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Computer science lacks women, minorities

By David Worthington

September 4, 2009 — Large segments of the U.S. population are not considering careers in IT, shaping a shortage in qualified developers. Few students are enrolling in computer science courses, and a dwindling number of those are women and minorities, government experts say.

The U.S Bureau of Labor Statistics forecasts high demand for programmers. Its Occupational Handbook for 2006-2016 lists computer application software engineers as the fourth most in-demand occupation due to "increased applications of emerging technologies" and the growing complexity of businesses. Software engineers for systems are listed at number 25.

Despite that demand, there has been a “huge drop off” in the number of computer scientists entering into the workforce since 2000, said Jan Cuny, the program officer at the National Science Foundation who oversees efforts to broaden participation in computing.

Seventy percent fewer students have majored in computer science since 2000; women declined by 80%, she said, citing Computing Research Association data. The Higher Education Research Institute has determined that only 1% of students are majoring in computer science, and 0.3% are women, she added.

Over the past eight years, there has been a slight increase in women's enrollment on the undergraduate level, according to data compiled by Anthony Chow, an assistant professor at the University of North Carolina at Greensboro.

"At the graduate level, however, non-resident aliens become a major factor while minority enrollment in general plummets to very small percentages," he added.

Cuny added, "If this trend holds true, we will be unable to produce enough students for the jobs that are out there. Large segments of the population do not participate in computer science-related careers."

Retention of minority employees is another issue. Nearly half of all minorities leave technology jobs to enter other occupations, said National Association for the Advancement of Colored People vice president Deborah Bey.

Isolation is a key factor for a higher attrition rate among women and minorities, said Teresa Dahlberg, director of the Diversity in Information Technology Institute at UNC Charlotte. People tend to associate with "like communities," where people have similar backgrounds and interests, she explained.

"If someone is the only woman or minority in a company, they will often not attract a peer group or informal mentor as easily as someone who is part of the majority.

"There is a good amount of research that shows that women are judged more harshly than men, for hiring, evaluations and promotions," she added. "Virginia Valian [author of "Why So Slow? The Advancement of Women"] shows this for women in science, technology, engineering and math faculty jobs." Virginia Valian is a professor at Hunter College.

Dahlberg also cited research from Carnegie Mellon University that interviewed computing students who had quit

computer science as a major. "A theme among the American women was, 'Well, I got an A in my programming class, but I seemed to have to work much harder than everyone else. So, I'm not really interested in computing anymore,'" she said.

Different perspectives

Alternate views on work could also be why minorities and women are not taking up careers in computer science, Dahlberg said.

Many women and minorities are looking for work that is socially relevant and meaningful, Dahlberg explained. "Women are becoming doctors; it's not about being good at math, the technical rigor is the same. The big difference is that [medicine] is seen as a helping profession." Women are more represented in the sub-disciplines related to family and children, she added.

Dahlberg believes that the social relevance attraction is different for minorities as for women. "I have had African-American men tell me that the only options that they thought they had growing up was to be a teacher or [a] preacher," Dahlberg said. "So, this might be more about a lack of role models. However, anecdotally, if you are an under-represented person in school or at work, doing work that helps others helps you to feel more engaged in your work."

The roots of the problem may be run even deeper, though. "Many women and minorities are being turned off in the fourth and fifth grade before they even know what computer science is," the NSF's Cuny said. "There are a number of things women don't understand about computing; they think they are insolated in front of a monitor."

The U.S. education system is doing a bad job at counteracting stereotypes that programmers are not part of a group effort, Cuny said. "Computer science is done in teams, and many teams have diverse opinions and backgrounds. It is not a solitary occupation at all."

Countering the trend

Dahlberg suggested that employers should emphasize the social relevance of their organization's business mission, and how supporting that mission in IT can have a social impact. Life/work flexibility is also important to women, and recruiters should send women and minority technical people to do recruiting, she added. "No one wants to be the only one."

Other techniques for recruiting employees include attending national events that aim to engage women and minorities; aligning with (or monitoring news feed on websites about) national organizations, to be informed of national and regional opportunities to connect; and, similarly, aligning with regional colleges and universities with computing programs, she said.

Mentoring and networking opportunities are important tools for retaining minority employees, in addition to training and skills-building to build confidence, Dahlberg said. She also suggested allowing new hires to explore different positions within an organization.

One of the ways the NSF is working to counteract declining enrollments is by providing opportunities for students, and it is partnering with local nonprofit and national organizations, said Cuny. The NSF has bridge programs to transition high school graduates into computer science majors at college, as well as programs to motivate undergraduate students to remain in the field.

Starting early

The NSF's K-12 programs focus on informal education designed to spark student interest in computing by showing how computers can solve problems through creating and manipulating rather than being used as tools, Cuny added.

It is also working to infuse computer science in middle school and high school curricula, advocate computational thinking, and introduce a new Advanced Placement course for computer science. That effort, though, is being

hampered by a shortage of computer science teachers, she said.

"There are few computer science teachers in the country. Many have degrees in other fields, especially business," Cuny said. The NSF has set a goal for 10,000 more computer science teachers by 2015.

To tackle workplace issues for women, the NSF works with the National Center for Women & Information Technology, as well as the Anita Borg Institute of Women and Technology. It also has a program called NSF Alliances for Broadening Participation in Computing (BPC).

BPC has a number of different programs that cover establishing best practices for recruitment, conferences, partnering academia with industry, and workshops. Programs focus on minority and women students.

Dahlberg participates in an NSF-sponsored program called the STARS (Students & Technology in Academia, Research & Service) Alliance. STARS mentors high-achieving computer science students at 20 colleges and universities in the southeastern United States, and has them talk to high school students, she said.

The program is also attempting to give businesses access to qualified computer science students in schools near them.

"The National Science Foundation has many studies and projects to increase number of minorities and women in the field," said the NAACP's Bey. "It's not that there's not something being done…there's just no magic pill."