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Strength in Diversity

Future-proofing PBL Research and Practice

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Strength in Diversity: Future-proofing PBL Research and Practice

Special Issue

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EDITORIAL

Problem-Based Learning (PBL), a student-centred learning approach that focuses on real-life problems in higher education, has been around for more than fifty years (Servant-Miklos, Schmidt & Norman, 2019). It originated in 1969 at McMaster University's medical school in Canada and spread to other academic disciplines including engineering (Guerra et al., 2017), law (Cleassens, 2020), humanities (Kloeg, 2023), and psychology (Wiggins et al., 2016), becoming a well-recognized approach in universities worldwide. This wide-ranging diversity of applications has yielded, on the one hand, a rich body of theory and practice, with different PBL models emerging to meet diverging curricular requirements and learning objectives (Savin-Baden, 2003). On the other hand, it has also created some confusion, wherein the differences in philosophical understanding, didactic basis, and concrete practice between the academic disciplines have not been discussed thoroughly. At the same time, PBL is facing a host of new challenges from emerging global threats and opportunities, such as climate change, biodiversity loss, socio-economic inequality, and technological progress, including artificial intelligence, with a commensurate rise in ethical challenges. Faced with the rapidly evolving environmental emergency, some PBL scholars have recently called for PBL to "change or risk irrelevance" (Servant-Miklos, Dolmans & Ryberg, 2023), advocating for the development of more socially engaged, transdisciplinary, and sustainable approaches to PBL.

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In line with this call to action, in this special issue, we brought together scholars from a range of disciplines to share their perspectives on how disciplinary, methodological and pedagogical innovation can help future-proof PBL practice and research. Our special issue includes expertise from the fields of medicine (Reinsch et al., 2023), engineering (Servant-Miklos, Holgaard & Kolmos, 2023), humanities (Kloeg, 2023), and three interdisciplinary perspectives (Duchi et al., 2023; Guerra et al., 2023; Scholkmann et al., 2023), to provide a well-rounded gathering of voices from the most prominent areas of application of PBL. In this editorial, we consider the methodological, disciplinary and future-oriented contributions of these papers before reflecting on what the future of PBL might look like in the light of current events and future uncertainties.

Methodologies

One of the aims of this special edition was to showcase the variety of research approaches that can be deployed in investigating PBL. In the past, PBL research was heavily skewed towards quantitative research designs, particularly under the influence of McMaster and Maastricht's cognitive psychology research departments (e.g. Strobel & Van Barneveld, 2009). This has changed in recent years, and all the papers in our special issue feature qualitative research designs. Some borrow from traditional PBL research methods, like the case study approach, but add a novel comparative element (Scholkmann et al., 2023). Others offer new approaches to PBL research, like the combination of Education Action Research and phenomenography proposed by Duchi et al. (2023) – a combination which had been suggested by phenomenographers in the past (Cherry, 2005), but not put into practice until now. Likewise, Servant-Miklos, Holgaard & Kolmos (2023) combined Braun and Clarke's (2012) Theory-led Thematic Analysis with a longitudinal qualitative study design; a methodological innovation that adds not just to the PBL research toolkit, but to education research methodologies more broadly. Reinsch et al. (2023) showed with their randomized cross-over design that it is a possible nod to experimental research strategies within participatory qualitative research processes, while Guerra et al. (2022) also used structured qualitative research methods, including surveys, that build on quantitative epistemologies. Both papers challenge the traditional binary divide between qualitative and quantitative research without explicitly crossing over into mixed-methods research. The collection of papers assembled in this special issue shows the need and possibilities for methodological innovation in PBL research beyond traditional quantitative approaches on the one hand, and descriptive qualitative case studies on the other. There is scope for creatively adapting existing qualitative methodologies to broaden the epistemological scope of PBL research beyond an essentialist / constructivist binary. Thus, phenomenological, phenomenographic, critical and participatory traditions, can, among others, not merely inform PBL research, but also help to rethink practices within the PBL classroom. This depends on our capacity to borrow PBL perspectives from different disciplines to spur innovation.

Disciplinary contributions

Although PBL was originally billed as an interdisciplinary educational approach (Servant-Miklos, Schmidt & Norman, 2019), PBL research and practice since the 1970s has been largely confined to disciplinary contexts, particularly in Medical and Engineering Education (Scholkmann et al., 2023). In fact, most PBL scholarship has been published in medical and health professions education research journals, or in engineering education journals. While international conferences like the Pan-PBL conference and journals like this one have tried to bring together educators and researchers from different disciplinary backgrounds under the same roof, we wanted to go further with this special issue and ask PBL scholars to reflect on the contribution of their discipline to the field of PBL studies.

