

An investigation of students' views on decolonising the science curriculum

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Abstract

Decolonising the curriculum in higher education has attracted a lot of recent attention. However, most of the work done on this topic has been within the arts and social science disciplines. By means of a questionnaire, this paper explores science students' understanding of decolonisation of the curriculum and their views on a range of potential actions to help achieve that, based on Swartz's theses for the process. The results indicate that, although understanding of decolonisation was low, a high proportion of students was supportive of actions linked to the agenda for decolonisation of the curriculum. Of particular note was the result that Black African/Caribbean students were more supportive of actions to decolonise the curriculum, particularly for actions focused on the content of the science being taught, than the rest of the student population. The results support the call to decolonise the science curriculum, in order to reflect the diverse student population.

Keywords:

Decolonisation, Inclusion, Curriculum, BAME

Introduction

Decolonisation of the curriculum originated as a movement to ensure that indigenous knowledge was taught in the universities of post-colonial countries (Gaudry and Lorenz, 2018; Botha, 2007; Walke, 2000; Alvare and Farugi, 2014). More recently the 'Decolonising the Curriculum' agenda was reignited in South Africa in 2015 with the 'Rhodes Must Fall' movement. Le Grange (2016) defined it as "*Africanising the curriculum*", meaning that knowledge based on African thinking and practices should supplement Western science. In 2020, the resurgence of Black Lives Matter after the death of George Floyd in America has raised the profile of decolonising the curriculum.

Even though the United Kingdom (UK) is not a post-colonial country, the agenda for decolonising the curriculum is prominent, owing to the UK's role as a coloniser. The National Union of Students' 'Why is my curriculum white?' campaign (Hussain, 2015) has been influential. The use of the term 'decolonising the curriculum' is contested, as decolonisation has been defined as the "*repatriation of indigenous land and life*" and it has been argued that it should not be used as a metaphor for improving aspects of society (Tuck and Yang, 2012). This position is acknowledged by Bhambra, Gebrial and Nişancioğlu (2018), though they argue that decolonisation should not be confined just to settler-colonialism projects and should be considered as a global project.

Liyanage (2020) has recently defined decolonisation as “*a fundamental re-evaluation of the existing forms of teaching, learning and pastoral support in Higher Education*”. She also highlights that many people do not know what it entails and that misconceptions about decolonisation are widespread. As a result, some universities avoid the use of the term.

To date, much of the focus of this agenda has been within the arts and humanities disciplines. Hussain (2015) suggested that these have the most work to do regarding decolonisation, but all subjects have opportunities to reconsider teaching matter. There is increasing recognition that the science, technology, engineering and mathematics (STEM) curricula need to be decolonised as well (Akinbosedede, 2020; Fernandes, 2021).

At Kingston University, work relevant to decolonising the curriculum has been part of a “Developing an Inclusive Curriculum” initiative (Hughes *et al.*, 2019). This work has been informed by theoretical research in the areas of critical race theory, culturally responsive pedagogy, universal design for learning and decolonising the curriculum. However, the initiative has not made prominent use of the term ‘decolonising the curriculum’.

Inclusive learning and teaching have been defined as “*Ways in which pedagogy, curricula and assessment are designed and delivered to engage students in learning that is meaningful, relevant and accessible to all*” (Hockings, 2010). Developing an inclusive curriculum has similarities with decolonising the curriculum because it encompasses the diversifying of content and reading lists and the reviewing of pedagogical practices and assessment. It has a broader scope in that it considers the broader diversity of all the protected characteristics, ethnicity being just one of them. However, it can be argued that focusing just on an inclusive curriculum can result in failure to consider the impact of politics and power hierarchies on the curriculum. Decolonisation recognises that knowledge is marked by power relations and the disproportionate prominence of contributions from the global north.

Nationally, the decolonising the curriculum agenda has grown in prominence, particularly after recent Black Lives Matter protests. The fact that Black, Asian and minority ethnic (BAME) students do not see themselves or their backgrounds adequately reflected in the curriculum could cause the under-stimulation and the under-achievement of these student groups, as reported by Richardson (2015).

A key aim of decolonising the curriculum is to ensure that all students can see themselves and their backgrounds reflected in the curriculum. As a result, various UK universities have developed guidance on how to decolonise the curriculum – School of Oriental and African Studies (2018), University of Bath (2020) – and how to decolonise a science curriculum – University of Sheffield (2020).

Swartz (2018) has proposed “*theses for decolonising the curriculum*” that recommend consideration of the following:

- the geographical location where you teach/learn;
- what is excluded and elided from and silenced in the curriculum is as important as what is there in it;
- who teaches, “*so that students can be exposed to a multiplicity of views from different kinds of people, and also be able to identify with people like them*”;

- the biographies and histories of who teaches and who is taught and who is being taught;
- the 'hidden curriculum' must be made explicit;
- what is taught needs to be considered: e.g., local and indigenous knowledge;
- how teaching is conducted: e.g., pedagogies;
- southern knowledge should be seen as having global relevance.

