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# Decolonizing and diversifying the biosciences curriculum – a practical guide to getting started

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To create inclusive bioscience learning environments, we need to challenge the dominance of white European perspectives within our discipline through diversification and decolonization of the curriculum. Bioscientists may be unsure how to start this process or may struggle to see how it is relevant within scientific disciplines. Here, we provide some practical suggestions of how to start with diversification and decolonization. We highlight a published culturally competent curriculum structure that may be of value and give multiple steps towards decolonization. These range from considering terminology, addressing gaps in our own knowledge to learning how to pronounce names from multiple cultures correctly and working in partnership with students and staff from diverse backgrounds. We also reflect on our own privileges, experiences and biases to illustrate the importance of self-awareness in this work. Decolonization and diversification may be uncomfortable and challenging, but our suggestions provide practical advice and support to bioscience educators wanting to create more inclusive curricula.

Decolonizing and diversifying the biosciences curriculum is important for students and staff who work and study in this discipline, as well as for future generations of bioscientists. Many, or possibly the majority of, staff and students within biosciences are unaware of how the discipline's colonial past has shaped what we teach and study today. We need to ensure that staff and students from all backgrounds feel included and are represented within our discipline and therefore have a collective responsibility to work towards decolonizing and diversifying the biosciences.

As we outlined earlier in this issue, the history of the biosciences is inherently linked to colonialism and exploitation. Whether it is the colonial exploitation of natural resources, the use of 'scientific' categorization to justify racial oppression or the biological arguments that underpinned eugenics, our discipline has a dark history. While it is tempting to think this is confined to the past, contemporary experimental design, scientific policy making, public engagement with science and intellectual property rights often reinforce exclusion on the basis of ethnicity, disability, sex and gender identity or indigenous heritage. If we are going to create inclusive biosciences curricula, we cannot ignore this history or its on-going impact within our discipline.

Decolonization and diversification can seem intimidating, and there can be multiple barriers to this, from resource issues and structural challenges to personal beliefs. There is often a lack of understanding of how

decolonization and diversification relate to disciplinary science, as well as a fear about causing offence or getting it wrong. To help staff and students get started in this area, we present a series of practical actions next. These are not intended as a 'complete guide' to decolonization and diversification; there is a vast amount of scholarship and activity in this area and no one person will ever have a complete understanding of the topic, but we hope our suggestions are of tangible use for those new to the area.

It can be difficult to know where to start with decolonization, but, thankfully, others have provided useful frameworks. We particularly recommend Dave Thomas and Kathleen Quinlan's 'Culturally Sensitive Curriculum Scale' and accompanying questions as a starting point for reflection and action (Thomas and Quinlan, 2021). The scale has four dimensions:

- i. *Representation of diversity* – ensuring that individuals from different demographic groups are highlighted in the curriculum.
- ii. *Positive portrayals of racialized minority groups* – ensuring that black, Asian and Indigenous peoples are not presented as 'problems' to be solved by white western science, but as valued communities with their own systems of knowledge.
- iii. *Challenge to power* – active discussion of historical and contemporary exploitation and ethics, including supporting students to critique the status quo and advocate for socially responsible science.

**Table 1.** Culturally sensitive framework applied to drug discovery. Examples partly drawn from Notman (2022)

Representation of diversity	<ul style="list-style-type: none"> <li>▶ Highlight a diversity of researchers who have identified novel drugs, e.g., <a href="#">Tu Youyou</a> identified the malaria treatment artemisinin by screening traditional Chinese remedies, winning the Nobel prize for medicine</li> </ul>
Positive portrayals of racialized minority groups	<ul style="list-style-type: none"> <li>▶ Ensure that traditional and indigenous medicine are fairly represented and not dismissed as pseudoscience</li> <li>▶ Ensure that white western researchers are not portrayed as the only valid experts</li> </ul>
Challenge to power	<ul style="list-style-type: none"> <li>▶ Scrutinize the ethics of western plant collectors extracting specimens from indigenous sources, both historically and today</li> <li>▶ Discuss western systems of intellectual property and the problems of applying these to insights gained from traditional knowledge</li> <li>▶ Discuss the politics and ethics of pharmaceutical company business practice</li> </ul>
Inclusive classroom interactions	<ul style="list-style-type: none"> <li>▶ Embed equality, diversity and inclusion training into curricula</li> <li>▶ Learn student names including correct pronunciation</li> <li>▶ Give space for students to share their experiences and views while maintaining a respectful classroom environment</li> </ul>

iv. *Inclusive classroom interactions* – ensuring all members of the educational community feel respected and valued, including interactions between teachers, students and peers.

