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**Hegemony and Assessment: The student
experience of being in a male homogenous
higher education computing course**

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Abstract

This work emanates from a previous study examining the experiences of male final year students in computing degree programmes that focused on their perceptions as students where they had few, if any, female classmates. This empirical work consisted of focus groups, with the findings outlined here drawn from two groups that were homogeneous with respect to gender. It identified that the masculinisation of computing and the resulting hegemonic masculinity has far-reaching impact. An unanticipated theme was how this homogeneity impacted their course assessments. Students participating in this research identified discomfort with their experience of the institutional hegemonic masculinity. Further work to understand how this hegemonic masculinity impacts teachers is also proposed.

Keywords

Gender imbalance; STEM; assessment; experience; male perspective; computer science education.

Introduction

This work emanates from a previous study examining the experiences of final year students in computing degree programs, more specifically, focusing on their perceptions as students in a higher education environment where they had few, if any, female classmates. The work is motivated by the large volume of research focused on the gender imbalance in STEM subjects that appears bereft of an exploration of the male perspective of this phenomenon (Griffith, 2010; Hill, Corbett and Rose, 2010).

In examining the impact of gender in the classroom, and on the students' experience, this work demonstrates that gendered expectations are harmful to men as well as women. It also gives voice to the sense of loss that the men feel resulting from the lack of women in their groups. This research finds that students describe as negative the impact it has on their ability and openness for discussion. They recall their second level experiences, in mixed gender environments, and draw comparisons that highlight their sense of loss in this regard. The participants lament the departure of the few women originally in their groups, and the consequences of their absence.

Although the purpose of this study was not to propose suggestions for changes in practice, the resulting findings have implications relevant to student assessment practices. This work has also identified, that from the students' perspectives, the masculinisation of computing and the resulting hegemonic masculinity has far-reaching impact.

Background

Positioning the Research

Gender is central to this research. The emphasis is on the men's experience, and it does not attempt to produce a comparison between women's experiences in similarly imbalanced environments (for

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example, nursing). The aim is to give voice to the variability of their experiences, not to generalise the experience. It aligns with the position held by Kimmel, that masculinity studies are a significant outgrowth of feminist studies, as summarised by Gardiner (2013):

Masculinity studies can be informed by a feminist project.... [projects can be] about men but also about gender – as a system, individually embodied and institutionally embedded, and as a set of practices, independent of the actors' struggles to accomplish it (Kimmel, foreword)

Focusing on the perspectives of men alone, not men in comparison to women, from a feminist perspective aligns with the concern identified by Parsons and Ward (2001) who urge that the gap in feminist research approaches has potentially far-reaching implications as students go on to possess a lack of understanding about the gendered nature of their educational experience. The research is viewed from a social justice theoretical perspective, rather than classroom level interactions (Charmaz, 2003; Weaver-Hightower, 2003a).

Given the large volume of work on the gender imbalance in STEM subjects, and computing specifically, studies of men's experience of the area have been largely absent from the literature. It is also worth noting that most of the literature is US based, which may in part be attributed to the prevalence of tech companies there. In treating men and boys as 'the shadowy other', a term introduced by Weaver-Hightower in his work on masculinity in schools (2003b), they have been largely ignored in pedagogical studies. Yates's observation of nearly two decades ago remains true (1999:15). And yet it is also true that the great bulk of empirical qualitative work on gender, pedagogy, subjectivity and schooling in the past two decades *has* studied girls rather than boys.

The current status quo of gender imbalance in computing has not always been the case; this trend represents an about turn in STEM subjects representation in general, although computing has been impacted the most severely in the downturn of participation (Smith, 2011; Riegler-Crumb, Moore and Ramos-Wada, 2011; Clark Blickenstaff, 2005; Ceci, Williams and Barnett, 2009; Riegler-Crumb and King, 2010; Elliott and Timulak, 2005). As noted by Riegler (2010:1); Riegler-Crumb, Moore and Ramos-Wada, 2011):

Participation in STEM has traditionally been the domain of White males, and correspondingly, researchers have long been interested in the topic of equity in STEM, examining how and why certain groups have more or less access, opportunity, and success in the educational trajectories leading to STEM occupations.

