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Science & Society

Designing equity, diversity, and inclusion training for postgraduate parasitologists

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Equity, diversity, and inclusion (EDI) have received increased attention in the sciences, with increasing expectation that students will receive formal training in this area. However, compared with other biosciences, little guidance has been produced for parasitology educators. Therefore, this article presents the contents and evaluation of pilot training designed for postgraduates.

Equity, diversity, and inclusion in parasitology

In the ever-evolving landscape of science, the importance of embedding EDI in our professional lives cannot be overstated. It not only fosters a just environment where every scientist feels valued and supported in their work but is an essential catalyst for innovation and excellence in science. Diverse perspectives that include and involve all of us are thus better equipped to tackle the complex global challenges we are facing. Given that an understanding of parasitology plays a role in understanding and mitigating economic losses, influencing healthcare outcomes, and comprehending the evolving dynamics of parasitic organisms in the face of anthropogenic climate change, EDI is not only a moral imperative but a pragmatic necessity, yet it has not been given sufficient attention within the discipline [1].

To fully achieve outcomes leveraged through EDI, it makes sense to begin to embed EDI within the education of emerging

scientists, and approaches to doing so for educators have been given substantial attention within the broader landscape of the biological and life sciences. Yet, a critical gap remains within the field of parasitology as its educators have not yet been provided with the same level of guidance, and many examples of practices in action from the broader biological and life sciences can be deemed irrelevant. Therefore, this article aims to provide an example of a focused approach to EDI training for postgraduate parasitology students that other parasitology educators can adapt and build upon.

In order to achieve this, a pilot 3-hour training session was designed and delivered by the author within the module Key Skills in Parasitology as part of the MSc Parasitology and Pathogen Biology programme at (Queen's University Belfast). The learning design behind the training was informed by an adapted version of the Ward–Gale Model, aiming to foster not only critical engagement with the topics at hand but society at large [2], as well as the work of Shahjahan *et al.* that advocates for equipping students to disrupt harmful societal practices [3]. As such, the learning outcomes of the session were:

- Discuss the key concepts of EDI and how they interact with science generally and parasitology as a discipline specifically.
- Recognise the impact of biases and prejudice on science and the discipline of parasitology.
- Reflect on the presence of unconscious bias in the self and others.
- Disrupt the impact of the biases and prejudices of others through the use of active bystander interventions.

Parasitology and the colonial period

One of the key issues in educating any group of students about EDI is demonstrating the relevance of it to their disciplines, as it can often be mistakenly seen as a social science concept rather than

an essential component of all scientific disciplines. Constructivist approaches to higher education place paramount importance on relevance for learners through real-world context and the use of storytelling to engage learners in the process of organising and understanding information, as well as activating an emotional resonance. As such, the class began with a presentation on the so-called Golden Age of Parasitology (1879–1924) during which great strides were made in the discipline [4]. Advances in parasitology during this period were attributed to growing curiosity in this area and fostered by improvements in related knowledge such as microscope technology. Students were then introduced to the additional context surrounding this: a driving force behind these breakthroughs was often the colonial expansion of Western powers and their economic need to address the harm caused by parasitic organisms on colonising administrators, indigenous labourers, and livestock within these colonial settings. These discoveries were frequently made by the colonial powers, who exploited indigenous knowledge without recognition. One illustrative example of this is *Trypanosoma rhodesiense*, which was studied extensively during this period in what is now Zimbabwe, previously Rhodesia, named after the mining magnate Cecil Rhodes whose British South Africa Company facilitated the violent political and economic subjugation of the local population [5]. In other parts of the world, a lack of informed consent from research participants was prevalent, as exemplified by Carlos Chagas' data collection from rural Brazilians [6]. Concurrently, a pervasive narrative stigmatised parasites as existing only among the socially and economically marginalised population, epitomised by Oswaldo Cruz's campaign of forced vaccinations and public health measures specifically targeting the Afro-Brazilian population [7]. Unironically, both men were descended from the wealthy Portuguese merchant class who had first brought enslaved people

from the continent of Africa to support the export industry. The presentation concluded with a discussion of how this legacy persists today, such as in health disparities in the treatment of parasitic diseases in Black American populations [8].

Context and key terms for students

Once students were 'hooked' with an understanding that parasitology as a discipline always had and still can have a flavour of injustice to it, we began to unpack the meaning of key terms in this area (equality, equity, diversity, and inclusion), and how they are fundamentally interlinked. This was supplemented by a discussion of the local equality legislation.

Unconscious bias

In order for students to understand why these issues have come about, they received a presentation on the evolutionary and social psychology roots of (un)conscious bias and how this creates stereotypes, prejudice, and discrimination. This included dual-process theories and associated cognitive biases like the just-world fallacy, the fundamental attribution error and the ultimate attribution error, categorical thinking, and the influence of in-groups

and out-groups on our thinking [9]. Student engagement for this section of the activity was enhanced by the use of starter activities: a thought experiment demonstrating unconscious bias, followed by polling on whether they had heard common stereotypes in parasitology, such as those levelled at women, scientists from low- or middle-income countries, and LGBTQIA+ individuals. This section concluded with a discussion on approaches to reducing and preventing unconscious bias.

