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Keywords

curriculum, inclusive, technology, gender, communications, information, australian, amongst, academics, perceptions

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Perceptions of a gender-inclusive curriculum amongst Australian Information and Communications Technology academics

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Abstract

The lack of female enrolments in ICT is widely recognised and has prompted a range of strategies to attract more women, most of which do not include curriculum changes at any level. Research suggests that there are aspects of the ICT curriculum that could appeal to females, particularly in relation to benefits to society and humanity in general, and that including these considerations in the curriculum would be of interest to all students. The perceptions of a gender-inclusive ICT curriculum in Australia have been ascertained from a survey and forum discussions of ICT academic managers and leaders of ICT learning and teaching. Although a significant proportion of the surveyed academics recognises that different features of the ICT curriculum appeal to males (mainly technology) and females (mainly the benefits of the technology to humanity) this has not translated into the practical implementation of a gender-inclusive curriculum in most institutions. Most respondents would welcome informative guidelines on developing a gender inclusive curriculum.

Keywords: Gender inclusive curriculum, perceptions, ICT, academics

1 Introduction

This paper is concerned with the perceptions of a gender-inclusive ICT curriculum held by Australian ICT academic staff as derived from survey and forum data. Gender is an issue in ICT – as it is in the related Engineering discipline (Mills et al. 2010) – because ICT has a male-dominated culture (Vilé and Ellen, 2008). Australian Women in Information Technology (OzWIT 2006) reported that 15% of ICT workers were female and that the trend in the employment of female ICT workers is downwards, with similar numbers and trends in Europe (Valenduc and Vendramin 2005). Lewis et al. (2006) reported that the proportion of women in many ICT courses in Australia is less than 15%. Some research suggests that few women enrol in ICT because of the perceived masculine stereotype (Cory et al. 2006) which is reinforced by stereotypical high school teacher behaviour (Dee 2007), and compounded by the differing societal attitudes and influences brought to bear on boys and girls during their development (Dingel 2006). Evidence shows that (perhaps as a result of these influences) anxiety and lack of confidence in using computers is more prevalent among women than men (Volman and van Eck 2001), even amongst experienced users (Beyer et al. 2003, Broos 2005).

Part of the definition of a gender inclusive ICT curriculum is one that is inclusive of social and human concerns and portrays technology in that context without lessening the content (Koppi et al. 2010). It is suggested that current ICT curricula that are focussed on technology-centred topics are biased towards male students (Lewis et al. 2007, Lewis et al. 2006, Miliszewska and Moore 2010). Other aspects of a gender inclusive curriculum include: respecting every student as an individual and enabling them to reach their potential; recognising and accommodating differences in interests, experiences and circumstances of all students; and adjusting the curriculum in response to feedback (Mills et al. 2010). Furthermore, it has been argued that gender inclusivity in decision making in the ICT context may result in more balanced and favourable outcomes (Cukier et al. 2002).

The apparent bias towards a masculine-oriented curriculum in a male-dominated culture may be a contributing factor to the attrition of females from higher education ICT courses. There is general concern about high attrition rates from ICT (Connolly and Murphy 2005, Koppi and Naghdy 2009, McMillan 2005), including that of women (Miliszewska et al. 2006, Sheard et al. 2008). The application of a gender-inclusive curriculum is pertinent to this situation. This paper examines the prevailing perception of a gender inclusive curriculum in ICT in the Australian higher education context.

The notion of 'Curriculum' is a broad concept (Hicks 2007), as are the influences on the curriculum when situated within a male-dominated ICT culture that is decades old and extends from primary school to the workplace and western society at large. Hicks (2007) points out that the 'Curriculum' is part of this broad temporal and spatially connected structure, no part of which exists in isolation. To adopt such a holistic context

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of the ICT higher education curriculum, this paper reports on what universities are doing with respect to attracting (reaching into schools) and retaining students, as well as the prevailing perceptions and practices of an inclusive curriculum (or otherwise) that imprints on postgraduate professionals in education, industry and government and feeds back to students and parents.

A survey and a related workshop were carried out as part of a recent project (Ogunbona 2009) funded by the Australian Learning and Teaching Council (ALTC) and comprised a team from four Australian universities: Wollongong (lead institution), Murdoch, Swinburne and Queensland.

