
Conclusion

Engineering Gender Balance in Computing

High-quality research into women's underrepresentation in computing is becoming available thanks to the support of funding agencies such as the National Science Foundation and the Alfred P. Sloan Foundation. The fruits of NSF support are evident in this book.

Even as these research results are disseminated, it is clear that we still have much to learn. Each chapter in this book raises many questions and calls for more research. We are far from understanding the relationship between gender and participation in IT.

Despite clear gaps in our understanding of the situation, the strong motivation to increase the representation of women and minorities has led to a change in priorities. Rather than focusing on fundamental research, the emphasis is now on action. NSF programs such as the ITWF, the new Broadening Participation in Computing, and Gender and Science and Engineering all seek to foster the wide adoption of practices that attract and retain more underrepresented groups. Nationwide movements, such as the National Center for Women in IT, seek to identify, pilot, and spread promising and effective practices. This new approach asks what works, rather than why it works. Mirroring the distinction between scientific efforts to know or understand, and engineering efforts to make or do, we see a shift away from the science and toward the engineering of computing's gender balance.

The engineering approach to creating gender balance in computing has promise. Just as engineering has produced many benefits in the absence of complete scientific understanding (e.g., SSRI drugs, telescopes, and steam engines), the hope is that it will allow us to move toward parity in computing before we fully understand why women are underrepresented in this and other technology fields. Instead of waiting

for full knowledge of a highly complex situation, the plan is to move forward by applying what we know, experimenting, and building on success.

The shift toward a pragmatic what-works approach brings an added need for high-quality evaluation. Evaluation enables us to know whether an intervention works. It sets specific criteria for measuring whether a program achieved its goals and provides evidence about whether the program satisfied those criteria. In this way, evaluation tempers enthusiastic and committed activists who claim that their practices are effective, but have no evidence to support their claims.

This heavy reliance on evaluation raises some concerns. Necessary as it is to provide evidence about the effectiveness of an intervention, evaluation in the absence of fundamental understanding can lead to negative consequences. Most seriously, it can prematurely narrow our focus so that we work at changing the immediate conditions while ignoring their underlying causes; it can undercut support for efforts that would produce long-term yet not quickly measurable results; and it can produce unintended side effects.

A narrow focus on the immediate conditions is like sticking your finger in a hole in a dike, washing floors on a rainy day, drinking diet soda with your cheeseburger and french fries, or saving money in a bank account with 1 percent interest when you carry a credit card balance charging 20 percent. It expends effort to create short-term or local improvement, but does not address the root problem. After twenty years, women's representation in computing could reach parity in the organizations that adopted effective practices, but if the root causes have not changed, the results could remain localized or the trends could reverse when efforts are discontinued.

The value in evaluation depends on how well it is done. Inappropriate comparisons, selection bias, wrong or poorly constructed questions, and sloppy data collection or analysis are only some of the problems that can lead to misleading results. Less well-recognized is how evaluation favors short-term, countable, anticipated outcomes. For example, we can measure whether women in a peer-support program persist in their computing major at higher rates than women who are not in the program, but we seldom think to measure whether participants enroll in computing graduate programs after raising their families. If we did, we might find that the support program had no immediate effect on undergraduate persistence, although it did result in more returning women graduate students. Similarly, we might miss the success of interventions with high school teachers of AP computer science if we look only for greater gender balance in their high school classes, and ignore the more

positive image of computing those teachers communicate and the subsequent higher rates of students from their school declaring a computer science major in college. If evaluation finds no immediate positive results for such programs, the programs would likely be labeled as ineffective and discontinued, despite the fact that they actually produced longer-term or unanticipated positive results. The practical constraints that focus evaluation on immediate and recognizable results raise the chances that these types of mistakes will occur.

Other unintended side effects of the heavy reliance on evaluation can result from acting in the absence of understanding the interrelated factors that produce a situation. Funding only interventions that have been proven effective can lead to a small range of cookie-cutter programs even though one size might not fit all. For example, it is possible that private or selective institutions might have success with methods to attract, retain, and advance women in computing that would not be practical or effective in public or less selective institutions. Failing to recognize the role that institutional control plays in the success of a program could lead to misplaced efforts or the discontinuation of support for programs that work only in particular settings. Even more problematic is the potential for an incomplete understanding to result in our working against true gender equity—for instance, by drawing women into mostly dead-end IT jobs—or harming the discipline—say, by emphasizing aspects of the field with little potential for significant advancement or impact.

The bottom line is that both the scientific and engineering approaches to improving the gender balance in computing are valuable, and each has its strengths and weaknesses. The three literature reviews in this book show the many gaps in our knowledge, and they lead us to call for more research on the root causes of the underrepresentation of women in computing. We believe that many of the chapters in this volume provide examples of how to do this research. But we cannot afford to wait to act until we have a perfect understanding of the issues; we are wasting too many resources by having so few women involved in computing—a waste for their own careers and for the nation as a whole. We can learn while we act, so long as we are careful about the way we conduct and assess our interventions.