Received: 30 November 2021 | Accepted: 20 December 2021

DOI: 10.1111/ele.13976

ECOLOGY LETTERS cnrs WILEY

VIEWPOINT

An intersectionality lens is needed to establish a global view of equity, diversity and inclusion

Rassim Khelifa[1,2] | **Hayat Mahdjoub**[3,4]

[1]Institute for Resources, Environment and Sustainability, University of British Columbia, Vancouver, British Columbia, Canada

[2]Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia, Canada

[3]Laboratory of Biology, Water and Environment, Faculty SNV-STU, University of 8 May 1945 Guelma, Guelma, Algeria

[4]Department of Botany, University of British Columbia, Vancouver, British Columbia, Canada

Correspondence
Rassim Khelifa, Institute for Resources, Environment and Sustainability, University of British Columbia, Vancouver, 429-2202 Main Mall, Vancouver, BC Canada.
Email: rassimkhelifa@gmail.com

Funding information
Schweizerischer Nationalfonds zur Förderung der Wissenschaftlichen Forschung, Grant/Award Number: P400PB_191139

Editor: Camille Mellin

Abstract

Equity, diversity, and inclusion (EDI) have become essential considerations in different academic fields in recent years, attracting an increasing number of voices and perspectives from different groups. There is a need for an intersectionality framework that is inclusive of both the local and global diversity of researchers. Here, we present an intersectionality framework called KLOB which structures barriers to academic success into four components: knowledge exchange (K), language (L), obligations (O), and biases (B), and thus helps to think about the cumulative effect of multiple barriers that individuals from different backgrounds encounter to succeed in academic activities such as scientific publishing, which is the primary currency of academic success in our current system. This framework highlights both local and global disparities in socioeconomic, linguistic, and discriminatory factors that determine the opportunity of individual researchers to succeed in academia. We emphasise that individual researchers have no control over most barriers they face because of where and how they were born. Implementing solutions to address barriers associated with KLOB requires a multiscale vision and initiatives that tackle local and global inequities.

KEYWORDS
bias, developing countries, discrimination, ecology, evolution, global south, science

MAIN

There has been a growing interest in the barriers that prevent scientists with different backgrounds from succeeding in science (Amano et al., 2021; Maas et al., 2021; Nuñez et al., 2021; Pettorelli et al., 2021). The recognition of the importance of equity, diversity, and inclusion (EDI) has started many years ago in STEM (Science, technology, engineering, and mathematics) (Ferrini-Mundy, 2013), but in ecology and evolution, we have witnessed an increased interest in EDI following the death of George Floyd in 2020 (e.g. publications, workshops, discussion groups) (Pettorelli et al., 2021; Trisos et al., 2021; Tseng et al., 2020). More than ever, scientists are actively trying to identify the occurrence of systemic discrimination that affects students and researchers from minoritised groups such as women, black, indigenous, LGBTQIA, and people from developing countries (Maas et al., 2021; Tseng et al., 2020). These groups are vastly underrepresented in student body, faculty positions, authorship on articles, and on editorial boards of most scientific journals (Evangelista et al., 2020; Nuñez et al., 2019). Unravelling barriers that inhibit minoritised groups to obtain leadership positions is crucial to create and maintain a diverse and inclusive academic environment (McGill et al., 2021; Nuñez et al., 2019). However, this requires a global vision that includes all diversities within the Global South and Global North to address the different barriers encountered by scientists at the local and global scale.

