Title

Mobilising more women into computing

Authors

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Summary

According to HESA data, UK universities' computing departments continue to suffer from a gender imbalance, where at present only 21% of students are women. This imbalance can deter women from applying and also be challenging for female and non-binary students. It is also a problem for the tech industry and users of potentially biased technology. Many universities are working to break this cycle through initiatives to encourage women and girls to get involved in computing and consider it as a degree and future career. Our research aimed to identify effective ways to boost this mobility and inclusion, especially through using role models to encourage participants and combat stereotypes. The Participant-Centred Planning Framework is the outcome. The framework was successfully piloted and the pilot study further indicated that the framework is likely to be useful more widely for anyone planning activities to bring underrepresented groups into their subject.

Paper

Introduction

The proportion of female professionals in the UK tech industry is estimated at 26% (Tech Nation, 2021). Gender imbalance in computing can lead to inappropriate, even biased, products and services (Criado Perez, 2019). Universities would struggle to change this with only 21% of computing students identifying as female (HESA, 2021). Lack of diversity and inclusion is also self-perpetuating, through gendered stereotypes, which deter women from choosing computing (Cheryan et al. 2015) and male-dominated work and study environments, which can make women feel out of place (Mooney and Becker, 2020; Widdicks et al., 2021).

To break this cycle, activities are organised to inspire women to study computing and pursue careers in tech (Hamilton et al. 2016; Morrison et al. 2021). Our study, commissioned by a government body, aimed to identify success factors for these initiatives, with a focus on using role models to encourage participants and combat stereotypes. Our research questions were:

1. What are the key features of successful initiatives to encourage girls and women to consider study and careers in computing?
2. Who are the role models in these initiatives and what characteristics and actions have positive effects on participants' aspirations towards studying computing?

This mixed methods study led to development of the *Participant-Centred Planning Framework* to support organisers to design successful events. This was successfully piloted by organisers of activities to encourage young people, especially girls, into computing / STEM.

Methodology

To address the research questions, the study investigated initiatives via their organisers and (potential) participants. A typology survey captured structured descriptions of activities; an online survey asked

female and non-binary computing students about their role models and motivations for choosing computing, including any activities to encourage this choice; and organisers from four successful initiatives were interviewed.

The typology was based on a literature review, then refined through online focus groups with organisers of initiatives, and implemented as an online survey. It garnered responses from 15 initiatives, revealing a wide range of activities, with many potential success factors, but little rigorous evaluation.

The student survey (n=269) was designed to fill this evaluation gap by asking female computing students to look back at their experience of relevant events and role models. Half of respondents had studied computing at school and 69% of these had female computing teachers. Asked to identify role models who had influenced their career plans, 42% of respondents identified someone and 56% of these role models were men. Being a powerful example and/or taking the respondent seriously could be more important than the role model's gender.

The interviews covered strategies implemented in school, universities, and by a non-profit. They focused on inspiring girls to take computing subjects and supporting computing/STEM students. Findings included the importance of a personal approach, such as talking to students individually; mainstreaming; and clarity of aims, focused on the participants' needs.

The free text from all instruments was coded (Given, 2008) using eight categories derived from the typology:

- Student Needs;
- Strategic Aims;
- Target Audience and Inclusion;
- Activities;
- Role Models;
- Evaluation;
- Impact on Students;
- Things to Avoid.

During coding, the category Gender Imbalance was added to collate experiences of gender imbalance and bias. The categorised text was distilled into a framework to support implementation of successful initiatives: a best practice card (flow chart, see figure), checklists with more detail, and questions to record decisions. The framework was tested and refined.

