Girls In Science, Engineering, and Technology (GISET)

Rasha Morsi, Ph.D.
Norfolk State University

Abstract

While the proportion of women earning bachelor’s degrees in science and engineering (S&E) has increased, the proportion remains significantly lower than that of women earning bachelor’s degrees in non-scientific areas, indicating a critical need for additional retention and recruiting techniques specifically for minority females. In the last few decades, recruiting of minority females has been a challenge to say the least. At Norfolk State University, the student population is 88% African American, 64% of this population is female, yet there is a disproportionately small percentage of African-American female students majoring in the Science, Engineering, and Technology (SET) fields (0.22% Engineering, 0.50% Technology, and 1.98% Computer Science). Revised retention and recruitment techniques were needed for these SET majors among others. The Girls in Science, Engineering, and Technology (GISET) is a newly founded club at NSU with the main purpose of retaining currently enrolled SET female students and recruiting more female students from the immediate community as well as nationwide.

Background

While the proportion of women earning bachelor’s degrees in science and engineering (S&E) has increased, the proportion remains significantly lower than that of women earning bachelor’s degrees in non-scientific areas, indicating a critical need for additional research into the reason behind this discrepancy. Not surprisingly, women also remain significantly underrepresented in the total S&E workforce, especially when compared with their presence in the total labor force or in the college-educated labor force \[1\].
In 1970, 451,000 bachelor degrees were conferred to males as opposed to 341,000 to females. While in 2001 these numbers drastically changed (532,000 male and 712,000 female) and even though women comprise 57.6% of college graduates, the percentage of females earning a bachelors degree in S&E degrees is still low. The percentage of females earning a bachelors degree in Engineering rose only from 0.8% in 1971 to 18.2% in 2001 (down from 18.5% in 2000), while in the Computer and Information Sciences, it rose from 13.6% in 1971 to 27.7% in 2001, down from 28.1% in 2000 (See Figure 1).

![Figure 1](image-url)  
Figure 1. Percentage of females earning a bachelors degree

In 2001, 65% of African Americans enrolled in college were females. African Americans in general were 14% of students enrolled in college. At the freshman level, 14.6% of totally enrolled freshmen chose Engineering, Technology, and Computer Science as their intended fields of study [2]. Looking at HBCUs, in 2001-2002, the percentage of African American women earning a bachelors degree is 57.2%, 3.52% of which were earned in the areas of Engineering, Engineering Technology, and Computer and Information Sciences [3].
It is apparent that although women have increased their participation in science, engineering, and technology, they still comprise only 19% \[^4\] of the U.S. science, engineering, and technology workforce. The talent and creativity of each individual in our society is vital to our future, hence the need for further investigation into the possible reasons for the reduced number of females in S&E. A particular interest is the large discrepancy between the percentage of females enrolled at Norfolk State University (NSU) and those enrolled in STEM disciplines in general.

**NSU History**

Norfolk State University (NSU) is one of the largest Historically Black Colleges and Universities (HBCU) in the United States. The student population is 88% African American, 64% of this population is female, yet there is a disproportionately small percentage of African-American female students majoring in the Science, Engineering, and Technology (SET) fields.

A simple count of enrollment of three departments at NSU (Engineering, Technology and Computer Science) is shown in Figure 2 \[^5\].

![Figure 2. Number of students in Engineering, Technology and Computer Science at Norfolk State University (2004)](image-url)
Figure 3. Percentage of female students in Engineering, Technology and Computer Science at Norfolk State University (2004) as it relates to department and NSU enrollment.

With 64% of NSU’s student population being female, it becomes necessary to investigate why there is such a large discrepancy in the percentage of these female students choosing SET fields as their major course of study as shown in Figure 3. Some type of action is needed to enable retention of current students and increase recruitment of more minority females into the engineering program at NSU. Professional organizations are available but are nationwide and even though Universities can have student chapters, the bond that is built by having a university connection does not exist. It is the author’s observation that these students need the nurturing factor which can be achieved by creating a club they can relate to in their undergraduate years.