This paper takes these suggestions as a starting point in thinking about what actions can be taken to decolonise the science curriculum. It is accepted that others may dispute that these actions are relevant to decolonising this particular curriculum.

The aims of this research project were: 1) to explore science students' understanding of the agenda for decolonising the curriculum and of developing an inclusive curriculum; 2) having provided students with a simple definition of decolonising the curriculum, to investigate their views of actions to decolonise the curriculum on the basis of Swartz's theses for this purpose. This research was carried out prior to the recent Black Lives Matter protests. Any advocacy of science students for initiatives to decolonise the science curriculum could help persuade more staff to take action on changing the curriculum.

Method

The main research questions were:

'What do science students know about the agenda for decolonising the curriculum?' and

'What actions do students think staff should take in order to decolonise the science curriculum?'

A questionnaire was developed to interrogate students' awareness and understanding of decolonising the curriculum and developing an inclusive curriculum.

Students were asked to rate their level of agreement – using the Likert scale (i.e., from 'strongly agree' to 'strongly disagree') – with the following statements:

I have heard of the 'decolonising the curriculum' agenda;

I understand what is meant by term 'decolonising the curriculum';

I have heard of the 'inclusive curriculum framework';

I understand what is meant by an 'inclusive curriculum';

The curriculum of my course would benefit from decolonisation;

The curriculum of my course would benefit from being made more inclusive.

Respondents were then provided with the following definition – from Muldoon (2019) – of decolonising the curriculum.

“There are diverse views of what ‘decolonising the curriculum’ means, but it generally involves a reconsideration of who is teaching, what the subject matter is and how it’s being taught, to ensure all students can see themselves and their backgrounds reflected in the curriculum.”

Students were then asked to rate their level of agreement (using the Likert scale) with eight potential actions for decolonising the curriculum, on the basis of Swartz’s theses (Swartz, 2018). These are given below.

In order to decolonise the curriculum of my course, academic staff should:

1. reflect on what is excluded from the curriculum, not just what it contains;
2. review who teaches the course so students can be exposed to views from different kinds of people;
3. include biographies and histories of scientists being taught and those who teach;
4. make more explicit the ‘hidden curriculum’ (the unwritten information that students pick up from close interaction with staff);
5. include more knowledge from the global south in the programme;
6. consider the geographical origins of the science being taught;
7. review how the programme is taught with greater focus on active learning;
8. include students more in the delivery of teaching;

Ethnicity data was collected using a question based on harmonised country specific ethnic groups recommended by the UK’s Office for National Statistics. The variety of national ethnicities were grouped under the five main categories: 1. White; 2. Mixed/multiple ethnic groups; 3. Asian/Asian British; 4. Black / African/Caribbean; 5. Other ethnic group. In this work the responses of students who identified as Black / African/Caribbean are compared to the responses of the four other groups combined.

‘White’ includes English/Welsh/Scottish/Northern, Irish/British, Irish/Gypsy or Irish Traveller and any other white background. The Asian/Asian British group is split into five sub-groups: Indian, Pakistani, Bangladeshi, Chinese and any other Asian background.

Ethical approval was gained from Kingston University research ethics committee via KUREOS.

Paper copies of the questionnaire were distributed face-to-face in lectures. A participant information sheet and consent form were distributed with the questionnaire and a short verbal introduction given. All students were encouraged to complete the survey but were reminded that it was voluntary.

Data analysis

Questionnaire responses were coded and input into an Excel spreadsheet. The data within the spreadsheet were anonymous. Clustered bar charts were used to present the Likert scale data as befits non-parametric data.

Given that the data were non-parametric, Mann-Whitney tests were used to test the hypothesis of whether the median rank of Likert scores for individual Likert items differs

between Black African/Caribbean students and students from all other ethnic groups, in order to identify whether responses were different between these two groups (De Winter and Dodu, 2010; Hollingsworth *et al.*, 2012). A significance level of $p < 0.05$ was used in all tests.

Results

Students (n=141) from Chemistry (n=12), Pharmaceutical Science (n=21), Pharmacy (n=89) Biomedical Science (n=13) and Pharmacology (n=6) courses completed the questionnaire in November 2019.

The study population – table 1 – was ethnically diverse, which is reflective of the very high percentage of BAME students on science courses at Kingston University. In 2019/20, 80.7% of students in the School of Life Science, Pharmacy and Chemistry were from a BAME background.

Students from all levels completed the questionnaire: third year (n=56); second year students (n=73) and first year (n=12).

