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Editor's Introduction

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We are excited to publish a collection of seven articles in this issue (Vol. 17, Issue 1) contributed by educational researchers from various parts of the world, representing diverse disciplines and different levels of education, particularly higher education. These articles can be categorized into the following groups: (a) confirmatory research testing the impacts of problem-based learning (PBL) in various disciplines and countries with specific social, cultural, and educational contexts; (b) exploratory research investigating new issues or constructs in the PBL research; and (c) methodological research exploring the use of alternative inquiry tools and methods to advance the PBL research.

Confirmatory research. Dated back to the 1960s, PBL was first implemented and tested in the setting of medical education. Although not a new pedagogical approach, PBL is still not as widely accepted or recognized in education worldwide as desired. There are disparities in perceiving, understanding, and implementing PBL across different disciplines, schools, societies, and countries. That said, efforts to implement PBL and promote PBL research continue to grow globally, as we have seen from the articles of this issue. Contributors are from different parts of the globe, including Israel, Sri Lanka, USA, and Vietnam, and their articles reported studies that investigated and confirmed the effects of PBL/PjBL in supporting students' critical thinking and problem-solving skills in various disciplines and contexts, such as civic education (Akirav, 2003), English education integrated with engineering education (Pham, 2023), veterinary science education (De Silva, et al., 2023), and radiography education (Balac & Ozogul, 2023). In addition, some of these authors sought to use PBL/PjBL to encourage interdisciplinary engagement, such as PBL with Invention Study, and integrate English communication skills with engineering education (Pham, 2023). Some of these studies revealed

students' perceptions and experiences about PBL (Balac & Ozogul, 2023), while others demonstrated the impact of PBL/PjBL in promoting civic engagement of college students from different ethnic and religious backgrounds (Akirav, 2003) or developing interdisciplinary problem-solving skills and facilitating meaningful English learning in the context of engineering education (Pham, 2023).

Culclasure et al's (2023) research on New Tech Network design indicated the positive impact of PBL on a large scale with a long-term effect and a strong large effect size in various aspects. The results showed the positive effects of PBL on students' academic achievements in various subjects, social-emotional outcomes, and equitable outcomes for all students. Moreover, the evidence showed that the students who had gone through PBL experiences were more motivated to pursue academic or professional goals in the future. While many studies demonstrate the local or short-term effects of PBL/PjBL in a specific discipline, subject domain, or context, there have not been many studies reporting a scaled up PBL implementation in a network of multiple schools and the long-term PBL effects (in helping students develop their career goals) in a curriculum-based, standards-driven school culture. Therefore, this study is a powerful testimony in favor of PBL, which has been controversial in education regarding its effectiveness as a pedagogical approach to improve students' academic achievements.

Exploratory research. Several studies showed the efforts to explore novel constructs or issues in the implementation of PBL to generate new theories, which is a crucial aspect of the interdisciplinary PBL research. For example, through discourse analysis in a design-based research study, Svihla, Gomez, and Crudo (2023) sought to understand the conditions in which the college students displayed behaviors of framing agency, compared to those in which students treated

problems as well-structured and exhibited the behaviors of offloading tasks, in the context of PBL groups. Their research revealed that problem authenticity and task and participant structures could contribute to students' framing agency of ill-structured problems and consequentially benefiting their learning.

Skukauskaitė et al. (2003) examined the networks that supported a high school team and their teacher as students tried to develop a solution to a real-world problem identified in their community. Through this study, they highlighted the importance of all levels of support (local, local-national, and national) in sustaining a thriving PBL program and engaging the student and teacher team in meaningful, real-world PBL projects for invention education. Skukauskaitė et al. (2003) indicates that a robust PBL implementation relies on the support of multiple levels of the educational ecosystem, and it also requires curriculum and educational reform. Another important contribution offered by Skukauskaitė et al.'s (2003) work is the role of PBL in providing a platform for engaging high school students in service learning for the local communities. In this case, PBL serves as a vehicle for the collaboration between high schools and universities in the invention process, which nurtures STEM education and a culture for real-world problem solving.

Culclasure et al.'s (2023) research addressed the fidelity issue by ensuring the consistent implementation and evaluation of PBL for valid and reliable results. They encourage other researchers to be more mindful about consistency and fidelity in design, implementation, and evaluation, an area that has not drawn sufficient attention or discussion in PBL research, which could have explained the confounding results that have been documented in the PBL literature.

Methodological research. Away from the conventional experimental or quasi-experimental study, some researchers adopted alternative research methods for PBL research. Svihla, Gomez, and Crudo (2023) and Skukauskaitė et al. (2003) applied research methods that had not been widely used in PBL research. Svihla and her colleagues (2023), in their effort to carry out a longitudinal study over three semesters, employed design-based research as a tool to examine how the college students in a chemical engineering course approached authentic problem-solving tasks differently in PBL groups. Skukauskaitė et al. (2003) used interactional ethnographic research methods to analyze the networks of support ecosystems in PBL through the analysis of videos and documentary data. These new research tools helped to provide new insights into various nuances and issues during PBL, including team interactions, the distributed cognition of a team, and the multilayer ecosystem of social support for PBL (school, community, and national support).

Looking forward, we would like to see more descriptions and discussions of the richness and uniqueness of social and cultural contexts in research papers focused on testing or investigating the effects of PBL/PjBL. Questions readers would be interested in knowing include: in what situations PBL/PjBL is conducted, how it is implemented, what motivated or drove the implementation of PBL/PjBL, what are the challenges, and what innovations are generated to address the issues and challenges presented. We would also like to encourage more work on understanding factors and conditions that influence students' PBL processes (individual and collaborative), including their cognition, metacognition, motivation, emotion, and outcomes. In addition, we welcome more studies of diverse topics, methods, and tools that explore new constructs and generate new theories aimed at expanding and advancing PBL research and practice.