# Designing the "Perfect" Women in Engineering Program

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Using a "uniform group technique" participants suggested characteristics of a "perfect" Women in Engineering Program; identified barriers to achieving those traits; and suggested methods or techniques to overcome those barriers. Characteristics suggested by group participants clustered around 15 issues. The participants then cast votes to determine which issues they believed were most important to the success of implementing a Women in Engineering Program. Following is a list of these issues including some of the individual ideas that characterized these issues. The number in parentheses indicates the relative weight (0-23) based on votes of participants.

1. **Systemic institutional change to the engineering educational environment (23)**

   - a curricular effort that addressed gender differences, sexual harassment, etc.

   - forming a sense of community among women in science and engineering

   - develop and implement ideas to change the classroom environment

   - providing a warm and supportive environment for women students

   - coordinated, well planned activities

   - the Women in Engineering Program would promote systemic institutional change affecting curriculum, issues of gender and pedagogy, sexual harassment, etc.

2. **Institutional support (22)**

   - emotional and financial support

   - a funding network consisting of grant money, money from industry, and a financial commitment from the engineering school or university

   - institutional rather than marginal support

   - a significant increase of women faculty

   - faculty involvement in the Women in Engineering program

   - Dean's Office support, both in terms of resources and philosophy

3. **A faculty sensitized to the importance of gender issues (21)**

   - faculty sensitivity program to prepare them for teaching to a diverse student population

- gender awareness sessions compulsory for all faculty, staff, and students
- strong faculty involvement at all levels of the Women in Engineering program
- training programs to sensitize engineering advisors to special issues in engineering which affect women
- gender sensitivity workshops

4. **Comprehensive outreach activities impacting K-12 students (19)**

- a high school recruitment program
- train women engineers, faculty, staff, and students who participate in recruitment activities so they promote the "human" side of engineering and its contributions to society
- first year students who has an awareness of engineering careers and access to those careers
- a one day conference for middle school girls
- educate high school math and science teachers and counselors about engineering
- utilize undergraduates for outreach programs to pre-college students
- a successful summer program for 11th grade girls who are strong in math and science, but unaware of engineering as possible career
- a comprehensive pipeline program starting in K-12 activities through practicing women engineers
- a summer workshop for middle high and high school girls promoting science, engineering and math

5. **Retention activities (16)**

- increasing undergraduate retention, graduating more women (number and percentage)
- orientation program with follow up focusing on assertiveness and computer/lab skills
- retention activities
- a mentoring program for first year students
- focus on lower-division students
- early exposure to engineering to help integrate the fragmented first year
- increase retention of women to 100% (or even 90%)

6. **Mentoring programs (15)**

- one on one match of upper division to lower division students
- mentoring program: seniors help first year students; etc.
- undergraduate peer mentoring component
- Big Sis Little Sis peer mentoring

- peer support component

- mentoring program for pre-college and college women

- enable undergraduates to grow and gain confidence by acting as "role models" to high school students

- graduate to undergraduate student connection groups

- women students developing and running their own program of mentoring and outreach to junior and senior high school women with our facilitation

## 7. Role Models (13)

- bringing in outside speakers as role models or exemplars

- show women who want to pursue science and engineering, do so and succeed

- incorporate practicing women engineers to serve as role models

- interaction with professional women engineers

- good network of women engineer speakers for various program activities

## 8. Evaluation (12)

- evaluation/assessment would be an integral piece of Women in Engineering Program from its inception

- set short term and long term goals (measurable)

- obtain feedback to the program through exit interviews with graduation women engineering students and students who leave engineering.