Table 1. Ethnicity of participants

Ethnicity	n
Black African	33
Black Caribbean	3
Asian-Indian	18
Asian -Pakistani	12
Asian-Bangladeshi	14
White	15
Asian-Chinese	0
Asian-other	14
Other (middle east)	11
Not declared	14
Mixed/multiple ethnic groups	7

Understanding and support for decolonisation and Inclusion

The results of questions interrogating students' understanding of decolonisation and inclusion are presented in figure 1. They highlight that only a small proportion of students said they understood what was meant by an inclusive curriculum or decolonising the curriculum.

In light of the Black Lives Matter movement and that the awarding gap is greatest for British Black African/Caribbean students, the data was analysed in order to make comparisons between responses of British Black African/Caribbean students and all other students (presented in figure 2). Black African students were the largest ethnic cohort within the responses.

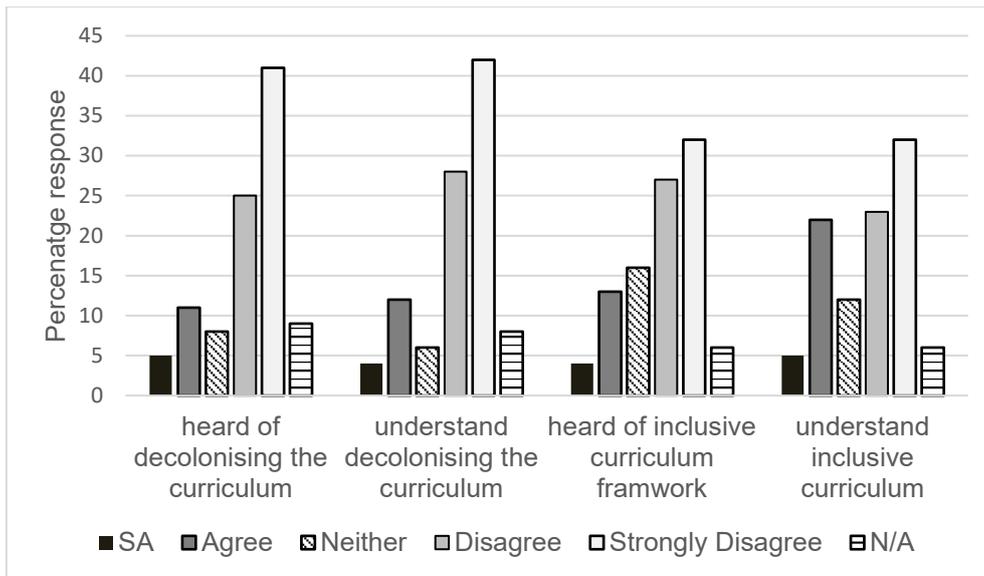


Figure 1. Low understanding of decolonisation and inclusion terminology

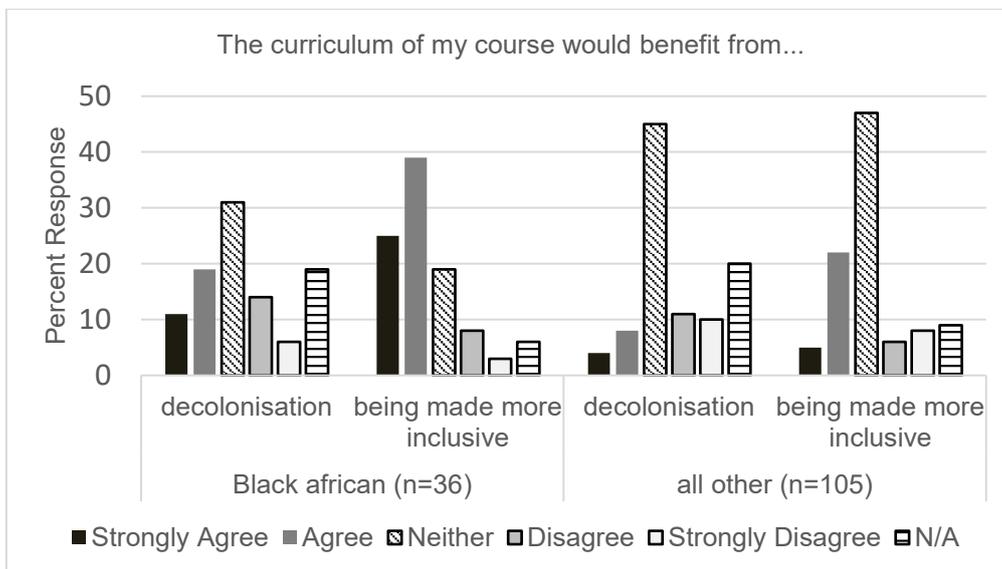


Figure 2. Students more supportive of having an inclusive curriculum

Actions to decolonise the curriculum

The suggested actions to decolonise the curriculum included in the questionnaire were based on the theses of decolonising the curriculum proposed by Swartz (2018). It is recognised that decolonisation of the science curriculum requires continuous reflection and dialogue on the impact of colonialism on science and higher education (HE). The levels of student agreement with these proposals to decolonise the curriculum are presented in figures 3 and 4.

