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# Integrating global perspectives in biomedical science education: the role of project-based learning in addressing Western-centric paradigms and enhancing student preparedness for global health challenges

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Biomedical Sciences education has traditionally focused on Western paradigms, often overlooking the health challenges faced in less economically developed countries. Integrating global perspectives is essential, yet institutional guidelines lack clear directives for doing so. This perspective paper proposes a project-based learning (PBL) approach within undergraduate biomedical sciences modules, which focuses on tropical infectious diseases to promote decolonized learning by contrasting the Global North and South. In this model, students will work collaboratively to learn problem-solving techniques relevant to real-world issues like tropical diseases. Although in theory PBL is a useful way of learning, there are potential challenges with group dynamics and engagement. This paper discusses the various benefits and limitations of implementing this approach.

## KEYWORDS

project-based learning, decolonisation of curriculum, biomedical science education, tropical diseases, global north, global south, Eurocentric curriculum

## 1 Introduction

Decolonising biomedical science education is essential for creating a more inclusive and globally relevant curriculum (Gopal, 2021). In response to this need, we propose an active learning approach to teaching tropical diseases of the Global South within a biomedical science degree, utilising project-based learning (PBL) in seminar settings. Tropical diseases, predominantly affecting regions in the Global South, have historically been underrepresented in Western-centric undergraduate biomedical curricula (Lu et al., 2024). By integrating these critical global health issues into our teaching, we aim to broaden students' perspectives and challenge the traditional boundaries of biomedical science education.

This paper proposes the implementation of PBL as a pedagogical strategy to engage students in active learning about tropical diseases. Through collaborative, research-driven work, students will not only gain a deeper understanding of the biological and socio-economic impacts of these diseases but also develop critical thinking and problem-solving skills (Pranjol et al., 2022). This approach aligns with decolonization efforts by emphasising the importance of global health equity and encouraging students to consider diverse perspectives in their scientific training.

## 2 The rationale for a diverse biomedical sciences education

As globalization continues to shape the landscape of public health, it becomes increasingly critical for biomedical science education to encompass a global perspective. The increasing interconnectedness demands that biomedical science education not only address local health challenges but also prepares students to engage with broader global issues. This could involve incorporating systems thinking around environmental sustainability for healthy ageing in teaching and learning to achieve greater pedagogical benefits (Chiu et al., 2022).

For instance, many of the major health challenges facing the world today, such as pandemics, infectious diseases, and antimicrobial resistance, transcend national borders (Baker et al., 2021). This can be attributed in part to demographic and technological changes that have reshaped how populations interact across the globe. Global mobility has increased with the rise of cheaper and faster travel (with airline flights doubling since 2000) and migration driven by economic, political, and environmental factors (Baker et al., 2021). Such connectivity can introduce disease vectors to new regions; global air travel is thought to have played a key role in the rapid spread of SARS-CoV-2, with genetic analyses revealing multiple introductions of the virus by air travel in the Middle East, north California, and Brazil (Baker et al., 2021). Climate change is also known to have an impact on the spread of disease; Mora et al. (2022) assert that 58% of known human infectious diseases have at some point been aggravated by climatic hazards, with empirical cases revealing 1,006 pathways in which climatic hazards lead to pathogenic diseases (Mora et al., 2022). These changes are eroding the geographic barriers that once contained certain health issues, and students should be prepared for these changing health dynamics (Baker et al., 2021).