We advocate embedding these principles within relevant disciplinary contexts. As biologists, we are not social scientists, nor should we pretend to be. However, we should be aware of where these ideas intersect with biological topics. Table 1 illustrates how Thomas and Quinlan's framework might be used to develop a culturally sensitive approach to teaching about drug discovery. In our experience, framing these issues in terms of ethics may help maintain disciplinary relevance and create space for them in a crowded curriculum.

### Practical steps for decolonizing and diversifying your bioscience curriculum

Decolonization and diversification is a journey. It is probably impossible to completely decolonize a curriculum, but we can take positive action to create more inclusive learning environments. In addition to the culturally sensitive curriculum structure earlier, here are some steps you could take towards decolonizing and diversifying your curriculum:

1. *Identify and address gaps in knowledge.* Most bioscientists are not taught about the history of the discipline and therefore there is a lot of ignorance around the impact of colonialism and the lack of diversity in our discipline. Sometimes, it feels embarrassing that we don't know about the history of our own subject, and the implications of this. While it can often seem that others may know more about the topic, a helpful first step is to identify the gaps in your own knowledge, particularly in your own

disciplinary context, and read to address this, however simple your own starting point might feel. There is an increasing volume of literature on this topic, most of it very accessible to staff and students alike (Table 2).

2. *Reflect on your own privileges, ignorance and bias.* We all have biases which shape our thinking. Being aware of your own 'positionality' can be helpful in identifying how your experience might differ from others. This also requires considering your privilege in society; for example English speakers are at an inherent advantage within science due to the default language of journals and conferences. Acknowledging your own privilege doesn't mean you haven't worked hard or that you don't deserve success, but it does mean recognizing that others may not have had the same advantages. The Wheel of Privilege is a useful tool to help with this. We share reflections on our own positionality in Box 1 as an example.

3. *Consider the language that you use.* The terminology we use can contribute to reinforcing or deconstructing systems of power. However, it can be easy to be overwhelmed by evolving terminology and fear of using language incorrectly, particularly when incorrect use can cause hurt and emotional distress. Educating yourself about appropriate language, and spending time reviewing written work and teaching material to ensure inclusive language can be a helpful starting point. Language guides exist, such as this one produced by Oxfam, and can be a helpful starting point. It is also helpful to voice humility and openness in evolving your use of language relating to this field - others can often support and correct where appropriate.

4. *Learn how to pronounce the preferred names of your students and colleagues.* Repeated

**Table 2.** Some decolonization and diversification resources relevant to bioscience

Resource name and link	Format	Brief Summary
Contextualising the curriculum in ecology and evolutionary biology	Online resource	A project at the University of Sheffield to decolonize ecology and evolution teaching, including curated resources, advice for staff and blogs detailing key findings
Black and Brown Skin	Online resource	A clinical guide to skin conditions expressed in people with black or brown skin, with an aim of better diagnosis and more effective treatment
Inclusive Education Framework and checklists	Online resource	A framework to embed inclusive teaching and learning approaches in any academic discipline, including curriculum, assessment, community and belonging. Includes checklists and case studies
Inclusive Curriculum Healthcheck	Online resource	A checklist used by staff at UCL to help embed the principles of inclusivity in all aspects of the curriculum
Manchester Met Decolonising the Curricula Toolkit	Online resource	A project at Manchester Metropolitan University to decolonize curricula in science and engineering, including experiences from academic staff in the faculty
GWAS diversity monitoring webpage	Online resource	Live webpage showing proportion of Genome Wide Association Studies by ethnicity, highlighting the disproportionately high frequency of European participants
<i>How to Argue With a Racist: History, Science, Race and Reality.</i>	Book	Popular science book by Adam Rutherford that considers what we know about race from a biological perspective and how to challenge racist views that appear to be based in science
<i>Superior: The Return of Race Science</i>	Book	Popular science book by Angela Saini exploring the history of scientific racism and how it has been co-opted by white supremacist movements
<i>Control: The Dark History and Troubling Present of Eugenics</i>	Book	Popular science book by Adam Rutherford that explores the influence of biologists such as Fisher and Pearson on eugenics, and how modern reproductive medicine risks recreating eugenics in the modern world

mispronunciation of your name, or having to rely on a westernized name can be very hurtful to those from other cultures. Students with non-western names may even be ignored in class when instructors are embarrassed about saying names incorrectly. If we can learn to pronounce *Xenopus*, *Escherichia coli* and *Saccharomyces cerevisiae*, we can learn to say names from other cultures correctly. There are online tools to help with this (e.g., <https://pronouncenames.com>), which even include audio recordings of many correct pronunciations.

