

Addressing Gender Imbalance in Computing Science Education

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Contents

Contents	1
Introduction	2
Group One: How can we link existing networks to utilise their resources?	3
Discussion	3
Existing networks/events	3
Challenges	3
Potential solutions	4
Main takeaway	4
Group Two: Addressing the challenges of bringing computer science into early years learning	5
Discussion	5
Group Three: Computing Science: A PR Issue?	6
Discussion	6
Rebranding?	6
Content	6
Targets	7
Media	7
Group Four: Can broader, more applied projects get girls motivated more?	8
Discussion	8
Group Five: Social Links	9
Contributors	11
Facilitators	11
Discussion Papers	13

Introduction

This document brings together the ideas discussed as part of the *Addressing Gender Imbalance in Computing Science Education* workshop hosted by the University of Glasgow, with support from the Scottish Informatics and Computer Science Alliance (SICSA), on 14 May 2020.

The workshop saw representatives from schools, universities and industry discuss the current state of gender balance within their own organisations. The event was split into three breakout sessions. Within each breakout group, a facilitator was tasked with taking notes.

In the first breakout session, the gender balance at participants' institutions was discussed, in addition to any initiatives that had been undertaken to improve it. Groups then shared summaries of their discussion with the wider group.

In the second session, each group was allocated a short paper describing a successful initiative to address gender imbalance (see Discussion Papers below). Each group discussed their paper and then reported back on what, if anything, could be learned from the initiatives described.

In the final session, each group was asked to work up one of the ideas that had emerged during the previous discussions and it is the results of this work that form the basis of this document.

With over fifty participants, the discussion was both varied and insightful. I'd like to thank all who contributed on the day and especially those who have indicated that they want to continue working on this issue together. The hope is that the colleagues listed below will come together as a working group, tasked with making some of these brilliant ideas a reality.

Dr Matthew Barr
Centre for Computing Science Education, University of Glasgow
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Group One: How can we link existing networks to utilise their resources?

- Lots of disparate and regional networks with existing resources.
- How can we link these together to utilise the resources we already have?
- How can we increase more consistent engagement and help with the time investment required?
- Perhaps consider an online network?

Discussion

Existing networks/events

- The Ladies of Code (Edinburgh/Glasgow)
- Equate Scotland
- Scotland ID
- CodeFirst: Girls
- ACM Women
- Women in Games
- BCS Women
- Scotland IS
- dresscode.org.uk
- University of Edinburgh's 'Hoppers'
- Christmas Cyber Security Lectures (in schools)
- EGX
- DataFest
- Turing Festival
- 30% Club

Challenges

- Creating a list is a temporary solution, it's prone to change.
- Merging groups can be difficult because they have their own areas/targets to hit. Amalgamation can be difficult.
- National Progression Awards not seen as valid (seen as 'easier' as there's not an exam).
- Apprenticeships are still not understood very well (open Zoom calls with parents can be useful).
- PR challenge around apprenticeships/computing science.
- Women more likely to join later in their careers? Can be to do with a greater awareness of the opportunities available.
- Who will host the festival? Need to create the umbrella group to organise it - steering committee.
- Funding required.

Potential solutions

- A common place to list resources for all institutions (a website?)
- Use the existing links of the group we have here to connect with different groups.
- Talking with student role models/utilising informal groups (ethical hacking society - Abertay). Student societies/conferences do good work at networking with industry, showing that it's a viable career path and creating a feeling of community.
- What about a festival, rather than a merger?
- How about proposing a target to government policy? That way there's a common goal without merging.
- Umbrella organisation?
- Even if we can't amalgamate the activities, perhaps consider cross-promotion/promoting appropriate organisations to students/workers at the appropriate career stages.
- Consider links with apprenticeships/National Progression Awards.
- Creating resources as takeaways/add to the curriculum.

Main takeaway

- A festival
- An umbrella organisation/steering organisation.
- Apprenticeships should be more prominent
- Collect information on as many groups as possible in a single place.
- Funding required. Potential for sponsorship?
- This festival could be good PR.
- Travelling festival, popping up in different locations (depending on the pandemic).
- Consider diversity of events/regional differences/local events.

Group Two: Addressing the challenges of bringing computer science into early years learning

- Upskilling primary and early years teachers
- Inspiring young minds
- Engaging and teaching external influencers

Discussion

- Time is an issue so if we could create more online resource for teachers that would help
- What gets measured gets done – is CS being measured. Process to ensure this is being delivered. Syllabus is vague so open to interpretation and therefore not consistent.
- Also the level of technology available across the schools is not consistent. But tech and connectivity is not required for CS learning and this should be made clear.
- Lack of awareness from parents
- Barefoot technology is really helpful.
- There is no shortage of stuff out there. Is there the skill, resource, and time for teachers to engage and deliver?
- Can we make it more enjoyable for teachers to learn
- Challenge – network within schools due to security issues.
- We need to have a framework in place to support the schools.