## 9. Research Experience (8)

- internships providing hands-on research experience in labs for freshman

- undergraduate research component

## 10. Scholarships (4)

- corporate fund raising for undergraduate scholarships for women

## 11. Student Leadership (2)

- student leadership in planning and executing activities

- women students developing and implementing their own programs

- interested students

## 12. Counseling (2)

- ongoing counseling

- counseling program for women students

- seminar on understanding problems facing women in today's society

### 13. Activities for Graduate Students (1)

- "pipeline" program to encourage and support undergraduate women to continue on to graduate school
- increasing graduate student enrollment and retention

### 14. Media (0)

- eye catching, gorgeous posters, brochures, literature
- video on women in engineering

### 15. Facilities (0)

- a center for activities/programs

## BARRIERS

### 1. Systemic institutional change to the engineering educational environment

**Engineering Faculty:** lack of support, fear of change, insensitivity to the needs of women students in learning, traditional stereotypes of the women students and the changing roles of women, no time to think about change, lack of understanding how climate effects learning, tradition, bad attitudes such as "we're doing all we can" or "it's worked well for years——why change", the old guard, insular nature of engineering (it's a closed club), unwilling to change an entrenched curriculum, unaware of gender issues.

**Engineering Administration:** inertia of existing systems, not a priority, not aware of gender issues, they're all men, unable to affect faculty behavior in other departments (e.g. math, physics, chemistry).

### 2. Institutional support

**Financial:** current economy, lack of money, competition with other programs for a diminishing resource pool, tighter budgets, zero sum mentality (money put toward women's programs means taking it away from other programs, lack of assistance with external fund raising, recession, budget administrators are males.

**Engineering Administration:** lack of knowledge regarding the need, low status of low profile of individuals running Women in Engineering Programs, short-sighted administrators who don't see long term benefits, personal biases.

### 3. A faculty sensitized to the importance of gender issues

**Faculty:** lack of awareness or understanding of gender issues, no rewards for their efforts on behalf of Women in Engineering Programs, not enough women faculty, tradition, individual biases, persistence of female stereotypes, those who need it are least likely to participate in training seminars, sexist, conservative attitudes, faculty have no time or desire to change, no understanding that traditional teaching styles prohibit women from doing well in class, rewards based on quality of research, persist

in holding stereotypes of females, ingrained attitudes, international faculty from cultures that devalue women, male faculty protecting their turf, faculty is resistant if sensitivity training is not required——resentful if it is, "good old boys" network.

**Dean:** sexist mindset, hire more international faculty from cultures that devalue women and do not insist of change of attitudes, continue to support a reward structure that is based on quality of research.

### 4. Comprehensive outreach activities impacting K-12 students

**K-12 Teachers/Counselors:** no math or science focus in teacher or counselor educational curricula, lack of time, overworked and underpaid, disinterest and/or preconceptions, few opportunities to interact with engineering faculty or staff.

**Faculty:** abstract nature of professors' knowledge not appropriate to student's need for concrete information about engineering, mentality of weeding out applicants rather than cultivating diversity, few opportunities to interact with K-12 teachers or counselors.

**Program Administration:** lack of training for students and staff participating in programs, lack of funding, lack of time, too few people to do the task, no institutional support, turnover in K-12 advocates, no time to cultivate or maintain links with teachers and counselors, few opportunities for interactions with teachers and counselors, student participants must be turned away because there are too many applicants for limited programs, not enough research about how to do it best.

**Engineering Administration:** doesn't provide funding or resources for K-12 activities.

### 5. Retention activities

**Courses or Curricula:** competitive nature of first year courses, fragmentation of lower division curricula, lack of internships or hands on experiences, difficulties with first year courses, lack of integration between courses and ethical/societal/people issues, inflexible curricula.

**Faculty:** poor attitudes toward women students, lack of understanding of pedagogical techniques and their relation to gender, faculty don't inspire students to stay in engineering, undergrads are unimportant, overt discrimination or sexism in the classroom.

**Women Students:** Society's conditioning of young women, women students consider anything less than perfect performance as failure, students who don't understand that their difficulties may be related to gender, students overcommited don't have time to participate in retention activities, students don't fully understand engineering careers.

**Engineering Administration:** lack of encouragement for women students, lack of understanding about the retention process (where and when to intervene), unsupportive environment, lack of funding for tutoring or advising.

6. **Mentoring programs**

**Women Students:** students are too busy to participate, no rewards for students to act as mentors, students unaware of value of mentoring, students are trained how to be good mentors.

**Program Administrators:** large amount of time and funding needed to implement, not enough mentors (pipeline narrows too much), don't know how to motivate students to participate, too many other demands on students and faculty, lack of support.