INTERNATIONAL VARIATION IN ACADEMIC PRODUCTIVITY AND IMPACT

The total number of publications and citations are often used as measures of academic achievement and success of researchers (Bornmann & Marx, 2014) and usually determine the opportunity to access academic positions or funding. However, academic productivity and impact vary considerably across countries (Maas et al., 2021). A correlation analysis between the total number of scientific articles (World Bank, 2018) and the number of highly cited researchers per country across all disciplines (Clarivate Plc, 2021) shows that countries that produce the highest number of scientific publications also have the largest number of highly cited researchers (Appendix S1). In the field of Environment and Ecology, 85.1% (172 out of 202) of highly cited researchers in 2021 were from the Global North. Both the total number of scientific journal articles and the number of highly cited researchers per country show a strong positive correlation with GDP (Gross domestic product) (Appendix S1). These results highlight the low geographic diversity in scientific productivity and impact among scientists. Here we try to offer a holistic intersectional framework that explains this geographic disparity as well as local variation driven by social identity (e.g. gender, race, people with disabilities).

INTERSECTIONALITY IN ACADEMIC OPPORTUNITIES

According to Bowleg (2012), 'Intersectionality is a theoretical framework for understanding how multiple social identities such as race, gender, sexual orientation, socioeconomic status, and disability intersect at the microlevel of individual experience to reflect interlocking systems of privilege and oppression (i.e. racism, sexism, heterosexism, classism) at the macro social structural level'. Thus, intersectionality is a suitable framework for understanding the impact of cumulative occurrences of privileges or barriers on individual success in academia based on the multiple identities of any one individual, such as nationality, race, ethnicity, class, gender, sexual orientation, and ability (Thomas et al., 2021). The intersectionality of gender and race has been thoroughly discussed (Arnold et al., 2020; Cantalupo, 2019; Ong et al., 2011), but researchers from many regions around the world face inequities in other linguistic and socioeconomic dimensions (Nuñez et al., 2021). Here, we discuss a general framework that helps the reader to think about intersectionality in academic success (S) (i.e. the ability of an individual to be productive and impactful in research) at the local and global scale based on four main components: knowledge exchange (K), language (L), obligations (O), and bias (B) [$S = f(K, L, O, B)$], where each component is determined by an array of factors (Figure 1a).

Knowledge exchange is a metric that depends on the economy of the country, educational institutions, one's mentors, and networking potential (Nuñez et al., 2021; Valenzuela-Toro & Viglino, 2021). The economy of a country is a large determinant of the quality of training because developed countries can invest more money into education and research, allowing to use cutting-edge technology and facilitating the transfer of knowledge and scientific productivity (Das et al., 2013). Universities play a crucial role in providing the resources (infrastructure), expertise (hiring the best scientists), funding, and other opportunities that affect the quality of education of students, their likelihood to pursue a science career, and the scientific productivity of researchers (Grogan, 2019; Khelifa et al., 2022). Also, the access to a supportive academic supervisor shapes the quality of training of students (Hund et al., 2018), availability of funding (Levitt & Levitt, 2017), the likelihood of successful accomplishment of the research, the size of the academic networks they build (Lunsford, 2012), and the impact factor of the journals in which they publish (Clement et al., 2020). Furthermore, networking potential is a powerful component of academic success that facilitates not only collaborations but also the transfer of knowledge and the discovery of new research, techniques, and tools (Roberts & Hilty, 2017). Researchers who go to conferences overseas have more opportunities to be exposed to the latest research and meet leading researchers in their field and create ties with them (Oester et al., 2017). However, many major international conferences are held in western countries (e.g. annual meetings of the Ecological Society of America) where researchers from the Global South often need to apply for visas, pay visa fees, and go through heavy paperwork to travel to international conferences whereas those from the Global North do not (Valenzuela-Toro & Viglino, 2021). However, nowadays social media and virtual conferences have reduced the difficulty of international interactions between scientists to a certain extent.

Language is the second major component of scientific success, particularly because English is the lingua franca in science and the ability of individuals to access the content of the literature and publish research in international journals depends on their knowledge of English (Ramírez-Castañeda, 2020). Although using a single language unifies and facilitates science communication, it also limits access to science to those who are proficient in English (Nuñez et al., 2021), which does not include those living in many developing countries. For countries whose main language is not English, students and researchers must invest heavily in English training (locally or overseas) and, ideally, receive it from an early age so they have a greater likelihood of mastering the language and succeeding in science (Amano et al., 2021).