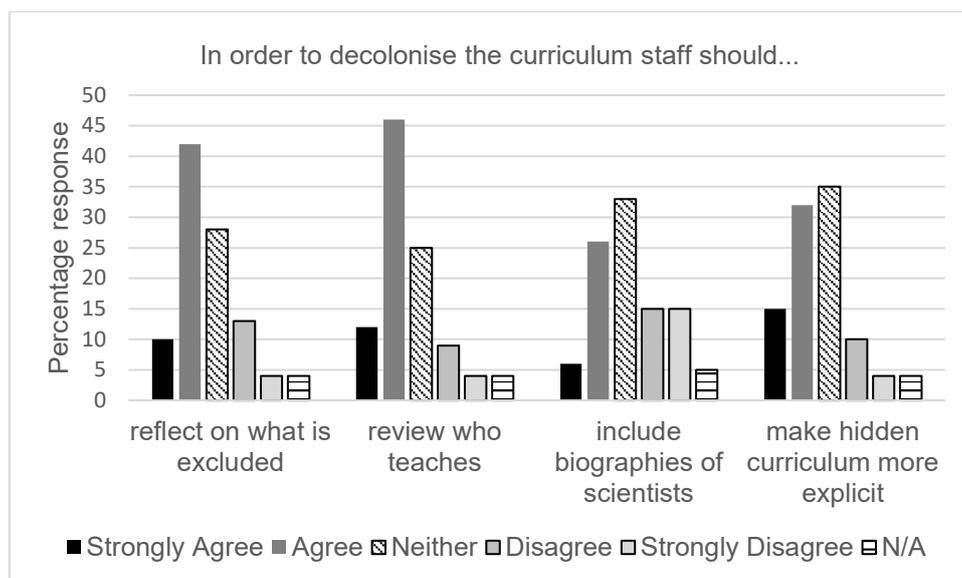


Figure 3. Who teaches is identified as more important than inclusion of biographies

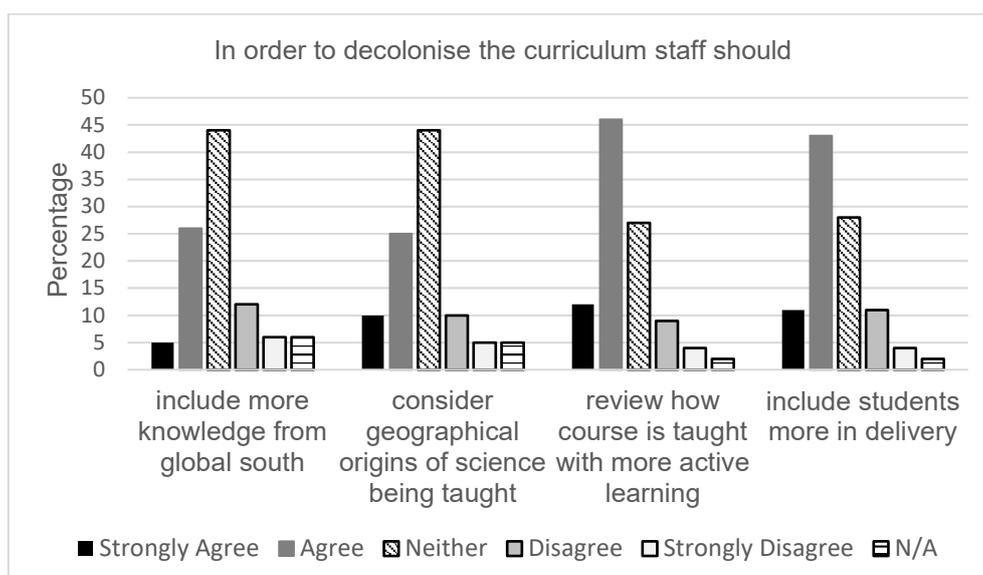


Figure 4. How course is taught is identified as more important than geographical origin of knowledge

Views of Black African/Caribbean students

The data were analysed in order to identify any difference in responses between Black African/Caribbean students and others. Figures 5-8 indicate that students of Black African/Caribbean origin are more supportive of most of the proposed actions to decolonise the curriculum than are all other students. It is noteworthy that students of Black African/Caribbean origin are more likely to agree that more biographies and global south knowledge should be included in order to decolonise the curriculum. In the wider student cohort, these actions gained the least support. The non-parametric Mann-Whitney test was used to test the hypothesis of whether the median rank of Likert scores for the proposed actions to decolonise the curriculum differed between Black African/Caribbean students and students from all other ethnic groups (table 2). A measure of effect size, r , can be calculated by dividing Z by the square root of N .