The resulting emphasis in the research field has been largely focused on responses to the attraction and retention of women in these fields (Sheedy and Moloney, 2014; Selwyn, 2007; Anita Borg Institute, 2013; Kinzie, 2007; Smith, 2011). This emphasis fails to look at the social outcomes of education to a large degree. Traditionally, measurements of academic achievement such as literacy or mathematical ability have been used to evaluate success. Research shows that such measurements do not show individuals competencies accurately. They fail to incorporate attitudes, beliefs and behaviours, the so-called *social outcomes* that constitute the various benefits of education in the non-economic spheres of life. Ehren and Dijkstra (2014:16-28) proposes one goal of education is to contribute to the formation of students' identity, to their personal development in a broad sense and to their social and cultural upbringing necessary for their participation in society and democracy. Education contributes to the wellbeing of the individual, as well as wider society (Prescott-Allen, 2001).

Methodology

Data, Sample and Procedure

Four focus groups were conducted with volunteers drawn from final year computing degree programs. Two groups were identified as heterogeneous with respect to gender from first year, with the other two having less than 10% women. The data sample was comprised of self-selected participants, with no relevance placed on the identity data in approaching them.

The analysis focused on the two homogenous groups and their experiences surrounding gender. In total, there were eight participants in the focus groups, with four in each group. The response rate from their degree program was 50%. Students were approached in class groups by the researcher, who outlined the topic and purpose of the research. Information leaflets were distributed, with contact details provided for the researcher and independent advisor. Focus groups were scheduled in deference to student workload and timetables, and students were invited to attend at will.

The researcher took into consideration the potential for students to feel coerced into discussing a topic that was potentially difficult or exposing for the students. As final year students, there was the additional potential for anxiety surrounding the researcher becoming biased when marking the students' work. The independence of the focus groups from all coursework was stated clearly from the outset, as was the voluntary nature of participation.

Focus groups lasted approximately one hour, and were conducted by the researcher in the presence of an independent third party. The interviews were recorded with participants' permission, and transcribed with the individuals anonymised using 'a', 'b', etc. to refer to individuals. The transcriptions were later coded to facilitate an understanding of the themes present (Elliott and Timulak, 2005; Gibbs, 2008). Although the focus groups describe the individuals' present insights and observations, as they were conducted face-to-face with a female teacher, social desirability bias is possible (Richman, Kiesler, Weisband and Drasgow, 1999). Indeed, one participant commented:

It is interesting that the girl is doing the research

(P A L:170) (P- participant, L- line number).

While the interviewed groups were entirely comprised of men by the time they reached final year, they started with 10% women in first year and 5% for the first semester of second year. This group can be deemed to be representative of the year on year trends of the course, with less than 9% women graduates over the last eight years'. Half of the eight years contained no women graduates.

Ethical Considerations

The University's Ethics Committee reviewed the research proposal and protocol prior to the scheduling of focus groups. Individuals were given the opportunity to review an information sheet on the focus groups prior to attending and the option to rescind consent at any time. They were given details of an independent third party to contact in case of any concerns, as well as contact information for the researcher. Assurances were given that resulting transcriptions would not include identifying information, and respect towards confidentiality of other participants was emphasised throughout. Focus groups were conducted in the presence of an independent third party, the student support services coordinator for the department. This role involves directly dealing with students who are in difficulty either academically or personally.

Discussion

A thematic analysis was performed on the resulting data from the original study. Two major themes emerged from the data. The first surrounds the gendered expectations observed by the participants', which they experience from both the industry they are about to enter as consumers

and workers, and the third level education institute. The second is the construction of the absent woman by the participants, as they discuss both the observed and presumed impact of the lack of women in their groups, as well as the sense of loss they experience. The analysis also has several minor themes, some of which are presented here. Observations drawn from the focus groups regarding the participants' experiences and reflections on assessment are presented.

