Increasing the Participation of URM (especially women) in Engineering Technology Education at Savannah State University

A WORKSHOP FOR K-12 TECHERS AND COUNSELORS

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Improving Minority (Particularly Women) Participation Rates in Engineering and Technology Education at Savannah State University

- Introduction/Scope of the Problem
- Barriers and Inhibitors
- Influencers and Change Agents
- Tools and Method of Solution
- Partnership with Savannah State University
- Our Goal/Conclusion
Scope of the Problem

The National Outlook

Engineering and technology are the major contributing factors to U.S. preeminence in the world and its economic competitive edge.

• Meanwhile, the college-age population is being made up more and more of underrepresented minorities and women who do not traditionally go into these fields.

• The white males who have long dominated engineering and technology education are no longer entering at the same rate as before. The result is a shrinking in engineering and technology workforce.

• In 1995, White men were projected to be 36% of the overall U.S. workforce and are projected to be 26% of the overall workforce by 2050. This declining demographic group represents about 70% of the engineering and technology workforce.
Thus in order to sustain U.S. productivity and economic strength, not only must we encourage more White males to pursue engineering and technology education, but we must also make efforts to drastically increase the participation of women and underrepresented minorities (URM) in engineering and technology education and careers to make up for the declining White male proportion.

Of the over 1,000,000 Technical (computer related) Jobs expected to come online by 2014, the US will graduate only 500,000 qualified persons for the job.

- By 2010, ONE OF EVERY FOUR NEW JOBS WILL BE TECHNICALLY ORIENTED.

- The National Trend – Undergraduate Degrees Awarded in Engineering

<table>
<thead>
<tr>
<th>Year</th>
<th>Degrees Awarded</th>
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<tbody>
<tr>
<td>1975</td>
<td>38,210</td>
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<tr>
<td>1986</td>
<td>*78,178 (peak)</td>
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<tr>
<td>1991</td>
<td>63,986</td>
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<tr>
<td>2000</td>
<td>63,635 (-18.6% from peak)</td>
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Women in The Picture

Even though women make up the majority of college students, they still are in the minority in technology fields:

- In 2004 – 2005, women received 57% of all undergraduate degrees but only 21% of all bachelor’s degrees in engineering and physics.

- A 2007 report published by the Commission on Professionals in Science and Technology shows that women (50% of the population) comprise no more than 15% of any engineering sub-discipline and only 9.5% of engineering managers.

- Before, Medicine and Law were traditionally dominated by males, but now almost 50% of Medical School students are women, and women are the in majority of Law schools. Similar results needs to be achieved in engineering and technology.

- We know that this can be achieved because research has shown that women who choose a science major in college persist and graduate at a greater rate than men. So it is not that women can not do it. They can, but they are not choosing to go into engineering and technology.
According to a report published by NACME in 2006, African Americans, American Indians, and Hispanics (URM) constitute 30% of the nation's undergraduate students. But fewer than 12% of baccalaureate engineering graduates in this country are underrepresented minorities.

The proportion of African American graduates that received bachelor's degrees in engineering between 1995 and 2005 declined by almost a percentage point. In 1995, 3.3% of bachelor's degrees awarded to African Americans were in engineering. Only 2.5% of bachelor’s degrees awarded to this group in 2005 were in engineering.
Girls Inc. 2006 Survey shows that:

More girls (17%) than boys (14%) thought that it was true that “teachers think it is not important for girls to be good in math.”

“More girls (44%) than boys (38%) agreed with the statement, “The smartest girls in my school are not popular.”

The misconceived notion that technology is a nontraditional field for women has become a dominant mindset of parents, teachers, counselors and society at large.
Even though girls can do just as well as boys in math and science, and in some cases better (studies have shown), they still shy away from math and science courses:

In 2007, girls made up 56% of AP test –takers but only 31% of AP physics and 17% of AP computer science.

In 2005, the National Center for Women and Information Technology reported that when high school girls think of computer scientists, they think of geeks, pocket protectors, and isolated cubicles.
Girls are not aware of their potentials to succeed in college engineering and technology education:

Even though girls are achieving higher grades than boys in high-school math, the average math score for girls was 34 points below the average score for boys in 2006, a consistent trend since 1972.

