

## Broadening the Appeal of STEM Fields and the Role of Partnering and Public Policy

[Michelle Tortolani, FY07 SWE President-Elect, remarks at 2007 NAMEPA Conference, Friday, February 23, 2007.]

I am very pleased to be here to speak to you on “Broadening the appeal of STEM fields and the role of partnering and public policy”.

[SWE Introduction]

I would like to first begin with an overview of SWE’s purpose.

SWE was founded in 1950 and is a not-for-profit educational and service organization. SWE is the driving force that establishes engineering as a highly desirable career aspiration for women. SWE empowers women to succeed and advance in those aspirations and be recognized for their contributions and achievements as engineers and leaders.

Our mission and objectives are best captured with our tag line:

- Aspire to make engineering a top educational choice for girls
- Advance women engineers in the workplace
- Achieve excellence as leaders within our fields

[Broadening the appeal of engineering]

How do we broaden the appeal of engineering and STEM fields?

Consider the following:

Why, while girls comprise 55 percent of undergraduate students, they account for only 20 percent of engineering majors, and boys

remain four times more likely to enroll in undergraduate engineering programs?

Two years ago, US engineering societies (including SWE), academic institutions, industry, and Boston public television station WGBH formed the Extraordinary Women Engineers Project. As part of this project, a research effort was conducted to better understand why girls account for only 20 percent of engineering majors.

The objectives of the study were to:

- Gauge high school girls' level of interest in and awareness of careers in the engineering field;
- Assess general career motivators and barriers toward the engineering field;
- Evaluate current messages being put forward; and
- Explore messaging opportunities for increasing enrollment in the engineering field.

There were 4 key findings from the study:

1) High school girls show little interest in engineering. They think it is for people who “love” math and science, and they understand little about engineering’s true nature.

2) The gender divide is real. The girls described engineering as a “man’s profession”. They said they received little encouragement to pursue engineering.

3) We are sending the wrong message to not only girls, but also other under-represented groups. The engineering community needs to modernize its message to high school students and to customize the message. We describe engineering as a “challenging

field” and caution students considering it to focus on developing superior math and science abilities. We emphasize the effort, but none of the benefits or rewards.

4) High school girls, as well as boys, want meaningful, comfortable, relevant and rewarding work that makes a difference. They want messages that portray engineering as interesting, hands-on, and financially rewarding work that takes place beyond the cubicle. They appreciate that engineers make a difference, improve lives, and get to use their imagination and creativity.

[Sending the right message]

With this in mind, we have tailored our pre-college programs to send a message which resonates with girls. This tailoring also broadens the appeal of engineering to everyone.

- For instance, we use examples that contain multiple career motivators;
- We provide personal and informational stories that tell more about the engineering lifestyle; and
- We demonstrate how engineering aligns with their career motivators - enjoyable, good working environment; making a difference; financial rewards; and flexibility.

We talk about the rewarding things about being an engineer, such as:

- Opportunity to have an impact
- Challenging work
- Diverse problems to solve requiring creative thinking
- Financial benefits providing a sense of success and comfort

We address the career and financial rewards in a number of ways. For instance,

- A four-year degree in engineering yields an outstanding salary (I have been to many panel discussions where an engineering executive or scientist is asked about their salary by a student in the audience and they are hesitant to respond or later apologize for responding. We need to highlight (and not apologize for) the outstanding salary that students can secure with a four-year degree in engineering.)
- We address the industry opportunities. For instance,
  - The ability to pursue advanced degrees while working full-time, and
  - Employer support for continuing education
- We also address the academic opportunities, such as,
  - Strong demand for engineering faculty at good salaries, and
  - Interesting consulting and research opportunities
- And we highlight the numerous career options
  - Technical tracks
  - Management and business tracks

[Working with educators]

We are also working with K thru 12 educators to change attitudes about engineering:

Teachers are overwhelmingly positive about engineering in the abstract, highlighting the virtues of an engineering education and career. However, when it comes down to their students, they believe that many—and especially females and minorities—cannot succeed in the engineering world.

We recommend several targeted classroom strategies....strategies which:

1) Focus on technical confidence through technical competence.

For instance,

- Don't assume background knowledge that makes understanding concepts or exercises "hard"; and
- We should work to develop fundamental skills

2) Foster Inclusion Rather than Isolation

3) Select Appealing Classroom Materials

For instance,

- Include diversity obvious in the images of engineers
- Feature teamwork
- Assign roles and shift throughout the project
  - Both girls and under-represented groups prefer role-playing over competition and wait to be invited....make role playing a natural part of the project.

4) Select Positive Projects

- Does the activity have a positive impact? For instance, if it is a project involving robots...
  - Are the robots battling each other or performing a service for a person?
- Is teamwork and partnership valued? Is this part of the criteria for selecting the project?

5) Highlight the importance of technology and engineering. For instance,

- The impact of designing life improving products, or

- The importance of clean water (Earlier this week, I attended the National Academy of Engineering Awards Dinner and the 2007 Grainger Challenge Gold Award of \$1 M was awarded for the development of a water treatment system.)

It is critical that the message that we deliver to students and the adults around them – parents, teachers and counselors – is both appealing and accurate.

