

**AC 2007-1953: MINORITY GRADUATE STUDENT ADVISING AND MENTORING
FOR CAREER ADVANCEMENT**

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Minority Graduate Student Advising and Mentoring for Career Advancement

Abstract

Minority students in graduate school in electrical engineering in the United States are quite few. The numbers are even fewer in small private schools. For example, statistics of black minority undergraduate students in electrical engineering are less than 5% in many small catholic private universities such as University of _____. Given that not all of the undergraduates go on to graduate school in electrical engineering, the numbers are even fewer in graduate school, typically less than 1%.

Facing this reality, it is important to offer minority graduate students in electrical engineering mentoring for retention, graduation and career advancement. The nature of mentoring for undergraduate students is different from that of the graduate students.

In this paper, we give an overview of our experiences of being faculty adviser to most electrical engineering undergraduate students of color and almost all black graduate students in our university. In addition, as founder of and co-adviser to the local chapter of the National Society of Black Engineers (NSBE) we share our experiences gained from advising these students with their graduate school experiences and eventually with their career.

We hope that from our experiences other faculty advising minority graduate students in electrical engineering in other universities can learn and utilize some of the best practices advocated here for their institutions.

Introduction

Minority students in graduate school in electrical engineering in the United States are quite few. The numbers are even fewer in small private schools. For example, statistics of minority undergraduate students in electrical engineering are less than 5% in many small catholic private universities such as University of _____. Given that not all of the undergraduates go on to graduate school in electrical engineering, the numbers are even fewer in graduate school, typically less than 1%.

Also, there are many efforts aimed at recruiting minority students into engineering both at the undergraduate and graduate levels. These efforts have had various levels of success in their effectiveness in improving the enrollment numbers of minority students in engineering both at the

undergraduate and graduate levels. In this paper, we do not focus on recruiting but on retention, graduation and career advancement.

The reality of low minority enrollment numbers in engineering and in electrical engineering in particular is unacceptable. Therefore, it is important to offer minority graduate students in electrical engineering mentoring on the issues of retention, graduation and career advancement. The nature of mentoring for undergraduate students is different from that of the graduate students.

In this paper, we give an overview of our experiences of being faculty adviser to most electrical engineering undergraduate students of color and almost all black graduate students in our university. In addition, as founder of and adviser to the local chapter of the National Society of Black Engineers (NSBE) [1] we share our experiences gained from advising these students with their graduate school experiences and eventually with their career.

The paper is divided into five sections. In Section 2, we start with the motivation for this paper. Then we state the problem as we perceive it. Then we give some background about the school of engineering at the University of _____. In Section 4, we mention some existing programs. In Section 5, we summarize some responses to survey questions about actual student experiences. In Section 6, we enumerate our ideas and suggestions for mentoring graduate electrical engineering students at the University of _____ on the issues of retention, graduation and career advancement. Finally, we draw some lessons from our experiences in the conclusions. We hope that from our experiences other faculty advising minority graduate students in electrical engineering at other universities can learn and utilize some of the best practices advocated here for their institutions.

Motivation

The motivation for this paper is borne out of the disproportionate representation of minority blacks in engineering at all levels: undergraduate, graduate, faculty, industry, etc. [4].

For example, here are some statistics from the website: <http://www.facultyforthefuture.org>

“The need for the focus on underrepresented groups is well documented. The representation of female faculty of all ethnicities in engineering and computer science in the US is extraordinarily low. The most recent data (CPST, 2001) indicate that female engineering faculty who have doctorate degrees employed at four-year colleges is at a level of 8.4%, an increase of 1.9% since 1997 (tenured and non-tenured, tenure track). The number of doctoral engineers employed as postsecondary faculty in two and four-year colleges is so small for Black, non-Hispanic, Hispanic and Native American women that there are blanks in the report indicating less than 500 people. For women, the data at the doctoral level has been on a slow but upward trend since 1998, from 810 degrees granted to 1,040 (17.3%) in 2003. African Americans and Hispanics received 1.6% (97) and 1.8% (107) Ph.D. degrees in engineering in 2003, respectively. This pool represents the potential source of college faculty. The need for female faculty in computer science is also compelling. In 2002, 97 women graduated with doctorate degrees in computer science. African Americans, Hispanics, and Native Americans received 17, 14, and 2 doctoral degrees in computer science respectively. The pool of doctoral degree recipients to draw on for a diverse faculty in computer science is extremely small (CPST, 2004).”

The Problem is Why are there so few of these students? There are many possible answers to this question. However, our goal is to propose some solutions.

