Article

Perspectives of Distance Learning Students on How to Transform Their Computing Curriculum: *"Is There Anything to Be Decolonised?"*

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Abstract: Recent years have seen a growing momentum within UK Higher Education institutions to examine the colonial legacy entanglements of teaching materials and knowledge production, as institutions explore what it means to 'decolonise the curriculum'. While the movement began in the University of Cape Town, South Africa, in response to a student call for the statue of Cecil Rhodes to be removed, elsewhere this has become a top-down imperative from institutions themselves. In 2014 University College London hosted a panel discussion 'Why Isn't My Professor Black' building on the previous year's video asking, 'Why is my curriculum white'. By 2020 the #BlackLivesMatter movement once again illuminated the need to rebalance the power of who decides the 'facts' with a call for a transformation of knowledge production. Arts and Humanities curricula have been more easily adapted in response to this call, but the argument for decolonisation of STEM subjects in general and computing in particular have been more difficult to articulate. Moreover, the decolonisation shift has been largely confined to bricks and mortar universities, with little exploration of online and distance learning. This paper reports on an initiative in a British distance learning university to decolonise the computing curriculum, with a focus on students' perspectives and what barriers might be encountered. A survey of just under 400 undergraduate computing students revealed multiple understandings about decolonisation, and reactions ranging from hostility and resistance to strong support and endorsement. Students identified several challenges to student engagement including structural and practical concerns which should inform the computing education community in taking forward this agenda.

Keywords: decolonising/decolonizing; distance learning; students responses/voice; computing curriculum

1. Introduction

The movement to decolonise curriculum has gathered momentum across UK universities in the past few years. This has largely been actioned in Arts and Humanities where identifiable actions to redress legacy coloniality in teaching content have been implemented. However, initiatives to examine Science, Technology, Engineering and Mathematics (STEM) disciplines have so far been fewer and present a challenge for educators both in terms of curriculum content as well as pedagogy.

The context of this study was an exploratory project within the School of Computing and Communications at a large distance education university, The Open University (OU) in the UK. The project brought together a small group of academics in the School (the current three authors plus four other academic colleagues) to examine how decolonisation might apply within our own field, both as theory and in practice. This was enabled through resources set aside within our faculty for the scholarship of teaching and learning [1].

If, as Tuck and Yang propose, decolonising is not a metaphor [2], then there are four considerations. Firstly, how do we understand and engage meaningfully with the

decolonising movement so that our efforts are not tokenistic. Secondly, how do we influence change within the teaching and researching of a highly technical subject such as Computer Science which is rooted in 'facts'. Thirdly, the Open University is an online institution, located in the UK across four nations, that is already positioned as inclusive and open to all. Finally, how do computer science students understand this concept and how can we engage them in taking forward necessary changes to their curriculum?

The trajectory of this project differed from decolonisation initiatives happening at other universities—it was not a response to student-led protests, nor was it part of a university-led top-down initiative. The Open University has been delivering open and distance learning for more than 50 years and is a world leader in using digital technologies and online methods for remote learners. Alongside this, researchers based at the OU have pioneered new fields such as learning analytics and been at the forefront of Massive Open Online Courses (MOOCs), Badged Open Courses (BOCs) and other online teaching phenomena over the past two decades. The recent COVID-19 pandemic saw a pivot by many traditional brick-and-mortar universities to online teaching, resulting in increasing interest in online pedagogies and technology-enhanced learning. This brings with it new challenges, for example how to ensure that online teaching and learning can respond to other movements for change within the sector, including decolonisation.

Hanesworth suggests it is imperative that those involved in curriculum development (academic or otherwise) consider 'our own identities, biases and backgrounds in the creation of curricula and teaching experiences in order to develop our understanding of how these impact on student learning experiences and how we should adapt our teaching appropriately' [3] (p. 16). We thus began by considering our own and collective positionality in relation to this project. The reality of doing this positionality exploration was complex and challenging, considering the varied backgrounds and identities of team members, although united by our commitment and academic interest in social (in)justice and equity [4]. For the authors involved in writing this paper, we acknowledge that as three white British academics, our views could be seen to reflect a Eurocentric 'white saviour' perspective.

Coming to this with a wide range of disciplinary backgrounds, over time we developed a common perspective on the issues we wanted to explore. We agreed that 'Computing' in this context should refer to the study of IT systems and related disciplines rather than the narrower field of Computer Science only. This necessarily then entails a fundamentally *sociotechnical* perspective on computing [5].

In our initial scoping document for the project, we specifically advocated for the adoption of a *critical* sociotechnical approach, which '*considers the entanglement of human, organisational, and technical components in a systemic assemblage as well as the* material infrastructure *of computing systems, both hardware and software, along with design, development, deployment, and regulation . . . analysing structural configurations of power and their differential impacts*' [6]. Decolonising would thus entail embracing the 'decolonial option' as a form of compensatory ethics, '*attempting to think through what it might mean to design and build computing systems with and for those situated at the peripheries of the world system*' [7] (p. 21).

2. Theory and Literature Review

The second part of our title reflects the viewpoint that some of our students expressed when we carried out our survey about attitudes to decolonising the computing curriculum. Mustafa Ali, who led the overall research project of which the work described in this article forms one part, summarises this position, common among many computer scientists, as '*surely it is somewhat of a stretch to describe computing as "colonial", especially since colonialism as a phenomenon tied up with imperial structures of domination and settlement is a thing of the past*' [7] (p. 16). Ali disagrees strongly with this position, arguing that computing "*is founded upon, and continues to embody aspects of, colonialism*" [7] (p. 21).

Shahjahan et al. [8] reviewed literature on decolonising curriculum and pedagogy in higher education, undertaking a critical analysis of 207 articles and book chapters. They divide the literature into three themes (decolonising meanings, actualising decolonisation

and challenges to actualisation) through which we now explore the existing research on decolonising the computing curriculum in particular.

