

## RECRUITING LOW-INCOME WOMEN INTO ENGINEERING

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Approaches developed over the past decade to encourage women to enter engineering have been widely replicated and refined. Those of us in the women's education and employment community can be reasonably sure that if we follow the models laid down for us, we will in all likelihood succeed in recruiting, retaining, and graduating a healthy number of women with Bachelors degrees in engineering. We are now beginning to turn serious attention to increasing the numbers of women with Masters and Doctoral degrees in engineering as well. Progress on the engineering front represents a triumph for women and the women's movement, and is all to the good.

However, a look at the language we use about women in engineering reveals what I believe is a rather significant assumption. We refer to high school education as "pre-college," making high school merely a prerequisite for college. We refer to the educational "pipeline," and look with sorrow and frustration at all those women who in effect drop out before reaching the goal line, a Ph.D. in engineering. We recall Lucy Sells' wonderfully expressive description of mathematics as "the critical filter," referring to mathematics as the instrument that weeds out so many women from higher education in engineering and the sciences. Conferences on the subject of women in the sciences and engineering, including the one for which this paper has been written, are exclusively concerned with the professional levels of these fields.

The assumption is that engineering can only be done at the professional level, with a Bachelors degree at minimum and preferably a full doctorate.

To us in the women's education and employment community, it's an understandable assumption. Most of us spend our work lives, our home lives and our social lives with people who, like us, have advanced degrees. For some of us, doesn't *everyone* have a Ph.D.?

No, everyone does not. In fact, most women don't even have a Bachelors degree. What's more, most women have never been to college. Only 17 percent of American women aged 25 and over have had four or more years of postsecondary education. (The comparable figure for men is 24 percent). Another 17 percent of women have had one to three years of college. <sup>1</sup>

Engineering, in the way we have been accustomed to speak of it, is therefore entirely out of reach for two-thirds of American women. Put another way, all these women, most of whom are high school graduates via a regular diploma or a G.E.D. (General Equivalency Diploma), are entirely outside our field of vision.

What jobs and careers do high-school educated women have? They are clerical workers and cashiers, receptionists and teachers' aides. If they manage an extra year or two of vocational school or community college, they are executive secretaries, licensed practical nurses, or laboratory assistants. The career advancement potential of these traditionally female, low-paid jobs is even poorer than the salaries.

I believe that non-college-educated women need us to help them attain well-paying jobs even more than their better-educated sisters do. Since postsecondary education in the United States is rarely free and financial assistance comes nowhere near filling the need, women with well-off family backgrounds are more likely to attend college. Women with college educations are more likely to marry men at equal or higher educational levels, not lower. (High-school women are the ones who by and large marry the high-school men.) Because income correlates with education, the family income of college-educated women is higher than that of women with high school educations. Consequently, college-educated women are more likely than high school-educated women to receive alimony and child support payments if their marriages end.

Earning less than their better-educated sisters to begin with, women with high school educations therefore have more need but less hope of financial help from families, husbands, and/or ex-husbands. They are far more on their own, with fewer resources to call on, when, as many but obviously not all do, they become single parents.

There are many reasons women don't go to college after high school. Some cannot afford to pay for four years of college, cannot obtain enough financial aid, or their families cannot afford to do without their salaries for that length of time. Family and/or job responsibilities may preclude going to college even part-time. Others do not get the necessary academic preparation in high school to enter college, due to poor counseling, poor opportunities, poor social environments, or other reasons. Some become mothers earlier than they had intended. Still others find their college plans thwarted by their own or family members' illnesses. Life happens, after all, in varied and often unexpected ways.

When women do manage to earn two-year Associate degrees, they do so overwhelmingly in female-intensive fields. In 1987 women earned 56 percent of the half-million Associate degrees, but they were far from evenly distributed across the programs of study.<sup>2</sup>

#### PERCENTAGE OF ASSOCIATE DEGREES EARNED BY WOMEN IN SELECTED FIELDS 1987

Women earned:

- 71% of the education degrees
- 99% of the secretarial degrees
- 93% of the general nursing degrees

But they earned:

- 11% of the engineering degrees
- 9% of the engineering technology degrees --
  - 5% of mechanics and repairers
  - 4% in the construction trades

In fact, over half (54 percent) of all Associate degrees awarded to women were in only two of thirty programs: health sciences, and business and management.

Which do you think pay more? Need I ask?

Engineering at the technician level is an excellent option for women without college educations. The average engineering technician earns about \$25,000 a year, not bad pay when you consider that the average natural scientist earns about \$32,000 a year for a much larger educational investment. Technician occupations are slated to grow much faster than average over the next decade, meaning that there will continue to be many job openings. Technicians often work for large and/or forward-looking companies with benefits that include tuition-reimbursement plans. This may be the only way some women can ever hope to get a college education, for their own self-enrichment as well as for career advancement purposes. It's also possible that baccalaureate Women in Engineering programs would find women in technician programs a promising recruitment resource, a good option for women who have had the opportunity to demonstrate that they deserve generous scholarships.

Under these circumstances, we need to think about why we in the women's education and employment community have ignored the needs of low-income women for so long. I can only speculate. Do these factors have anything to do with it?

- We have advanced degrees ourselves. Are we more interested in people like us?
- There has been more scholarly and advocacy attention to women in the trades than technicians. Do women in the trades strike us as exotic?
- Technicians are subordinate to engineers, most of whom are men. Do we shy away from perpetuating the stereotyped male/female relationship?
- The lower the educational level, the more African-Americans and Hispanics one finds: <sup>3</sup>

They earned 13% of Associate degrees  
8% of Bachelors degrees  
7% of Masters degrees  
5% of Ph.D.s

Many of us are white, middle class women. Are we afraid of being accused of racism if we advocate technician jobs for minority women while engineers are primarily white males?

- Most existing intervention programs for women in engineering are located at universities, as are most of us. Is self-interest involved in promoting women's access to university-level engineering?

None of these reasons, if any of them are true, is necessarily compelling. We can and should widen our spheres of attention and effort to include low-income women at the technician level of engineering. How can we do it?

When we recruit in high schools for Women in Engineering programs, we should go out of our way to stress that professional engineers aren't the only ones who do engineering work. We should provide girls with information about technician-level career options, educational resources, and financial aid possibilities. This may entail a formal arrangement or understanding with a local community college with a good engineering technology program, or we can make the pitch on our own as a kind of public service announcement. Surely those of us whose institutions include two-year degrees should make a concerted effort to recruit more women for these programs.

When we meet with our colleagues in engineering and women's advocacy in our home institutions as well as at conferences and meetings, we need to be more aware of the needs of low-income women than we have been. It is not difficult to remind our colleagues at appropriate points in the conversation that women are a good source of new engineering technician talent, and that a good deal of engineering work is done by technicians too.

It seems to me that the great barrier now in 1990 to low-income women's access to engineering technician careers is awareness of the need for it on the part of educators, employers, and women's advocates. We know by now how to recruit, train, and place women in nontraditional occupations such as engineering.<sup>4</sup> When will we apply our hard-won expertise to the population of low-income women?

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NOTES

<sup>1</sup> *Digest of Educational Statistics, 1989*. National Center for Education Statistics. Office of Educational Research and Improvement, U.S. Department of Education. Data collected in 1987.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> My own book, *The Nuts and Bolts of NTO: How to Help Women Enter NonTraditional Occupations* (Scarecrow Press, Metuchen New Jersey, 1986), includes much of what we know, and others have learned even more since its publication.