The importance of outreach programs to unblock the pipeline and broaden diversity in ICT education

Lang, Catherine, Craig, Annemieke and Egan, Mary Anne 2016, The importance of outreach programs to unblock the pipeline and broaden diversity in ICT education, *International journal of information and communication technology education*, vol. 12, no. 1, January-March, pp. 38-49.

DOI: [10.4018/IJICTE.2016010104](http://10.4018/IJICTE.2016010104)

©2016, IGI Global

Reproduced with permission.

Downloaded from DRO:
[http://hdl.handle.net/10536/DRO/DU:30080959](http://hdl.handle.net/10536/DRO/DU:30080959)
The Importance of Outreach Programs to Unblock the Pipeline and Broaden Diversity in ICT Education

Catherine Lang, La Trobe University, Melbourne, Australia
Annemieke Craig, Deakin University, Geelong, Australia
MaryAnne Egan, Siena College, Loudonville, NY, USA

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)
While these politically motivated messages may not filter down to students, a YouTube video targeted the student market more directly (Taylor, 2013). In this video a number of celebrities, business leaders and trendsetters, through the non-profit organization ‘code.org’, promoted their belief that computing should be part of the core curriculum in all high schools. This video went viral, receiving 12 million views within two weeks of release (Taylor, 2013).

Now that we have this ‘top-down’ attention, we believe that we should not underestimate the transformational opportunity offered through computing outreach programs. We posit that these “grassroots” outreach programs are essential to encourage students to pursue computing through their provision of hands-on experiences and one-on-one contact with current computing students and computing professionals. To support this stance we provide evidence that localized outreach programs are creating change in students’ perceptions around the career path. We show that our programs have contributed to improving student numbers and broadening diversity at the next level of courses, be it ever so localized, and contribute to keeping gender and diversity on the agenda in universities and schools and that different strategies are required to engage different groups of students in computing (Lang, 2010).

In the following sections we will analyse three programs that are a sample of the type of outreach activities currently being conducted. Two of the programs are one-day events; one is small scale with hands-on activities, the other is large scale using seminar delivery. The third is a semester-long course of study conducted through high school curricula. Each of the authors has been involved in program creation and delivery for a number of years. The programs all have the same underlying assumption: that despite the recent “top down” proclamations of the importance of computing to national status, students need to be reminded about the creativity and potential of a computing career on a more personal “grassroots” level so that it remains on the radar of their future career options. The intent of the programs has been that exposure to the variety of computing career choices would ensure that when the opportunity arises to enroll in a computing course or declare a major, these positive experiences of outreach would influence their decisions.

**PROGRAM DESCRIPTIONS AND EVIDENCE OF CHANGE**

Table 1 presents a summary of the three programs according to their audience, duration, types of activities they present and the evaluation methods used.

The following sections provide details about the structure and content of each of these programs as well as the evidence collected that demonstrates the program’s value.

**The Digital Divas Program**

The Digital Divas Program delivered in Australian schools was modelled on a UK based program, Computer Clubs for Girls (CC4G). CC4G had the aim of encouraging female students to consider careers and courses in computing, addressing a similar decline in numbers in the UK (e-skills UK, 2000). The Digital Divas program had the same aims as CC4G but after trialling the program in a lunchtime format in 2008, it was clear that modifications were necessary for the Australian environment (Lang, Craig, Fisher & Forgasz, 2010). Funded by an Australian Research Council grant, a curriculum was developed to fit the Victorian Essential Learning Standards and implemented in four high schools in the second semester of 2009. The program was delivered for three years and has been conducted in 12 high schools in the states of Victoria and New South Wales.