For instance, Guerra et al. (2023) discuss the usefulness of PBL tools developed within engineering education for broader international teacher training programmes, which can help develop PBL outside of engineering education. Reinsch et al. (2023) move beyond the traditional medical PBL tutorial setting to look at the potential of PBL within the formation of communities of practice, while Kloeg (2023) encourages PBL practitioners to look beyond "how" questions asked within the social sciences and address "why" questions posed by the humanities. Duchi et al. (2023) and Scholkmann et al. (2023) discuss issues at the cross-over between disciplines. Duchi et al. look at novel forms of student reflection within project-PBL as a way to integrate disciplinary input in a multi-dimensional reflection framework that toggles students' epistemological assumptions. Scholkmann et al. provide a case study in how Kloeg's call to include hermeneutical thinking in PBL could work in practice – by integrating social sciences and humanities thinking within STEM PBL programmes (while also cautioning of the potential pitfalls!).

These papers reflect an increasing appetite within the PBL community to make good on the promise of PBL to break down disciplinary silos. This is especially important in light of the chaotic, transdisciplinary nature of global challenges. As we head into unchartered climate waters, present global geopolitical and environmental instability is likely to increase, urgently calling educators to break out of disciplinary confines and put forward robust educational methods that can prepare students for present and future challenges and uncertainties.

Future-proofing

To paraphrase the former United States Secretary of Defense Donald Rumsfeld, the future consists of known knowns, like the inevitable consequences of warming the world by at least 1,5°C (IPPC, 2023) and destroying 70% of animal life on Earth (World Wildlife Fund, 2022), known unknowns, like the final extent of climate warming, which depends on emissions pathways and system feedback loop sensitivities (Steffen et al., 2018), and unknown unknowns, including potential socio-economic, geopolitical and nuclear risks, or what Nassim Taleb (2005) called "Black Swan" events. In this context, we use the term

"future-proofing" with a degree of irony: the idea that any educational method, let alone a method from the 1960s, could shield us or be shielded from events of such magnitude makes little sense. Nonetheless, as Servant-Miklos, Dolmans and Ryberg (2023) pointed out, there is a real risk of PBL becoming irrelevant if it does not rise up to the challenges coming in hard and fast into our classrooms, affecting the learning process, including difficulties in heating learning spaces, emergency remote teaching caused by the pandemic, and the rise of artificial intelligence, and the learning contents by challenging traditional disciplinary perspectives. Four papers in this special issue suggest avenues for increasing PBL's relevance and resilience for the future. Duchi et al. (2023) and Kloeg (2023) propose PBL as a process of personal sense-making, in which students are invited to reflect on personal and social meaning-making. This requires moving away from purely cognitive perspectives on PBL that focus solely on problem-solving, collaborative and professional competences, the relevance of which has been in doubt in the literature since at least the 1980s (Servant-Miklos, 2019). It also calls to move away from viewing PBL purely as a tool for increasing learning and knowledge retention efficiency, focusing instead on personal hermeneutics and a sense of who students are in the world. Duchi et al. (2023) propose that student agency for action can be born from the "sweet spot" in this reflection process. Servant-Miklos, Holgaard and Kolmos (2023) looked at the factors influencing students' awareness, interest, and engagement with environmental sustainability issues, and found that professional identity construction within PBL engineering education can act as a barrier to broader social and political engagement, confining engagement to the personal and professional realm. The paper discusses ways in which student concern about sustainability might usefully be channeled towards institutional forms of engagement within universities, in a way that would circumvent identity barriers towards forms of engagement that are viewed as more contentious.

Finally, Scholkmann et al. (2023) call for a reversal of decades of increasing disciplinarity in PBL, particularly through the framework of "Mega-projects" and Techno-anthropology, that ambition to foster cross-disciplinary thinking within STEM education. However, the authors caution that both projects have faced difficulties – Mega-projects were placed on hold in 2021, while the largest part of the Techno-anthropology programme was also shut down. These case studies show how difficult changing PBL to meet present and future needs will be. We would like to highlight the authors' conclusion that the capacity to *keep experimenting* will be crucial to PBL's capacity to adapt. Some of the experimental pedagogies highlighted in Duchi et al. (2023) show the potential in combining PBL with other approaches like serious gaming, jigsawing, and more experimental approaches. In Dutch and Danish, the terms "*proef*" / "prøve" mean to try, to experiment. Perhaps we might end on this play-on-words from our Northern European colleagues to suggest that what we're really calling for is future-experimenting with PBL.

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