While decolonisation should be distinguished from other movements to redress inequity and increase diversity and inclusion, it is worth recalling the past challenges to knowledge systems in science and technology. Feminist Science and Technology Studies have long been critical of the design and architecture of computer systems which overwhelmingly represent the perspectives and voices of one group of people, namely men, and where users in the imagination of the designer are presented as 'everybody' [9]. Authors such as Sandra Harding alerted educators of the need to examine the standpoint of those involved in scientific knowledge production [10] and as Haraway has argued, '*"subjugated" standpoints are preferred because they seem to promise more adequate, sustained, objective, transforming accounts of the world*' [11] (p. 584). Indeed, technology itself is never neutral but is co-constructed with race and gender. Gendered meanings and attributes are inscribed into technologies even if the creators and users are not aware of this [12]. These are also mutable and subject to change over time. Computing culture only became inscribed as masculine in the UK from the 1970s onwards after initially being considered 'women's work' [13], a phenomenon observed in the US and elsewhere too. There are numerous, now well-known, examples of technologies and innovations that have been gendered by design [14], as well as studies showing how algorithms including search engines, can contribute to ongoing inequities [15,16]. Critical race perspectives have also highlighted the racism inherent in technology design, for example, as Buolomwini has illustrated, in facial recognition technologies and AI, leading to the ongoing replication of historic racial injustices [17,18].

Taking the notion of co-construction further, an increasing body of work has looked at what Amrute and Muillo [19] describe as Computing in/from the South, using this as both an empirical and a methodological framework. As well as feminist epistemologies, this brings the contributions of non-Western and queer knowledge systems to the examination of computing worlds [19]. A number of decolonisation interventions are focused on redressing gaps and absences to bring Indigenous knowledge and belief systems into STEM education more generally [20]. This includes challenging unsustainable extractive practices that underpin computing technologies by the introduction of ancestral knowledge into computer science education [21,22]. Building on traditions of using ICT for development (ICT4D) as well as the historical use of ICTs by progressive and social justice movements, many decolonising initiatives are using technology to support marginalised and Indigenous communities to bring their knowledge online [23], including online spaces such as Reddit to build resilience among Asian American and Pacific Islanders [24]. In Aotearoa/New Zealand, a decolonising project focuses on supporting the empowerment of Maori people to shape ICT education and professions through '*seeing Indigenous knowledge as the context for computing, a basis for deeper learning, or even a reason for learning*' [25] (p. 1101), while in Guatemala, a project co-designed with the Ixkoj Ajkem Council in Xenacoj, offers '*a novel re-imagination of computational modelling for teaching and learning about complex systems that is grounded in Mayan traditions of garment weaving*' [26].

This view from the South extends to scholars and/or migrant communities in the global North. Wong-Villacres and colleagues [27] present the perspective of a group of Latin American students of HCI in the US, who challenge the universalising assumptions of the knowledge and teaching approaches in this subdiscipline. Roldan et al. suggest that involving youth from nondominant communities as design partners in computing education can contribute toward decolonisation: '*Inspired by a decolonizing imaginary framework (decolonization as a theoretical guide), we aim to transform the inherited world of computing as being historically for White cis-men by restoring the subjugated knowledges of youth who have been marginalized*' [28].

Stressing the importance of a sociotechnical approach, Alvarado Garcia and colleagues have developed a framework for approaching decoloniality within the subdiscipline of Human Computing Interaction (HCI) that can support researchers '*to investigate their own practice and the spaces of sociotechnical research and learning they inhabit*' [29]. Their framework

is based on five pathways for HCI researchers and practitioners: '*Understanding The Why*' (reflecting on the colonial histories of knowledge production), '*Reconsidering The How*' (understanding the colonial roots of methods and tools), '*Changing the For Whom*' (refocusing criteria around 'good' research to make it more relevant to participants), '*Expanding The What*' (embracing multiple frames of references and cultural perspectives) and '*Reflecting on The What For*' (unpacking and resisting existing power dynamics in the field) [29].

There is a growing awareness of the racist history of some of the foundational knowledge behind scientific disciplines, much of which underpinned the emergence of Computer Science and modern computing practice more widely, for example the association of early statistical methods with eugenicists such as Francis Galton. Engineering educators have also begun to question the knowledge that underpins several engineering disciplines based on the imperative for resource extraction that drove the colonial and imperialist expansion of the 18th and 19th centuries [30].

Eglash et al. point to specific examples of race-positive design in developing CS curriculum including the 'application and assessment of African fractals, Native American bio-computation; urban artisanal cyborgs and other hybrid forms' [31]. In some cases there is an explicit move to connect to the IT industry: for example, a framework based on SFIA (an international skills and competency standard, standing for 'Skills Framework for the Information Age'), which was developed in South Africa, was based on an 'understanding of requirements as set out by the South African ICT industry and to this extent, address the need for a decolonized ICT curriculum' [32].

Following the calls for decolonisation of universities originating with the Rhodes Must Fall activists in South Africa, where lived legacies of colonial systems are physically visible and ongoing, and in the wake of the global Black Lives Matter movement that grew after the death of George Floyd, a number of British universities have more recently embarked on projects aiming towards decolonising the university [33]. Initiatives have involved whole institutions as well as focusing on specific areas of curriculum.

There are a range of challenges faced by HE institutions in carrying out decolonising curriculum initiatives, notably that 'a decolonising education is one that might arouse opposition, incredulity and even outright hostility. It interrupts the perceived order of things' [34] (p. 198). Challenges include student resistance, as well as the context, such as the institution type and specific disciplinary differences. Other institutional barriers are leadership support or lack of it, as well as resource availability such as staff, knowledge, or funding. The final challenge, again relevant within the context of this study, can be the lack of specific Indigenous knowledge that could replace or supplement existing curricula [8].

Three examples below show how individual universities have been addressing decolonisation within the Computing field.