The Digital Divas Program has three aspects that make it unique and relevant to the Australian education environment. Firstly it is included in the regular secondary school curriculum as a timetabled class. Eight modules of work were developed in conjunction with a practicing computing teacher and specifically designed to focus on middle school girls’ interests, with technology as the transformational pedagogy, not the driver. For example, girls participate in group work assessing image manipulation in fashion magazines using multimedia applications; they are introduced to programming using
“Storytelling Alice”, a tool designed specifically to engage adolescent girls; and use the spreadsheet to design their own healthy menus. The students create their own “Digital Divas” brand which in the past has been reproduced on key-rings, posters and lanyards, using a variety of multimedia and image manipulation software. This unique curriculum helps demonstrate the wide-ranging applications of computing, and allows girls to experience creative success in a collaborative environment. The second unique aspect of the Digital Divas program is an active informal mentoring system linking university students currently studying a computing degree (labelled “Experts”) with each school. The “Experts” visit the class every week and interact with the students. Finally the program “closes the loop” between doing things on the computer and what a computing career might entail by bringing in guest speakers to each classroom (Fisher, Lang, Craig & Forgasz, 2013). This visit is part of a module that each school is encouraged to use to finish the program. Students research how computing is used in different industries and also address some of the myths associated with the career path. Academics, other teachers and parents have been invited to the final student presentations on this topic.

The Digital Divas program used an established qualitative research process and gathered the following data from participants:

- Pre and post attitudinal surveys of students in each class;
- Teachers’ pre-program survey responses and interview at conclusion of the program;
- A collection of regular reflective blogs from the “Experts”;
- Collection of statistical information from each of the schools to provide a situational analysis of the school culture and environment (Craig, Fisher, Forgasz & Lang, 2011).
Evidence of Change: Digital Divas

Pre and post surveys were collected from 294 female students, aged 13-15, from 2009 to 2011. The assumptions that were made prior to starting the Digital Divas program were that the curricula will excite participants and secondly that stereotypes will be challenged. There was also the assumption that the program would give students a better understanding of the range of careers in computing resulting in students from the program being more likely to consider a computing career.

When analysing the data it was found that in the student post-Digital Divas survey 87% of respondents answered Yes to the question: “Overall, did you enjoy being in Digital Divas?” We may deduce from this result that students enjoyed the curricula.

Paired sample t-tests were conducted on several items in the pre- and post-surveys to determine if indeed the program had made some significant changes to student perceptions of computing as a possible career choice:

Pair 1: People who work in computing work alone (P<0.000);
Pair 2: Boys are more suited than girls to work in the computing industry (P<0.519);
Pair 3: Boys are better than girls at working with computers (P<0.460).

The first paired sample t-test shows a statistically significant decrease in the perception that computing is a solitary career. The other two paired sample questions did not show statistically significant change but the mean scores of each of the sets decreased in the direction desired. For example, fewer girls believed that boys were better at or more suitable to work in computing. In addition, student responses to the question “Did you learn about jobs/careers in IT” were 72% positive. Assuming that students who have confidence in computers will consider it as a future career, we can report that more than half the Digital Divas students responded Yes, (61%) to the question “Has your confidence with computers changed?” Despite the fact that there was no statistical difference in their response to the question “Would you consider a computer career in the future?”, there were many positive comments about the program provided by the students in the post surveys, for example, “I can use more programs”, “I don’t get so frustrated.”, “I feel I’m more capable of driving a computer without having it freeze up on me.” “I feel like I can do more and I enjoy using the program that involves editing.”

The evidence of success of the Digital Divas program is varied, with some student survey data not as positive as anticipated. Deeper analysis indicates that the confidence and engagement of the classroom teacher has had a considerable impact on student responses to the program. Some schools where the class was delivered by teachers who appeared to be disengaged and unenthusiastic had less positive responses from students than those classes where the teacher was fully supportive and willingly involved in the program. It is too early to determine if this program will achieve the desired result of more female students enrolling in computing at university, but the program has made a strong difference in student perception of the career path. A second indicator of success is that in every school where the program was trialled, it continued to run at least once a year, showing that the faculty believe there is a need for this type of program. A third promising longitudinal result has been observed at the first school where we trialled the program in 2008. They report an increase in the number of female students selecting final year computing units. The curriculum created for the program is now freely available to schools via the website and we know from monitoring the website that four new schools are implementing the elective in 2013. All these indicators are evidence of the success of the Digital Divas Program.

