The Impact of COVID-19 and "Emergency Remote Teaching" on the UK Computer Science Education Community

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Overarching Research Question

Q: *How has the UK computer science education workforce viewed the move to online learning, teaching and assessment (LT&A)?*

Target Population

- Those who have been actively involved in the delivery of LT&A across education globally;
- In order to identify CS practitioners:
  - HE respondents were asked to select their primary discipline against UK JACS codes;
  - Schools/FE were asked if they taught a particular subject;
  - Some recoding of responses to include common cognate areas (e.g. “informatics”, “software engineering”)
- Convenience sampling due to nature of survey dissemination (and ongoing pandemic).

Sample Size

- **N=2,197** members of the UK education workforce responded to the survey;
- This included **n=1,148** respondents from the HE sector (52.3%), **n=279** respondents from FE (12.7%) and **n=569** respondents from schools (25.9%);
- **n=214** respondents indicated that they taught CS (or cognate subjects e.g. ICT). This included **n=119** from the HE sector (55.6%), **n=24** from FE (11.2%) and **n=71** from schools (33.2%).

Survey

- Anonymous [international] survey was launched on 26 March 2020 (immediate aftermath of closures) and remained open for four weeks;
- Likert and slider scale questions explored respondents' views of the changes;
- In addition, respondents were asked three open-ended questions: "*Please provide any comments of how the online learning and teaching changes brought in as a response to COVID-19 will impact upon...*" followed by:
  - "*...your role*";
  - "*...your institution*"; and
  - "*...your sector of education*".

Quantitative Results

- Those who work within the **CS discipline were significantly more likely** to say that they...
  - ...**felt prepared** ($\chi^2(1)$=22.02, p<0.001);
  - ...were **confident** ($\chi^2(1)$=22.98, p<0.001);
  - ...were **supported by their institution** ($\chi^2(1)$=4.5, p=0.03);
  - ...held a **good working knowledge of appropriate technologies** ($\chi^2(1)$= 47.75, p<0.001);
  - had **access to appropriate technologies** ($\chi^2(1)$=13.19, p<0.001);
  - ...were **confident that their students could access online LT&A** ($\chi^2(1)$=17.16, p<0.001);
- Binary regression demonstrated that the **impact of working within the CS discipline remains significant** when controlling for **setting**, **gender**, and **years teaching**;
- It also shows that **those in schools were significantly more likely to agree** with the statements than those in HE and FE.

Qualitative Results

- Responses were coded as positive/negative/neutral (IRR=0.82);
- Of the n=102 that commented on the impact on their **role** 23 (22.6%) were positive, 54 (52.9%) were negative and 25 (24.5%) were neutral;
- n=94 provided a comment on the impact on their **institution**, of these 20 (21.3%) were positive, 59 (56.7%) were negative and 15 (15%) were neutral;
- n=67 commented on the impact on their **sector**, of these 16 (23.9%) were positive, 36 (53.7%) were negative and 15 (22.4%) neutral.

Change as Progressive

"*Computer science education is probably a good place to be right now...*" [HE]

- A key theme was how the changes would lead to more recognition of the importance of technology;
- Respondents foresaw long-term benefits for CS as a discipline across education.

Change as Progressive

"*ICT has gone up massively as a valued skill – hopefully a trend that will be reflected and its impact will be increased in terms of curriculum timetabling...*" [school]

- Respondents also mentioned the potential positive impact of financial investment in digital infrastructure. This was coupled with discussion of the opportunities for professional development in the area of online LT&A. It was recognised that there had been "*...more ongoing support for staff with technology*" [school] and this would lead to long term benefits.
- There was also acknowledgement that while there may be difficulties in terms of equity of access:

"*Computer science will be one of the least hit as our colleagues and students are among the most capable when it comes to operating online...*" [HE]

Change as Challenge

"*I am concerned that my institution thinks a move online is a move to more innovative and modern teaching, just by virtue of it being online...*" [HE]

"*HE will move increasingly to online provision, sadly. Our technologies do not currently allow the creation and manipulation of shared mental representations which is necessary for effective teaching and learning of mathematics and computer science...*" [HE]

Change as Challenge

- A key theme was whether the move to online LT&A would be as effective or beneficial to the students as face-to-face teaching;
- Concerns were also raised about the equity of access to the necessary resources for learning:

"*Online learning in CS is heavily dependent on pupils' home access...*" [school]

- The impact of the shift to online LT&A on workload (esp. for research) was also a concern raised across the discipline.

"*My role is shifting towards advising and away from teaching. A major challenge will be students' mental health, not their ability to write Java code...*" [HE]

Key Themes

- The COVID-19 context has not gone away, but has certainly shifted;
- Challenges/opportunities presented from "emergency remote teaching" and rapid shift to online LT&A could be applied more broadly across education;
- Fragility, precarity, workload, jobs, career progression, financial sustainability (especially for HE);
- Impact on prominence and perceptions of the "new" discipline of CS (especially in schools);
- Key focus on appropriate pedagogic/assessment approaches for CS;
- Wider public policy context: post-COVID economic recovery, increased focus on "digital", future skills demands.
- **Q:** why were schools more prepared/confident than HE?
- **Q:** why was Wales more confident than rest of UK?

Related Work

- Paper in *Higher Education*: "*COVID-19 and digital disruption in UK universities: afflictions and affordances of emergency online migration*" `https://doi.org/10.1007/s10734-020-00561-y`
- UKICER 2020 paper: `https://doi.org/10.1145/3416465.3416472`
- Article in *Research Intelligence*: "*COVID-19 as a Catalyst for Rethinking Digital Education: A View from Wales*": `https://cronfa.swan.ac.uk/Record/cronfa55558`
- EDUCON 2021 paper (and SIGCSE 2021 poster): "*The International Impact of COVID-19 and "Emergency Remote Teaching" on Computer Science Education Practitioners*" (to appear)
- Related surveys, invited blog posts (e.g. Nature and Wonkhe), as well as recent COVID-19 government consultation submissions: `https://proftomcrick.com/tag/covid-19/`

Diolch/Thanks!

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