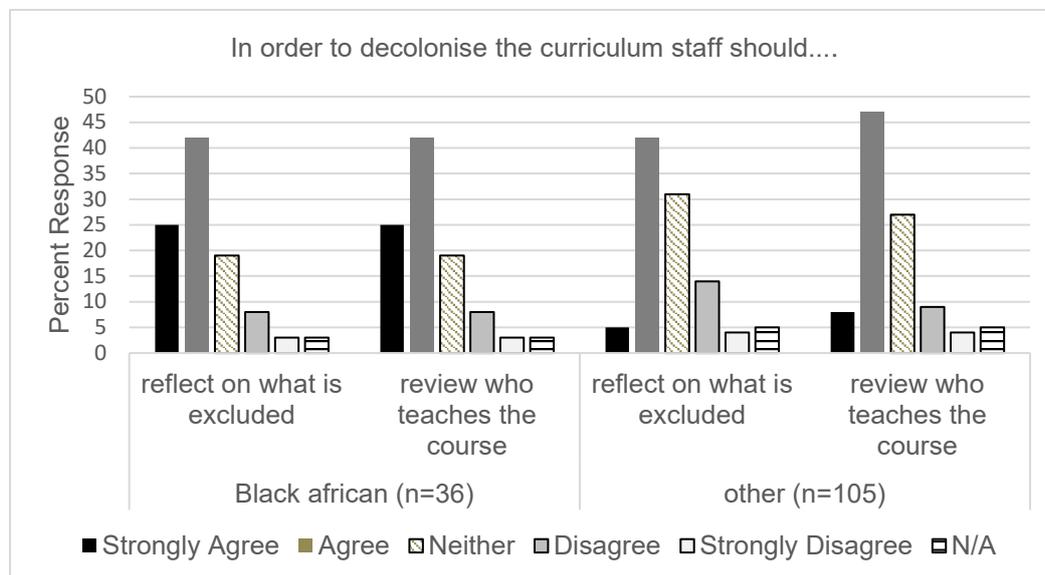


Figure 5. Responses to actions on content and who teaches on the course

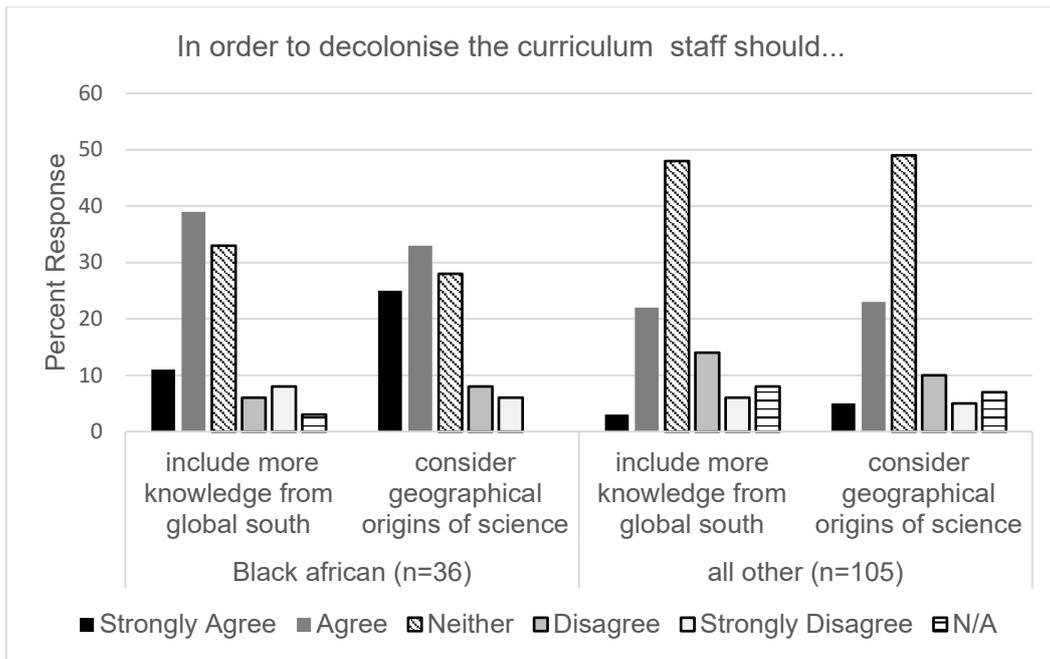


Figure 6. Responses to actions based on geographical origin of knowledge and science