Obligations are duties that are financial, family-related, health-related, administrative, or adaptive,

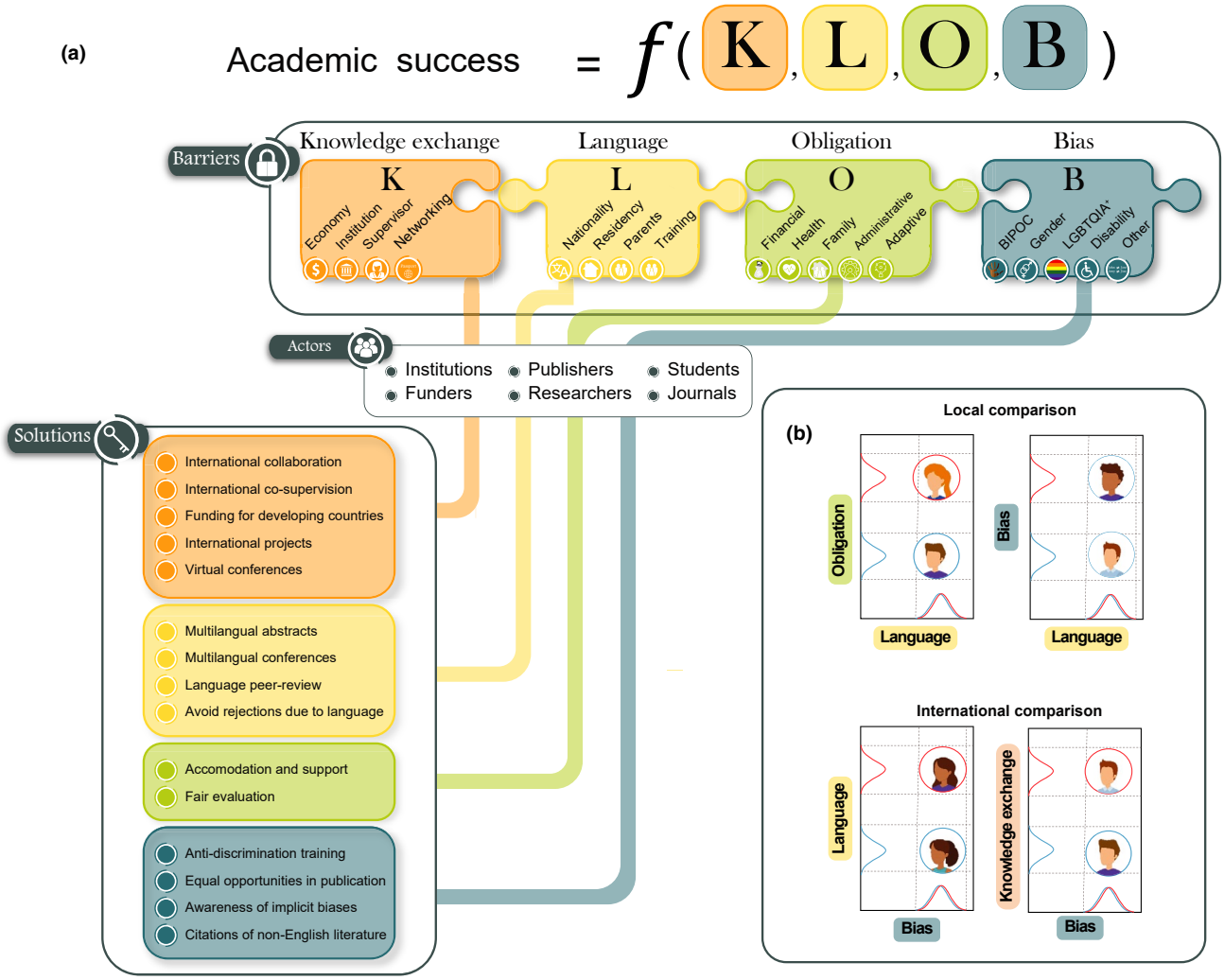

FIGURE 1 A simplified diagram of an intersectionality framework that explains academic success, highlighting the barriers and solutions. (a) Academic success depends on knowledge exchange (*K*), language (*L*), obligation (*O*), and bias (*B*). Each component is determined by different factors. *K* depends on the institution, economy of the country, supervisor, and access to international travelling. Advantages in *L* are related to English proficiency which is determined by the nationality, residency, parents, and training. *O* varies among individuals with different identities, and it increases for women, people with disabilities, people without financial security, and those who need to learn English. *B* is mainly driven by whether an individual belongs to BIPOC (black, indigenous, or people of colour), particular gender, LGBTQIA+, has disabilities, and others. (b) The consideration of one dimension obscures the real variation among individuals. For instance, individuals with the same linguistic skills might have received different training in different countries, or individuals with the same training can be affected differently by biases

preventing an individual from accessing higher education or, if enrolled, limiting the amount of time allocated studying and/or doing research. Obligations affect a large number of people from different identity groups, but some are more prone to heavy obligations than others. Historically minoritised groups such as Black and Indigenous people do not often have the financial prosperity that white people have (Darity et al., 2018), and often have to work while attending university. Women have more duties than men outside the work environment because they are often responsible for the household, child care, and family support in case of an illness (Grogan, 2019). People with disabilities (physical and mental) have to allocate substantial time for medical appointments and self-care to sustain their health and stay focused on scholarly activities (Powell, 2021). Students and researchers whose main language is not English must invest heavily in English training while studying or doing research, and when they study in a foreign country, they also have to adapt culturally and spend time doing their immigration paperwork (Khanal & Gaulee, 2019). Obligations also affect students, researchers, or faculty members who have different loads of teaching and administrative duties (e.g. faculty meetings, student advising, application evaluation, job interviewing).