Furthermore, health outcomes vary significantly across different regions of the world due to factors such as genetic makeup, socioeconomic conditions, healthcare infrastructure, and cultural practices; an awareness of this is thus important to consider when treating patients (Javed et al., 2022). People of color in particular often experience social and environmental barriers (i.e. limited access to healthcare, unsafe living conditions, lower-quality education experiences) that predispose them to higher risk of poor health outcomes such as cardiovascular disease (Javed et al., 2022). Similarly, Lennon et al. found that despite lower dementia prevalence in black participants, they showed more dementia risk factors, cognitive impairment, and neuropsychiatric symptom severity compared to white participants (Lennon et al., 2021). Alzheimer's disease management in the UK reflects similar issues; black patients are less likely to engage with Alzheimer's related diagnosis and treatment (potentially due to socioeconomic circumstances and access to healthcare issues), and South Asian and Black populations were found to die earlier than their white counterparts and lose more years in life despite being diagnosed at younger ages (Mukadam et al., 2022; Logue et al., 2023). The younger diagnosis and earlier deaths of these populations necessitates targeted research into the genetic, environmental, and cultural factors that contribute to these disparities, as well as personalized approaches to diagnosis and treatment.

The latter examples thus highlight a lack of understanding of disease mechanisms in ethnic populations, whilst also offering an opportunity for precision medicine. Despite Africa having the greatest human genetic diversity, much of medical innovation takes places

outside the continent and without sufficient consideration of African populations in studies; there is a significant lack of understanding of dementia mechanisms in indigenous African populations due to the underrepresentation of African samples in research studies (Maina et al., 2023).

Thus, introducing this diverse and global perspective of diseases and management to biomedical science students is crucial during their studies. The growing cultural diversity within the UK creates the need for healthcare professionals equipped to provide competent and compassionate care to all patients (Salway et al., 2020). Understanding the social, cultural, and environmental determinants of health through incorporation of diverse perspectives in higher education can be crucial in delivering culturally sensitive care and improving health outcomes for diverse populations (Lu et al., 2024). An awareness of global health issues also helps foster a sense of global citizenship and responsibility within students. Lunn asserts how knowledge of diverse political, environmental, and socioeconomic issues help students make sense of modern global issues, fostering skills that create graduates who can "contribute to the nation's economic, social, and political life in an increasingly interdependent world" (Lunn, 2008). By integrating these perspectives into their education, students gain a broader understanding of global challenges but also develop the skills and desire needed to address them. This holistic education thus empowers them to become active, informed citizens capable of making meaningful contributions both locally and globally, enhancing their personal and professional growth.

## 3 A lack of guidelines for a global biomedical sciences education

Despite the need for a more comprehensive approach, current global awareness among students appears insufficient (Lunn, 2008). Surveys reveal troubling gaps in graduates' knowledge of global issues; the RoperASW survey commissioned by the National Geographic found that a significant percentage of young people from various countries, including the UK, struggled with basic geographic knowledge, such as locating Afghanistan or the Pacific Ocean (RoperASW, 2002). Furthermore, the international exam board Cambridge Assessment International Education's Global Perspectives Survey, which surveyed over 11,000 students aged 13–19, revealed that although 96% of students believe it is important to learn about global issues in school, up to 31% reported not having sufficient opportunities to do so (Cambridge Assessment, 2020).

Further concerns are raised by the Sussex Centre for Migration Research, which notes low outward mobility of UK students compared to other European countries and a lack of interest in experiencing other cultures (as evidenced by declining participation in exchange programs such as Erasmus) (King et al., 2004). This is concerning considering the benefits of international experiences to personal and professional development, for instance the development of intercultural competences and tolerance toward other values and cultures (Nada and Legutko, 2022).

Biomedical Sciences education in the UK follow a similar pattern. The Institute of Biomedical Science (IBMS) and the Quality Assurance Agency for Higher Education (QAA), key bodies in overseeing the standards and quality of UK biomedical science education, both lack clear directives for the integration of global perspectives. QAA

guidelines on the matter are limited to a single sentence in the Subject Benchmark Statement, stating that “*they should be designed to address issues in global healthcare, including factors affecting access to good quality diagnosis and treatment*” (QAA, 2023). Moreover, students from minority backgrounds are not represented by the current biomedical science curricula, potentially leading to a wider awarding gap (Lu et al., 2024).