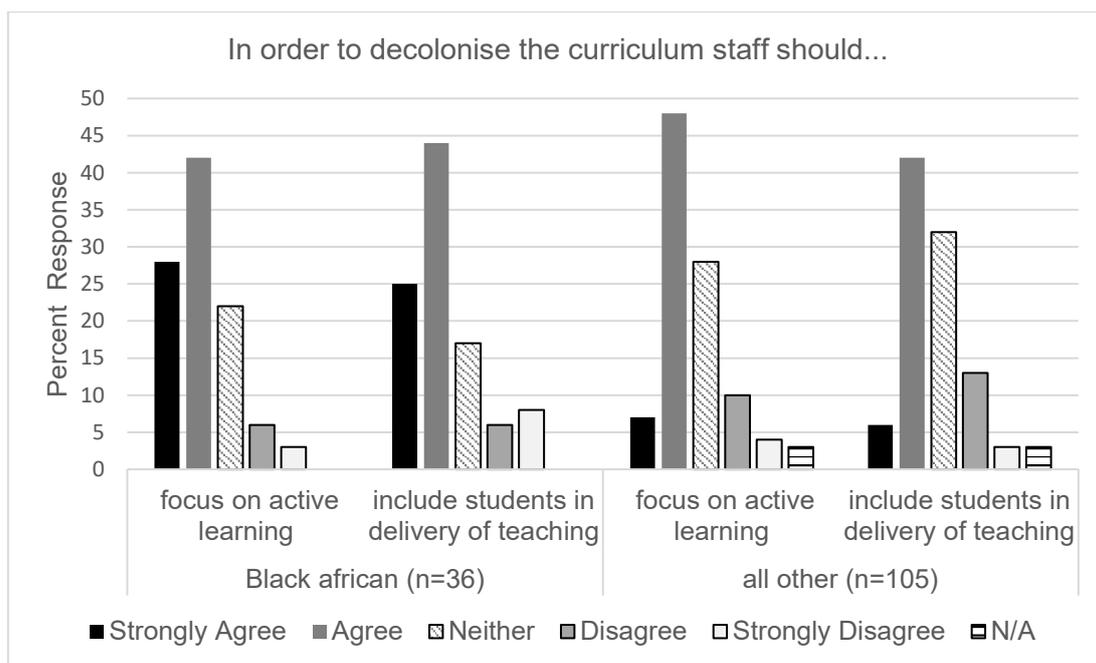


Figure 7. Differences in responses for actions based on teaching style

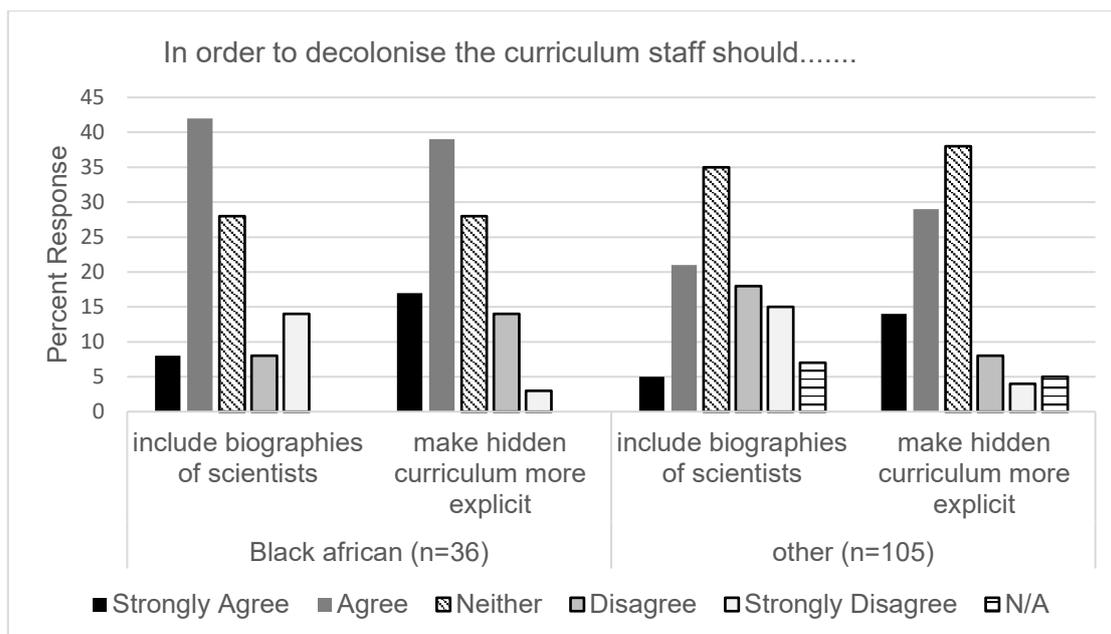


Figure 8. Differences in responses to actions on biographies and hidden curriculum

Table 2. Statistical analysis of difference in Likert scale responses between Black African/Caribbean and other ethnic groups.