Actions:

- Time needs to be prioritised for teachers to learn
- Provide support from uni students to help with the classes
- Guide for primary teachers to create a pathway from zero up. Provide Zoom support?
- But we need a framework – it cannot exist on goodwill
- Shared learning task with parents
- Look at SCDI (Scottish Council for Development and Industry) for teacher support and also DDB for classroom aides.

Group Three: Computing Science: A PR Issue?

- Can we rebrand computer science?
- What would be the barriers to doing so?
- What would the main focus of such a marketing exercise be?
- Does the media have a role?
- What do we need in order to take this further?

Discussion

If rebranding goes forward, it has to be on top of existing resources - the priority has to be resources in educational establishments.

Rebranding?

- There is a disconnect between the name “computer science” and the roles it leads to. Could the course name be changed? There still seems to be “ICT” instead of “Computing Science” within many secondary schools. Renaming comes with its own issues: “Applied Software Development” would get searched for within UCAS, whilst “Creative Computing” might not. There is a trade-off between excitement and effectiveness. The change would need to begin in secondary school in order to feed through into University applications. Changing the name might be counter-productive, as you can lose anything good that is currently associated with computer science. What might be more helpful is a slogan.
- Really, computer science is just an umbrella term. A greater emphasis should be placed on the vast array of sectors that exist within it. It should also be emphasised that there is a lot of scope for interdisciplinarity.
- The NPA Cyber Security course information has been branded well with colours that capture the different topics. Subjects should be marketed so that students want to take them. Simple interventions such as colourful leaflets can make a difference - aesthetics can be important. Literature for different courses can be great; however, advertising for courses doesn’t necessarily influence the gender imbalance.
- A main aspect of any campaign should be promoting the range of careers within computing science. It is also important to educate students about the unexpected links between computing science and less expected jobs, such as medical careers. Women use technology in slightly different ways to men, so do we need to look at the wider picture?

Content

- It can’t just be leaflets and pretty course content - this will only reach those who are already interested in computer science.
- There can be huge cynicism around advertising, so it might not cut through.

- Who should create the content? Teachers are already overstretched. It would need to be other professionals. Universities do need to market their subjects, so this should be targeted at secondary schools.

Targets

- Career guidance staff and other staff in schools.
- Social media - TikTok, YouTube, etc. Content highlighting career opportunities could be promoted on these platforms. Latch onto what young people are accessing online (i.e. game tutorials) and use it to connect their interests to computer science. If people are not going to search specifically for information about computer science, then the content needs to reach an audience in other ways.
- Public engagement - more scientists are becoming interested in science communication, but an increase in computer scientists becoming more active might improve the subject's reach. Computer scientists in the public eye would allow the public to ask any questions they have and find out more about the field in a more accessible way.
- We need to raise the profile of modern computing heroes. Who is the Computer Science David Attenborough equivalent? (Hannah Fry must be a contender?)

Media

- Media has a role - an increased proportion of female reporters working on news stories about AI and computing.
- Influencing journalists and script writers etc would be very challenging - how likely is it that existing media can be changed? It worked in law - female high powered lawyers could have led to an increase in females studying law. Traditional audience research might suggest there isn't a market, but what if there is? Look at how well "Wonder Woman" did. It would need to be done in a way to promote the positive side of computing work.
- There was a TV show in which females were given female mentors and taken through the process of building an app. Changed the perceptions of the females involved. More interventions like that could have an effect.
- Computer science needs both factual and fictional programming - this will generate greater public interest.

Group Four: Can broader, more applied projects get girls motivated more?

- Having opportunities for broader, more interdisciplinary projects, more applied maybe
- Include students into creating subject design

Discussion

- Organisations helping to get projects on the go; example: JP Morgan with app
- More free reign for what they create
- Freedom important, but hard to stay within cope
- Need to manage expectations
- Meetings once a months, with teachers, sharing problems, but not always shareable
- Government: more direction about timetabling and managing of time; disparity in schools; no backup on importance of CS in schools; will need high level backup to make sure it is seen as important and getting resources and time allocated
- Working with universities to get access to hardware; and industry, to see what is available
- Projects might not be long-term enough
- Universities sometimes have workshops and lectures (Christmas lectures) which are exciting, but don't really motivate long-term
- University: more and more students come, but staff cannot keep up; STEM ambassadors could help, but organisational overhead can be big; projects including students are successful, but there is no funding
- Some companies like to contribute, but more towards schools not universities, as it is right now

Group Five: Social Links

- How can social links for students and their teachers/lecturers be proactively set up?
- How can social links be created that help to inspire and break down stereotypes of students studying computer science?

First, stereotypes were identified as a key issue.

One participant noted that at school parent's nights, parents say that they do not know what CS is. A huge proportion of families are not working and have never worked so computing is a career that they can't imagine. It is a social problem that teachers might not be able to fix on their own.

