Resisting the gendered categorisation of Computing and Engineering

Authors

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Abstract

As information infrastructures increasingly shape decisions that affect us, especially through the undertow of artificial intelligence, it is essential that women and gender minorities are well-represented across computing and engineering. However, the gender imbalance in technology education seems to be self-perpetuating, leading to a deficit of women lecturers and students, and providing a gender imbalanced education environment, which further discourages women from technology degrees and careers. Through online surveys and focus groups of computing and engineering students of all genders, we explore the tension between students' vision of "not just for men" subjects and careers, including their suggestions for recategorisation, and their day-to-day experience of male-dominated courses. While keen to proselytise their career paths in ways they perceived to be attractive to women - such as being friendly and of benefit to society – many of our students experienced isolation, doubt, and sexist assumptions.

Paper

Introduction

Everyday digital technologies, such as social media and digital assistants, have absorbed and now amplify sexist and racist stereotypes (e.g., Guilbeault et al., 2024; West et al., 2019). While images representing careers become more stereotyped, the need for diversity in the tech industry becomes more urgent. For example, period trackers may put women in danger where there are abortion bans (Tirk, 2022) and Internet of Things devices have been used to "abuse, harass, monitor, intimidate, and gaslight victim-survivors" of domestic abuse (Brown et al., 2024).

Researchers studying Equity, Diversity, and Inclusion (EDI) issues in Higher Education (HE), such as gender imbalance in STEM, also become activists, drawn into increasing and supporting our gender minority students. The subject areas with the greatest male-dominant gender imbalance at our university are engineering, technology, and computing, with about 20% female entrants in 2023. This average covers programmes with relatively balanced cohorts and more technical subjects, such as Cybersecurity and Civil Engineering, with very few women on each course. Bowker and Star (1999) use *texture* as a metaphor to describe the experience of inhabiting an ill-fitting category: the category "provides surfaces of resistance (where the real resists its definition), blocks against certain agendas, and smooth roads for others" (p.324). Fox (2014) describes gender characteristics for women (e.g., "maternal, emotional, talkative, physically fragile, inherently bad at math and science ") as *historically-assigned*. Our students are "torqued" by the gender stereotypes governing themselves and their subjects, even as they twist and torque the categories to change them.

This study focuses on students' suggestions to improve gender balance in the department; recognising this in terms of students' rights to define the categories they are establishing careers in.

Methodology

Data was gathered through an online survey, two focus groups, and two short interviews. The survey asked undergraduate computing and engineering students questions related to studying in the department,

including this open text question: “What would make your course more appealing to women? (To address gender imbalance)”. We specifically asked about women, as we do not know whether the needs of other gender minority students are aligned. This gained 176 responses, excluding “not applicable” (etc.). Students were also asked if they would be willing to discuss gender imbalance in their department. Those responding yes or maybe were invited to take part in online focus groups / interviews. Two mixed-gender focus groups (n=8; n=4) and two interviews were held.

The responses to the survey question were added to a dataset (in NVivo). Focus groups and interviews were transcribed and the texts added to the dataset. Data was coded to identify suggestions for improvements. Within these texts, the data was iteratively coded and themes were developed, following Reflexive Thematic Analysis (Braun and Clarke, 2020). This led to five themes (suggestions for improvement) with subthemes. After further reflection, the theme of *categorisation* was chosen to provide further insight into the students’ context and suggestions.

Suggestions for improvement

1. **More women**: as lecturers, professors, and students; a higher profile for female graduates and professionals. The more technical the subject, the fewer female lecturers the students had; sometimes none, whereas more creative subjects reported more gender balance.
2. **Promote careers for women**: ways to counter the erroneous “*just for men*” categorisation of the students’ subjects and careers. For example, “*being able to display the wider benefit of cyber security may also attract more women to consider it as a viable career path*. ” (Survey response).
3. **Events and networks**, such as guest speakers, societies, and opportunities to share their experience.
4. **Support for female students**, such as mentoring, skills/awareness training, and clear reporting structures for problems. Also, easily-accessible information for single parents: “*for example, there's an opportunity to study abroad for a month... Now what I really need to know is: is it possible to get family-friendly accommodation, so I can take my son along?*” (Focus group).
5. **Gender-neutral bathrooms:** “*as a trans person, the gender imbalance that I experience could be helped by giving students access to gender neutrals bathrooms on campus*.” (Survey response).

The next phase of analysis adds data not coded as suggestions, including themes around male allies, intersectionality, and strategies for dealing with gender imbalance and sexism (Taylor-Smith et al., 2023). In terms of activism, we need to support our students’ agency in defining the categories they find themselves in, especially according to gender and career choice. We are working with students of all genders to explore these categories and experiences, to further develop empathy (Fox, 2014) and encourage allies.

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