Biases are another force that prevents people from succeeding and reaching leadership positions (Chaudhury & Colla, 2021). Some identity groups are more likely to meet favouritism whereas other groups often endure exclusion. In STEM, discrimination against Black, Indigenous, and

People of colour (BIPOC), white women, LGBTQIA+, and people with disabilities in academic hiring and success recognition is common (e.g. Hofstra et al., 2020). Whether explicit or implicit, people in power make assumptions about individual performance based on their identity (Eaton et al., 2020). Social biases are important barriers for minoritised people because, regardless of the level of training and language proficiency that individuals have, discrimination could drastically reduce their probability of success.

Overall, there are multiple factors that affect individual performance in research, and addressing a single barrier does not solve the issues related to EDI either at the local or at the global scale (Figure 1b).

CORRELATION BETWEEN DETERMINANTS OF KLOB

We argue that the high international disparity in academic success, particularly between the Global North and Global South, is mainly due to the accumulation of disadvantages in multiple factors that determine KLOB (Figure 2). Using data on 96 countries, we investigated the potential correlation of three factors (economy, English proficiency, and access to international travelling) that determine *K* (GDP and visa-free score) and *L* (English language proficiency score) (Figure 2a-c, see Appendix S1). The economy, English proficiency, and access to international travelling were positively correlated (Figure 2d-f, see Appendix S1), showing that researchers from wealthy countries often have better English proficiency and much fewer restrictions to travel worldwide than researchers from developing countries. This positive association shows that, on average, researchers in the Global South are more prone to face multiple barriers that require time, efforts, and money, which exacerbate their obligations (*O*) to meet the standards of people who wield power in academia (mostly white men from developing countries). It is important to highlight that although our international perspective describes disparities among countries in *K* and *L*, there are also differences within countries driven by socioeconomic background, race, gender, and other social identities (Figure 2g). A genuine comprehension of EDI should be based on the understanding that the main drivers of academic success go beyond the control of individual students and scientists (Zivony, 2019).