Active bystander intervention

The training also hoped to equip students with the ability to challenge bias in others once they had challenged bias in themselves. Active bystander intervention provides people with the strategies to intervene if someone is being abused, harassed, or are otherwise having their identity challenged [10]. Students were taught about the bystander effect and how to overcome it, as well as the 5Ds of being an active bystander [11]. They had an opportunity to practice being an active bystander in small groups through crafting responses to scenarios tailored to parasitology.

Training evaluation

To evaluate the impact of the pilot on students ($n = 11$, $N = 18$), they anonymously completed the Social Justice Scale [12] before and after the session which was analysed using a paired sample t test (Table 1). Overall, the results suggest that the students have become more aware of the negative social attitudes of themselves and others, and feel better equipped to challenge social injustice, but there is no quantitative evidence that they are more likely to do so, as it appears that behavioural intention did not change.

After the session, students also completed the Diversity Fatigue Scale [13]. Scores ranged from six to ten. With the highest possible score on the scale being 30 (most fatigued with diversity initiatives), the low scores suggest that students were not fatigued with diversity-related work after this training session. However, individual items that did score marginally higher for agreement on average, compared with other items and to their peers, were the statements 'I am uneasy that diversity classes are required for students at my university' and 'I worry that my university has neglected other important

Table 1. Paired sample t -test results for pre- and post-training measures

	Mean	Std Dev	S.E. Mean	Paired t -test		
				t value	df	Sig (two-tailed)
Attitudes pre	72.5	3.33	1.003	-3.39	10	0.003***
Attitudes post	74.4	3.35	1.012			
Subjective norms pre	20.2	3.71	1.119	-1.74	10	0.056*
Subjective norms post	21.7	4.47	1.349			
Perceived behavioural control pre	28.7	2.97	0.895	-2.84	10	0.009***
Perceived behavioural control post	30.4	3.50	1.055			
Behavioural intention pre	25.2	1.99	0.600	-1.11	10	0.147
Behavioural intention post	25.7	2.00	0.604			
Social Justice Scale pre	146.5	8.00	2.413	-3.88	10	0.002***
Social Justice Scale post	152.2	10.62	3.202			

* $P < 0.1$; ** $P < 0.05$; *** $P < 0.01$

issues because of too much focus on diversity initiatives'. Students were also encouraged to share qualitative feedback on their opinions of the training (Box 1). Though limited in sample size, the feedback overall suggests that this was a useful and informative session.

Recommendations for training design

The evidence collected suggests that the training was a successful pilot from which further training could be developed. In addition to standard discussions of EDI generally and in science, exploring the intersection of the history of parasitology and the colonial period served to set the training in context to better engage students. However, it is acknowledged that not every topic could be covered, and in such depth, so there are a range of other topics that could be included such as more active decolonisation of parasitology, further discussion of social marginalisation (locally and globally), racial inequity, gender parity, and LGBTQIA+ issues, as well as a more specific focus on certain parasitic infections that intersect with these social nuances such as *Schistosoma haematobium* (female genital schistosomiasis) or *Plasmodium falciparum* (placental malaria). Students can also have the relevance of the topic localised by presenting both global and institutional data, such as racial or gender imbalances in student cohorts, career progression and research funding awards.

Incorporating content on unconscious bias addressed students' subjective norms while training in active bystander interventions

improved perceived behavioural control. Overall, this increased the awareness of these issues in students and made them better equipped to act against them if they needed to do so. However, the training did not make them any more likely to act. Evidence from related training programmes suggests that demonstrating that others would look upon them acting more favourably than initially perceived, as well as regular follow-up sessions, would increase this likelihood to act [14]. However, limiting the number of sessions directly related to EDI is efficient in keeping diversity-related fatigue low. Therefore, it is important that educators account for pace and saturation of their training to retain student interest without leading to disengagement. One potential method is a more embedded approach, in which these issues are touched on throughout the students' educational experience, rather than just touchpoint sessions, which may create a culture of positive regard, maintain the salience of these issues, and allow explicit training to be more targeted on building action rather than awareness. There was some worry, although minor, about classes on EDI being mandatory, and that this may have come at a cost to other institutional priorities. This may be related to system-justifying beliefs whereby one's status and achievements in life are seen as purely a result of their own endeavours, and that EDI is viewed as charity at best and unfair at worst, so this could be overcome by training that further emphasises how everyone benefits from EDI and how it can be an enabler of other aspects of institutional life [15].

In conclusion, this article has advocated for the importance of EDI in parasitology and presents a successful pilot training session for postgraduate students. It highlights the need for continued efforts to bridge awareness and action within the educational experience. This training, and hopefully others based on it, represents a significant step toward a more inclusive and informed generation of parasitologists, poised to tackle complex challenges with empathy and justice.

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Declaration of interests

The author declares no competing interests.

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Box 1. Qualitative feedback from students on the training

- I found this class to be very useful and informative. I felt engaged with the conversation. I genuinely feel I am leaving class with more knowledge from the training. Thank you!
- I enjoyed the training and the relevance to parasitology in particular.
- Really beneficial session. I'd never received a class on this before and found it really interesting, especially the colonial roots of parasitology.
- Today helped my own understanding of how I was unaware I had been affected by social injustice along with friends, family, and colleagues.

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