[Partnering]

How can we broaden our reach and message?

We have expanded our efforts by reaching out to our partners, both corporate and non-profit.

1) We teamed with Northrop Grumman, as National Engineers Week 2006 Co-chair, to launch the “Connecting Educators to Engineering” program. The program is designed to create and strengthen links between educators and the members of the engineering profession, and focuses on the middle school years since these years are the formative years in the development of future math, science and technology majors.

The concept of the program is such that working scientists and engineers contact and partner with local middle school educators.

In order for this program to be successful, volunteers need training in effective outreach techniques....so we have developed online training, containing material from experts in education and outreach and from some of the latest findings on student and educator attitudes and messaging needs.

NAMEPA would be an excellent resource for this program and we invite you to include or point to your resources.

2) We are working with the ExxonMobil Foundation to launch a K thru 12 website center and they have funded this project. The center will introduce girls to the world of engineering and technology, and provide career guidance materials for students, parents, teachers, and engineers.

This is another area in which NAMEPA would be a valuable resource, and we invite you to include or point to your resources.

3) We have partnered with Girl Scouts, Girls Inc, FIRST, National Girls Collaborative Project, and the Future City Competition to offer pre-college programs which put engineering in front of girls and send an accurate and appealing message of what engineering is, what the typical experiences of an engineer are, and how to prepare for a career in engineering.

We are also working with Girls Inc and Girls Scouts on training for staff and leaders because these adult influencers often don't reinforce what we present.

4) And lastly, there are the opportunities for partnering on campus

Diversity groups such as SWE, NSBE, SHPE and AISES are beginning to partner on campus to address retention. They are finding that as a team, they can get more sponsorship and participation for their career guidance and professional development activities.

Benefits include:

- Opportunity for students to work together

- Removal of the duplication of effort. This is especially important as funding becomes tight.
- Joint activities (such as career fairs and award banquets) are more appealing to corporate sponsors...and it not just the money, but also the time.

[Public policy]

What is the role of public policy in broadening the appeal of STEM fields?

As a center of information on women in engineering, SWE naturally serves as an advocate to:

- promote and improve STEM education
- increase the visibility and importance of STEM education and work, and
- promote the success of women in completing academic programs and advancing in academia.

Why should we have an influence on public policy?

- One it is a scale issue, we can reach further, and
- Two, if you are going to serve as an advocate, then you have a responsibility to be an advocate.

In this respect,

- SWE is working to promote and improve STEM education including K thru 12, higher education, and workforce issues.
- We are working to increase the visibility and importance of STEM education and work, and to educate members of Congress and their staff on the issues surrounding STEM education.

- And we are positioning ourselves to serve as an information source and a catalyst for advancing legislation and funding to improve STEM education.

In the past year, SWE has published two position papers – one on STEM education and a second on the application of Title IX to STEM fields. We have hosted two Congressional briefings – one on “Strengthening the STEM workforce” and a second on “Are more women and diversity needed in the STEM workforce”.

In the area of STEM education, SWE supports:

- Enlarging America’s talent pool by improving K thru 12 STEM education through the recruitment, training, and retention of STEM teachers. Some examples of how this can be done include:
  - attracting STEM teachers via scholarships, and
  - instituting mentoring programs for STEM personnel in schools.
- SWE also supports expanding the STEM pipeline, especially targeting women and minorities, by increasing the number of students who pursue STEM coursework. Some examples of how this can be done include:
  - providing incentives and mentoring for students to pursue K thru 12 STEM coursework; and
  - supporting STEM magnet schools in school districts with large minority enrollments
- SWE also supports making the United States the most appealing setting for study and research to recruit and retain top quality students, scientists, and engineers. This can be done by:

- providing incentives and mentoring for students, including women and minorities who pursue STEM coursework and
- providing federal tax credits to encourage employers to make continuing education available (either internally or through colleges and universities) to practicing scientists and engineers

In the area of the application of Title IX to STEM fields:

- SWE recommends that policymakers step up enforcement of Title IX with regard to STEM disciplines, and fund programs that will help educate students and their parents, and STEM faculty, of their rights under the law
- SWE believes educational institutions should fulfill their obligations under the law; examine their institutional policies, procedures and practices for gender bias; and provide suggestions for areas to examine when evaluating programs for gender bias
- SWE also recommends that federal funding agencies should fulfill their monitoring and enforcement obligations under the law, and make this information available to the public.

There are 3 ways to address Title IX issues -- thru litigation, enforcement, or voluntary compliance. We are focusing our efforts on voluntary compliance, specifically, education.

Educational institutions do not want government agencies coming in and telling them what to do to address Title IX issues. We can put the education in place on how you can be compliant and then you have the tools to develop your processes and put them in place.

Both NSBE and SHPE have endorsed our Title IX position paper recommendations and I invite NAMEPA to do so also. I also

encourage NAMEPA and other diversity organizations to leverage legislation for advancing equity for all under-represented groups, and SWE looks forward to supporting your efforts.

There is also opportunity for us to work together in putting forth before college administrations suggestions on how to support diversity and implement those recommendations.

We clearly have a stronger impact working together so lets work together in broadening the appeal of STEM fields.

Thank you.