2 Survey and Analysis Methods

2.1 Survey Groups

The aim of the survey developed by the project team was to obtain an understanding of the representative view held by Australian ICT academic staff about a gender-inclusive curriculum. The first targeted group was the heads of ICT units at all Australian universities who were members of the Australian Council of Deans of ICT. A series of four approaches was used in order to obtain their participation in the data-gathering exercise: a paper-based survey was mailed to each university representative on the Council; a fortnight later an email reminder with the survey attached was sent to the same people; a telephone follow up was undertaken two weeks later and finally they were sent an invitation to complete the survey online. As a result of these efforts a total of 22 completed surveys were received from 18 universities (a few ICT heads had distributed the survey to other ICT heads internally). The second group to complete the same survey was the Associate Deans for Learning and Teaching (or their equivalent) in ICT at an Australian Council of Deans of Information and Communications Technology (ACDICT) forum of 35 attendees representing 25 universities, and 24 completed surveys were received. In addition, a workshop session on gender issues was held at the forum and the recorded discussions were also used to inform the project. The total of 46 completed surveys and forum deliberations are considered as representative of Australian ICT academia concerning a gender-inclusive ICT curriculum.

2.2 Survey Analysis

The survey consisted of a series of questions to be rated on a 5-point Likert Scale, where a tick was sufficient to indicate the response, to provide quantitative data. In addition, a number of open-ended questions were presented to allow free text responses. These free text entries were read several times to enable the coding and categorisation of responses which were then counted to enable quantitative comparisons. This qualitative data analysis method was informed by the work of Boyatzis (1998), and Bogdan and Bicklen (2002).

2.3 Workshop Discussions

During the ACDICT forum workshop, participants were organised into small groups to discuss gender issues in ICT and invited to focus particularly on the possible reasons for the lack of women in ICT, and on the nature of a gender-inclusive ICT curriculum. Their deliberations were summarised on paper by each group, collected and later compiled by the facilitator. Plenary discussions were summarised and typed for the whole group to see on screen and edit at the time.

3 Findings

3.1 Enrolment Trends of Women in ICT

About half of the survey respondents noted that undergraduate enrolments of women are steady (with some respondents commenting that these are small numbers) and about one third noted that the numbers of women were falling. Only five respondents indicated that the number of female undergraduate enrolments was increasing at their university. Most respondents (76%) noted that they were trying to increase the enrolments of women in ICT but few (18%) noted that their strategies to do so were effective.

3.2 Strategies for Increasing the Enrolment of Females in ICT

3.2.1 Current Strategies from Survey Responses

The survey included the open-ended statement: "Our strategy for increasing the enrolment of women in ICT is:". The responses indicated that most of the strategies being used were apparently not effectively contributing to increased enrolments of females. Presumably, the situation could be worse without any strategies aimed at encouraging females to enrol in ICT. This presumption may explain why similar strategies, at a range of universities, have been used repeatedly over the years and why it is that Craig (2010) has recently recognised that strategies intended to attract females must be more formally structured and stringently assessed.

The survey data revealed that the main practices in targeting female students from years 9–12 are threefold: (1) female ICT staff or students visiting schools as role models or ambassadors; (2) inviting female students to participate in various ICT activities at universities, such as engineering or programming workshops; and (3) female specific events, e.g., Go Girl Go For IT, supported by Victorian ICT for Women (2010) held bi-annually at Deakin University since 2006. This event also includes invitations to careers advisors and teachers, has been attended by over 2000 people and is, apparently, a successful activity (now called 'Digital Divas') in improving female perceptions of a career in ICT (Lang et al. 2010).

Other strategies mentioned by respondents include scholarships for females enrolling in ICT. Notwithstanding the success of marketing events or inducements, survey respondents noted that females in high school still have negative experiences with ICT which probably significantly contribute to the overall low enrolment rate of females in ICT higher education. Not one respondent mentioned whether or not the high school curriculum is gender inclusive and the impact this may have on female experiences. It would seem that for a subject with such a strong gender imbalance, trying to attract more females is akin to treating the symptoms and not the cause, which still remains to be clearly articulated.

While most of the strategies being used are apparently not contributing to increased enrolments of females, the situation would presumably be worse without any strategies aimed at encouraging females to enrol in ICT. This rationale may explain why similar strategies, at a range of universities, have been used without modification over the years.

3.2.2 Further Desirable Strategies from Survey Responses

A follow up open-ended statement was "Additional activities that we should be doing to attract more women into ICT are:". Common responses included: working further with females in high schools; emphasizing employment opportunities; and improving perceptions of the ICT profession generally. A few respondents mentioned working with high school teachers and ensuring that relevant enabling subjects are taught. One person mentioned an inclusive curriculum in terms of being inclusive of different interest areas, one person noted gender inclusive projects, and one respondent noted that social and business dimensions should be emphasized. No one mentioned the desirability of a gender inclusive curriculum *per se*.