	Mdn (O) ^a	Mdn (BA) ^b	U	Z	p	r
Reflect on what is excluded from the curriculum	3	4	1353	-2.53	0.011	0.213
Review who teaches the course	4	4	1497	-1.85	0.064	0.156
Include biographies and histories of scientists	3	4	1371	-2.45	0.014	0.206
Make the 'hidden curriculum' more explicit	3	4	1670	-0.88	0.378	0.074
Include more knowledge from the global south	3	4	1371	-2.45	0.014	0.206
Consider the geographical origins of the science	3	4	1204	-3.12	0.002	0.262
Review how the programme is taught	4	4	1376	-2.43	0.015	0.204
Include students more in the delivery	3	4	1357	-2.45	0.142	0.206

^a Mdn (O) = median response of students from all other ethnic groups combined ^b Mdn (BA) median response from Black African/Caribbean students

Discussion

Understanding and support for decolonisation and Inclusion

As noted above, student understanding of the terms ‘decolonisation’ and ‘inclusion’, as applied to the curriculum, was low. Students were more familiar with the term ‘an inclusive curriculum’. This is perhaps to be expected, given Kingston University’s focus on promoting an inclusive curriculum (McDuff *et al.*, 2020). In addition, more students thought that the curriculum would benefit from being more inclusive than that it would benefit from decolonisation. This may be partly because ‘inclusion’ embraces a broader range of protected characteristics, such as disability, gender reassignment, race, religion or belief, sex and sexual orientation. It is worth noting that this survey was carried out in November 2019, before the Black Lives Matter movement gained pace in 2020. Nonetheless, the results do suggest that more needs to be done, by extensive discussion by academic staff and students about what decolonisation of the science curriculum means and what it would entail. This has been to a certain extent achieved through workshops for academic staff that introduce what decolonisation of science means and how it can begin to be addressed it within individual academics’ work practices (Karodia and Lalemi, 2019; Lalemi, 2020). A key feature of such workshops is the provision of a safe space for discussion, learning and growth in decolonising science, as well as examples of work on decolonisation in science courses. This should improve staff confidence in discussing the issues with students.

On first inspection it appears that students from a Black African/Caribbean background were more likely to think that the curriculum would benefit from decolonisation (30%) compared to all other groups (12%), as figure 2 shows. In the ‘all other’ group, more students disagreed with the statement that the curriculum would benefit from decolonisation than agreed. The opposite was seen for Black African/Caribbean students. However, more detailed analysis through a Mann-Whitney Test ($U [N_B = 36, N_o = 105] = 1587, Z = -1.37, p = 0.171$) showed that there was no statistically significant difference between the response to this question of Black African/Caribbean students compared to all other students. However, there is a statistically significant difference in the response to the question about making the curriculum more inclusive ($(U [N_B = 36, N_o = 105] = 1142, Z = -3.4, p = 0.0006)$), where 64% of Black African/Caribbean students agreed that the curriculum would benefit from being made more inclusive, compared to just 27% from all other ethnic groups. This highlights one of the shortcomings of grouping such a diverse range of students as BAME. There is likely to be considerable variation between different ethnic groups.

The fact that students with the largest degree-awarding gap are showing greater advocacy for a more inclusive and decolonised curriculum provides strong evidence to persuade staff to reflect on this when they review curricula. This is particularly important in schools – such as the School of Life science, Pharmacy and Chemistry at Kingston University – where a large percentage of students come from a Black African/Caribbean background. It is also reflected in the views of Black African/Caribbean students on actions to decolonise the curriculum, discussed below.

Actions to decolonise the curriculum

It is acknowledged that many of these actions would be considered good learning and teaching practice and students would be likely to support them outside this particular context of their contributing to decolonising the curriculum.

Figures 3 and 4 generally indicate that students are more supportive of actions focused on who teaches and how they teach rather than what they teach. There is less support for inclusion of scientists' biographies and knowledge from the global south. It is interesting to note that reviewing who teaches on the courses and how the course is taught with greater focus on active learning gained the most support (58% agreed). Reviewing how the course is taught with greater focus on active learning may not have been the first action to consider with regard to decolonising the curriculum; however, it has been heavily promoted as the means of improving the quality of teaching in HE in recent years (Freeman *et al.* 2014). A recent meta-analysis of research on active learning publications (Theobald *et al.* 2020) revealed that active learning narrows achievement gaps for under-represented students in undergraduate science. The work highlighted that active learning benefits all students, but most benefits students from under-represented backgrounds, reducing award gaps for examination marks and pass rates. This is significant, as one of the driving forces for decolonising the curriculum is that it is thought it may well help to address the issue of awarding gaps.

Given the low level of understanding of 'decolonisation of the curriculum', as revealed in the earlier questions, it is perhaps not surprising that more specialist actions regarding decolonising the curriculum – such as including biographies and histories of scientists and more knowledge from the global south, as well as considering the geographical origins of the science being taught – got less agreement, while many students would be expected to support actions centred on established good learning and teaching practice, such as active learning.