5. *Highlight existing diversity in your field.* Science is inherently international and researchers come from a diversity of backgrounds, but this might not be immediately apparent to students. One study by Henri and others identified that including photographs of scientists alongside Harvard-style references can have a positive impact on student perceptions of diversity within science (Henri, Coates and Hubbard, 2023). It may be easier to represent diversity by focusing on cutting-edge researchers than by presenting the key historical figures in the discipline who are more likely to be white men.
6. *Explore and use resources developed elsewhere.* There are many examples of individuals and

institutions that have developed or are developing resources in this space that relate to all aspects of biosciences (Table 2). As aspects of biosciences curricula may be similar across institutions, it makes sense to explore and use resources developed elsewhere, many of which are made available online. These may include fully developed teaching materials or suggestions of how decolonization and diversification projects have been successfully conducted elsewhere. Education practitioners are often very willing to share resources, and this can also contribute to increasing their own impact. Finding (or establishing) a like-minded community, however small, can be really valuable in sharing practice and providing support and motivation.

7. *Actively listen and learn from those with lived experience.* The lived experience of those with minority heritage is incredibly valuable when constructing a decolonized and diverse curriculum and environment. To increase participation, marginalized and indigenous groups should be given a safe platform to verbalize or write about their experiences. Platforms could include a seminar series, representation in institutional committees, participation in governance structures and forums where their voice can be heard.

**Box 1. Positionality**

CM: I am a white, heterosexual cis-female from the UK whose parents attended university. I am an early-career teaching-focused academic, with a discipline-specific background in plant biology. I do not consider myself part of a marginalized group on a day-to-day basis and recognize my privilege in being able to access education and resources because of this. I came to this topic aiming to contribute to a more diverse, inclusive and representative biosciences community.

LJ: I am a heterosexual cis-female of South Asian descent, born in the UK. My parents did not attend university. I am a mid-career, research-focused academic, with a discipline-specific background of medical and molecular microbiology. I consider myself to be part of a marginalized group on a day-to-day basis, with limited privilege in academia and wider society. I am able to access education and resources; however, from my lived experience, my academic career and position in society are disproportionately affected by external factors such as my race, gender and socio-economic background. I have come to this topic to highlight the importance of an equal, diverse and inclusive academy and aim to contribute positive actions to support appropriate adoption and analysis of EDI within academia.

IJT: I am a bisexual cis-male of South-East Asian descent, who migrated to the UK at a young age and whose parents attended university in the Philippines. I am concluding my PhD studies at the University of Surrey in chronobiology and have participated in a plethora of actions and committees within the EDI sphere of my institute and this is how I have come to be passionate about this work. As a member of an ethnic minority in the UK, often marginalized, I am grateful for the advancement in the inclusive work that is taking place but realize that more action is needed for an effective overall change within academia. I have come to this topic to explore ways in which a safe and inclusive platform can be built to make space for a more diverse, inclusive and equitable bioscience community.

KH: I am a white, heterosexual cis-female academic with two young children and whose parents went to university. I have a chronic mental health condition which has a substantial and long-term impact on my life, which technically makes me disabled under UK law, although I do not self-identify as such. I do not consider myself as part of a marginalized group on a day-to-day basis, and recognize that I therefore have a considerable amount of privilege within higher education and wider society. I primarily come to this topic as an ally, trying to establish a more inclusive environment for all members of the bioscience community

8. *Be aware of the emotional labour this requires, particularly for those from minoritized groups.* Constructing a decolonized and diverse curriculum can be emotional and complicated for educators generally. Therefore, it is important to be an ally and advocate for equality, diversity and inclusion without letting your voice dominate those of minoritized heritage. Individuals who offer time to discuss and talk about their personal experiences often do so in their spare time outside of their paid roles. These contributions are vital in creating a more inclusive environment and these individuals should be compensated and recognized for their time and contributions where possible.
9. *Advocate for change.* Consider the voices around you and what platforms and opportunities you have to advocate for change. This could include responding to student queries and being an ally and voice for students or others who may not have a presence in meetings and on committees. Staff could make change through working groups or committee structures, while students can work directly with teaching staff or campaign via their student union. Sometimes, questioning and challenging colleagues, staff and those in leadership roles can start fruitful conversations that may lead to change and new ideas. Champion these issues on behalf of colleagues who are less able to advocate due to minoritized status.
10. *Involve students and staff as co-creators.* Many successful diversification and decolonization efforts have been partnerships between staff and students. Involving students can ensure that a greater diversity of perspectives are included, as students are typically drawn from more diverse backgrounds than staff. For example, at Kingston University, undergraduates explore published literature by identifying studies published by authors that share a characteristic with them, including their name or nationality. However, staff shouldn't delegate this work entirely to students; we should work genuinely in partnership and learn from one another.
11. *Explore funding and resource options.* Funding for projects that focus on EDI matters can be difficult to access and may not fit into designated categories for grants and financial support. Some external grants are available, for example, the Biochemical Society's Diversity in Science Grants or the Society of Experimental

Biology's Diversity Grants that, while small, can facilitate projects. University funding, such as teaching and learning funds, can also sometimes be accessed, especially if impact for this work can be demonstrated across the institution. Some institutions also provide funding and resources for student partnership projects that can be accessed to allow appropriate financial payment to student co-workers.