Apart from university strategies, when asked what else could be done to entice more women into ICT, it was observed that on-going attempts by the ACS (Australian Computer Society) professional body were largely ineffective, and that the Federal Government should be more forthcoming with financial incentives to encourage more students into ICT and in helping to drive cultural change through government policies. High schools were still seen as the primary focus for changing the perceptions of ICT and that women professionals in industry should be more involved in school visits, as well as industry engaging in more marketing and promotional activities in general. Revising the high school ICT curriculum was seen as essential, and suggestions included: less focus on technology; promoting the value of mathematics; emphasising the communication and 'soft skills' aspects of ICT; and having gender-inclusive projects.

3.2.3 Workshop Deliberations

During the workshop event, participants discussed the issue of the small number of women attracted to ICT. It was observed that there was a greater proportion of female students in international cohorts than domestic students and that this reflected cultural differences. The Australian ICT culture was described as male-centred (e.g., advertisements portraying men in the profession; lack of female role models; and a perception of being unsuitable as a female career), geeky, and technology-centred rather than outcome focused. High schools were thought to be reflecting this culture, providing a narrow curriculum that focused on technology tools and lacking creativity, diversity and failing to present the broad ranging functions and roles of ICT. Furthermore, high school teachers and careers advisors were thought to have a limited understanding of ICT and its potential. Apart from gender issues, the high school ICT curriculum was considered to lack inclusivity in terms of content, scope and application, and probably contributed to domestic students deciding, early in their high school education (before year 10), against a career in ICT.

The survey results (essentially of individuals) concerned with attracting women into ICT revealed that a minority of respondents demonstrated awareness of notions of a gender-inclusive curriculum. By contrast, the group discussions (which had women at almost every table) at the workshop event concerned with the lack of women in ICT revealed a greater awareness of gender inclusivity. This may have been due to the specific gender theme and individual concerns expressed through the group work.

3.3 The Gender-Inclusive ICT Curriculum: Theory and Practice

The survey data (Table 1) revealed that 24% of respondents agreed with the statement that there is a link between having a gender-inclusive curriculum and the low proportion of women studying ICT, while 41% disagreed. 28% agreed that they make an effort to have an explicitly gender-inclusive curriculum, and 24% agreed that an ICT curriculum that appeals to women would be different to one that appeals to men. The majority of respondents (89%) agreed that they would welcome informed guidelines on the practical implementation of a gender-inclusive ICT curriculum. In addition, 62% of respondents agreed with the statement that they are unsure of what a gender-inclusive ICT curriculum would really look like – indicating that the majority of ICT academic staff is unclear about the nature of a gender-inclusive curriculum.

Statements regarding an ICT curriculum	SD	D	N	A	SA
We are unsure of what a gender-inclusive ICT curriculum would really look like	2	9	6	21	7
An ICT curriculum that appeals to women would be different to one that appeals to men	6	15	13	10	1
We make an effort to have an ICT curriculum that is explicitly gender-inclusive	1	20	10	8	4
There is a link between having a gender-inclusive curriculum and the low proportion of women studying ICT	3	14	14	10	0
We would welcome informed guidelines on the practical implementation of a gender-inclusive ICT curriculum	1	0	4	25	15

Table 1: Compiled responses to survey statements about a gender inclusive curriculum (SD = Strongly Disagree to SA = Strongly Agree)

Margolis and Fisher (2002) have noted that, on the whole, women have a different perspective of computer science (a part of ICT) to males, and the awareness of any such difference amongst Australian ICT academics was explored in the survey by asking about the features of the ICT curriculum that would appeal to females and males.

3.3.1 Perceptions of an ICT Curriculum that would Appeal to Females

Respondents to the survey were asked about the features of an ICT curriculum that appeal to females (Table 2) and 35% of respondents either left this field blank or stated that they didn't know. Only 11% stated that there was either no difference in what appealed to males and females, or that generalising was inadvisable. A little over half of the respondents gave some indication of what appealed to females in the ICT curriculum. Of the total, 30% of respondents noted that it was the 'people' side of ICT that appealed to women, using words such as: 'people', 'social', 'community', 'collaborative', 'society' and 'humanity'. These responses are consistent with the conclusions of Courtney, Timms and Anderson (2006) and Craig, Fisher and Lang (2007) that females are particularly interested in the people part of the profession. A total of 11% of the respondents mentioned that a focus on communication (interpersonal rather than technology) appeals to females. That there are differences in communication between males and females have been reported many times (Monaghan and Goodman 2006, Still 2006, Wood 2005), and one would therefore expect it to be a relevant factor. A total of 11% of respondents also noted that creativity and problem solving, especially in a global or big-picture context, would appeal to females.

