**What does decolonising the curriculum mean for STEM subjects?**

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**Abstract**

The concept of decolonising the curriculum is a wide spread and current discussion in higher education. While it is clearer how this can be done in disciplines in Humanities and Social Sciences, it is less obvious how this can be done in the STEM subjects, which are based on more technical knowledge and problem solving.

**Introduction**

With the move towards decolonising the curriculum in institutions, how do the Science, Technology, Engineering and Mathematics (STEM) subjects diversify their curricula when they tend to be based on sums, formulas and problem solving? This question will be explored through defining what decolonising the curriculum means as a concept, and how this can take place in practice in STEM subjects.

**What does ‘decolonising the curriculum’ mean?**

The background of decolonising the curriculum can be traced to 2015 with the ‘Rhodes Must Fall’ protests at the University of Cape Town in South Africa. The South African context, with the backdrop of Apartheid in its history, challenged the wider education system and advocated to decolonise education in a bid to diversify narratives and perspectives. While at first glance this can be interpreted as a political notion, on closer inspection from a wider viewpoint on the education system, it also calls on educators to consider inclusive pedagogy where inclusive curriculum design is at the forefront, and students have a say in what and how they are taught (Florian and Black-Hawkins, 2011).

From this standpoint, decolonising the curriculum is twofold in which is enables academics to consider firstly what is taught, and secondly the way in which it is taught. As educators we need to review what we teach. Decolonising the curriculum means going beyond the western models or theories, but also including various perspectives and voices that often go beyond race and gender constraints. Rethinking what we teach allows students to be exposed to various contexts, views and opinions which contributes to their development as independent learners and critical thinkers.

In addition to this, we need to also consider how we teach. This an opportunity to redesign curricula that is based on an inclusive approach such as diversifying assessments, using inclusive language, reviewing the skills that we want students to develop in our modules, and consider various teaching platforms to ensure all students have equal access to module materials. In both of these points, students can be consulted to get a sense of what they want taught in their modules.

On an institutional and sector level, there is additional pressure to address decolonising education. The black, Asian and minority ethnic (BAME) student awarding gap data illustrates black students are the most disadvantaged. In 2018/19, there was a 22.1% difference between black students and white students obtaining a 1st or 2:1st degree (OFS, 2020). To address this discrepancy, the Office for Students (OFS) created 9 key features one of which was for institutions to ‘review curriculum, teaching and learning practices’ (OFS, 2020).

**How can STEM subjects be decolonised?**

What does decolonising the curriculum look like for STEM subjects that are more technical or problem-solving disciplines? One way could be to include the history, philosophy and evolution of science subjects (Raju, 2012), and potentially include more diverse individuals or voices where racism and misogyny are challenged (Akinbosede, 2020). Perhaps there is also scope to explore and include alternative methods to problem solving that are less known but done in other countries and cultures. For example, teaching the Japanese model of multiplication, or exploring how the comma is used in decimals in Maths in other countries. The benefits of teaching alternative problem solving techniques is twofold. Firstly it teaches students there are several ways to solve a problem which could appeal to student’s different learning styles, and secondly it demonstrates STEM is not Eurocentric but rather has a diverse background (Nhemachena, Hlabangane & Matowanyika: 2020). These approaches will undoubtedly challenge the nature of STEM subjects, and could possibly bridge the gap that currently divides STEM from Social Sciences/ Humanities.

The challenge of decolonising the curriculum in STEM is the belief that science is objective and neutral (Bhambra, Gebrial and Nisancłolu: 2018). To overcome the challenge of neutrality, we need to reassess how we think of STEM subjects as academics. There have been suggestions to re-orientate science in the wider body of knowledge so it becomes more inclusive (Bhambra, Gebrial and Nisancłolu: 2018), thereby becoming truly objective as it’s taking into account multiple and diverse perspectives (Future Learn: n.d). While STEM subjects might be presented as neutral disciplines, the context through which these subjects emerged is not. How and why were theories developed and by whom? Part of inclusivity is to recognize where knowledge has come from and the individuals who contributed to these disciplines. By doing so, the invisible voices who have been eliminated from the narrative become known. For example, Chien-Shiung Wu, an American-Chinese female physicist who specialised in beta decay, provided experimental evidence for theoretical physicists Chen Ning Yang and Tsung-Dao Lee, which resulted in Yang and Lee being awarded the Nobel Prize for Physics in 1957 (Physics World: 2020). Wu’s contribution, like many others, hasn’t been acknowledged however decolonising the curricula has created an opportunity to introduce new knowledge and inspire students who question the representation of marginalised groups in their subjects and want to see themselves represented in the subjects they are taught.

**Conclusion**

Decolonising the curriculum enables educators to rethink how and what is taught. This allows a more holistic, inclusive and creative approach of designing modules and curricula, and also encourages a dialogue to take place between educators and students. STEM subjects are not exempt from having to review their curricula, however in doing so, there might be more coherence between the sciences and humanities where individuals and different perspectives on theories are included.

**Biographical note:**

Dr Monica Fernandes is a Senior Lecturer in Academic Professional Development at Brunel University London. In addition to being the CPD lead in the Academic Professional Development Unit, she teaches Race, Gender and African History in the Politics and History department at Brunel University. She has experience of working in Higher Education in the UK and abroad, where she has helped academics further develop their curriculum to support their students. Her interests include decolonising the curriculum, inclusive teaching, working with students as partners, and increasing student engagement through creativity in teaching.

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