Education and Society

The concern that women's underrepresentation in STEM encompasses not only the obvious inequities for women, but also the potentiality for lost opportunity for society is not new. In line with Raftery (2008), this work believes that education reflects, implements, often challenges and sometimes destabilises values in society. It can have extraordinary power, and this power can be harnessed to help bring about gender equality.

Scharpiro (1995) identifies that education is supposed to move the society in the direction of its ideals. It behoves third level institutions to question the ideals and norms that are presented to those it purports to educate, with both educators and students aware that expansion of education alters the way people perceive membership and authority in society.

Self-Identity development in Male Students

Identity development focuses on helping practitioners to understand how students discover their 'abilities, aptitude and objectives' while assisting the students to achieve their 'maximum effectiveness' (Torres, Jones and Renn, 2009:1). As identity is shaped by how one organises experiences within the environment that revolves around oneself (Erikson, 1959), the lack of women in the classroom has an impact that is personal. Each academic discipline differs in how they define how individuals organise these experiences. Computing as a discipline has not come to a definition of identity. Identity is generally accepted as being socially constructed, with impacting contexts including educational institutions and work, as well as power and inequality such as race, social class and gender (Andersen and Collins, 2007).

Recent findings suggest women leaving technology, or not entering, may be due to having a wider career choice, as women have proportionately greater high mathematical and high verbal skills than men (Wang, Eccles and Kenny, 2013). Individuals with high mathematical and moderate verbal abilities are more likely to enter STEM subjects than those with high mathematical and high verbal skills (Wang, Eccles and Kenny, 2013). It also suggests that the somewhat prescriptive nature of STEM courses appeal to those with moderate verbal abilities, in part because they rely more heavily on their mathematical ability in developing their identity. The identity of the individual student is established with a mathematical leading value, with the emphasis on verbal skills reduced.

Social impact and constructing beliefs around women's competencies

Research looking at the feminist examinations of gender roles, and consequential economic and work force challenges, identifies the limitations of enrolment and test scores as initial indicators of equality (Yates, 1999; Yates and Leder, 1996). The prevailing view is that the economic and social outcomes of education are stronger indicators of parity. An economic outcome of women following men into well-paid careers such as computing is that the median pay for all employees drops (Levanon, England and Allison, 2009). Levanon (2009) finds that computer programming, which used to be deemed a relatively menial role done by women, began paying more and gained prestige when male programmers began to outnumber female ones.

Ridgeway (1991) examines how nominal attributes such as gender or race can acquire status or value once identified. This leads to the observation of most societies that people value male over female when it comes to gender. She states that status value generates belief about competences:

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One can form beliefs about those that one does not interact with, but people are not likely to hold widely beliefs that contradict experience from their interactions (p.370).

When one considers that male students cannot construct their beliefs about the value of female students through actual engagement, due to the absence of women from their third level classroom, a worrying gap in the social outcome of this college environment can be identified. Without any meaningful way to construct their status beliefs through interaction, it is difficult for young men to gauge competence of women in computing. Beliefs about competence and power develop out of direct interaction experience, without requiring any assumptions about individual personal ability.

The dominant group determines the characteristics and status that is conferred on the subordinate group (Ridgeway, 2001:640). In constructing their views of women in computing, male students may not be aware their assumptions are impacted by a lack of interaction with women in their college classroom.

Positioning the Institution of Education

The Carnegie Foundation (Boyer, 1990:7) describes the ideal educational institution along six axioms, one of which is:

A just community with a commitment to heterogeneity and diverse opportunities in the curriculum and social activities, and an honouring the individual person

Pascarella and Terenzini (1991) also emphasises the importance of 'socializing agents' - the people with whom students connect with – in developing identity and ego during the college years. They find it is the diversity of individuals (particularly other students) that developmentally challenges students' conceptions of themselves and that requires adaptation and commitment to certain attitudes, values, beliefs and actions (p. 190).

