Guest Editors' Introduction

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Global Development of Problem-based Learning: Adoption, Adaptation, and Advancement

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Problem-Based Learning's Vitae

When the medical school at McMaster University first implemented problem-based learning (PBL) at the end of the 1960s, the faculty might not have imagined that half a century later this innovative instructional method would reach worldwide. PBL has been adopted across almost all disciplines, learner levels, and cultures. After some decades of implementations, the number of new adoptions of PBL has not slowed down.

Instead, despite skeptics' concerns and criticism about its effectiveness (e.g., Kirschner, Sweller, & Clark, 2006), PBL is still on the rise as an instructional method for enhancing students' learning. The growth of PBL may partially be attributed to the rise of constructivist learning theories in the 1990s, which had a significant influence on educators' educational philosophy and, in turn, helped educators realize the strengths and benefits of PBL. Yet, the soundness of theoretical conception of an instruction or the alignment with contemporary educational philosophy alone would not sustain or even push a continuing popularity of an instructional method. A long-standing need for cultivating students to become independent problem solvers and lifelong learners is perhaps a far stronger driving force that bolsters the growth of the adoption of PBL across disciplines, learner levels, and around the globe.

PBL has been implemented in countries on five continents. Numerous institutions have adopted PBL at campus, department/college, or on a single course scale. These include, for example, McMaster University and the University of Sherbrooke in Canada, Maastricht University and Erasmus University Rotterdam in the Netherlands, New Castle University in Australia, Republic Polytechnic in Singapore, and Michigan State University and Southern Illinois University in the US.

An instructional method that has been adopted in such a wide range of educational settings and cultural environments inevitably sustains modifications of the original format of PBL. As a result, a number of variations have been developed to adapt to the different contexts where unique variables and constraints were imposed by the structure of institutions, cognitive maturity of the learners, nature of discipline, cultural/social influences, administration, or the advent of technology (Hung, 2011; Loyens, Kirschner, & Paas, 2011). The proliferation of various PBL models not only indicates a need to modify the format of the instructional method to adapt to different contexts, but also signifies that different learner populations may react differently to PBL in general or to some aspects of its implementation. Nevertheless, PBL can be considered as "one of the few curriculum-wide educational innovations surviving since the sixties" (Schmidt, van der Molen, te Winkel, & Wijnen, 2009, p. 2).

PBL's Goals Resulting In Different PBL Research Areas

As part of the natural course in an instructional method implementation, evaluation, and research for improvement takes place when or after the implementation has been in place. PBL is undoubtedly an instructional method that has been heavily researched. Besides the ultimate research question—how effective is PBL?—historically, PBL research has focused on the issues centered around Barrows' (1986) and Norman and Schmidt's (1992) assertion of PBL's main educational objectives, which are to help students develop (1) contextualized knowledge structure, (2) problem-solving and reasoning skills, (3) self-directed learning skills, (4) motivation to learn, and (5) collaboration skills.

These objectives are realized by the features and process of PBL in which instruction is problem-initiated and problem-driven and students actively pursue and direct their own learning in a small group collaborative learning setting with facilitation from the instructor (Hung, Jonassen, & Liu, 2008; Loyens et al., 2011). These features make PBL a unique instructional method. However, it should be mentioned that some of the aforementioned goals can be emphasized more than others in different implementations of PBL. Schmidt and colleagues (2009) refer in this respect to different types of PBL: one stressing the construction of a flexible knowledge base (Type 1), one emphasizing the development of inquiry skills (Type 2), and one that sees PBL primarily as a tool for "learning how to learn" (Type 3; Schmidt et al., 2009).

On the other hand, PBL's educational objectives also manifest themselves as PBL research interest areas. For example, a significant number of studies investigated the effects of PBL on students' development of problem-solving skills (Gallagher, Stepien, & Rosenthal, 1992; Lohman & Finkelstein, 2000), self-directed learning skills (van den Hurk, Wolfhagen, Dolmans, & van der Vleuten 1999; Loyens, Magda, & Rikers, 2008; Schmidt, Vermeulen, & van der Molen, 2006), tutors' roles and facilitation skills (Azer, 2005; Dolmans

et al., 2002), group processing (Visschers-Pleijers et al., 2005), or assessment issues (Gijbels, Dochy, Van den Bossche, & Segers, 2005; Savin-Baden & Major, 2004). More recently, the emergent research areas in PBL include technology-enhanced PBL (Bowdish, Chauvin, Kreisman, & Britt, 2003), as well as the effects of utilizing various instructional facilitation techniques and tools.

These PBL research topics can be summarized into three overarching agendas of research. A first line of research can be described as exploratory research on student and teacher perceptions of and experiences with the implementation of and/or shift toward PBL as well as on whether specific study objects are suitable for PBL. The second line of PBL research is concerned with the effectiveness of PBL as an instructional method, reporting effects on students' knowledge and skills, as well as effects of PBL curricula as a whole, for example, with graduation rates and study duration (Loyens et al., 2011). The last line of PBL research investigates specific elements of PBL such as problem and group characteristics or the tutor. These studies target the development of "the ideal PBL format."

This Special Issue

This special issue presents six PBL studies from four regions: Asia, Africa, Europe, and North America. First, Hallinger ("Overcoming the *Walmart Syndrome*: Adapting Problem-based Management Education in East Asia") reported an adaptation of PBL in re-designing a business school curriculum in Thailand. Next, Henry and her colleagues ("'I Know This Is Supposed To Be More Like the Real World, But…': Student Perceptions of a PBL Implemen-tation in an Undergraduate Materials Science Course") studied the US undergraduate engineering students' perceptions about PBL in affecting their studying habits. Third, Summers and Dickinson ("A Longitudinal Investigation of Project–based Instruction and Student Achievement in High School Social Studies") explored the effects of PBL in enhancing US high school students' social studies achievement. These three studies fall into the first and second line of PBL research, and at the same time, they provide readers with different perspectives on adaptation issues, such as localizing the curriculum and problems used to help students connect the content knowledge with their social-cultural context, as well as adjusting the level of self-directed learning and facilitation in response to the nature of the discipline and cognitive readiness of the students.

On the other hand, studies from Europe and Africa fall into the third line of PBL re-search. Smith and Cook ("Attendance and Achievement in Problem-based Learning: The Value of Scaffolding ") and Zwaal and Otting ("The Impact of Concept Mapping on the Process of Problem-based Learning") focused on scaffolding in the pre-discussion of the problem, however, with different methods. Smith and Cook used the Six Hats method (de Bono, 1995) with undergraduate sport and exercise psychology students in the UK, while Zwaal and Otting investigated the functionality and effects of the concept map with

hospitality management students in the Netherlands. Lastly, Singaram and colleagues ("Relationships between Language Background, Secondary School Scores, Tutorial Group Processes, and Students' Academic Achievement in PBL: Testing a Causal Model") focused on how diversity in students' backgrounds in PBL groups influence group functioning in a South African medical education context.

This special issue is a collection of works conducted by PBL researchers around the world. The research findings from different regions and different cultural contexts help draw a picture of current PBL development by addressing some important factors that have a great impact on the success or failure of a PBL implementation. These factors include institutional structure, implementation scale, curriculum standards of the country, cultural influence, nature of discipline, or age group of the students. The findings reported in the studies in this special issue provide PBL educators with insights about the important adaptation issues and challenges, as well as inform PBL researchers of the current advancement of PBL research, and hopefully shed some light for the future directions for PBL research.

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