The University of _____ Graduate Electrical Engineering Program

At the University of _____, we offer a MS degree in Electrical Engineering with many possible emphasis areas including Networks, Analog Circuit Design, VLSI Design, Wireless Communications, Digital Signal Processing, Image Processing, RF and Microwaves, Mechatronics and Control and Microelectronics and Nanotechnology. The core of the Masters degree Electrical Engineering program is the following sets of courses:

1. Four courses in Applied Mathematics (8 units)
2. One course in Digital Systems (Logic Design or Synthesis) (2 units)
3. One course in Electromagnetics (2 units)
4. One course in Electronics (2 units)
5. One course in Electric Modern Networks (2 units)
6. One course in Control Systems (2 units)
7. One course in Applied Ethics (or Professional Practice) (2 units)

Out of a 45 units required for graduation, this MSEE core takes up 20 units. The original intent was to ensure a breadth of knowledge of electrical engineering at the master's level. With the remainder of 25 units, the student can take courses in emphasis areas like the ones mentioned above.

In the graduate curriculum, we also offer a PhD program which requires 72 units of combined thesis and courses beyond the MSEE degree.

The School of Engineering graduate program was started at about 1950 nitially as an early morning and late evening professional classes for working engineers. It has since grown in size.

Total current enrollment stands at about 600 students for the MSEE and 50 for the PhD program.

About 30% of these students are full-time while the rest are full-time workers studying part-time towards their graduate degrees.

Existing Programs for Minority Graduate Enginnering advising, mentoring, etc.

There are some existing programs for career advancing of minorities considering a faculty position. I will mention two of them here :

(1) The National Science Foundation (NSF) has funded a program called “Presidential Award for Excellence in Science, Mathematics, and Engineering (PAESME)” [2].

A two day workshop held in June 2004 provided a forum on the needs, goals, methods, and best practices for mentoring engineering students interested in an academic career and young faculty beginning such a career. The emphasis was on mentoring members of underrepresented groups in

academic engineering, especially women. The workshop was jointly supported by the [Presidential Award for Excellence in Science, Mathematics, and Engineering](#) through the National Science Foundation and by the School of Engineering at Stanford University. Participation was by invitation and application. There were no registration or other fees.

The workshop had two primary goals. The obvious one is to provide an opportunity for mentors, mentees, and mentoring facilitators to educate each other and have fun doing so. The second goal is a deliverable: we intend to produce a Proceedings of the workshop including summaries of the talks and discussions, a document distilling the best practices, resources, and other important issues.

(2) General Electric (GE) funded the web site for the Faculty for the Future [3]. FacultyForTheFuture.org is a website dedicated to linking a diverse pool of women and underrepresented minority candidates from engineering, science and business with faculty and research positions across the country. The major components of the website are described including lessons learned and the project evaluation. FacultyForTheFuture.org is funded by the GE Foundation and administered by WEPAN (Women in Engineering Programs and Advocacy Network).

Examples of Student Experiences at University of _____

I asked some of my graduate students (who are black minority students) to respond to these four questions. Here is a summary of two of their responses:

(1) How have you found the environment for you as a black or African-American graduate student at the University of _____? Please detail any interesting experiences.

"I think that my experience as a black student at University of _____ has not been much different than if I were any other color. Either that or I have set my expectations too low?"

More seriously, the differences in my experience, I find arise more from my being a foreign African student rather than from being a black student. That said, it is possible that parts of my unique experience may be shared by students who are either black or African or both.

The environment I have experienced at University of _____ is an open one. I have found the school to be readily supportive of my academic pursuits and disposed to consider me as they would any other student irrespective of background and color. I have had no problems taking classes, using facilities and getting my requests heard by the appropriate people. Given that I meet stipulated requirements, I have also not experienced any biased hitches in my academic progress.

(2) Has the university been supportive (or not) of your academic pursuits? Describe.

One unique quality about University of _____ is that its graduate program is tailored to accommodate working students. While I well appreciate this quality now, then as a new student, I think it contributed to my sense that the school adopts a laissez faire approach when it comes to directing a new graduate student.

In trying to registering as a fresh student, I was not hand-held through the process nearly as much as I had been in other universities. I found out in bits and pieces, what was required at the minimum, to be considered a fully registered fulltime foreign student.

I am very grateful to my academic adviser who acted as adviser, mentor and general problem-solver all wrapped in one.

At University of _____, the absence of a graduate housing did little to help as far as providing a community more focused on some of the general issues I faced as a fresh graduate student (especially a foreign one). Then there is the absence of a group of any size, focused on the general issues that a foreign African student might face in adjusting to University of _____.

One perspective I keep in mind however is that University of _____ is in a location which is home to a very diverse and active community. It is perhaps not such a stretch to imagine that a foreign graduate student joining University of _____ has been orientated to the school by some informal support group. ”

(3) What advice will you give to new black graduate students coming to the University of _____ for MSEE and for PhD?

“The orientation process at the University of _____ needs to be better done.”