**Engineering Administration:** doesn't give priority for funds or staff time.

## SOLUTIONS

In the final phase of the workshop, participants suggested what would help achieve the top six characteristics of the "Perfect Women in Engineering Program".

1. **Systemic institutional change to the engineering educational environment:** Support and "buy in" to the Women in Engineering Program from the top down (dean, dept. heads, etc.); Women Board of Trustees and university administrators; hire more women to achieve a critical mass; growing acceptance of women's right and equality; demonstrate statistically the need for more quality engineers showing a need for change; develop new teaching paradigms, improve curricula, required faculty sensitivity training; dean develops task force to make changes; education on issues for all faculty, staff, and administrators; government and media support of new educational initiatives; use data to show need for change in attitudes and behaviors; change faculty reward system to reflect value of participation in Women in Engineering Programs.

2. **Institutional support:** Only hire deans who are pro-active, fully committed to institutional change, and Women in Engineering efforts; a multi-faceted approach to get funds from within the university and without (corporations, alums, government agencies); use institutional support to seek outside support; pressure, encouragement, and role modeling by external funding sources; each department of engineering makes Women in Engineering Programs one of their priorities; external funding that is tied in to proof of commitment to Women in Engineering Programs; more public or community awareness; political activism to put the issue on the forefront; use data to show need and lend programs credibility; collaborative programs with existing campus departments and organizations; educate the upper level administrators.

3. **A faculty sensitized to the importance of gender issues:** Involve sensitive, aware men as role models in gender awareness sessions; create rewards or incentives for faculty involved in Women in Engineering Programs and for participation in awareness workshops; provide diversity and gender workshops; include sensitivity issues in raises; commitment and leverage at high levels of administration; hire more young female faculty; death and retirement of insensitive faculty; increase number and diversity of female students; dynamic progressive leadership with big bucks support; special budget lines for female faculty at the institution or school level rather than departments; educate the faculty; change the promotion and tenure process to

reflect commitment; develop open forums for male and female faculty discussions to dispel myths of female stereotypes.

4. **Comprehensive outreach activities impacting K-12 students:** Network with successful programs to give yourself and your administration a reason to believe these activities make a difference; make K-12 programs as "hands on" as possible; develop strong funding and support for these activities; get more help from industry and students; train presenters, provide audio-visual aids and literature; more funding from agencies and companies for ongoing programs, not just new ones; work with teacher education schools, a reward system and financial support for increased pre-college activities; develop relationships with local high schools; get more engineers into the classrooms; use a grad student or senior to help coordinate activities; involve teachers and counselors in planning activities; industry support; form connections within key states, counties, etc. with K-12 organizations to cultivate and nurture interest; get more information about engineering to science and math teachers; system of support and recognition of K-12 teachers and activities by engineering schools; provide training workshops for high school teachers/counselors to increase their awareness of opportunities; piggyback onto growing recruitment programs at all universities.

5. **Retention activities :** Provide mechanisms for networking, socializing, mentoring; faculty champions and institutional support for change; change teaching methods in math and science to be more compatible with female's learning methods; funding for advisors and tutoring; changes to curricula; hiring an eager women's program director willing to work hard; change the way engineering is taught; develop a supportive environment; develop industry internships early in the educational process; work with university-wide retention programs; train faculty to be more accepting of women students; reduce peer harassment; develop a caring attitude; train faculty to recognize the importance of encouraging women students; sharing of retention ideas from other successful Women in Engineering Programs; listen to student input; successful mentoring and faculty change programs; involvement by students who are positive in their "womanhood"; make sure women recognize their social conditioning and know they act as they choose in spite of their conditioning.

6. **Mentoring programs:** Provide organized activities to promote interaction between mentor and protege; help women students recognize the need and value of mentoring; pair up students during their freshman year; train student mentors; develop sessions for women students training them to challenge perceptions and stereotypes; supply evidence that shows need for mentoring; develop student leaders to help coordinate; get more faculty involved to avoid overloading those who always participate; have a physical gathering place; require participation by first year students; have activities which provide an opportunity for students to interact and find their own mentor; increase the number of women students and faculty; reward mentors; ask students to identify their own area of expertise; involve interested and caring males as mentors; get institutional and corporate support; give funding and academic credit to mentors.