(a)   Beginning in 2020, a prestigious UK university initiated a university wide project of Decolonising the Curriculum through re-framing established values in their module review and update process. By 2022, the focus moved to college-level discussions on a broad range of topics including diversity, EDI and decolonising, with the aim to raise an awareness of what decolonising is about via workshops and enabling inclusive behaviours. These activities have been further developed through an incubator approach with outputs such as a 'decolonising STEM' blog with four case studies for module leaders. In the summer of 2023, the cross-university team presented a re-imagined tool kit on their experiences over this four-year period 'Encompassing and decolonising STEM in our learning and research'

(b)   A post-92 university (former polytechnic) has been supporting curricula decolonisation through signposting to external podcasts, videos, articles and resource lists. Internally there are also discipline-specific resource lists including lists from the School of Science and Technology. Critical questions support the process of curricula decolonisation and the library is running a 'Hidden Voices' campaign to find voices who have not been previously heard.

(c)   A university in the US has developed a module called Critical CS1 that teaches Computer Science through feminist and critical race theory. The module includes critiques of power and of algorithmic decision-making … '*highlighting how diverse ways of knowing are supported or resisted through epistemologies of computer science, and by introducing racial and gendered marginalization to students as both a political and epistemological problem*' [35] (p. 301).

We have already shown how computing should be seen in its wider sociotechnical context in order to begin addressing colonial legacies and possibilities for decolonisation of curriculum. This necessitates foregrounding social justice and addressing continuing colonial dependencies within the computing and IT world ecosystem [30]. As the field of computing and related subjects rapidly expands, subdisciplines within computer science are developing their own explorations and perspectives on decolonisation, for example, in HCI [27,36–39] and Artificial Intelligence [40,41], as well as in Science and Technology Studies (STS) and digital media [42]. The teaching of ethical values within computer engineering education are considered necessary for creating professional capabilities for the future, curriculum that can support '*students' development as engineers who are respectful of people and the planet*' [30]. Educational technology itself may also be become a barrier when it comes to decolonising curriculum, as the medium may constrain the efforts of educators who want to incorporate more critical reflection and inclusivity rather than merely functionalist approaches to curriculum delivery [43]. Indeed, online and distance education was noted by Shahjahan et al. [8] as a major gap in the literature and recommended further research as more and more universities have adopted remote learning practices, especially during the COVID-19 period.

Student engagement with decolonisation varies across locations and can become a barrier to, as well as an enabler of, this process. As noted above, original decolonising movements, for example those in South Africa, have been sparked by student protests. Within the UK, student-led calls for decolonisation, built on the Rhodes Must Fall protest at the University of Oxford, converged via the National Union of Students. In 2014, University College London students produced a video 'Why is my curriculum white?' with protests in 2015, at Warwick and the London School of Economics, and in 2016, at Bristol, Birmingham and Manchester, which were also student led. Student counter-spaces for activism around anti-racism, as well as decolonisation, often exist in parallel to the formal curriculum and teaching which rarely have explicit support from academic departments [44]. However the subsequent strategic initiatives of many universities to address the decolonisation agenda have potentially led to '*institutional co-option, incorporation, and the dilution of the radical message of decolonising*' [45]. Meanwhile, formal diversity efforts and policies are not adequately addressing the concerns of racially minoritised students who feel a sense of alienation from predominantly white universities [46]. Moreover, there is a call to move away from a focus on individuals (both as role models and in efforts to support individuals) which can '*superficially appear reformatory*', and instead focus on systemic barriers [47].

The involvement of students becomes vital for those projects that are aiming to include Indigenous voices and communities in knowledge production. Ancestral Computing for Sustainability (ACS), an initiative in four US universities, draws on Indigenous methodologies and Participatory Action Research, using 'storywork' with students as co-researchers to reflect on wider issues of ethics and sustainability. They outline how for African American and other Indigenous/earth-centred communities, '*their ancestral knowledge may be embedded in the daily lived experience and cultural aspects of life such as foodways (family recipes, food stories/ethnographies; farming and food growing practices); language (expressions, sayings, idioms); childrearing and family socialization practices (family reunions, oral histories); and religious/spiritual aspects (dreams, visions, baptismal and tent revival stories); and other dimensions of shared family knowledge.*' [22] (p. 437).

Many researchers have noted that student resistance was the biggest barrier to engaging in decolonising the curriculum and pedagogy, with majoritised student groups expressing resistance to challenging mainstream knowledge [8].

3. Methods

The data reported in this article come from two principal sources:

- a large-scale survey of undergraduate students;
- a series of online workshops with some of the students who had answered the survey.

We opted to use a mixed-method survey of undergraduate students through a survey instrument and submitted and received approval from the OU Human Research Ethics Committee. The university's student survey panel undertook the sample selection and participants were selected in a non-random way. Module chairs were first asked to 'opt in' to the survey and internal policy ensured students were not over surveyed, for example, students were excluded if they had previously been invited to complete a survey that month and/or had received four surveys invitations that year. A survey invitation was subsequently sent to 3695 undergraduate students, across 17 different modules. Of these, 399 participants completed the survey, of whom 394 consented to the use of their data—a pleasingly high response rate of 10%.

While survey participants were self-selecting and were not asked for demographic details, we were given access by the university to the demographic characteristics they had disclosed on their registration records, including gender, religion, ethnicity, disability and age. We maintained the anonymity of respondents throughout our analysis (as required by the ethics committee and guaranteed to respondents), with strict controls over who had access to the demographic data.

We used these demographics to check that the population of respondents was broadly similar to that of our whole student cohort in the School of Computing and Communications. In summary, the gender balance of respondents (21.3% female, 78.7% male) was broadly the same as the student population; the ethnic balance likewise was similar (86.3% white, 4.3% Asian, 3.6% Black and the rest from other groups); the respondents were a bit older than the student population; and rather fewer respondents (13.2%) had a declared disability than typical students (around 20%). Although religion is an interesting factor in relation to decolonisation, most students did not declare this to the university—35% had chosen 'prefer not to say', and 41% had chosen 'none'. Further details of the demographic characteristics are in an earlier paper about this project [45].