“At my previous university, the mandatory orientation were a week long orientation by the Graduate School, the department, and the orientation by the International Students Office. Running parallel to the latter was a semi-mandatory orientation by the Institute for African Development(IAD). This was very useful because I was immediately introduced to what seemed to me like a close-knit home away from home. The IAD took up finding accommodation for African students who had no adequate arrangement for that – even off-campus. They helped with scholarships, light-weight academic advising, more relevant mentor-mentee pairings and introductions to people of similar background. All this in addition to its numerous activities such as holding weekly classes on African issues. I found impressive, the fact that I was automatically subscribed to its mailing list. “

“At my previous university, through the semi-mandatory advising, I made several lasting friendships,gained a scholarship,, experienced the campus as though it were a close community of good friends as opposed to a large sea of unfamiliar faces.”

“And so in other universities, although there were fewer options e.g. in housing, health insurance options etc., there was more of an immersion in interactions geared towards making a new comer feel at home.”

(4) How has being (or not being) involved with NSBE helped (or hindered) you in any way with respect to staying in school, graduating from MSEE and in your career advancement in general.

“I was not involved with NSBE, at least not yet.”

“Finally, I would encourage a new black student at University of _____ (especially an African), to ask a lot of questions, quickly find a mentor if possible, and also to begin looking for an adviser as early as possible.”

Another student responded as follows:

(1) How have you found the environment for you as a black or African-American graduate student at University of _____?

Please detail any interesting experiences.

“Typically, University of _____ simple does not have more than a hand full of black students in both graduate and undergraduate classes thus making it difficult to study in groups with people of ones kind like the Chinese or Indian student especially in the first year of school. This makes it necessary to a typical black student to have to work allot harder to achieve good grades.”

“As a result of the poor enrolment of black student, there are very few or no black students as Teacher Assistants to serve as mentors to younger black students thus encouraging them to graduate school.”

(2) Has the university been supportive (or not) of your academic pursuits? Describe.

“University of _____ has somewhat been supportive of my education. I was granted a scholarship to pay my last tuition by the Jesuit catholic community to conclude my masters degree (spring 2004). The reason being that, I lost my grand father and the funeral took too much out of my parents that I could not pay my tuition fee for the quarter. I highly appreciate this effort. Thus I can claim that the university also was supportive of my education. “

(3) What advice will you give to new black graduate students coming to University of _____? For MSEE and for PhD.

“I would advice them to go to bigger university with more financial support, get your degree and then come to University of _____ to teach as a faculty. When you come back to teach, mentor the blacks and support them to be like you.”

(4) How has being President of NSBE (or being involved with NSBE) helped you in any way in staying in school, graduating from MSEE and in your career advancement in general.

“My period as President of NSBE only made it clear to me that from the political and financial stand point University of _____ is not ready for more back students. We need a black dean for the school of engineering or president of the university that has a mind to develop the enrollment and help surrounding black communities in the area.”

Best practices for advising, mentoring minority graduate EE students

From our experiences and from the responses from the graduate students we asked for their comments, we offer the following ideas about best practices for advising and mentoring minority graduate EE students:

- (1) Challenge your university to hire a minority faculty member to ensure minority students have a mentor to whom they can relate and will be a good advisor for them.
- (2) Assign new minority students to the minority faculty as advisees (if at all possible).
- (3) Ensure minority students form study groups as well as encourage them to use the other academic resources available to the rest of the university students.
- (4) Get minority students involved in groups such as National Society of Black Engineers (NSBE) [1] which is a large country-wide organization (and local chapters) with lots of opportunities for networking, job search, career advancement, etc.
- (5) Hold mandatory orientation meeting for new minority graduate engineering students each semester/term.

Conclusions

In this paper, we have identified a major problem of recruiting, retaining, advising and mentoring black minority students for success in graduate electrical engineering programs.

We gave an overview of our experiences of being faculty adviser to most electrical engineering undergraduate students of color and almost all black graduate students in our university. In addition, as founder of and co-adviser to the local chapter of the National Society of Black Engineers (NSBE) we share our experiences gained from advising these students with their graduate school experiences and eventually with their career. Also, from responses from actual current students, we found ways to improve upon what we offer them currently.

We hope that from our experiences other faculty advising minority graduate students in electrical engineering in other universities can learn and utilize some of the best practices advocated here for their institutions.

Bibliography

- [1] National Society of Black Engineers (NSBE)
(URL: <http://www.nsbe.org>)
- [2] PAESME
(URL: <http://paesmem.stanford.edu>)
- [3] FacultyForTheFuture
(URL: <http://www.facultyforthefuture.org>)
- [4] American Board for Engineering and Technology (ABET) Engineering Accreditation Commission, *Criteria for Accrediting Engineering Programs*, Baltimore, MD, 2003. (URL: <http://www.abet.org>)