There are a number of successful efforts that have worked on increasing the number of female students in SET fields. GISET is a club that tries to provide the community outreach found in the following projects while keeping the connection/bond to the school. These projects include:

1) The Northwest Girls Collaborative Project (NWGCP)[11]: This project brings together organizations in Washington and Oregon to network, share resources, and collaborate on
projects that will increase the number of girls in STEM educational programs and careers in Washington and Oregon.

2) **Making Connections**[^12]: is another project run by the Women's Center at the University of Washington. The program serves socio-economically disadvantaged high school students in the Seattle area by promoting college enrollment and offering career explorations in math, science and technology. Students are encouraged to pursue opportunities in higher education through hands-on workshops, mentoring, parental involvement, and regular high school visits.

3) **Tech Savvy Girls**[^13]: a unique technology equity project that uses a strategic approach to make a difference in the number of girls involved in technology related opportunities over a period of time. The program offers week-long technology camps for girls in the summer, a leadership institute for high school girls, and teacher training.

4) **Counseling for Gender Equity**: a project that sought to make counselors aware of available career opportunities in STEM fields, the skills and attributes of successful scientists and engineers, and the potential of these careers for females.[^14]

**GISET**

Historically, enrollment of African American females in SET fields has been very low. This can be further seen from NSU’s enrollment. To alleviate the discrepancy found between SET and NSU enrollment, the Girls In Science, Engineering, and Technology Club (GISET) club was initiated. This club is based in Norfolk State University’s Department of Engineering. GISET was formed to increase retention and recruitment of minority females in the SET degrees at NSU.

Since the majority of NSU students (61%) are local, the first initiative of GISET is to increase awareness in the Hampton Roads area of the possibility of an engineering career for minority girls in our local school systems. Young minority females are often discouraged from joining STEM fields. It is believed that uncertainties in student’s minds about the suitability of women to be Engineers and that the lack of female role models in Engineering schools plays a large role in these uncertainties. Hence the premise of our club is ‘SEEING IS BELIEVING’. If these school girls ‘SEE’ females explaining to them that SET careers are possible and accessible to them then

[^12]:  
[^13]:  
[^14]:
they may ‘BELIEVE’ it can happen for them also. The Engineering Department at NSU is lucky to have four full time minority female faculty who are dedicated to increasing the participation of young minority females in the Engineering department and in NSU’s SET programs as a whole. GISET was founded by the author in April of 2004 to retain current SET female students and to recruit more SET female students primarily from the Hampton roads area but also from the whole nation in general.

As mentioned above, the club home is the Department of Engineering although membership in the club is for students in any of the SET programs currently offered at NSU. The reason for this is to allow for a diversity in educational background of the students.

Initiation of the club was difficult initially due to the lack of funds but through the support of the School of Science and Technology faculty and staff, funds were raised to begin club activities Fall of 2004.

**Student Retention**

Following is a list of activities performed by the club to enable female student retention. Some are in the planning phase since a large amount of funds is required to implement them.

- provide a comfortable work environment for these minority female students where they can find computers to work on, books to reference, tutors to help them out when they need it, and female faculty who are available to advise and mentor them as needed.
- Provide an environment that builds the confidence, and abilities of currently enrolled females and emphasize the impact women can make in these vital fields. A Lecture series is planned for 2005 where prominent females in our immediate community will be invited to speak to club members discussing issues like obstacles faced in the path to success, survival in male dominated fields, study habits, learning styles, and more.
• **Help/study sessions:** Female faculty will provide help/study sessions for club members. Female faculty from all the SET majors at NSU will be solicited to donate their time for this cause. These are currently scheduled once a month.

• Promotion of student mentorship by allowing female SET students in their junior and senior years to provide tutoring sessions to help retain current freshmen female SET students. The diverse background of the club members allows for example Math majors to help Computer Science, Engineering, and Technology majors and vice versa.

• Develop a dedicated web-site that will contain all presentations used in the workshops so interested persons could gain the most out of the data provided. The site will also contain gender specific scholarship and grant information for current and upcoming STEM students, successful techniques for time management, study techniques, leadership skills etc. Current GISET club members along with the author (faculty advisor) will develop this site and club officers will have personal web pages to be able to provide some kind of feedback to the interested school girls on college life being an SET student.