The IMPACT Program

IMPACT is a one-day program in career exploration that involves a competitive team approach to develop responses to Computer Science challenges (Egan & Lederman, 2011). The program was
developed and conducted at a Liberal Arts Institution in the USA. The program is designed to provide students with an opportunity to explore some of the ways that computing students and professionals think and work. This opportunity is made available for students aged 16-18, who have not yet experienced a computer science course and are undecided about their academic and career goals. It gives participants the chance to investigate areas in which they have potential talent. To increase diversity, schools are required to include at least two female students in each team of four students.

The IMPACT program consists of a set of short (25 minute) instructional sessions where students are presented with computing topics taught by university professors. These sessions are followed by slightly longer (40 to 45 minute) activity periods where students work on problem solving tasks related to the material of the instructional sessions. Past topics have been drawn from the areas of computer graphics, software engineering, geographic information systems, finite automata, security and database systems. Almost all activities require students to work together in order to achieve the stated goals. Once the activity is complete, scores are computed for each team before they proceed to the next instructional session. Undergraduate students provide assistance to the groups, sign off on the achieved objectives and generally act as informal role models for the secondary school students throughout the day.

The program also provides participants with advice from faculty members and professionals about academic and career opportunities in computing. The day culminates with an industry speaker presenting on a topic steered by discussions with high school faculty.

Evaluation of the program is carried out through pre and post surveys of the students and a post survey of the teachers and guidance counsellors who accompanied them.

Evidence of Change: IMPACT

In the pre-survey many students indicate that they had never considered computer science for a major because they were unsure what computer scientists did. Or if they did have an idea, it typically wasn’t a very appealing image. Previous research shows that exposure to computer science during secondary school is a deciding factor in 33% of girls’ decisions to major in computer science (Margolis, Fisher & Miller, 1999), and this influenced our affirmative requirement that females be half of each school’s team.

Additionally Galpin and Sanders’ (2007) research indicates that students have a narrow understanding of the nature of computer science and they often make a strong link between computer science and programming to the exclusion of other aspects of the discipline. Research indicates that this may be due to the lack of career counselling, and an introduction to computing at the secondary school level that focuses on applications, such as word processing, and programming (Galpin & Sanders, 2007). This lack of understanding of the diversity of the discipline may be due to its mix of science, engineering and mathematics leanings and because it is not well-defined (Nielsen, von Hellens, Greenhill and Pringle 1998). Many research studies verify that students hold incorrect perceptions such as “computing careers only involve programming”, “there are limited career opportunities”, “there is little interaction with people”, and “computing careers are linked to administration or secretarial work” (Egan & Lederman, 2011; Greening, 1998).

Pre and post surveys were collected from 78 students aged 16-18, from 2010-2011. The three assumptions that were made prior to developing the IMPACT program were firstly that perceptions and stereotypes will be challenged, secondly that students will gain a better understanding of the range of careers in computing and finally that students from the program will be more likely to consider a computing career.

Paired sample t-tests were conducted on student responses to items in the pre- and post-surveys to determine if indeed the program had made some significant changes to student perceptions of computing as a possible career choice. The first two paired sample t-tests show a statistically significant increase in the awareness of the career opportunities in the computing field. These were:
Pair 1: I know what kind of work computer scientists do (P<0.000);
Pair 2: I know what jobs are available to computing majors (P<0.000).

The next three paired t-tests demonstrated a statistically significant increase in the perception of computing as a sociable pursuit:

Pair 3: Computer scientists need to be good communicators (P<0.000);
Pair 4: Computer scientists usually work in teams (P<0.000);
Pair 5: Computer scientists need to be good listeners (P<0.000).