This gap highlights a broader issue within the curriculum, which often perpetuates a narrow Eurocentric view of biomedical sciences which fails to incorporate contributions from diverse scholars and overlooks the health challenges faced outside North America and Europe. There remains a need for more comprehensive and actionable guidelines in order to equip educators with the knowledge and skills to teach from a global perspective and foster an educational environment that values diverse viewpoints, thereby better preparing students for global health challenges of the 21st century.

## 4 Project-based learning and the relevance of decolonial pedagogy to broadening student perspectives

The inadequate integration of global perspectives in biomedical sciences education can be traced, in part, to the historical and ongoing colonization of STEM higher education. This refers to the dominance of Eurocentric frameworks and methodologies that have shaped curricula, research, and pedagogical approaches in STEM fields, which is rooted in historical colonial events and ideologies (Lalujan and Pranjol, 2024).

For instance, a study by Pan et al. (2012) revealed that North America and Europe received 42 and 35% of global citations, respectively, (Pan et al., 2012), whilst a life sciences reading list analysis at the University of Sussex showed that most authors were white (83.4% white vs. 7.4% Black, Asian, and minority ethnic (BAME)) and male (75.9% male vs. 16.7% female) (Taylor et al., 2021). This imposition of a Eurocentric perspective and epistemology as the universal standard has manifested as a marginalization of contributions from indigenous scholars, and it is thus unsurprising that current biomedical sciences education lacks adequate integration of global perspectives.

Further evidence for the need to broaden perspectives is seen in a recent study, which aimed to explore attitudes and understandings of students and staff toward decolonising the curriculum at the University of Bristol (UK) (Lu et al., 2024). The mixed methods study surveyed 71 staff members, 121 students, and also conducted focus group interviews. The results of this study revealed that students from minority ethnic groups felt significantly less represented by content and scientists in the curriculum than their white counterparts, with the majority of black students feeling “not at all” represented. This feeling may be attributed to the predominantly Eurocentric nature of the curriculum previously discussed, coupled with a lack of diversity among academic staff, who, like the student body, are primarily white (Lu et al., 2024).

Decolonial pedagogy provides a framework for addressing these issues by challenging the traditional narratives that have historically marginalized diverse viewpoints. For instance, PBL is a “student-centred, inquiry-based instructional approach where learning is achieved through hands-on activities centred around questions,

challenges, or real-world problems” (Lalujan and Pranjol, 2024). Students are typically posed a real-world situation that requires them to work together in groups; learning is achieved through engaging with this extended inquiry to produce a tangible product/outcome. Alongside its pedagogical benefits in engagement and learning, PBL is able to achieve several decolonial elements such as collaboration, knowledge consolidation, and enhancing transferable skills, as discussed previously (Lalujan and Pranjol, 2024).

### 4.1 Collaboration and knowledge integration and consolidation

The collaborative nature of PBL allows students to share their experiences with each other, promoting a more inclusive learning environment in which diverse viewpoints, values, and knowledge systems are recognized and acknowledged. Power relations are also addressed as the activity offers a more horizontal approach in which knowledge is co-created; Cain and Cocco describe this as a flat leadership model in which “leaders are situational and collaboration is dynamic and non-coercive” (Cain and Cocco, 2013).

Students engage in discussions that help them form differential diagnoses by drawing on a wide range of knowledge sources, encouraging the recognition and validation of different cultural approaches to healthcare and diagnostic methods (Badge et al., 2024). This collaborative learning experience closely mirrors real-life practice in healthcare providers, where medical diagnoses are often made within multidisciplinary teams composed of professionals from various ethnic and cultural backgrounds. In the NHS, such teams bring together diverse perspectives, which is crucial for accurate and comprehensive diagnoses, particularly in a multicultural society. Currently, in the NHS, Black and minority ethnic (BME) staff represent nearly a quarter of the total workforce, accounting for 24.2% or 383,706 individuals—an increase of 27,500 since 2021, when they made up 22.4% of the staff (NHS-England, 2023). By working with peers from different backgrounds, students are effectively simulating this collaborative environment, learning to appreciate how cultural and genetic factors influence disease presentation and diagnosis.