The survey was carried out using the onlinesurveys.ac.uk tool, provided for the UK academic community by JISC, and ran for four weeks in June 2022. The survey consisted of 17 questions: 12 quantitative questions using a five-point Likert scale and 5 qualitative questions using a free text box (along with an 'any other comments' box). Of the quantitative questions, 9 were taken from an instrument that was developed and validated by Thomas and Quinlan, the Culturally Sensitive Curricula Scales [48]. The other three quantitative questions, plus the five qualitative questions, were developed for this survey. Full questions for the survey can be found in Table 1.

Table 1. Survey questions.

Likert-Scale Questions (Choice of Five Options, from 'Strongly Agree' to 'Strongly Disagree')
1. The curriculum raises critical questions about power and/or privilege that are usually taken for granted
2. The curriculum encourages students to challenge existing power structures in society
3. The curriculum encourages students to critique unearned privilege
4. The curriculum encourages students to connect learning to social, political or environmental concerns
5. The curriculum encourages students to take actions that fight inequity or promote equity
6. The curriculum features people from diverse backgrounds
7. People of diverse ethnicities are represented as researchers or professionals not just as participants in research, clients, consumers, customers, etc.
8. The curriculum respects that different cultures may have different understandings, skills and/or philosophies
9. The curriculum addresses problems that are of concern to marginalized people/communities

Table 1. *Cont.*

Likert-Scale Questions (Choice of Five Options, from 'Strongly Agree' to 'Strongly Disagree')
10. Do you see yourself reflected in the module materials?
11. How well do the materials value/appreciate difference?
12. Does the module allow your lived experience to be drawn upon?
Free-text questions
13. What does decolonising mean to you?
14. What do you think it means to decolonise the computing curriculum?
15. How do you think we can start to decolonise computing at the OU?
16. It is important to engage students as partners in decolonising activities—how best could this be done?
17. What challenges do you foresee?
18. Any other comments?

The quantitative data from the survey were analysed in two ways. First, we obtained an overview of the questions about which respondents felt strongest, through a tallying method; second, we analysed through SPSS whether question responses varied by demographic characteristics, using two-tailed *t*-tests. We identified statistically significant differences (at the 95% confidence interval) according to three demographic factors, gender (female/male), ethnicity (white/non-white) and religion (religious/non-religious). We acknowledge the flaws of using binary gender for these calculations, which is the way we received gender demographics, and for grouping together all non-white respondents into a single group, which was due to the relatively small number of any single non-white ethnicity. Religion is not reported in this paper given the high numbers of respondents who had not declared a religious affiliation.

The qualitative data open-text responses were analysed using inductive coding. Two members of the project team took the qualitative question with the most responses (*n* = 270), which asked the question 'What does decolonising mean to you?', coding all responses individually and then combining their codes. We tested this with the team for intercoder reliability, by coding a sample of comments across the team [49,50]. This produced a set of 13 broad codes, showing views of decolonising computing from the very positive to the very negative, which were in turn applied to two further qualitative questions.

These codes were then grouped into three broad categories, reflecting the positive, neutral or negative stance of the response (see Table 2).

Table 2. Categories and codes used in qualitative coding.

Position	Code
Positive	Accurate history
	Global perspective
	Inclusive perspectives
	Independence
	New ways of thinking
	Removing privilege/bias
	Undoing colonisation
Neutral	IDK (I don't know)
	No response
Negative	Irrelevant to Computing
	Not needed
	Rewriting history
	Woke Marxism

The final two qualitative questions were thematically coded differently (see below). As well as collecting data on our students' views, we used the survey to obtain participant consent for the qualitative student workshops. A total of 54 students agreed and were

invited to be part of the workshop; of these, 18 students expressed an interest and eventually 9 students took part across two different online workshops in October 2022.

4. Findings

This paper is principally concerned with responses to the qualitative questions, and specifically those around student engagement. After a brief discussion of the quantitative data and the early parts of the qualitative data, this section will consider the way that student engagement was understood by respondents, both in terms of ways to engage students and in terms of the challenges to engagement, and will specifically focus on the voices of Black and Minoritised female students in the survey.

The full analysis of most of the Likert-scale questions is beyond the scope of the paper; more details can be found in our earlier paper [51]. However, we include here brief details of the key results of these questions, to inform later discussion.

Table 3 contains the 12 Likert-scale questions ranked by the percentage of all respondents who answered, 'strongly agree' or 'agree'. In six out of the twelve questions, *t*-tests showed a statistically significance difference according to gender or ethnicity, and the nature of that difference is reported.

Table 3. Key results from Likert questions.

Question No.	Question Summary	% Strongly/Agree	Statistical Significance	Details of Difference
6	People from diverse backgrounds	52.1	Gender: $t(114.269) = 2.389$, $p = 0.019$	Males (M = 2.40, SD = 0.890) agreed more than Females (M = 2.71, SD = 1.104)
4	Social/political/ environmental concerns	50.5	None	-
7	Diverse ethnicities shown as professionals	46.9	Gender: $t(119.732) = 2.446$, $p = 0.016$	Males (M = 2.45, SD = 0.923) agreed more than Females (M = 2.76, SD = 1.060)
12	Own lived experience	46.5	None	-
8	Different cultural understandings	46.4	None	-
10	Self reflected in module materials	41.0	None	-
11	Materials value difference	35.8	Gender: $t(123.744) = 2.255$, $p = 0.026$	Males (M = 2.67, SD = 0.866) agreed more than Females (M = 2.86, SD = 0.866)
9	Problems concern marginalized people	29.5	None	-
1	Critical questions regarding power/privilege	24.1	Ethnicity: $t(374) = 2.184$, $p = 0.030$	Non-white respondents (M = 2.87, SD = 1.191) agreed more than white respondents (M = 3.22, SD = 1.001)
2	Challenges existing power structures	20.5	None	-
5	Encourages actions to promote equity	19.2	Ethnicity: $t(374) = 2.088$, $p = 0.038$	Non-white respondents (M = 2.98, SD = 1.170) agreed more than white respondents (M = 3.31, SD = 0.994)

Table 3. *Cont.*

Question No.	Question Summary	% Strongly/Agree	Statistical Significance	Details of Difference
3	Encourages students to critique privilege	17.2	Ethnicity: $t(374) = 2.231$, $p = 0.026$	Non-white respondents (M = 3.02, SD = 1.225) agreed more than white respondents (M = 3.37, SD = 0.980)

Turning now to the free-text questions (labelled as Qu. 13–17 in Table 1), these fell into two groups. Questions 13–15 covered how respondents saw the nature of decolonisation and its relationship to Computing; Questions 16 and 17 covered issues around student engagement in decolonising the curriculum.