MIT has found that its women students that earn higher GPAs than their male counterparts even though their (women) average SAT-math score is 20 – 25 points lower than that of their male peers.
Barriers to URM

Factors that have been identified as contributing factors to racial/ethnic differences on standardized and college admissions tests, as well as entry into engineering and technology majors include:

- The number of advanced math & science courses taken by students & offered by high schools.
- Teacher effectiveness.
- School resources.
- Parental income, wealth, and education.
- Out-of-school opportunities.
Barriers and Inhibitors Cont...

**Barriers to URM**
African American and Hispanic college students with high grade point averages and SAT scores above 600 typically do not pursue engineering and technology as college majors for reasons including:

- Poor and inflexible teaching in engineering and technology courses.
- Lack of encouragement from teachers or parents.
- Self-perception of their own inability to be successful as engineering and technology majors.
Other Factors That Have Been Known to Inhibit URM Participation in Engineering Education…

<table>
<thead>
<tr>
<th>Lack of role models</th>
<th>Stereotype and Low Expectations</th>
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<tbody>
<tr>
<td>URM often do not know any successful engineers within their communities.</td>
<td>Minority groups are generally considered unable to succeed in the technical sciences and thus students are not encouraged to go take those courses despite their fears of making lower grades. URMs are subjected to peer pressure by their peers who often stress the “uncool” aspects of academics in general and hard sciences.</td>
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<th>Lack of information</th>
<th>The MYTH</th>
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<tr>
<td>URM often do not have access to accurate information about the requirements and nature of engineering and technology education. URMs aren’t aware of the benefits &amp; rewards of engineering &amp; technology careers.</td>
<td>The perceived difficulty of math and physical sciences. Students fear that they might achieve lower grades in STEM than they would in other courses are often reinforced by inordinately high emphasis on grades.</td>
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Influencers and Change Agents

**Teachers**
- Most available for students making decisions
- Most sustainable motivators
- Reliable source of good academic advice and counsel
- Role models
- Their roles are magnified when dealing with students & uneducated parents

**Parents**
- Educational Background, Occupation, and Aspiration
- Cultural & Social Capital
- Economic Status

**Media**
- Propagating myths that Engineering, Math & the Technical Sciences are too difficult for students to pass
- Glorifying Athletes & Entertainers
- Highlighting the perceived failure of U.S. students in Science & Math

**Colleges**
- Sources of accurate info on Engineering education and Careers
- Community Outreach
- Collaboration with K-12 on Pathway to Engineering Education
- Admission requirements
- Pre-College Bridge
Tools and Methods of Solution

- Identify when and why children lose interest in Science and Math
- Identify ‘Switch off’ factors
- Bridge the transition gap between primary and secondary, and between secondary and tertiary
- Identify the different ways children learn
- Identify individual differences (the child’s strengths and weaknesses). Teach individuals, not groups
- Teach not just for competence but also to cultivate and sustain interest
- Inspire, encourage and support
- Emphasis examples of positive role models (Parents)
- Teach children to think as (champs) victors not victims (parents)
- Encourage self esteem
- Tear down the myth
- Combat peer pressure
- Publicize success and good results
- Showcase minorities and women scientists and engineers
- Use positive images
## Partnership

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<tr>
<th>With SSU</th>
<th>With Parents</th>
<th>With the Media</th>
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<tr>
<td>Share resources – labs,</td>
<td>Effective communication</td>
<td>Publish success stories</td>
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<tr>
<td>faculty, college student</td>
<td>Reinforce the same message</td>
<td>Publish positive events and noteworthy activities</td>
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<td>peer mentors</td>
<td>Include progress in science</td>
<td>Show images of minority</td>
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<tr>
<td></td>
<td>math and technology in</td>
<td>and women in engineering</td>
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<td></td>
<td>PTA programs</td>
<td>and technology</td>
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<td>Play up progress and</td>
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<td></td>
<td>apparent interest</td>
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<td></td>
<td>Triangulate: SSU – Teacher – Parent collaboration</td>
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<td>Organize science and</td>
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<td>technology clubs</td>
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<td>Organize scientific events – competitions, fairs, field trips, technology week, SAT review, etc.</td>
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<td>Channel information to</td>
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<td>students</td>
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<td>Identify interested</td>
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<td>students and follow up</td>
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<td>Inform students of</td>
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<td>financial and other</td>
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<td>opportunities</td>
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Our Goal/Conclusion

• To establish a sustainable pipeline for the continuous supply of URMs especially women freshmen in engineering and technology at Savannah State University

• To recruit at least 20 URMs (women in particular) into engineering and technology programs each year (with 10% annual increases).
Bibliography


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