Students can also integrate knowledge from their own backgrounds with contemporary biomedical practices and share this with others, creating a more comprehensive understanding of tropical diseases that includes social and cultural dimensions (Margaryan et al., 2004). For example, a student with firsthand experience of leprosy might highlight the stigma surrounding the disease, illustrating how such social factors affect patient care and disease management. This teaches others that diseases impact more than just physical aspects and that diagnosis and treatment should be approached with these additional factors in mind.

Furthermore, by interacting with students who share cultural values and experiences from the Global South, they gain invaluable insights into the healthcare challenges faced by these regions (Walkowska et al., 2023). This exposure helps them appreciate the global context of healthcare, which is increasingly important in a connected world where diseases know no borders. In essence, these proposed seminars will prepare students to work in diverse, multidisciplinary teams, equipping them with the cultural competence and diagnostic acumen that are essential for effective medical practice in the NHS and beyond. Therefore, this embedding

diversity and perspective of the global south into teaching biomedical science students should be considered a decolonised teaching method.

## 4.2 Enhancing transferable skills

PBL's hands-on and collaborative nature helps students develop transferable skills (e.g., analytical, problem-solving, communication) which are relevant in various contexts beyond the classroom and are crucial to personal and professional success. Colonial power dynamics are disrupted through development of these skills, which students can use to “engage with knowledge, adapt it to their contexts, and create new knowledge in future contexts” in order to become creators of knowledge rather than just recipients of knowledge (Lalujan and Pranjol, 2024). Students are empowered with the tools needed to navigate real-life situations, preparing them for careers in biomedical sciences across diverse cultural, social, and economic landscapes.

Global interconnectedness demands that higher education equips students with the skills to address complex global issues. Biomedical sciences education has traditionally been Western-centric, neglecting the teaching of health challenges of less economically developed countries. This narrow focus limits students' ability to handle global health emergencies and work in diverse, multicultural environments (Mudaly and Chirikure, 2023; Chiu et al., 2024). Current guidelines from institutions like the IBMS and QAA lack directives for integrating global perspectives, highlighting the need for new pedagogical approaches. Thus, teaching our students about tropical diseases utilising PBL through active learning, collaboration and knowledge consolidation could enhance students' learning experience.

## 5 Limitations of the tropical disease PBL approach

The success of PBL hinges on effective group collaboration. However, issues such as unequal participation, dominant personalities, or conflicts within the group could hinder the overall learning experience (Le et al., 2017). Power dynamics, which are traditionally thought to exist between staff and students, can also emerge within groups through differences in gender or social class, thereby affecting engagement and distribution of contributions (Lalujan and Pranjol, 2024). In some cases, certain voices might not be heard, counteracting the decolonial intent of the exercise. Additionally, cultural and interpersonal barriers may hinder effective collaboration, particularly in diverse groups where differing communication styles and expectations can create tension (Poort et al., 2020). These challenges are frequently exacerbated by poorly designed group tasks and insufficient guidance (Reid and Garson, 2016). Thus, the success of group work relies on careful planning, clearly defined objectives, and proactive facilitation to mitigate these issues and maximize its benefits.

Technology can play an important role in addressing collaborative challenges. One such tool is BuddyCheck, a peer evaluation platform designed to enhance fairness and accountability in group work in a final year biomedical science module (Wood and Pranjol, 2024). In this model, BuddyCheck was applied to the entire activity. Here, students can anonymously assess the contributions of their peers in several categories (e.g., knowledge, contribution), allowing for a more

accurate reflection of individual contributions and identifying any discrepancies in participation (Wood and Pranjol, 2024).

## 6 The future of the global, decolonised pedagogy

Academic subjects beyond biomedical sciences are also subject to remnant colonial ideologies; the increasing interconnectedness of the world and relevance of global issues occur not only in the realm of health and other disciplines should thus also incorporate diverse perspectives in their education.