For context we will summarise briefly the responses to Questions 13–15 with Table 4 showing the number of responses for each question (as not all respondents answered all questions), along with the proportion which were coded into each of the three categories of positive, neutral and negative. This shows a broadly positive view, though becoming less so as the questions progressed. It is worth emphasising again that all of our respondents are distance-learning students based across the whole of the UK, and that all were mature adults, with the single greatest age group being 30–39 year olds (39%), followed by 40–49 year olds (26%).

Table 4. Categorised responses to Question 13–15.

No.	Question	Responses	Positive	Neutral	Negative
13	What does decolonising mean to you?	267	65.9%	16.1%	18.0%
14	What do you think it means to decolonise the computing curriculum?	251	57.8%	18.7%	23.5%
15	How do you think we can start to decolonise computing at the OU?	243	46.1%	22.6%	31.3%

To illustrate the three categories of responses, the following are representations of what decolonising computing means to student participants:

- Positive responses: "to rethink and revise the curriculum so that it takes a broader view rather than just the European or Euro-centric". "Not focusing on white people white men as the only way".
- Neutral responses: "I have no idea, too many fancy words going on." "Honestly, before now, I had never heard of the word."
- Negative responses: "Nothing, this is a computing course not critical race theory". "'Decolonisation' is part of the insane woke ideology, which [has] no place in academia, least of all in a STEM subject such as computing or IT."

*4.1. Student Engagement in Decolonising the Curriculum*

We will now focus specifically on the responses to Questions 16 and 17, concerning the engagement of students in decolonising the curriculum. One of the underlying objectives for this project was to engage with students in shaping ways to bring decolonisation as a concept and as a practice into the curriculum and pedagogies of teaching computing. In a two-part free-text question we asked students how best to engage with them to achieve this and what challenges they might foresee in putting this into practice. Responses in this section are not framed in terms of positive or negative views, but rather in terms of the way students thought about the issues, and were categorised through a loose form of thematic analysis [52].

Out of the 394 total respondents, there were 225 responses to Question 16, and 208 responses to Question 17. The demographics of respondents to these specific questions

were very similar to respondents who answered any questions, though there were slightly fewer female respondents to these questions (19%) compared to all respondents (21% female), and slightly fewer white respondents to these questions (83%) compared to all respondents (86% white), with somewhat more respondents who were either Asian or Black.

Student responses to the first question, namely how best we could involve them, fell into three main categories, which we have labelled as Explain, Engage and Extraneous (see Figure 1), which are described below:

- *Explain*—communicate, examples, fiction readings, new curriculum examples, new learning materials.
- *Engage*—consult, co-create, include, inclusive perspective, involve. Possible methods suggested for this include: focus groups, surveys, workshops, newsletters, debate, forums, emails, included in development, co-creation, online discussions, previous and currents students, industry, social media, student panels, questionnaire, webinar, working groups.
- *Extraneous*—these responses expressed either do not know, not needed or irrelevant.
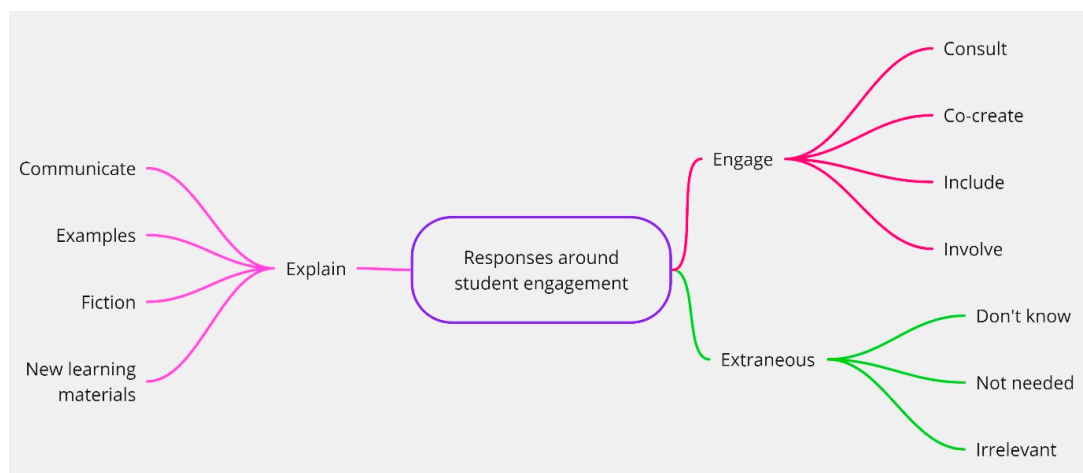
Figure 1. Categories of response around student engagement.