Nonetheless, these results do show there is support from students for actions that Swartz has suggested underpin the decolonisation of the curriculum. They also offer a counter argument to the claims that students are not interested in decolonising their university and so a reason for academics not to engage with decolonisation (Liyange, 2020).

Views of Black African/Caribbean students on actions to decolonise the curriculum

Mann-Whitney statistical tests on the questionnaire results

The tests indicate that Black African/Caribbean students were more supportive of the following actions to decolonise the curriculum than students from all other ethnic groups combined:

- Reflect on what is excluded from the curriculum, not just what it contains;
- Include biographies and histories of scientists being taught and those who teach;
- Include more knowledge from the global south in the programme;
- Consider the geographical origins of the science being taught;
- Review how the programme is taught with greater focus on active learning.

Many of these actions are centred on the actual content taught on the science programmes and indicates there is a strong desire for more focus on the contributions and knowledge of people from the global south by students from a Black African/Caribbean background.

The tests indicate that there is no significant difference in the response of the two groups for:

- Review who teaches the course so students can be exposed to views from different kinds of people;
- Make more explicit the 'hidden curriculum' (the unwritten information that students pick up from close interaction with staff);
- Include students more in the delivery of teaching.

It is worth noting that the median score for 'Review who teaches the course' was high for both Black African/Caribbean students and all others. This is evidently something all ethnic groups favour.

The much stronger advocacy for action regarding content by Black African/Caribbean students highlights the importance of reflecting global south knowledge, diverse biographies and the geographical origin of the science being taught to this group of students. This backs up the work of many writers who have called for greater representation of the contribution from the global south in the curriculum. Akinbosede (2020) has noted that the discussion of race in the context of science subjects might increase engagement and a sense of belonging for students of colour. The teaching of the biographies of those involved in the science provides opportunities to discuss racial injustices within science as well as diversifying representation. There is now an increasing number of biographical resources (Ries and Mensinger, 2021) to help lecturers diversify content. These actions are important as they would help Black African/Caribbean students see themselves being reflected in the curriculum – a key feature of an inclusive curriculum.

It is noteworthy that reviewing how the programme is taught, with greater focus on active learning – one of the popular actions for the overall cohort – was still significantly more supported by Black African/Caribbean students. The importance of such action is reflected in recent recommendations for supporting historically under-represented students in science, which highlighted the value of implementing student-centred learning (Arif *et al.*, 2021).

Liyanage (2020) recommends that a change of pedagogy and broadening of content are needed as part of decolonisation, as is reflected in Swartz's theses for decolonisation. However, she also notes that conflation of decolonisation with diversity and inclusion can be damaging, allowing tokenistic or unrelated measures to be branded as decolonisation. The Keele manifesto (2021) states that decolonisation should be more than diversity and inclusion and should consider the power structures behind the hierarchy of knowledge and seek to break down the prominence given to knowledge derived from the global north. The strong advocacy of Black African/Caribbean students for 'Reflecting on what is excluded from the curriculum not just what it contains' highlights the need for this within the science curriculum. It is important to note that decolonisation is more than equality, diversity and inclusion.

Impact of research

These results have influenced the continuing development of teaching of science at Kingston University. The redesign of a first-year chemistry module involved the replacement of a series of lectures with a project-based learning approach (Williams, 2021). This allowed students to co-create the curriculum around atmospheric chemistry pollution and encouraged them to explore the global impact of atmospheric pollution. This approach addressed the actions of reviewing how the programme is taught and incorporating more active learning and a greater focus on the global south and the geographical origins of the science. The positive impact of this approach has led to the introduction of project-based learning into the foundation year of Kingston university's extended degree programmes in science. Staff have also taken steps to introduce the biographies of a diverse range of chemists into the chemistry curriculum to coincide with Black History month. In addition, workshops are being run to discuss and support staff in the decolonisation of science (Lalemi, 2020).

Conclusions

Despite the promotion of the Inclusive Curriculum Framework (ICF) at Kingston (Hughes *et al.* 2019), most science students do not understand what is meant by an 'inclusive curriculum' or 'decolonising the curriculum'. This indicates that more work needs to be done to generate discussion about these topics with science students. After having the term 'decolonising the curriculum' explained in simple terms, students were most supportive of actions centred on who teaches and how they teach, rather than on what is taught.

Interestingly, students from a Black African/Caribbean background are more supportive of actions about what is taught and how it is taught than students from all other groups combined. Both sets of students are similarly supportive of actions regarding who does the teaching. In addition, around half of students from a Black African/Caribbean background agreed that, to decolonise the curriculum, the geographical origins of science should be considered and that more knowledge from the global south should be included.

These results highlight the problems of treating BAME students as a homogenous group, as there is likely to be variation between different ethnic groups.

Overall, the results indicate there is considerable student support for decolonising the science curriculum and that this is particularly strong for students from a Black African/Caribbean background.

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