



Open Forum on Broadening Participation in STEM (OFBP)

Reflecting On Our Roots – Part Six: Women and Engineering **- by Shirley Malcom**

Reflecting On Our Roots is a series of essays outlining some of the historical context of the field of broadening participation. The essays were originally published in the NSF INCLUDES Open Forum group on Trellis, and are now located in the new Open Forum on Broadening Participation microsite. Shirley Malcom is the Senior Advisor and Director of SEA Change at the American Association for the Advancement of Science and co-PI on NSF grant 1748345 which supports the NSF Open Forum on Broadening Participation in STEM.

Part Six of Reflecting on Our Roots introduced you to early work by researchers such as sociologist Lucy Sells who, in the early 1970s, spotlighted the differences in high school mathematics course taking between young men and young women as part of the explanation of why women were not majoring in many STEM fields, especially in the physical sciences and engineering. Without the requisite mathematics background from high school, the role models or the expectation that young women should be entering these fields at all, it was an uphill battle to diversify those areas of study.

Almost 50 years later, huge gaps in high school mathematics course taking have largely been closed, yet low participation levels by women in physics, engineering, and computer science (or so-called PECS) remain, with a stubbornly persistent 4:1 male : female ratio. What was wrong with our assumptions?

Several areas of research suggest that the original thinking presented necessary but not sufficient conditions related to the young women. While they needed mathematics skills to pursue PECS, somehow gaining the competencies was not enough. Is there something about the fields themselves that make them less hospitable? Are PECS welcoming areas of study to diverse student populations? Do those currently in these fields make assumptions about who can succeed such that the cultures favor males?



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Findings from Cimpian, et.al introduced a new wrinkle in trying to understand the gender participation patterns that we see in PECS—that of the differences in male : female participation gaps by mathematics achievement levels. High STEM achieving women show a much smaller gap in participation levels compared to high STEM achieving men; but women who exhibit lower mathematics performance show wider gaps in majoring in PECS compared with men who score are comparable levels. Why is the gender gap different across the achievement distribution such that men with lower mathematics achievement scores are more likely to major in PECS fields than women with the same (or even higher) scores? Are the cultures of these fields likely to be ones where the men are more likely to feel welcomed?? <https://www.science.org/doi/10.1126/science.aba7377>

The authors of the above referenced research suggest that perhaps so-called “male-favoring cultures” of PECS are attracting less qualified men over more highly qualified women. Once again, we are reminded that broadening participation cannot be just about fixing the women. We cannot just look at the preparation and choices of the entrants, but also must look at the cultures of the fields and the messages that are being sent to the women as well as to the men.