4.2. Challenges to Student Engagement

The second question asked 'What challenges do you foresee?' This was left quite open, although the implicit meaning was what challenges did they foresee *in engaging students as partners in decolonising activities*. However, some also interpreted this as challenges about decolonising the curriculum more widely, and the responses here are described in those two broad categories. They are summarised in Figure 2.
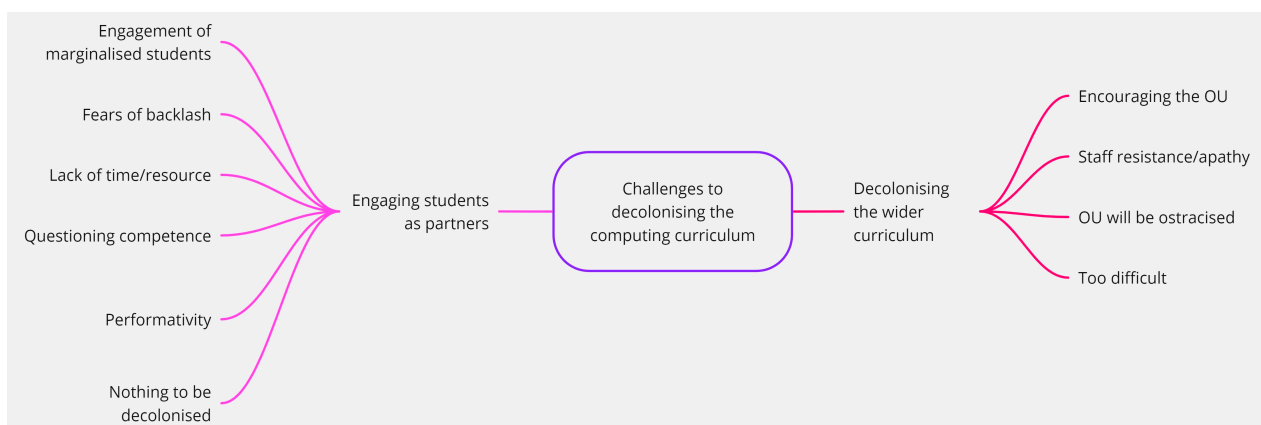
Figure 2. Responses to challenges.

We found six types of challenges that students anticipated regarding student engagement.

1. **Engagement of marginalised students**: These responses were concerned both with how it was possible to engage marginalised students, partly due to the smaller numbers of such students, but also pressures on their time and energy, and also with whether it was ethically appropriate to ask marginalised students to do such work. Example responses included the following:
   - *The challenge I foresee is how to promote the participation of the marginalised participants.*
   - *Because this is a mostly UK based university, getting diverse input from students might be difficult.*
   - *But also marginalised people should not be forced to educate their peers on this topic when they have come to an environment to learn and be treated as an equal.*

2. **Fears of a backlash**: A number of respondents were concerned about how others may respond in terms of its effects on the university, and whether participating students may receive more hostility. These were not framed as hostile comments in themselves, rather as concern for others' hostility. Example responses included the following:
   - *bigoted students being unwilling to participate, creating a hostile environment for others participating.*
   - *This will cause protest, and anger, and cost the students.*
   - *I think some individuals may feel like diversity is a forced thing. Or woke culture. I think it's important to recognise the issue, but others may feel attacked.*
   - *Additionally forcing students to engage in these activities could result in bigoted harassment or comments that might not be properly handled by staff.*

3. **Lack of time/resource**: By contrast with concerns for the time of marginalised students, these respondents were concerned about the availability of time or resources for decolonising the curriculum, for both students and staff:
   - *Students are busy. Many of us work alongside our courses and are likely to have very little time to spend on this.*
   - *Already hard-pressed staff having the time and support available.*

4. **Questioning competence**: Some respondents doubted the ability of students to engage and educators to respond appropriately. In some cases, this was a judgement on competence, in others it was seen as arising from a lack of knowledge and/or awareness which prevented effective engagement. Examples included the following:
   - *Issues like these are difficult to address, and as such, students may not know how they would address these issues, so their input may be haphazard, politically motivated, or ineffective. Educators may struggle to distil concrete proposals from suggestions that are able to be implemented.*
   - *Students may not know what is decolonisation of a curriculum and why is it important. Not being able to understand this may prevent them from giving their opinion on the subject.*

5. **Performativity:** These respondents felt that, while there might be plenty of rhetoric in favour of decolonising the curriculum, in practice this manifested as empty gestures and there was little chance of actual change. As one respondent commented with the following:
   - *[Students] do not feel that what they say will actually be actioned. Too often the Government has asked for input and then ignored it and done what it wants to while citing that they 'engaged with the group affected'.*

6. **Nothing to be decolonised:** There were also several responses that reiterated the positions already identified in other questions, e.g., ridicule, insults, denial there is an issue, the irrelevance of decolonisation to computing, or just simply unsure/do not know. These were summed up in the response from which this article takes its title:
   - *The major challenge here is how you'd do it in the first place since there isn't anything there to be decolonised!*

Four further sets of challenges were identified, which related to more general issues around decolonising the curriculum.

7. **Encouraging the university**: There was a feeling among a number of respondents that the university might struggle to rise to the challenge of decolonising, but that the institution needed to be encouraged to do so:

- *This will cause protest, and anger, and cost the students. But, that does *not* mean it is the wrong thing to do—far from it, in fact. The university has an opportunity to be a leader in equality, diversity, inclusion, and decolonisation—all of which are, I would say, at the heart of what it stands for. It's important not to let the vocal majority who are losing their privilege stop them doing the right thing.*

8. **Staff resistance or apathy:** Some respondents perceived that the challenge of decolonising the university and/or its computing curriculum arose from issues around staff unwillingness to change more generally:

- *how could this be implemented when the tutors only mark assignments.*
- *There is no appetite in the module teams to change material or accept responsibility for what they present*

9. **The university will be ostracised:** This extended the concerns in the earlier set of responses around a backlash. Some respondents also feared that there could be a significant impact upon the university as a whole, in terms of its standing with the current government:

- *Another challenge is that the university may be cancelled by UK structures of power if they promote a more equitable and less biased view on current world issues that relate to computing and IT.*
- *Right wing political parties will call this indoctrination and attempt to cut funding.*

10. **It is too difficult**: The final challenge was around the complexity of the process, and whether it would prove too difficult in conceptual and academic terms, notwithstanding other issues:

- *I think there will be a lot of varying inputs, a lot of disagreements and restructuring of the curriculum of course is not an easy task, it also may be hard to come to a consensus that is equal and fair to everyone. If certain material also needs restructured this could prove difficult while still holding to the truth while lending less bias. Providing more opportunities for minority professors and less discrimination is also a difficult task as well as for students in the curriculum. In the end there is many difficulties to face, too many to list here.*

4.3. Amplifying the Voices of Black and Minoritised Female Students

As we saw earlier, a significant strand of the decolonising computing literature argues for the inclusion of Indigenous knowledge and/or a 'view from the south'. Although we were unable to target our sampling in the survey to Black and Minoritised students, we did analyse the responses by ethnicity and gender as given in student registration records.

