Chapter 8.23
Social Change Research and the Gender Gap in Computer Science

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INTRODUCTION

At Carnegie Mellon University, home to one of the top computer science departments in the country, only 7% of the students in the entering computer science class in 1995 were women. By the fall of 2000, that proportion had risen to 42%. While the percentage of women entering has declined slightly, likely reflecting the bursting of the Internet bubble, Carnegie Mellon's female computer science enrollment remains at about 30%, far higher than the average among research departments of computer science. Today, in 2005, the Carnegie Mellon School of Computer Science, with its increased number of female students, is a changed place. What sparked this development?

The story of the research that served as a catalyst for these increased numbers can be found in our book Unlocking the Clubhouse: Women in Computing (Margolis & Fisher, 2002). In this book we lay out the blueprints—the walls, doors, and windows—of the "boys' clubhouse" of computing education. We describe some specific institutional changes, enacted both by us and by others at Carnegie Mellon, which resulted in increasing the recruitment and retention of women students. These changes range from rethinking admissions criteria; contextualizing computer science ("computing with a purpose"); paying attention to students' experiences and the department culture; accommodating a wide range of previous computing experience; recognizing that women and students who do not fit the prevailing norm are disproportionately affected by problems like poor teaching, unapproachable faculty, or hostile peers; providing students with a broader picture of what it means to be in computer sci-

ence, other than the hacker stereotype; outreach to high schools; and the formation of a vibrant women's organization.

In this article we offer reflections about some of the critical factors that contributed to our research becoming an instrument for social change. We provide some "lessons learned" for other institutions that are thinking about addressing the gender gap in their computer science departments. While the Carnegie Mellon developments began with a body of research, we do not believe that extensive research is necessary for all institutions. However, it is important to understand the local situation well enough to customize a general set of strategies. While people rightfully want to learn from successful initiatives, and not "reinvent the wheel," the constitution of each department—its history, the culture, the demographics, the leadership, the pressure points, what is known and not known about the experiences for women students—will differ from institution to institution. In most cases, but not all, initiatives can be modeled after existing programs by understanding the commonalties and differences between the situations. To achieve this, some straightforward data gathering, as opposed to in-depth research, is usually called for.

Here we present brief summaries of "lessons learned" from our research on the gender gap in computing. We believe that what we learned applies to planning an intervention as well as to conducting research.

ADDRESSING THE PROBLEM

- **Understand Your System and Know Your Numbers:** While lessons from other settings and other "diversity projects" can be instructive, the critical question is how this all applies to your own institution. The management truism that "you can't improve what you do not measure" applies here. Where is the bottleneck in your department?

Is it in admissions? Is it in retention? When are people being lost? How many women students are in the department? How many women faculty? How does this compare to other technical departments in your institution? What are the retention rates of women in computer science? What have the trends been? What is the culture of your department? How do women experience the department? And, where are the relevant points of intervention within your department?

Local information is also critical to community engagement. While information about the gender gap from other places can be imported, especially when you have a "convinced audience," there is nothing like shining the light on your own backyard, and providing evidence from your own students, to make an institutional community take notice. The Carnegie Mellon research was based on some 300 Carnegie Mellon student interviews, over a 4-year period of time with a core sample group of 50 male and 50 female computer science students. We also conducted observations of computer science classes, and held interviews with computer science administrators and faculty. We lived in the department (Allan as Associate Dean of Undergraduate Education and Jane as Visiting Research Scientist) and were familiar with it from the inside.

- **Leverage Interdisciplinary Expertise:** Our research was conducted by an interdisciplinary team. Jane is a qualitative researcher with a background in Education and Women's Studies. Allan is a computer scientist and at the time of our research was Associate Dean of Undergraduate Education in the Carnegie Mellon School of Computer Science. While we originally referred to our research partnership as an "insider-outsider" collaboration (with Allan as the insider and Jane as the outsider), we quickly realized

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