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## Guest Editor's Introduction

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## Guest Editors' Introduction

*Brent K. Jesiek and Johannes Strobel*

We are pleased to introduce this special issue of *IJPBL*, dedicated to research on problem- and project-based learning (PBL) in engineering education. The articles that follow engage a diverse array of questions and themes at the leading edge of research on PBL. To begin, Beddoes, Jesiek, and Borrego perform a large-scale analysis of PBL research papers to identify current research trends and collaborative patterns. Pierrakos, Zilberberg, and Anderson systematically characterize the kinds of projects and problems encountered in a novel PBL context, namely undergraduate research, and use their findings to develop recommendations for enhancing traditional engineering courses and labs. Turns, Cuddihy, and Guan examine the use of portfolios to support reflective learning in a project-oriented undergraduate engineering course. Ge, Huang, and Dong present findings from an ethnography of another interesting PBL environment, a graduate-level software engineering course, and they especially emphasize the interplay of student and project characteristics. And finally, we include Begum's review of a recently published volume of particular relevance for this special issue, namely *Research on PBL Practice in Engineering Education*, edited by Du, de Graaff, and Kolmos (2009).

Yet despite the rich and varied content of this special issue, in one regard our efforts were unsuccessful. Some additional background detail will help explain what we mean. This special issue originated in the International Workshop for Research on PBL in Engineering Education, held June 24-25, 2009 at Loughborough University, UK. The workshop brought together six US participants with about a dozen British and Irish participants and one Australian. Most of these individuals were university faculty or staff, but the group also included administrators, academic researchers, and graduate students. One of the major goals of the meeting was to promote cross-national research collaborations on PBL in engineering education.

Knowing that such meetings often generate enthusiasm and momentum that quickly fades once the event is over, we arranged this special issue as one strategy to encourage continued collaborations among participants. Our open call for submissions initially yielded 28 abstracts, with workshop participants listed as authors on seven of these. However, none of these seven involved cross-national collaborations among workshop

participants. In the end, only one of these seven papers made it through the review process to appear in this issue, and it was co-authored by three of the workshop organizers (Jesiek, Borrego, and Beddoes). Further, US-based authors submitted all the papers that ultimately made it into this special issue.

How do we account for our failure to publish a more international collection of papers? Our efforts help reveal some of the difficulties associated with cultivating an international community of researchers around PBL. First, there is the challenge of developing the kinds of relationships that lead to collaboration and then co-authorship, a process that frequently requires a longer timeline and more encounters than possible at a single workshop. In other current work under review, Beddoes, Jesiek, and Borrego elaborate on this challenge and argue for thinking beyond the workshop format in promoting research collaborations. Second, there is wide variation in what counts as PBL across countries and regions, and a number of submissions were deemed not sufficiently relevant to the scope of the special issue. And third, there is the question of what counts as empirical research. While we received many submissions that promised to provide rich descriptions of PBL implementation, they often failed to make clear their empirical components. Nonetheless, we are very mindful of the challenges and barriers associated with conducting research on PBL, including the need for educational or social science research expertise, and sufficient resources (time, funding, people) to conduct high-quality studies. All of these issues must be kept in mind as we continue to watch—and encourage—the development of this research field.

Yet looking beyond such challenges, we can report other successes. For example, the workshop led to discussions about a number of leading themes and questions for research on PBL in engineering education, such as:

- measuring the effectiveness of PBL, including via novel assessment strategies,
- assessing the impacts of PBL in relation to cognitive development, conceptual understanding, and higher order skills (e.g., problem solving, self-directed learning),
- comparing PBL across disciplines (e.g., engineering, medicine, science),
- surveying and evaluating different PBL formats and defining characteristics,
- understanding differences in PBL across countries and cultures,
- managing and understanding change dynamics during PBL implementation, and
- studying faculty and staff development and experiences related to PBL.

We are pleased to note that the papers in this special issue make productive contributions in a number of these areas.

As another modest report of success, a number of workshop participants acted behind the scenes as reviewers for this special issue, while two of the workshop organizers (Jesiek and Strobel) served as co-editors and another co-organizer (Begum) graciously agreed to

write the included book review. And as we report elsewhere, other kinds of cross-national collaborations have developed among workshop participants, and we hope that in the future we will see their projects and papers reach fruition, perhaps even on the pages of this journal. We therefore continue to see this special issue as one reflection of a growing global network of researchers and practitioners who are eager to study and implement PBL in diverse contexts of engineering education.

In conclusion, we extend our appreciation to the many reviewers and contributors who not only made this special issue possible, but greatly enhanced its quality. We are very pleased with the result, and hope it provides foundations for additional research on PBL across disciplines and countries. We also gratefully acknowledge the National Science Foundation (grant DUE-0810990), along with the Engineering Subject Centre and engCETL at Loughborough University, for supporting the workshop that helped precipitate this special issue.