During Black History Month in October 2023, which in the UK had the theme 'Saluting our Sisters', one of the present authors (Tompkins) wrote an online article, internal to the university, discussing the survey results coming from Black, Asian and Mixed heritage women. There were only seven women identifying as such, meaning the results could not be considered statistically significant, but we felt it was important to amplify the voices of this highly marginalised group, through looking at their responses to the five qualitative questions.

These students called for a shift in knowledge production via a 'decolonial turn' [7,34] through the acceptance of different and diverse forms of knowledge, to '*rethink the curriculum with new ways of delivery*' and so to produce a combination of knowledge and pedagogic transformation. It is through deeper thinking that the adaptation of curricula is possible, but how to remove the legacy of colonisation is a challenge—as illustrated in the words

of one respondent by acknowledging that to begin decolonising requires *'unpicking the ideologies that are creating colonisation in the first place'*. Dennis calls for *'free decisions made by free people'* [34] (p. 201). The use of the word 'freedom' was expressed by these female voices as they wanted to bring in their lived experience so that the curriculum did not just celebrate difference but normalised it, referring to: *'freedom to be able to apply personal learning ... into the workplace'*.

This was further supported by a call for a global perspective through representation and chimes with Thomas's view [53] that it is through representation that one's existence is acknowledged. If one views decolonising as a transformation, then this change must not be tokenistic. One participant captured how a decolonised curriculum would represent everyone and perhaps suggests a wider focus than just celebrating difference, but also to normalise diversity: "*Don't just focus on culture, consider lived experience too*".

These Black and Brown women believe in allyship and seek opportunities for enhanced student collaboration through "*offering students the ability to engage with each other more*"; and a strong dialogue with students and alumni across the world: "*Keep in touch with students; not just in the UK, but worldwide*". To conclude the views of these students, perhaps the pertinent starting point for decolonising the computing curriculum is not just what is being done, but also the way it is done: "*Who is doing this work... do they reflect and support decolonisation of this subject?*"

5. Discussion

Our findings show that computing students have a range of understandings and perspectives on decolonisation as it applies to their curriculum. Some are curious to know more, others contend this is irrelevant to them and the subject discipline, and some are downright hostile invoking tropes such as 'wokeness' to describe these efforts. But many students identified suggestions about how to engage with the student community despite acknowledging the constraints and difficulties within a large distance education university.

Shahjahan et al. [8] (p. 95), whose work we have drawn on earlier, noted five challenges often faced by universities undertaking decolonising efforts:

(a) *'student resistance,*
(b) *context (institutional type and culture and/or disciplinary context),*
(c) *systematic/structural barriers (policies, lack of leadership support),*
(d) *lack of access to resources (knowledge, funding, and staff), and*
(e) *finally, a major challenge was the recognition that there was no pure local or Indigenous knowledge and that all knowledges were entangled with each other, particularly in postcolonial and White settler contexts.'*

It was interesting to note how closely these challenges mapped onto the responses from our students, as they imagined decolonisation of their own computing curriculum, as these illustrative quotes show:

(a) Student resistance: *"finding something to decolonise"*; *"history is written by those who won. No matter how hard you try you won't please everyone so please don't try"*.
(b) Context (culture): *"the language in this sector is so ingrained and habitual. The vast majority will see no harm and therefore find it difficult to justify the time to change"*.
(c) Structural barriers: *"red tape"*; *"how to engage the proper people. As a subject we have a small number of passionately involved people but also a large number who may be indifferent. Finding a proper balance will be difficult"*.
(d) Lack of access to resources (knowledge): *"misunderstanding of what the goal is"* (there was minimal comment by respondents on funding and staff).
(e) No Indigenous knowledge: *"acceptance that colonisation exists amongst the student base"*; *"identifying issues that actually represent a colonial mindset"*; *"I'm not sure it is a good idea, all knowledge has a bias somewhere, would be difficult to reference specific aspects of study without having a reference"*.

The position of "*There isn't anything to be decolonised*" expressed by some students may also reflect the type of institution and discipline specific context of our study. We noted above that Costa et al. argue that many educators have adopted a '*functionalist approach of education to suit commercial interests [rather] than promoting a diversity of educational experiences as reflective of a critical understanding of digital technologies and digital cultures*' [43] (p. 1). This seems to be the expectation of those students who have articulated a 'what has this got to do with computing' stance. We could therefore conclude that the distance teaching and learning model, which makes heavy use of online learning through our Virtual Learning Environment (VLE), is perhaps antithetical to the adoption of Friere's call for a '*critical educational approach that aims to use content as a starting point for dialogue and opinion formation*' [43] (p. 1).

We have noted above that the first of Shahjahan et al.'s five challenges was student resistance [8]. The idea of resistance to change is one that is often explored in management literature. For example, Repovš et al. argue that '*resistance to change addresses two important aspects: resistance as behavior and resistance as attitude*' [54] (p. 309).