Category of responses regarding curriculum aspects appealing to females	Number (n = 46)	%
Blank	12	26
Don't know	4	9
No difference	2	4
Unsafe/unwilling to generalise	3	7
Soft/softer skills	2	4
People/social/community/society/humanity/collaborative	14	30
Communication	5	11
Creative/problem-solving	5	11
Technology	1	2

Table 2: Categories of responses to the survey question of features of the ICT curriculum that appeal to females

The implication is that these responses are also related to the people interests that appeal to women. With respect to the skills of problem solving and creativity *per se*, there is apparently little if any difference between males and females and that context has a strong influence on the expression of many skills (Hyde 2005). It is interesting to note that only one respondent mentioned technology itself as appealing to women, and there was no mention of laboratory work.

3.3.2 Perceptions of an ICT Curriculum that would Appeal to Males

From the survey, Table 3 shows the categories and responses to the open-ended question about the features of an ICT curriculum that appeal to males.

35% of respondents either left this field blank or stated that they didn't know. Of the total responses, 50% mentioned some aspect of technology or playing with technology with the words: 'hardware', 'networking', 'programming', 'games', 'competitions', 'technology', and 'shooting'. Only two people thought it was difficult to generalise and one noted that not all men like playing with technology.

Various other aspects of the curriculum that appealed to males were mentioned, such as laboratory work, solo efforts, creativity, problem solving, design, building, and project management. There was no mention of males having an interest in people or the application of technology to social issues. This view that males in ICT tend to be more interested in the technology than social and human concerns has been reported elsewhere (Lewis et al. 2007, Lewis et al. 2006, Moore et al. 2005).

Category of responses regarding curriculum aspects appealing to males	Number (n = 46)	%
Blank	13	28
Don't know	3	7
Difficult/unsafe to generalise	3	7
Hardware, networking, programming, games, competitions, technology, shooting, play,	23	50

Table 3: Categories of responses to the survey question of features of the ICT curriculum that appeal to males

3.3.3 Workshop discussions on a Gender-Inclusive ICT curriculum

Three groups of six discussed the issues concerning a gender inclusive curriculum before the plenary session (35 attendees). Two of the three groups contained both men and women and their group summaries identified the perception that females were concerned with human issues and that they needed to see the benefits of ICT to the community on a broad range of fronts such as health, education and the environment. The all-male group was unable to speculate on what a gender-inclusive curriculum would look like.

The plenary session reinforced the perception that women need to know 'why' and have people and community concerns about how ICT can solve people's problems: women have human concerns about how technology can build a better world. These greater humanity concerns of females expressed at the workshop are consistent with the literature cited above. It was noted that business ICT degrees have a greater proportion of women than technology-focused degrees. It was also concluded that the ICT curriculum problem starts in high school.

3.3.4 Measures to Ensure a Gender-Inclusive Curriculum

From the survey, Table 4 shows the categories and responses to the open-ended question about the measures taken to ensure a gender-inclusive ICT curriculum.

39% of respondents either left this blank or indicated that they didn't know or were unsure. 20% noted that they had done nothing to make their curriculum gender-inclusive or that it was not gender-inclusive. A few noted that 'soft skills' such as teamwork and communication

had been increased, and that stereotypes and male-centred examples were avoided. A few also noted that technology was presented as part of a systems or society or people perspective. Allowing students to select their own projects of interest was seen as part of being gender-inclusive. One person also mentioned the use of female role models.

Measures taken to ensure a gender-inclusive ICT curriculum	Number (n = 46)	%
Blank	14	30
Don't know/unsure	4	9
Done nothing or non-existent	9	20
Increased soft skills such as teamwork, communication	3	7
Avoiding stereotypes and male-centred examples	3	7
Technology as part of the system/society/people perspective	3	7
Project choice	2	4

Table 4: Categories of responses to the survey question of the measures taken to ensure a gender-inclusive ICT curriculum

4 Discussion

4.1 Enrolment Strategies in Relation to a Gender-Inclusive Curriculum

In Australia, it is widely recognised that the ICT culture from high schools through to industry is male-dominated and that the proportion of females studying ICT is small (Craig et al. 2007, Lang et al. 2010, Lasen 2010, Lewis 2006, McLachlan 2010, Miliszewska 2010, Young, 2003). Results from this study have shown that the higher education ICT curriculum is largely reflective of that culture and that a gender-inclusive curriculum is not well understood or established. It would seem that the culture and the curriculum are related, mutually reinforcing and perpetuating. However, only 24% of survey respondents agreed with the statement that there is a link between having a gender-inclusive curriculum and the low proportion of women studying ICT. It is therefore not surprising that strategies to increase female participation in ICT higher education over the years have not changed much and have largely been unsuccessful.