Correspondingly, the sixth paired t-test indicated a significant decrease in the perception of computing as a solitary career path:

Pair 6: Computing is solitary – always in front of a computer (P<0.000).

These findings clearly show that the IMPACT program delivered significant changes in student perceptions and understandings of career paths in computing verifying the success of the program by satisfying two out of three of the assumptions held at the start of the program.

The teachers and guidance counsellors who attended the event were also surveyed at the end of the day. The results of this post-event survey of the teachers and guidance counsellors indicate that 100% would bring students to a similar event if held in the future and 95% were “more likely” to recommend computer science as a career option for their talented math students.

The secondary school faculty provided many positive comments about the program, for example; “My students loved it and certainly had new experiences”, “It was surprising to me to hear which activities each student liked best – I would not have guessed!”, “I think it is a great motivator for the students and a real eye-opener for their futures”, “The kids had fun and I think at least one of them is considering CS”, “The students on the panel seemed really into the work they were doing – and it was clear they had built important relationships with their peers...”

This is evidence that the IMPACT program achieved the primary aim of the activity; the changed perception of computing by students, teachers and guidance counsellors. Many schools return year after year and there has also been an increased enrolment in the major at the university that hosts the program.

The Go Girl Go for IT Program

Numerous large scale programs supported by industry and government and universities have been conducted on a state-wide basis in Australia. Each has their own unique title and branding, but each share the same purpose and aim to attract more female students into the computing discipline (Craig et al, 2008).

In the state of Victoria one such program is called Go Girl Go for IT and is held every two years. The program planning and implementation is carried out by volunteers sourced from the Victorian ICT for Women network, industry and academia. The event normally takes a year to plan, and involves 30 to 40 committed volunteers, mostly women.

A one day program is repeated over a second day enabling as many girls to participate as possible. The event targets secondary school girls aged 14 to 17 from city, regional and rural schools within the state. Funding is provided from government and industry sponsors to enable the bus travel required for regional and rural school groups to attend. The day-long program is deliberately designed to expose female students to the wide range of careers and options available within the computing industry. The aim is also to inspire the girls to consider pursuing computing studies beyond secondary school.
The presentation topics include software development, project management, risk and security as well as other technical and business related roles. Each speaker is encouraged to relate her own story about her pathway into computing and in the process debunk the myth that computing is not a suitable career path for women.

Apart from the formal presentations conducted in lecture halls, a Trade Show is available during the morning and lunch breaks to further promote the variety of roles and services in the industry. To encourage the girls to ask specific questions from representatives of each of the trade show companies, a treasure hunt activity is conducted where girls are required to seek information from each sponsor.

A one question pre-survey (“Are you considering a career in computing?”) is carried out followed by a more extensive post-event survey. The most recent Go Girl Go for IT program was conducted in June 2012 for 800 participants and the survey data responses are presented in the next section.

Evidence of Change: Go Girl Go for IT

In 2012 the pre and post-event surveys indicated that:

- 38% of students considered computing an option before the event;
- 95% indicated that they are more interested in computing after the event;
- 72% of students reported they would now consider a career in computing after attending the event;
- 96% of students reported that they found it helpful to hear each presenter talk about her personal experiences in computing.

This immediate post-event change in perception is consistent with results from previous years. As well, indicative comments provided by students on the survey in response to a question asking them what they had learned, include: “IT isn’t just on a computer”, “there are loads of opportunities in IT”, “the importance of the jobs the speakers have on society”. Comments provided by teachers were that they learned about “the overall diverse and immense opportunities in the field of IT”, “the diversity of IT roles open to women”, “that I’m in the wrong job! Can I be young again and go back to Uni?”