Insofar as decolonisation was essentially presented as hypothetical in the survey—we were not proposing a specific programme of decolonising the computing curriculum—it can perhaps be argued that attitudinal resistance is more relevant to consider than behavioural resistance. We certainly did observe resistance in some respondents' attitudes, as we have noted above in the 'negative' categories in the earlier free-text questions and the responses to some of the challenges. However, this is offset by the larger proportion of 'positive' responses (see Table 4), and the openness of a significant number of respondents in favour of decolonisation. That some of these respondents also had questions and concerns was seen by the various challenges which were identified, but it would be inappropriate to characterise the negative responses as principally ones of resistance to change.

There are, however, undoubtedly institutional tensions and challenges to overcome in relation to decolonising the curriculum within universities similar to our own. Our university's reliance on large-scale modules whose materials are developed over time and then locked in place (either in print or in a VLE whose materials are overseen by media professionals) makes for an inflexibility which means we can only decolonise materials and pedagogy gradually. Our commitment to open distance learning, unquestionably a great strength, also makes student engagement difficult, as some of the challenges identified in Section 4.2 of this article shows.

Then there are challenges that arise from the tensions between work in Equality, Diversity and Inclusion (EDI) and decolonising of the curriculum. Many universities, including our own, have a deep commitment to EDI work, at both the institutional and departmental level, especially in the areas of gender and racial equality, through accreditation exercises such as the Athena Swan gender equality charter and the university's recent Inclusive Curriculum Tool [55]. All three of the authors of this article have been involved in this work at school, faculty and university level. However, there is an argument to be made that EDI work can get in the way of radical change, allowing universities to pay lip service but not challenge fundamental ways of working and knowledge production [46].

Lastly, there are practical issues around decolonisation of the computing curriculum. We have discussed the importance of a sociotechnical approach to computing at the start of this article. Such an approach necessarily draws on methods and concepts from social sciences and humanities [56]. It is unclear how far can this go in an undergraduate degree which is essentially conceived as technical by students and educators—there have been sociotechnical approaches to computing for many decades, but their teaching has often fallen by the wayside in UK universities since the introduction of high student fees. Moreover, as Malazita and Resetar argue, '*though many CS students become interested in practicing ethical coding, they also construct their technical competency as split from the social, political, and ideological world*' [35].

As a highly professionalised field, computing education is subject to a range of forms of external accreditation. In the UK, these include the British Computer Society (BCS), the

SFIA skills framework and the increasing use of standards for degree apprenticeships; the School of Computing and Communications makes use of all of these frameworks, as well as being assessed by various government agencies. Each has many benefits for establishing the nature of a computing professional and assuring employers of the appropriateness of our curriculum. However, they create an inflexibility to the decolonising process. Both the BCS and the degree apprenticeship frameworks, for example, require a specific form of adherence to a particular understanding of legal, ethical and professional skills. Nevertheless, while these can sit badly with decolonising the computing curriculum, they also present opportunities if these frameworks evolve; the most recent Subject Benchmarking statement on computing from the UK's Quality Assurance Agency explicitly mentions decolonising, suggesting that education providers could consider 'acknowledging and addressing how divisions and hierarchies of colonial value are replicated and reinforced' [57].

6. Conclusions

This article has particularly focused on how to engage students in decolonisation of their curriculum and universities. Historically, this was student led and in response to global movements; then universities started their own initiatives, but there are inevitable constraints on how far that can go. As we have observed, there is some overlap and blurring of mission with EDI efforts, which can provide impetus and a platform to go further but can also put constraints on how deeply things can change.

The data we have presented in this article have shown that students are well aware of the complexities and challenges of such changes, and many are open to widening their understanding, although some are additionally resistant and hostile. Subject knowledge is always changing and under review so perhaps this is no different to previous 'turns' in academic knowledge production.

One of the strengths of this study is that there have been few previous studies of decolonising computing education within distance learning. However, this also means it is not typical of the rest of the sector. To make links with colleagues in other UK higher education institutions with similar interests, members of the project team have been therefore been involved in two further projects.

First, a small grant was obtained from the Council of Professors and Heads of Computing to organise a workshop bringing together scholars from across the UK interested in decolonisation of computing education. This was held at the University of Leicester in May 2023. Discussion was held covering the nature of decolonisation, technologies and pedagogies to which decolonisation is particularly applicable, and methods for decolonising the computing curriculum. A summary is available on our research group's website [58].

Second, a further scholarship project, funded through our STEM scholarship centre (eSTEeM) and led by one of the authors of this article, has started to look at decolonising activities in computing and IT departments across the UK. Starting from the Quality Assurance Agency benchmark cited above, this project intends to 'investigate UK universities which have begun to transform their curriculum along related lines by mapping the terrain of decolonial activity', both through examining public-facing websites and through interviewing computing practitioners at a variety of universities [59]. The focus is on the process of decolonisation rather than the outcome, with the aim to provide an overview of the emerging trends in the decolonisation of Computing at HEIs, e.g., what this entails, the challenges and obstacles being encountered, and will provide suggestions on how to advance the decolonisation of the Computing and IT curriculum. If indeed there is a best practice or benchmark against which we can drive our decolonial agenda, then we need to know what this looks likes. Initial findings illuminate a range of activities within STEM including toolkits, podcasts, blogs, articles, working groups, poetry, international partnerships, awards and physical hubs. An early theme of the analysis indicates that the work underway is linked through the commonality of a collaborative approach to change, be that within a school, across departments, interdisciplinary, linking with the library or

linking with the student union or also outside the university, connecting with museums and with other universities internationally.

The results of our survey offer unique insights from the student perspective of what it means to decolonise the computing and IT curriculum within a large distance learning provider, and the affordances and constraints of engaging students in this process. Regarding decolonisation as a gradual process rather than an outcome, we acknowledge that it is both complex and continuous as dominant Western forms of knowing, and knowledge, are questioned. We hope that these results will inform computing educators about the need to shift practice in order to dismantle traditional hierarchies by enabling new perspectives to be heard, to create space for new knowledge, and for new learning to be encouraged. In doing so we must all check our privilege and be brave in asking difficult questions of those holding power.

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