Chickering (1993) developed four axioms aimed at encouraging growth along the identified developmental vectors and helping students to develop the capacities for living and working in the twenty first century. The scope of the axioms is 'Recognize significant dimensions of individual difference between students'. They find:

[...] the importance of age, gender, and ethnicity as dimensions of individual difference that have serious consequences for the way students experience particular content. [...] The consequences are not subtle. They range from low-level disaffection and passivity to outright protests and active resistance (pp. 325 - 326).

Student faculty relationships are of great import for students in developing both their competence and sense of competence (Chickering, 1993). Combined with Ridgeway's (1991) theory of construction of competencies, it can be argued that the treatment of female students by faculty in gender imbalanced classrooms also impacts on the male students in how they construct female classmates. In a male homogeneous group, the construction given by a teacher of 'women' could have wide reaching implications.

Assessment as an influence on student's experience

In considering the impact the institute has on the student, it is important to recognise the key role assessment. The seven principles outlined by Boud suggest effective approaches to think about assessment as it is one of the 'most significant influences on students' experience of higher education and all that they gain from it' (Boud, 2010; Beede, et al., 2011).

Students and teachers become responsible partners

In calling for students and teachers to engage in a dialogue about assessment, a value system that affords students a position in their learning is being fostered. Participants in the focus group identified an experience in which they attempted to become the responsible partners regarding gender and stereotyping.

The participants in the focus groups spoke of Samus, who was one of the first female protagonists in a video game and was initially featured in the 1986 Nintendo game *Metroid*. Samus' reveal in the game as female at the end of the game provoked a strong and overwhelmingly negative reaction in the industry amongst both players and commentators. More recently, in 2014 GamerGate highlighted the gender-based discrimination, intimidation, and abuse prevalent in the primarily white, cis-gendered, male gaming industry.

Participants were keenly aware of this aspect of the industry, and discussed at length the difficulties that they had in challenging norms they are asked to accept. Both groups brought up one assessment they were set. They felt they were being asked to create a heavily gender stereotyped piece of assessment, and it did not resonate well with them:

comes across as you shouldn't try and make a game that breaks the whole, you know, pink is for girls and blue is for boys. Like you should just try and go with it and go with the ...

(P G:1160 – 1163).

the status quo

(P E: 1167).

you shouldn't try and break it because no one will buy your game and there's no point in even trying to make a game that has a female protagonist.'

(P G:1169).

They felt they weren't listened to when raising concerns surrounding these norms. In describing questioning this project:

I felt it was coming from a very respectful teacher, but I felt it was very non-respectful. Like it was questioned. We did question it. The whole class questioned it

(P F:1029-1031)

The project remained. The participants' attempts to break the gendered norms they were being presented with were rejected, and they were left feeling unheard, as well as ill at ease with the assessment they were set. They repeatedly spoke of their regard for the teacher and attempt to bring about change with dialogue.

An interesting aspect of this was students' attempt to tackle the assessment being set, and the association they made to the wider industry. The teacher obviously had established an environment of partnership and interactive dialogue with students, as they were able to challenge the assessment. Given their discomfort with many of the industry norms discussed in the focus groups, it may well be that the lecturer was accurately mirroring the normative challenges of the industry they are entering in setting the assessment.

Assessment provides inclusive and trustworthy representation of student achievement

The focus group participants were aware that the absence of women in the classroom can have long-term consequences as identified by (2004) 'old fashioned' views.... [having] learned 'not to think of girls in an academic environment' (P. 43).

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Both groups continuously refer to the single female student who was in the year ahead:

She is like the bane of our existence, she's a 90% student. It's just like everything she has done is like surpasses most people in the class... people in the room were like it would be great to have a female touch right now, wouldn't it, like, ... just to figure out where we are going with this

(P F: 436-437).

And later:

she's like an inspiration to people in the room. People like look up to her work

(P F L:495).

The participants construct the missing woman using this excelling student as their baseline. While acknowledging their primary need is for some input from differing perspectives:

there's absolutely no female input in that room at all'

(P: G L:524).

