; Hispanic students from 3.9% to 6.2%; and American Indian students from 0.4 to 0.6%. This is sad news considering the rising reliance of the American economy on employees with engineering and technology related fields. The call has been sounded once again for higher education to make a difference.

Each year the US News & World Report ranks academic institutions based on several factors. One way to sort their list is by academic rankings. An interesting fact was discovered when comparing those schools ranked high by reputation (in engineering) and those that graduate the greatest number underrepresented minorities. Those who are in the top five academically are also among the top five in terms of students of color enrollment. Evidently, those who pride themselves in high academic standards also pride themselves in having a diverse student body. MIT, Stanford, Georgia Tech, UC-Berkeley and the University of Michigan-Ann Arbor were ranked by other academicians as the five best engineering schools². Similarly, these same schools graduated the highest numbers of under-represented students of color in engineering¹.

Studies have shown that reasons for under-representation of minorities in science and engineering graduate programs are numerous. One such study sited four reasons: (1) lack of early encouragement, (2) lack of financial support and limited opportunities, (3) limited recruitment, and (4) institutional racism⁴. Therefore, programs aiming to support graduate students should be designed to combat these issues. University of Wisconsin-Madison has employed several strategies that target these issues at the undergraduate and graduate level: the Engineering Summer Program, the Summer Undergraduate Research Scholars/Research Experience (SURE/REU) Program, the Opportunities in Engineering (OPPS) Conference, and the Graduate Engineering Research Scholars (GERS) Program.

II. Background and Significance

As we consider strategies for recruiting and retaining students traditionally under-represented in science and engineering, we look to those schools that are successful for a benchmark for other programs. The Taylor Retention Model⁵ was identified as a blueprint for planning, implementing, and evaluating such programs. This model is based on a holistic approach to recruiting and retaining students. It covers pre-college to alumni considerations. This model was selected for several reasons:

- Comprehensive approach
- Involves the entire campus in the retention and recruitment effort
- Recognizes the vital role faculty must play
- Highlights the interdependence of each of its components
- Recognizes social problems as significant
- Grounded in research and tested on many campuses

As we apply this model to the graduate experience, three main factors are important: academic preparation, socio-cultural adjustment and financial resources. What follows is a discussion of current programs at the University of Wisconsin- Madison that attempt to meet the above-mentioned factors for success in retention, presented here as a blueprint for other Research I institutions in search of a strategy to increase the retention of students of color in engineering.

III. University of Wisconsin- Madison

History

Rice University in Houston, Texas expanded their very successful “Spend a Summer with a Scientist” Program with the assistance of funding through the National Science Foundation Minority Education Grant (MSG). Originally a successful minority retention program within the Computational Science department at Rice, the NSF proposal provided funding to expand the program to include other departments within Rice’s College of Engineering. One “cluster” of that effort is at the University of Wisconsin, which duplicates the successful Rice program at a Research I public institution. The UW cluster is called the Graduate Engineering Research Scholars (GERS) Program.

UW Programs Supporting GERS

Programs designed to support the efforts of the GERS initiative were expanded both in fiscal support and activities. Although the GERS program is in its first year, evidence supports the fact that the UW cluster has successfully developed a community of committed and supportive graduate students.

Summer Undergraduate Research Scholars/Research Experience for Undergraduates (SURE/REU)

This program provides students with opportunities to conduct research and explore opportunities available with a graduate degree in engineering. Participants spend 10 weeks conducting research under the direction of faculty mentors, and work as members of laboratory research teams investigating problems in engineering and the physical sciences in a well-recognized academic environment. Students are exposed to other research available on campus through weekly meetings and faculty seminars, and have opportunities to visit industry and national laboratories. Planned social activities are available to all participants. At the end of the program, students present their work in an open forum

Participating students seemed to have benefited greatly from the program. Eighty five percent of the students felt the conference answered their questions about graduate school. Most students commented that the program solidified their decision on pursuing graduate studies and that the experience gave them practical and real world experience. Eighty three percent of students reported that they were more interested in attending graduate school after the program, with 89% more likely to attend at UW-Madison. Students also noted that they enjoyed expanding their knowledge base by interacting with students in different disciplines as well as creating new social ties. Students were paired with both faculty and a lab mentor. The majority of students found benefit in creating these relationships. The fact that 97% of students would recommend the conference to friends solidifies the program's success and indicates a promising future for the experience.

Efforts to improve the applicant pool for SURE/REU 2000 were successful. Applications grew from 40 in 1999 to 185 in 2000. SURE/REU 2000 doubled in size from 22 in 1999 to 44 in 2000. Activities supported by the SURE/REU program were expanded to include weekly faculty research presentations, and field trips to industry and national labs. Several weekend excursions were executed to expose the students to Wisconsin natural resources, culture, and social events.

Opportunities in Engineering Conference (OPPS)

This annual conference brings to campus undergraduate students from across the country interested in the UW for graduate study. Student participants are exposed to faculty research presentations, laboratory tours, and graduate school informational workshops. All OPPS attendees met in small groups with current GERS scholars; program evaluations identified this activity as a conference highlight. The College of Engineering and the Graduate School provide funding for the Opportunities in Engineering Conference.

The 1999 program saw 35 applicants from which 25 students were selected. Of those 25, five were seniors who subsequently applied to the UW, two of whom accepted their department's nomination to the GERS fellowship program and are currently enrolled as GERS Scholars. The

conference mailing distribution was expanded for the 2000 conference. The pool of applicants grew to 157 in 2000, with 38 students selected to participate. Response from the 2000 conference was very favorable with 89% of students being more likely to attend graduate school at UW as a result of participating in the conference. All conference attendees were issued graduate school application fee waivers.