A longitudinal study is underway to trace whether this change in perception on the day is sufficient or strong enough, to have a lasting impact. The participants of the 2006 event have been re-surveyed to see what longer term impact there has been from the event, if any. Of the 1768 participants in 2006, approximately 600 students and most teachers had provided their contact details to enable this follow up to occur. A total of 25 teachers and 116 students completed a follow up survey in 2010 (Coldwell & Craig, 2011). Responses indicated that in the year following Go Girl Go for IT, 53 of the 116 students (46%) had chosen some form of computing. Two years later this dropped to 25% (n=29), and three years after the event 19% (n=22) were enrolled in some form of computing, perhaps indicating a tailing off of the post-event perception change or perhaps that competing factors are in play.

It needs to be pointed out that when the longitudinal survey was mailed out to the 2006 attendees, 41 of the girls were still at secondary school, and 75 had completed their secondary education. Of those who had graduated secondary school, fifteen (20%) were enrolled in an undergraduate computing degrees (Coldwell & Craig, 2011). From this data we cannot determine all factors that influence student university course choices however, we believe that the Go Girl Go for IT event positively influenced future course choices of those students who attended.

WIDER INFLUENCE OF THESE OUTREACH PROGRAMS

We have evaluated success through quantitative methods in each of our programs as reported above. In addition, there is also anecdotal evidence to substantiate the relevance of these programs.

With Digital Divas we have clearly changed perceptions of the career path for those students who completed the course. We have also had a positive impact on at least 15 undergraduate students
(“Experts”) who now are equally as evangelistic about promoting computing careers for girls as the program creators.

With the IMPACT program, the engagement of students and their faculty advisors in the activities throughout the day is obvious. Just one example of the impact of this program is the enrolment of a computing student who heard about computing through her teachers and friends who attended the program! The excitement and knowledge that the participants brought back to the secondary school classroom did indeed affect her future career choice.

At the Go Girl Go for IT event, the students report enjoying the day’s activities and the teachers continue to bring students each year when it is run. An exemplar from the Go Girl Go for IT 2012 event was a young woman who volunteered to be part of the organizing committee because she had been a participant at the 2006 event and she wanted to ‘give back’ to the event that had shaped her career journey into computing.

DISCUSSION

While measuring the success of these three programs’ longer term effects is difficult to determine, we have provided evidence of change in student perception of computing careers and the broadening of their knowledge of the computing discipline. This attitudinal change to the stereotypical perception of the discipline may influence the uptake of future computing careers. Research indicates that positive experiences in high school may be enough for students to choose a career path (Lang, 2010). Providing these increased opportunities for happenstance in career choice is an important aspect of these outreaches activities. Many students do not know that they may enjoy computing until they have the opportunity to explore it. To further verify our position, career choice research indicates that a clearer understanding of a career may be enough for students to consider it in the future, for example: “... the fact that there are jobs for girls in engineering is irrelevant if a young woman does not perceive engineering as an appropriate career” (Hodkinson & Sparkes 1997). These same researchers found that some young people reject careers because they lie outside their radar, that is, they don’t fit their schematic view.

The format of each of our programs is different, yet each has returned effective results. The one-day mixed gender program has been shown to increase students coming into the university that delivers it and declaring computing majors. The one day seminar program has also resulted in students selecting computing in later years. When the age of attendees is in the late teens, more immediate action after the event is evident. The longer program (Digital Divas) allowed more time for other factors to impact on student perceptions, namely teacher engagement. However a positive result in the one school that has run it for four-years is already evident. From this we cannot conclude that one program is better than the other, rather it is dependent on the enthusiasm and initiative of the academics and other volunteers who support these outreach programs. While we believe that each of the outreach programs broaden the horizons of participants and position computing in their schematic view of possible future careers, we acknowledge that student career choice is influenced by many factors, and the stereotypical perceptions that computing is a male domain is entrenched in our society. Our results demonstrate the value and relevance of outreach programs in the twenty-first century and that we need to continue working in this space.

CONCLUSION

*The greatest tragedy I know of is that so many young people never discover what they really want to do. Edna Kerr. (as cited by Carnegie, 1990)*
Each of the programs described in this paper contribute to a bricolage of outreach programs. Each program has refocused student perceptions of computing careers and in doing so positioned computing as a career option in the minds of the participants.