Incentives are a major portion of this endeavor since it seems that providing an incentive usually allows the students to envision a goal to reach. The incentives offered by GISET are:

• **Prizes for largest number of club member recruitment:** Nowadays it is quite difficult to recruit members for this type of club since being in the above mentioned SET fields is quite strenuous on the student’s daily activities and having something to look forward to as a prize provides an incentive for these students to take a little time out of their busy schedule to recruit members for the club. Two prizes are currently on display for the club member that recruits the most new members.

• **Achievement Awards:** These are awards that are currently monetary awards for most improved GPA per semester (current semester award for one student). Future plans include acquiring donations of known electronics stores to create even more of an incentive for these students to go against the wind and achieve higher GPAs and standards for themselves. The awards are for ‘most improved GPA’ rather than
‘highest GPA’ to allow the average student a chance to improve and work harder and have a chance at winning the award.

Student recruitment and Community Awareness

Activities performed by the club to enable female student recruitment and community awareness are:

- Conduct workshops for teachers, counselors and parents to increase the participants’ knowledge of SET and issues of equity in STEM disciplines and careers. In December 2004, GISET held a parent workshop at a local elementary/middle school to provide parents with the basic knowledge of acquiring and using email, performing internet searches, and creating presentation using Powerpoint®. The theme of the workshop was ‘Helping you to help your kids’. The workshop was a successful three day event with GISET members along with the author conducting the sessions. It allowed the GISET members to apply the knowledge they have learned about computer technology and the parents to SEE that girls can be in SET fields and succeed at it. These workshops will be replicated at a number of middle and high schools to allow the parents to acquire technical knowledge so they can in turn help their children achieve success. The plan is to have one workshop a year for at least 3 schools.

- Provide instructional ideas for working with African American females in the middle and high schools

- The club will adopt techniques/videos developed by ‘Counseling for Gender Equity’, an NSF funded project No. HRD-9714637 [14], to make counselors at our community schools aware of career opportunities in the STEM fields and inform them of methods for motivation of African American females in STEM areas.

- Offer hands-on experience to middle and high school students through specially designed mini-projects to increase the interest of these female students in STEM disciplines. These will be conducted as summer camp style events.
Conclusion

For the last few decades, recruitment of female students, specifically African American females, into SET fields has been a challenge. The GISET club was initiated at NSU’s Department of Engineering in hopes of alleviating this low recruitment which can be seen in NSU’s current enrollment numbers. This paper describes the need for this club as well as the activities performed to increase the awareness of our immediate community and to keep current students interested in our profession. A major hope of this club’s achievement is to be able to provide a replicable Model for Retention and Recruitment (MRR) of African American females in the SET disciplines. Although ideally a formal Women in Engineering Program (WEP) would be very advantageous, it is not currently feasible due to lack of resources. This club along with its activities will obviously create a time management burden for the female faculty involved but it is a welcomed burden if the outcome is increased awareness in the community and enrollment at NSU’s SET programs.

Bibliography

[5] NSU Office of Planning and Budget, Figures on School of Science and Technology, enrollment by gender, Fall 2003.


[8] Barbara Leitherer, Increasing the Number of Women in Computer Fields: A community College Approach, NSF funded project #: DUE-0302845

[9] Jane Butler Kahle, Gender Equity in Science Classroom, NSF funded project #:ESI-9619139

[10] Northwest Regional Educational Laboratory, Science and Mathematics for All Students, DOE funded project #: R96006501


[15] Pre-Service Teacher Program (PSTP), http://edu.larc.nasa.gov/pstp/


[18] Patricia B. Campbell, PhD, Jennifer N. Storo, Girls are, Boys are: Myths, Stereotypes & Gender Differences, Office of Educational Research and Improvement, U.S. Department of Education, 1994.

Biography

RASHA MORSI is an Assistant professor in the Department of Engineering at Norfolk State University. She has a B.Eng. degree from King’s College, University of London (1991), an M.E. in Computer Engineering (1996), and a Ph.D. in Electrical and Computer Engineering (2002) from Old Dominion University. Her research interests include Digital Cellular Mobile Communication Networks and Protocols, Object Oriented Modeling and Simulation, and Technology Based Engineering Education.