Another participant from the private sector recalled working on a project that took students out to schools for workshops with areas where school children had never met someone that had been to university. Another participant, a teacher, said that she found it difficult to get students out to schools but had a positive experience with it.

It was suggested that just connecting with someone and being able to talk with someone would help with this, but resources are a big challenge. Students are keen to do outreach, but they have a lot of work and other jobs. There is some coordination around student engagement but ensuring it is efficiently conducted is difficult. Getting the right students to the right places is difficult.

SICSA employs students as student ambassadors to be the face of computing, although it is difficult to get teachers to agree to host students as they do not have enough capacity. It was questioned if it was a paid role as this might be important to allow students to be able to concentrate on the role. It was noted that students were simply not able to go out much.

It was suggested that long-term intervention had the most impact. However, it was questioned how this was obtainable given funding. It was questioned whether government and structural coordination was needed, while it was also unclear if being government led was ideal. It was observed that engagement in teaching was difficult as there are, so few teachers and it is difficult to get engagement with teachers. It was suggested that coordination might be beneficial there.

It was said that when trying to design things for young people to think about things it is always top-down. Often those voices are missing and then it is difficult to be effective. The communities as well need to be engaged with as they do not always see the relevance.

One participant wondered, with the current pandemic and people online more, does it get an opportunity for students to engage with other students? Another participant from HE said that from her perspective that 1-1 conversations with other girls helped to build a relationship with

someone they can relate to. She felt that building these relationships would be more difficult. Another HE colleague felt a long-term mentoring scheme might be more beneficial, while the other agreed and added that she had heard of other's experiences of long-term mentoring programmes, and the bigger impact it had on pupils.

A participating teacher said that her pupils often talk about computing being hard and not willing to push through problems. They need lots and lots of encouragement to move through problems. She said that different backgrounds can affect pupil's attitudes to this. She said that it was important to have people come into class and discuss.

It was questioned if prioritising younger recruits in industry would help support students to connect. The teacher agreed and felt that it was important for people who are currently in industry to give their input.

It was observed that face-face meetings were the most powerful. In current circumstances this is impossible. They discussed the possibility of online chat groups but felt that some research on this would help. Another felt that a spin-off investigation from this would be helpful. All agreed that this would be something they would like to engage with. A lot of the funding doesn't care about the student's interest and impact, and there was keen that this was investigated more. One participant noted that she will often use Google forms to make sure that her students enjoyed the experience. Another added that more long-term metrics are needed. It shouldn't just be about how many students were reached.

One participant mentioned that he was very keen to get things moving to get better evidence. Another suggested that other organisations already do outreach work and might have expertise concerning efficient uses of outreach. Many other banks in Glasgow have large graduate programmes and have a collective interest in engaging with students. He suggested students have an onus to contribute to the engagement effort. It was suggested that collaboration between HE and industry would help in order to trial this.

The SICSA representative offered that if people wanted to engage in a project then he would appreciate further contact and networking.

Contributors

Dharini Balasubramaniam	University of St Andrews
Matthew Barr	University of Glasgow
Nigel Beacham	University of Aberdeen
Mireilla Bikanga Ada	University of Glasgow
Deborah Blackburn	Deans Community High School
Judith Cochrane	Our Lady & St Patrick's High School
Iain Donald	Abertay University
Ruth Falconer	Abertay University/Women in Games
Mary Ellen Foster	University of Glasgow
Craig Henderson	Angus Council
Paul Herbert	Invergordon Academy
Alistair Hudson	Barclays
Ohad Kammar	University of Edinburgh
Fiona McNeill	Heriot-Watt University
Suzanne Miller	St Stephen's High School
Sarah Morton	West Highland College UHI
Chrissie Nyssen	North East Scotland College
Cameron Rigg	Comhairle nan Eillean Siar - The Nicolson Institute
Toni Scullion	dressCode
Derek Shanks	Barclays
Jeremy Singer	University of Glasgow
Lewis Sturrock	West Highland College UHI
Ella Taylor-Smith	Edinburgh Napier University
Sam Thiese	Robert Gordon University
Duncan Thomson	University of the West of Scotland
Carol Webster	School of Computing Science, University of Glasgow
Susan Welsh	Alva Academy
Heather Yorston	University of Edinburgh
Tiffany Young	Robert Gordon University
Mark Zarb	SICSA/Robert Gordon University

Facilitators

Gabe Cohen
 Patrizia Di Campli San Vito
 Anna Doyle
 Elle Lindsay
 Michael Taylor

Discussion Papers

Below are the papers made available on the day of the workshop.

1. [Improving Gender Composition in Computing](#)
2. [How to Increase Female Participation in STEM \(Gender Gap\)](#)
3. [Effective Strategies to Increase Girls' Success in STEM Education](#)
4. [The Leaky Tech Pipeline](#)
5. [Increasing the Number of Women in STEM](#)