## Conclusion

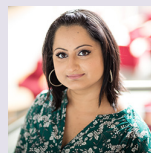
The most important step towards diversification and decolonization is the first one. We will all have individual experiences and perspectives, and identifying the key first steps for yourself is crucial. We hope the practical steps outlined here give some food for thought on how

you might start or continue this journey. Confronting the norms and cultures of our discipline can (and arguably should) make us uncomfortable and make us question ourselves, but making positive change does not have to be as scary as you might think. Recognizing that this work is important within the context of bioscience is essential and underpins action. You do not need to re-invent the wheel; learn from others who have already started re-imagining their curricula, reach out to them and share resources. We will all get it wrong at times, but being open to criticism and new ways of learning will enable a deeper understanding and confidence in addressing these issues. If we all take practical steps to decolonize and diversify our science, we can start to address the historical legacy of our discipline and create an inclusive culture where all feel welcome within bioscience.■

### Further Reading

- Dessent, C.E.H., Dawood, R.A., Jones, L.C. et al. (2022) Decolonizing the undergraduate chemistry curriculum: an account of how to start, *J. Chem. Edu.* **99**, 5–9. doi: 10.1021/acs.jchemed.1c00397
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- Oxfam (2023) *Inclusive Language Guide*, Oxfam. doi: 10.21201/2021.7611 (Accessed: 9 January 2024)
- Thomas, D.S.P. and Quinlan, K.M. (2021) Why we need to reimagine the curricula in higher education to make it more culturally sensitive, *Widening Participation and Lifelong Learning*, **23**, 37–47. doi: 10.5456/WPLL.23.3.37
- University of Wisconsin-Madison (2023) *Wheel of Privilege and Power*, Center for Teaching, Learning & Mentoring (CTLM) Instructional Resources KnowledgeBase. Available at: <https://kb.wisc.edu/instructional-resources/page.php?id=119380> (Accessed: 9 January 2024)

## Box 2. Author information



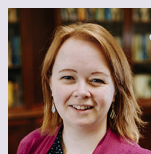
*Dr Tina L. Joshi is an Associate Professor of Molecular Microbiology at the University of Plymouth, where she specialises in Clinical Microbiology and Infectious Disease. She is Principal Investigator of the Molecular Microbiology Research Group. Her interdisciplinary research spans disinfectant resistance and novel diagnostics to tackle Anti-Microbial Resistance (AMR). Dr Joshi sits on international external advisory boards including Antibiotic Research UK's Science Committee, and the Microbiology Society Council where she Co-Chair's their Impact and Influence Committee, and the international Knocking Out AMR initiative. She is deputy Editor in Chief of the Journal of Medical Microbiology and holds two granted patents.*



*Dr Catherine Mansfield (she/her) is a Senior Strategic Teaching Fellow in the Department of Life Sciences at Imperial College London, teaching undergraduates across Biological Sciences and Biochemistry. Her scientific background is in plant developmental biology, and she completed her PhD at the John Innes Centre in Norwich before working for a widening access charity. She is interested in increasing diversity in and access to Life Sciences Higher Education. Dr Mansfield has completed a Masters in University Learning and Teaching, focusing on the role of enjoyment in Life Sciences, and is a Senior Fellow of the Higher Education Academy.*



*Isaiah Ting (he/him) is a PhD student at the University of Surrey, investigating the role of biological rhythms (ultradian and circadian) in metabolism. His scientific background is in cell biology and bioinformatics, and Isaiah has keen interest in raising awareness of EDI causes within his university. He has been a part of many schemes and events that celebrate and raise awareness of diversity within academia as well as highlighting inequity of certain groups within academia. Isaiah is originally from the Philippines, and grew up in London, and is the first in his family to be doing a doctorate.*



Continued



*Dr Katharine Hubbard (she/her) is a Reader in Bioscience Education at the University of Hull and Director of Studies for the School of Natural Sciences. She is a National Teaching Fellow, Senior Fellow of AdvanceHE and the Royal Society of Biology HE Teacher of the Year 2016. Her background is in plant physiology, and she currently teaches cell biology and biotechnology. Her research interests are around inclusive education, awarding gaps, and effective STEM pedagogies. She established the Royal Society of Biology Bioscience Educators Network, and has developed an Inclusive Education Framework for HE funded by the Quality Assurance Agency.*

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