Graduate Engineering Research Scholars - Student Support

The fall of 2000 brought to campus the first class of GERS scholars. In addition, seven continuing UW students were incorporated into the program. The Graduate School forwarded funding for the GERS fellowship to the GERS committee. Accepted students are nominated by their department for the GERS fellowship and do not apply for this funding directly. Each potential faculty advisor's nomination must include a "financial plan" which outlines funding sources to support each student's expressed program. All underrepresented students within COE are invited to participate in GERS events regardless of their funding source.

The GERS fellowship program is open to Ph.D. and MS students of color in the college of engineering who meet the eligibility requirements of the college. The GERS financial support package offered to a Ph.D. candidate is a three year package comprised of graduate school and research funds sometimes supplemented with departmental and College of Engineering funds. Departments/individual investigators have the option to distribute the allocated funds in a manner that enhances their funding situation. The GERS financial support package offered to an MS candidate is a one-year award. As with the Ph.D. award, departments/individual investigators have the option of distributing funds in a manner which best enhances their available funds. MS students must be on the thesis track, as the GERS fellowship requires placement within a research group.

In addition to the financial package, the benefits of the GERS program include social and professional ties with new and continuing GERS scholars; professional development activities and programs; annual research presentations (GERS Symposium); opportunities to attend discipline-specific national and international conferences; and opportunities to explore and share the university and the Madison community.

Now in its first full year, the GERS Scholars began the academic year with an orientation and dinner with faculty from the GERS committee. The orientation included an explanation of the GERS program, including an historical overview of the Rice program and NSF objectives. The semester continued with GERS scholars meeting every three weeks for dinner and seminars facilitated by underrepresented UW faculty and industry representatives. It is anticipated that the professional development activities will expand in the spring semester, and will include student presentations as the scholars become more involved in their research.

GERS scholars assisted the Opportunities in Engineering Conference as mentors, and will serve as mentors for both SURE/REU 2001 and the Engineering Summer Program (a recruiting program for high school students) in an effort to duplicate the successful "tiered mentoring program" established by Rice University. The UW believes it has established a community of supportive peers within its GERS scholars evidenced in part by the current GERS scholars' interest in participating in recruitment efforts. The College of Engineering will include current GERS scholars in recruiting trips to both the National Society of Black Engineers (NSBE) and Society of Hispanic Professional Engineers (SHPE) conferences this year, supported by a collaboration of college and departmental funds.

The first class of GERS scholars was surveyed to assess their perception of the program. Initial response from the GERS scholars has been very positive. First semester survey results revealed that these students have received many benefits from their participation in GERS events. As could be expected, funding is the most important motivation for entering the program, with 83% citing reliable financial support a factor in considering UW-Madison - but just as important are the other benefits of the program. All of the students find the social ties from GERS most beneficial, with most students commenting on the "family like" atmosphere that is fostered in the program. All students polled (100%) found the social ties with new and continuing GERS scholars the most valuable benefit to the program. Students have also found valuable professional ties with students and faculty and professional development activities. The programs presented in the semester have been both professional and social. Student responses to these activities indicate that these events have personalized the graduate school experience. Eighty three percent of the scholars have participated in more than half of scheduled GERS activities. Isolation often prevalent at similar Research I institutions seems to have been alleviated due to the exposure and support the students experienced through GERS program activities.

Recruitment Strategies

Some key observations that have already caused changes in previous practice are the pipeline approach to recruitment. All students submitting applications for programs supported by GERS who are not selected are treated as potential graduate students. Each applicant receives information on the GERS fellowship program as well as other programs supported by GERS. For example an Opportunities in Engineering Conference attendee who is in his/her junior year is actively recruited for participation in SURE/REU for the following summer. Similarly, a SURE/REU participant interested in returning to campus the following fall for the Opportunities Conference is brought to campus again to share experiences with other conference attendees. It is anticipated that this linkage between program participants will begin to create communities of students interested in the graduate programs at the UW on campuses where GERS is attempting to establish linkages.

In addition, the College of Engineering Information Systems department is designing a tracking system. All students for both SURE/REU and Opportunities will apply on-line.

Information will be entered into a database and used to track student applicants and participants. It is anticipated that this program will allow the College of Engineering both to measure the effectiveness of each of these programs in recruiting graduate students and identify patterns between applicants, participants, and subsequent graduate students. All programs supported by GERS are available on-line at: <http://www.engr.wisc.edu/services/dao/>. Informational material for the GERS program was developed in the summer of 2000 and includes a web site (<http://www.engr.wisc.edu/services/dao/gers/>) and brochure.

IV. Conclusion

The University of Wisconsin- Madison is reflecting on its past and present recruitment efforts in hopes of increasing the number of students traditionally underrepresented in the College of Engineering and the quality of their experience. The partnership with Rice University has provided a model of successful programming. The Taylor Retention Model would tell us that Research I institutions often have no problem attracting students with good academic preparation but may not concentrate on the importance of two other factors: socio-cultural adjustment and financial resources.

As we look to the 21st century, we hope to build upon what has been learned and reach into areas that have previously been unexplored. Using a systematic approach that was based on empirical recommendations (Rice University model) and an existing infrastructure, a program has been implemented with early success. Based on the Taylor Retention Model, success should be within reach. Each of the programs that are currently being implemented can be described as attempting to address academic preparation, socio-cultural adjustment and financial resources. The University of Wisconsin- Madison is committed to seeing that success is reached.

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