A key advantage of PBL lies in its flexibility as it serves as a framework that can be adapted to different contexts and needs. In this case, PBL could be applied through the lens of tropical diseases, allowing not only for decolonial elements and pedagogical benefits such as consolidation of learning and integrated exam preparation, but also for the incorporation of global perspectives.

Similarly, this incorporation of diverse perspectives through PBL can be adapted to other contexts. PBL has been successfully implemented in a civil engineering course at University College Dublin, with 90% of students agreeing it “improved their understanding of material delivered in traditional classroom settings” (Gavin, 2011). Building on these pedagogical benefits, the PBL exercise can be adapted to incorporate global perspectives such that students design infrastructure projects considering the needs of various communities, taking into account local customs, environmental concerns, and social dynamics. This not only broadens students' understanding of the challenges of engineering in a globalized world, but also trains them to design solutions that are culturally sensitive and sustainable, ultimately preparing them to work in diverse international contexts.

A further advantage of PBL relates to its replicability as it can be considered relatively easy to implement. A study in Oman of a grade 11 female environmental science class found that implementing PBL did not require more time or resources than traditional pedagogical methods, reinforcing its feasibility across different subject areas (Al-Balushi and Al-Aamri, 2014).

Further pedagogical approaches and modifications can also be explored to enhance the effectiveness of a decolonial and diverse education; authentic assessments present a promising avenue for broadening student perspectives and deepening their engagement with real-world issues. Authentic assessment, a concept emerging in the 1980s through the examination of primary and secondary school assessments (Archbald and Newmann, 1988), refers to the design of assessment methods that relate to “real-world” tasks, professions, and knowledge. Though this definition can be fragmented, it is generally understood as an approach that connects learning and academic tasks to practical applications, making learning more meaningful and relevant to students' futures (McArthur, 2022).

McArthur (2022) also suggests a shift in the understanding of authentic assessments, one which focuses not only on a student's preparedness for their future professions but also extends to their role in broader society, encouraging them to think critically about how their learning can contribute to solving global challenges such as climate change, healthcare inequities, and social injustices (McArthur, 2022). Students are better able to see the connection between their learning and its societal impact, fostering a deeper sense of purpose

and responsibility in their studies and as global citizens. Extending this authenticity further involves making the social importance of these tasks explicit—in this context, the need to broaden student perspectives is a critical goal of education that authentic assessments can help achieve (McArthur, 2022).

Incorporating authenticity into PBL exercises can thus enhance both the academic and decolonial elements present while also broadening student perspectives. For instance, authentic assessment design could incorporate the use of real, anonymized data from a patient with a tropical disease and mirror the diagnosis process in an actual lab setting. As the exercise is still PBL-based, the pedagogical and decolonial elements are still present, and as it is still tropical-disease-focused, the incorporation of diverse perspectives is also still present. Benefits of the authenticity include those mentioned prior, while also mitigating several challenges of modern education, particularly relating to the increasing use of artificial intelligence, academic integrity, and student inequities (Ajjawi et al., 2023).

## 7 Conclusion

As higher education continues to navigate the remnants of colonialism and the demands of an increasingly interconnected world, the need for pedagogical approaches that broaden student perspectives is pressing. This paper has proposed the implementation and impact of a tropical-disease focused PBL exercise in biomedical sciences; the exercise is designed to not only facilitate the consolidation of academic knowledge but encourage the integration of diverse cultural perspectives to foster a holistic understanding of global health challenges.

PBL thus offers a flexible and replicable framework that can be applied across various academic disciplines to similarly decolonize curricula and broaden perspectives. However, the success of PBL is contingent upon effective group dynamics, and challenges such as unequal participation and power imbalances must be carefully managed. The incorporation of technology, authentic assessment elements, and innovative models such as the Global Classroom can further enhance the impact of PBL and prepare students not only for their future professions but also for their roles as global citizens equipped to address complex societal issues.

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## Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

## Author contributions

JL: Investigation, Writing – original draft. MP: Conceptualization, Project administration, Supervision, Writing – review & editing.

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