The survey revealed a range of intervention strategies employed by universities in an attempt to encourage more females into ICT, including using female ambassadors and female-only events at universities. A likely reason for the lack of success of these intervention strategies is that their evaluation is apparently not usually carried out (Craig et al. 2011).

Other suggested strategies included more effective ACS activities (unspecified) or greater Federal Government financial incentives and policies to bring about cultural change. However, if the curriculum remains male-centred, the culture is unlikely to change and enrolment strategies will continue to be largely ineffective fringe activities with regard to increasing the proportion of female enrolments. They may, in fact, be effective in maintaining the small numbers.

4.2 Gender-Inclusive ICT Curriculum Perceptions

The majority of survey respondents agreed that they were unsure about what a gender-inclusive ICT curriculum would really look like, yet a relatively large proportion identified the features of an ICT curriculum that appeal to males and females that are consistent with other published findings. About 40% of survey respondents noted that females tend to be more interested in the people side of the discipline and the skills required to benefit society and humanity at large, a view that is supported by the literature (e.g. Bissell et al. 2002, Margolis and Fisher 2002, Tillberg and Cohoon 2005, Courtney et al. 2006, Craig et al. 2007). About 50% of survey respondents also noted that males tend to be more interested in the technology rather than human concerns, which is a view also supported by Moore, Griffiths and Richardson (2005); Lewis et al. (2006); and Lewis et al. (2007). Workshop attendees also expressed similar views. These findings are not meant to imply that different perspectives are as a result of exclusively masculine or feminine characteristics, rather that there is a tendency broadly related to gender resulting from societal influences which dictate what is feminine and what is masculine (Dingel 2006, Jaworski and Coupland 1999, Seymour and Hewitt 1997). Undoubtedly there are women interested in the technology *per se* and men interested in the social application.

If the curriculum creators are also affected by these societal influences which dictate gender, and are unaware of them to an extent (as suggested from these survey results) then gender stereotypes are being reinforced and contributing to the lack of a gender inclusivity in the teaching of ICT.

Almost half of the surveyed ICT academic staff is aware of gender differences and interests in the discipline yet a much smaller proportion indicated that any practical measures addressing these issues were in place. There appears to be a considerable gap between what is known (or at least suspected) and practiced. This is supported by the fact that 89% of survey respondents expressed the desire for informed guidelines on the practical implementation of a gender-inclusive ICT curriculum.

The issue of a gender inclusive curriculum is not confined to ICT. Engineering (a related discipline) is also beginning to address these issues (Mills et al. 2010). While Engineering and ICT gender curriculum issues may be perceived as being different, the similarities probably outweigh the differences. A significant factor in making the curriculum more gender-inclusive is concerned with emphasising the *context* of the technology so that all students may readily perceive its relevance to improving society (Koppi et al. 2010). Other curriculum aspects such as student experiences, forms of assessment, learning and teaching methods and the learning environment are also part of gender inclusive considerations (Mills et al. 2010). The deliberate implementation of gender inclusive practices has been shown to make significant differences in attracting and benefiting all students (Margolis and Fisher 2002). However, changing the curriculum depends on many factors, such as individuals, politics and fashion; and

academic merit and curricula practiced elsewhere are not necessarily major concerns (Gruba et al. 2004).

5 Conclusion

While there is a broad appreciation amongst a significant proportion of ICT academics in Australia that there are different gender perspectives and interests in ICT, this perception has not necessarily translated into a gender-inclusive curriculum. The desire for such a curriculum has been expressed even though the practical development and implementation is unclear and there are different perceptions of what a gender-inclusive curriculum would entail.

Given the gender balance amongst ICT academics, it is likely that the survey results reflect a male perspective.

Research has shown that a comprehensive approach to curriculum design needs to be adopted to make it more inclusive. This is likely to be a protracted process because of innate conservatism and the slow pace of curriculum change in the sector (Gruba et al. 2004).

Most universities make a special effort to attract more female students into ICT, even though the prevailing culture is male-dominated, the majority of academic staff is male and the curriculum is apparently largely biased towards programmes more appealing to males. The culture is reinforced by the lack of a gender-inclusive curriculum which can only perpetuate the imbalance. Significant increased enrolments of females cannot be expected to occur if bias persists at all levels. What is needed is a new curriculum that will produce a new style of ICT professional so that the cycle can evolve.

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