A formal pilot was conducted with four organisers who used the framework live, while planning their activities to support young people into computing/ STEM; plus five organisers looking back on recently completed initiatives. The framework was found to be a useful tool to support planning; only minor revisions were suggested.
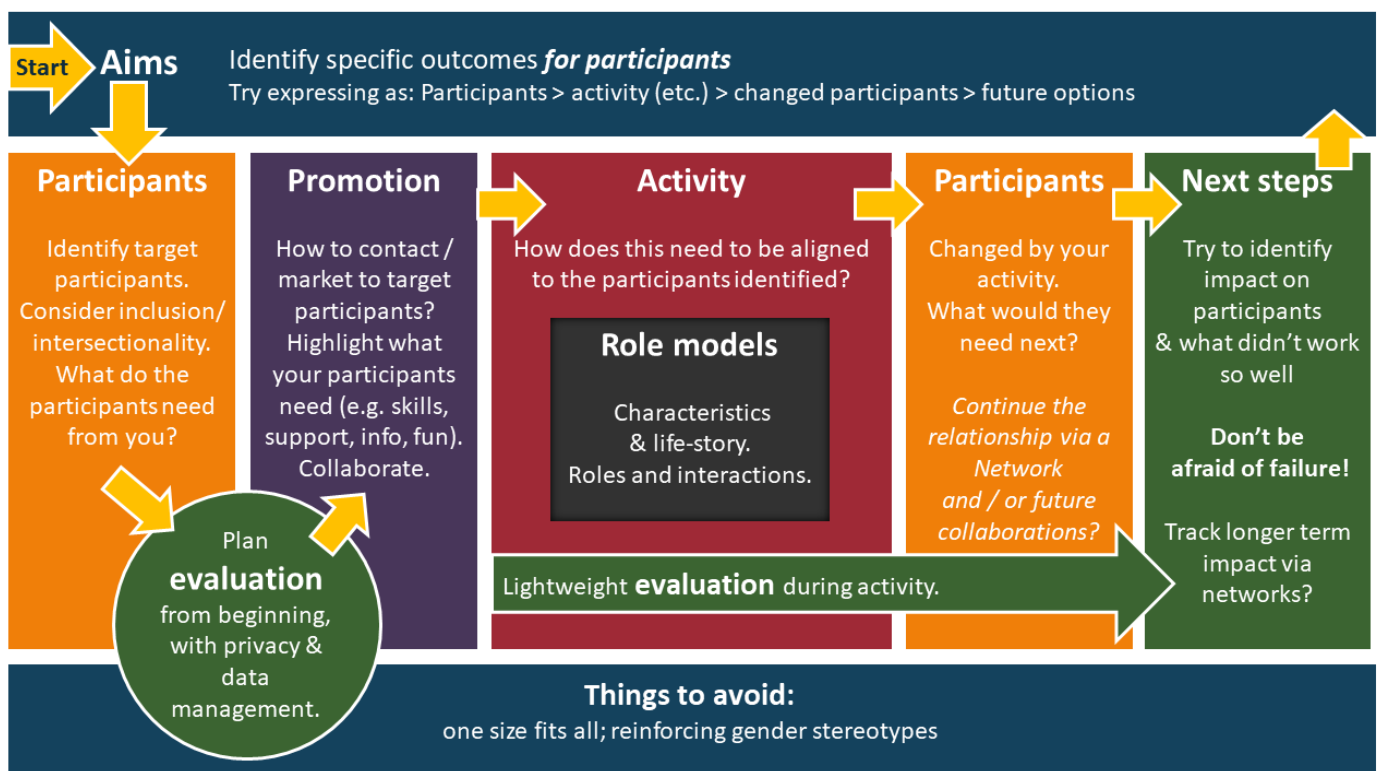
Framework

The framework puts participants at the centre: who are organisers trying to engage, and what is the change they wish to inspire in these participants? The framework has six aspects:

- Aims;
- Participants and inclusion;
- Promotion (reaching target participants);

- Activity;
- Role models;
- Next steps.

Evaluation is integrated throughout. The best practice card is a quick reference for busy organisers, putting the elements into chronological order, while illustrating their interconnections. A one page checklist for each of the elements includes: questions, examples, suggestions, tips from organisers, and comments from the research providing lived experience. Each checklist includes evaluation advice linked to that aspect of the planning.

Using and piloting this framework indicates that it would be useful for mobilities of all sorts, e.g. people from other underrepresented groups into different subjects. It need not be specific to either women or computing.

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