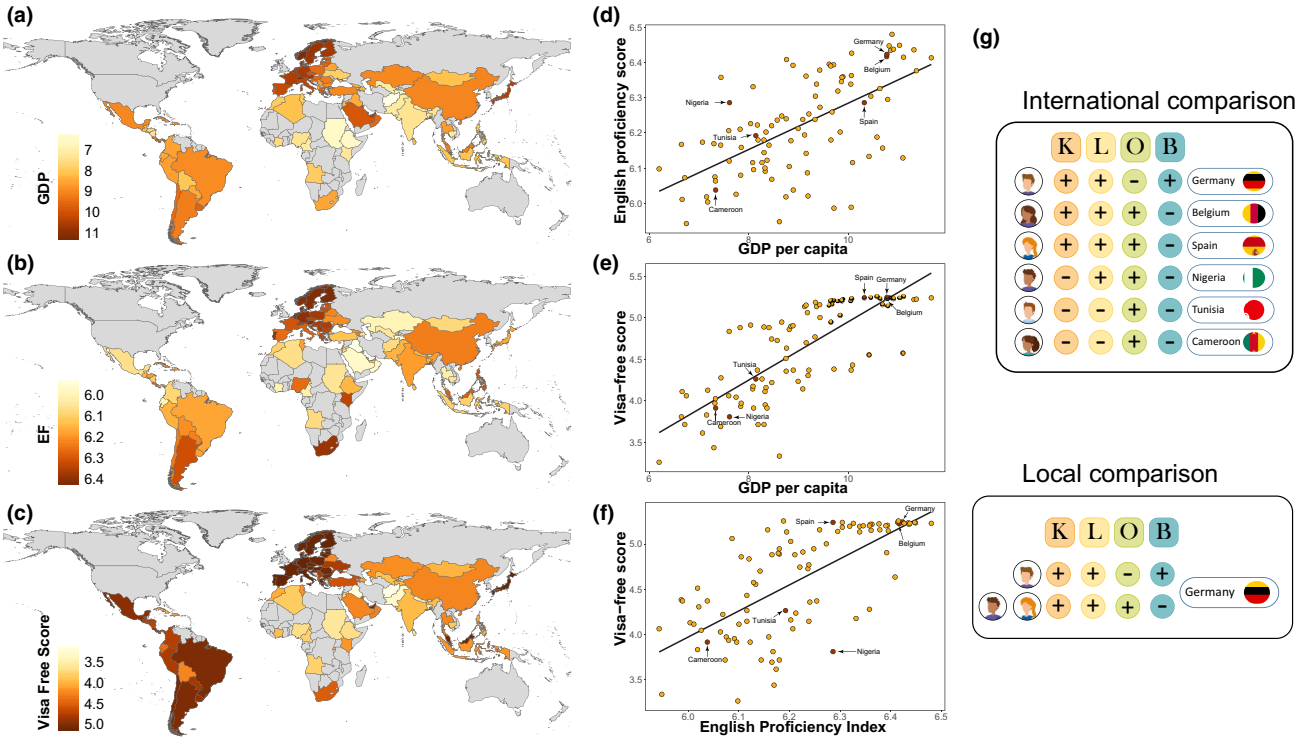

FIGURE 2 Correlation between determinants of academic success. Maps showing the gross domestic product per capita of 2018 (GDP) (a), English proficiency score (EF) (b), and visa-free score (c) in 96 English as Foreign language countries (more details in Appendix S1). All three variables were log-transformed. d. Correlation between GDP and EF. e. Correlation between GDP and visa-free score. f. Correlation between EF and visa-free score. In d-f, we highlight three Global South countries (Nigeria, Tunisia, and Cameroon) and three Global North countries (Germany, Belgium, and Spain). The black lines are linear regressions. Theoretical chart applying the KLOB framework [Success = f(Knowledge exchange[*K*], Language[*L*], Obligation[*O*], Bias[*B*])] in random individuals from the six countries (g). The chart shows that because economic status is generally positively correlated with English proficiency, researchers from the Global South have often at least two components (*K and L*) below average (−) while researchers from the Global North have typically these two components above average (+). The chart also illustrates that within each country, researchers from different backgrounds (ethnicity or gender) could be affected by *O* and *B*