The 'female touch' is attributed as having a wider impact. They construct the opinions of the absent peer using women they know in other realms of their life; they question siblings, fellow gamers, friends, for their input where required. They identify that:

the girls have a different like feeling about things, and like artistic style

(P A L:123).

Ultimately, they seek diversity in their learning environment, a break from:

It's a whole lot of white male in the room, you know what I mean. A whole lot of white males

(P F: 478-479).

In continually presenting students with exemplars from one female student, teachers appear to be enforcing a sense of otherness, and enlarging the perceived gap:

If there were an alternate version of our class where everyone was girls they would all be getting 10% more than us

(P A: 1048-1049).

While it is difficult to represent inclusivity in such an environment, it is worth considering the impact that continuously presenting students with the outlier as the example has.

Assessment accurately and richly portrays graduates' and students' achievements to inform future careers and learning

Digital products have become more attractive to male than to female users (Oudshoorn, Rommes and Stienstra, 2004). This is often a subtle, but present, factor in how technology is created (Selwyn, 2007). This aligns with the student's perceptions:

you hear a lot about how there's a gender bias in products being made, they are being geared towards men. And you really see it when there is a room full of men creating demographic for another group of men and they want you to market it to someone and guess who they are going to like? They are going to like their own demographic

(P D L:357-362).

They describe the difficulty in creating work that appeals outside of the expected demographic, as:

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It's very easy to target towards men. There's a lot of things to reference it from
(P F L:684).

However, when asked if they identify with what they are, as part of this demographic, being marketed, all participants responded in the negative:

No, not at all
(P F L:694).

I hate it
(P G L:696).

It's not representative
(P H L:720).

In directing students towards industry 'norms' in assessing them on projects targeted at the standard male demographic, it appears teachers are instructing them towards stereotypical projects that are actually contrary to the students own preferences and insights.

Students further questioned the hegemonic masculinity present in the assessment of their work, as evidenced when they described their research presentation sessions as follows:

you went up and said it in front of the whole class and like our panel of teachers were the ones who gave you feedback but it was like open to the class if they wanted to say anything. But I think what was interesting with that was because of all the teachers on the panels are also males, so there's absolutely no female input in that room at all
(P F L:520-527).

In describing their experiences of the idea that good design is important, students appear to find themselves limited by the dominant hegemonic masculinity of the field, as well as that presented to them in their assessments.

In looking forward to their future, as they are on the verge of entering the industry, reservations about the environment are observed:

I think if (college) mirrors the rest of the world then I think it's kind of bleak for the industry...
geeks making geeks
(P E L:1249 – 1256).

I'd like to see more women in the industry because it would actually probably help the industry grow further
(P E L:1261-1263).

A sense of lack of preparedness to work with women is also apparent:

I think the main thing is having more women in the class would have taught me better how to interact with them in the workplace when I get out
(P: B L:1010-1012).

Participant B refers to the desirable skills that characterise our abilities in a societal setting as impacted, and was met with general agreement. It provides an insight into the awareness they have of the loss of opportunity this represents for them, and how diversity with respect to gender is daunting for them:

... it would just be difficult when we get out of here because we would have more tendency to work with other men rather than to work with women because we have had less experience
(P C L:348 – 352).

Conclusion and Future Work

College men are facing significant issues which the current literature has yet to fully and effectively address (Laker, 2003). This study was informed by the literature on the societal context of computing which is heavily skewed towards the woman's experience, and fails to question how college men experience the same environment. The purpose was to understand this experience from the male perspective, with gender positioned as the contextualising factor. The resulting findings suggest teachers should be cognisant of gender in setting assessments, in presenting exemplars, and in how they conduct the assessment process. It provides insight into how the gender imbalance impacts the students, as well as their own awareness of and sensitivity to the position of gender in their class.

Future work is required to understand how this hegemonic masculinity is observed and experienced by the teachers is proposed. Additionally, more European focused research on the gender divide in STEM focusing on male agency for effecting change is being considered.

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