The Importance of Outreach Programs to Unblock the Pipeline and Broaden Diversity in ICT Education

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ABSTRACT

There is a need for outreach programs to attract a diverse range of students to the computing discipline. The lack of qualified computing graduates to fill the growing number of computing vacancies is of concern to government and industry and there are few female students entering the computing pipeline at high school level. This paper presents three outreach programs that have the underlying assumption that students need to be reminded about the creativity and potential of computing so that it remains on the radar of their future career options. Each program instigated social and cultural change through a paradigm shift where girls moved from being ICT consumers to ICT creators. By exposing students to a wide variety of ICT activities and careers during secondary schooling, they were more likely to consider studying information systems, computer science or any other computing course at the university level. Results are presented showing student attitudinal changes as well as observed increases in enrolments at secondary school and university courses.

KEYWORDS

Broadening Participation, Computing Education, Gender and Diversity, Outreach Programs, Secondary Education

INTRODUCTION

The demand for qualified computing graduates is high and a skills shortage has been predicted in the USA, the UK, Australia and several other westernized nations (Australian Computer Society, 2012; Kirkup, Zalevski, Marumyama & Batool, 2010; NCWIT, 2012). These same sources report that there are not enough students studying computing in high school and at university to satisfy future employment demands. For example, it is anticipated that there will be 1.4 million computer specialist job openings in the USA by 2020 and only 30% of these jobs could be filled by US computing graduates.
(NCWIT, 2012). In the UK in the next five years there will be a need for over half a million new IT and Telecoms professionals (Kirkup et al, 2010). The Australian Computing Society’s annual statistical compendium reports that in September 2011 there were 16,600 unfilled vacancies in strategic and management roles yet only 25% of these positions could be filled by domestic graduates (ACS, 2012).

Female students have been recognized as an underrepresented group within the discipline since the mid-1980s (Camp, 1997) and this is still a major concern to academics, professionals and government bodies. Prey and Weaver (2013) argue that efforts to attract and retain women to computing will contribute towards meeting future workforce needs. A second imperative is voiced by DuBow (2013), who states that unless women and other underrepresented groups are recruited into computing our society will lose potential innovations that a diverse workforce would bring. Since “schools are the major site for reproduction of gendered meaning” (Clegg, 2001, p. 313) and the place where masculine stereotypes are often perpetuated, it is appropriate that outreach programs focus on secondary school students. The outreach programs featured in this paper illustrate the different types of programs that have been delivered. We argue that these programs are each a necessary component in the complicated tapestry of outreach strategies to broaden participation in the discipline. Each program aims to instigate social and cultural change through a paradigm shift where women move from being computing consumers to computing creators.

BACKGROUND

There are fewer female students entering the computing pipeline at high school level. For example in Australia in 2001, 36% of all students who satisfactorily completed a final year computing subject at high school were female. That percentage had declined to 18% in 2010 (VCAA, 2010). In the USA the proportion of females in the discipline is also low. The College Board AP Program Summary Report (2012) reports 56% of all Advanced Placement (AP) test-takers in 2012 were female, but only 19% of the AP Computer Science A test-takers were female (College Board, 2012). In the UK, while girls make up 50.7% of all enrolments in the General Certificate of Secondary Education (GCSEs) they represent only 9.6% of students undertaking computing at GCE A level (Kirkup et al., 2010). The lack of girls completing senior secondary computing subjects leads to a lack of girls undertaking computing education at university level, and the lack of qualified computing graduates from universities to fill the growing number of computing vacancies is of concern. In the USA, it was acknowledged by President Obama in his 2013 inaugural address:

We cannot cede to other nations the technology that will power new jobs and new industries, we must claim its promise. That’s how we will maintain our economic vitality... we must harness new ideas and technology to remake our government, revamp our tax code, reform our schools, and empower our citizens. (Obama, 2013)

Similarly, the ex-Australian Prime Minister Julia Gillard while in office referred to the lack of domestic students studying computing as a critical national issue:

It is just not acceptable that information technology jobs, the quintessential jobs of the future, the very opportunities being created by the digital economy, precisely where the big picture is for our kids, should be such a big area of imported skills. (Gillard, 2013)
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