IMPLICATIONS OF INTERSECTIONALITY IN GLOBAL CHALLENGES

Global biodiversity conservation requires the involvement of many nationalities from the Global South and the Global North as well as the empowerment of local populations worldwide. The goal of global biodiversity conservation is very difficult to achieve because access to knowledge is currently localised, mostly unilingual, not inclusive of indigenous people, and not equally transferred across countries (Amano & Sutherland, 2013; Fletcher et al., 2021; Kashwan et al., 2021). Countries that have the greatest barriers to publish their research in international journals often also have global biodiversity hotspots where valuable ecological knowledge is still unshared. In these areas, research has been historically carried out by scientists from the Global North (Wilson et al., 2016), a practice commonly known as helicopter research (Haelewaters et al., 2021). Addressing these issues should involve diversifying expertise (i.e. supporting the training of a more geographically and socioeconomically diverse group of scientists), including indigenous knowledge, and reducing barriers to knowledge transfer with developing countries, which involve solving issues related to *K*, *L*, *O*, and *B* (see below).

CONCLUSION AND PERSPECTIVES

We hope that our intersectionality framework (KLOB) (Figure 1a) will help readers to develop a broad understanding of EDI and facilitate the process of finding solutions that tackle barriers that impede some identity groups from reaching leadership positions. Developing strategies to address EDI issues should involve different actors, including the scientific community, universities, funders, publishers, journals, and institutions. At the global scale, addressing inequities in *K*, *L*, *O*, and *B* requires finding solutions to the language barrier, knowledge transfer, and scientific networking (Amano & Sutherland, 2013) through initiatives such as generalising multilingual abstract and title in all journals (Amano et al., 2021), promoting international collaborations (Gui et al., 2019), and integrating virtual component for international conferences (Raby & Madden, 2021). At the local scale, we should promote policies that enhance diversity in institutions and societies and prevent discrimination (McGill et al., 2021) by fostering training in EDI, implicit biases, and fair evaluation (Tseng et al., 2020).

ACKNOWLEDGEMENTS

R.K. was supported by the Swiss National Science Foundation (P400PB_191139). We thank Leithen K. M'Gonigle, Melissa Guzman, Amy Angert, and Darwin Sodhi for helpful comments and suggestions. R.K. is grateful to the Equity, Diversity, and inclusion discussion group at UBC for fruitful discussions.

CONFLICT OF INTEREST

The author declares no conflict of interest.

AUTHOR CONTRIBUTION

RK and HM conceived the idea, analysed the data, and wrote the manuscript.

PEER REVIEW

The peer review history for this article is available at https://publons.com/publon/10.1111/ele.13976.

OPEN RESEARCH BADGES

This article has earned Open Data Design badge. Data design and analysis plan are available at: https://doi.org/10.6084/m9.figshare.18093221.

DATA AVAILABILITY STATEMENT

The authors confirm that the data supporting the results are available on Figshare: 10.6084/m9.figshare.18093221.

ORCID

Rassim Khelifa https://orcid.org/0000-0001-6632-8787
Hayat Mahdjoub https://orcid.org/0000-0002-8972-9628

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How to cite this article: Khelifa, R. & Mahdjoub, H. (2022) An intersectionality lens is needed to establish a global view of equity, diversity and inclusion. *Ecology Letters*, 00, 1–6. Available from: https://doi.org/10.1111/ele.13976