The evidence gathered from attendees shows that each program resulted in a changed perception of the computing discipline. It is no longer considered a solitary and narrow career path; participants are now aware of the breadth, creativity and social aspects of the discipline.

Secondly, our evidence demonstrates that there is a need for these outreach programs to continue because each is important in attracting more students to computing. Each of the regional outreach activities complements national initiatives that have been implemented to improve numbers and the diversity of the computing discipline. We concur with Eney, Lazowska, Martin and Reges’ (2013, np) position:

There’s no silver bullet. Sometimes, it’s one woman at a time—a student who has made a connection with an advisor, an instructor, or an undergraduate TA, or who gets hooked because of an honors section, the women’s seminar, a cool assignment, or a great exploration session. Progress comes from a multiplicity of efforts, and every little bit helps.

Our research validates that localized outreach programs are necessary to complement top down initiatives to attract a diverse group of students to computing.

Limitations

In this paper three representative outreach activities have been analyzed. We acknowledge that this is a small sample however we believe that it is indicative of the types of outreach carried out in many western countries where the gender imbalance in computing education is prevalent.

ACKNOWLEDGMENT

Each of the authors would like to thank the many volunteers and industry sponsors who make these programs possible. Additionally, we would like to thank Dr Lederman for his work on the IMPACT statistics.
REFERENCES


Gillard, J. (The Honorable). 2013. Australian Broadcasting Commission. 7.30 Interview. Broadcast: 14/03/2013. Reporter: Chris Uhlmann “With skilled migration a political talking point of the moment, what are the industries and experts saying about it?” http://www.abc.net.au/7.30/content/2013/s3716010.htm Accessed 22 March


Catherine Lang is an Associate Professor in the Faculty of Education at La Trobe University, Melbourne, Australia. Her research focus since 1996 has been on the under-representation of women in computing, which resulted in an Australian Research Council grant called Digital Divas, encouraging girls to consider computing as a course and career option. She has published on the topics of student transition to higher education, computing education and pedagogy as well as social networking in education. She was a founding board member of the Victorian ICT for Women’s Network, the ACM-W Australian Ambassador from 2005-2011 and the International Committee Liaison at ACM Special Interest Group for Computer Science Education (SIGCSE) in 2012 and 2013. She is the recipient of several competitive national and university grants and awards in recognition of her research strengths and her teaching and learning abilities.

Annemieke Craig is an Associate Professor in the Business School at Deakin University. Annemieke researches in the field of Information Systems with particular emphasis on trying to increase the involvement and representation of women in the computing professions. Annemieke has contributed to building the Women in Computing community, nationally and internationally. She established VicWic, was a founding board member of AWISE, and has been co-chair of numerous women in computing conferences. On an international scale Annemieke was a council member of ACM-W, the Australian Ambassador for the ACM’s Committee for Women and then led the ambassador program. She has chaired the Global Advisory Committee for two Grace Hopper Conferences as well as organising international panels at three Grace Hopper Conferences. Annemieke has been on the organising committee for the Go Girl, Go for IT program and a chief investigator in the ARC Funded research project Digital Divas.

Mary Anne Egan is Professor of Computer Science at Siena College, Loudonville, NY. She works on issues of underrepresentation in computer science and is involved in the research of pedagogical influences on the recruitment and retention of women and minorities. She has implemented various strategies to improve students’ first year computer science sequence, served as director of Siena’s Luce Foundation grant to provide scholarships for female STEM undergraduates, has developed a course on Diversity in Computer Science, and has created an alternative programming contest for non-programmers (IMPACT) as a way to introduce high school students to computer science. Dr. Egan is a council member of the Association of Computing Machinery Committee on Women in Computing, co-founder of the regional New York Celebration of Women in Computing (NYCWIC), and an active member of ACM Special Interest Group for Computer Science Education (SIGCSE).