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Editorial: Teaching palaeosciences to future generations

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Editorial on the Research Topic
Teaching palaeosciences to future generations

Introduction

Palaeosciences reconstruct past environments and climates through the study of a diverse range of biological and geological remains stored in natural archives (peat bogs, lake sediments) (Lowe and Walker, 2013). Data generated are used to understand the dynamics of Earth system interactions over a range of temporal and spatial scales. This is essential for assessing the impact of human activity, including testing and validating predictive models used to explain present patterns and predict future challenges (Bradley, 2014). The range of evidence employed means that the palaeosciences are truly interdisciplinary, drawing on biology, geology, archaeology, and geography, and can form part of the undergraduate curriculum in all four disciplines. This presents a particular pedagogic challenge, since student training is happening in a wide range of environments, all which have their own focus.

The long-term observations of earth systems generated by the palaeosciences are increasingly understood as important for addressing the major challenges facing the modern world (Gillson, 2015; IPCC, 2021), but awareness and understanding of their contribution is highly varied among the relevant professions. Therefore, it is important to consider and reflect on how this broad topic is communicated and taught in universities. Palaeosciences teaching includes both theoretical and practical aspects, and a typical undergraduate course or unit covers a wide range of material, from theoretical concepts to hands-on laboratory work. Regardless of the disciplinary label of the department, teaching often follows a "tried and true" sequence where students collect samples during a field trip and then analyze their samples in laboratory practicals, with lectures running alongside. Constraints on contact time, combined with the expectations and needs of a

diverse student body, can make this path challenging. Nevertheless, it is essential that teaching methods are appropriate and appealing so that new generations are aware of, and able to use, palaeodata.

Fieldwork is central to the palaeosciences, but assisting all students to get the most out of it when time and resources are limited is a challenge. Similarly, laboratory hours and access to equipment—such as microscopes—are often under pressure. Increasing awareness of the importance of inclusion to ensure that diverse students can all take part effectively also challenges the assumption that "tried and true" is always best.

Experiences during the pandemic "pivot to online" led to much wider engagement with online learning than before (Bacon and Peacock, 2021), including the production of new materials, and to lived experience of teaching in different ways. This forms the basis of an opportunity to develop richer future pedagogies that are more inclusive of diverse students and teaching methods.

An example of this pedagogy is the use of virtual field trips (VFT) to support (rather than replace) in-person field experiences in the palaeosciences. This provides benefits to both students and staff, including helping participants to visualize and prepare for the field localities to be visited, which in turn leads to more effective time spent in the field (Stainfield et al., 2000; McDougall, 2022). VFT also allows sites to be revisited—a real bonus for students with disabilities, seen and unseen—and can be beneficial to all students, especially in the case of poor weather. VFT can also extend the field experience by providing visits to other sites that, pedagogically, may assist student understanding because they are similar or completely different.

The goal of this Research Topic was to stimulate the sharing of good practice and new developments around teaching methods within the palaeosciences. The collegial sharing of methods, experiences, and recommendations was greatly encouraged by the COVID-19 pandemic "pivot to online", and led to the development of the Virtual Palaeosciences project (Hutchinson et al., 2022; https://virtualpalaeoscience.uk/), a community of practice focused on palaeoscience education. Pedagogical ideas are always developing, and the more extensive use of active learning, flipped classrooms, and online tools is opening a range of new opportunities.

Challenges and developments in teaching palaeosciences

Most educational research and development of teaching resources is undertaken in universities, but much of this work remains "in-house" and unpublished, meaning that academics are often "reinventing the wheel". As an interdisciplinary subject being taught in many different departments, palaeosciences has the potential to develop in many directions, but also faces more structural barriers to communication. This Research Topic gives insights into some of the challenges and developments that have happened recently in educating new generations of palaeoscientists. Palaeoscience education focuses on problem solving, hands-on experiential learning, interdisciplinarity, communication, competence development, and collegial sharing. Revisiting standard elements such as field work, laboratory work or museum visits can lead to new developments such as the game *Surviving Extinctions* (Mead et al.). Virtual field trips, field guides and other online tools make the subject available to a wider audience (Carter et al.), both students and the public. Kelly and Dietl highlight the challenge posed by the between what we teach, and the "real-world" problems students will encounter, especially in relation to conservation and management.

As highlighted by Barbolini, university teachers must have many skills and roles. They must be motivated and skilled to share their own and published knowledge, overcome the barriers to sharing this knowledge, and feel that there is some institutional support. Communication with the public and teaching at a variety of academic levels requires an understanding of the audience, a true personal responsibility to share the knowledge, and a set of skills in communication (Barbolini, Dewar et al.). Sharing these communication skills with students is important in any subject, and Dewar et al. share some of the modules they use. In addition to developments in teaching methods, diversity of staff members is also important, and as a STEM subject the palaeosciences have challenges to address here too (Carter et al.).

By showcasing research and sharing experience and practice, this special issue capture the recent development and innovation for the longer-term good of the field and its students. The papers in this Research Topic are all based on how to communicate and transfer the knowledge of scientific methods, important results, knowledge, and the general use and importance of palaeoscience better and more effectively to students as well as the public.

Author contributions

AB wrote the first draft of this editorial. All co-authors edited the text and provided the final version of the manuscript. All authors proposed the Research Topic, contributed to the article, and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Bacon, K. L., and Peacock, J. (2021). Sudden challenges in teaching ecology and aligned disciplines during a global pandemic: Reflections on the rapid move online and perspectives moving forward. *Acad. Pract. Ecol. Evolut.* 11, 3551–8. doi: 10.1002/ece3.7090

Bradley, R. S. (2014). *Paleoclimatology: Reconstructing Climates of the Quaternary*. Oxford, UK: Elsevier Science and Technology.

Gillson, L. (2015). *Biodiversity Conservation and Environmental Change: Using Palaeoecology to Manage Dynamic Landscapes in the Anthropocene*. Oxford, UK: Oxford University Press. doi: 10.1093/acprof:oso/9780198713036.001.0001

Hutchinson, S. M., Bacon, K. L., Bunting, M. J., and Hurrell, E. R. (2022). The Virtual Palaeosciences (ViPs) project: resources for online learning in or out of a pandemic. *J. Geogr. High. Educ.* doi: 10.1080/03098265.2022.2129599. [Epub ahead of print].

IPCC (2021). "Climate change 2021: The physical science basis," in *Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change,* eds V. Masson-Delmotte, P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, et al. (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press).

Lowe, J. J., and Walker, M. J. C. (2013). *Reconstructing Quaternary Environments (3rd ed.)*. London, United Kingdom: Routledge. doi: 10.4324/9781315844312

McDougall, D. A. (2022). More inclusive fieldwork. Available online at: https://fieldwork.wp.worc.ac.uk/wordpress/ (accessed September 29, 2022).

Stainfield, J., Fisher, P., Ford, B., and Solem, M. (2000). International virtual field trips: a new direction? *J. Geogr. Higher Educ.* 24, 255–262. doi: 10.1080/713677387