

# EUCEET 2018

4th International Conference on  
Civil Engineering Education

CHALLENGES FOR THE THIRD MILLENNIUM

## Benefits and limitations of adopting project-based learning (PBL) in civil engineering education – a review

Ted McKenna\*, Amanda Gibney† and Mark G. Richardson†

\* Cork Institute of Technology  
Rossa Avenue, Bishopstown, Cork, Ireland  
ted.mckenna@cit.ie – www.cit.ie

† University College Dublin  
Belfield, Dublin 4, Ireland  
amanda.gibney@ucd.ie – www.ucd.ie  
mark.richardson@ucd.ie – www.ucd.ie

### ABSTRACT

A lack of balance between theoretical and practical learning has been a systematic problem in engineering degree courses during the second millennium [1]. The challenge for the third millennium therefore remains that of blending assimilation of knowledge with responsible application of theory in practice, during the formative undergraduate years. A report published at the turn of the millennium noted the serious decline in applications from bright young people to study engineering, especially built environment programmes, while drawing attention to a finding that programmes which attract the best students are those that encourage a high level of interdisciplinary thinking and project work [2]. Inductive teaching and learning approaches include inquiry learning, problem-based learning, project-based learning, case-based teaching, discovery learning and just-in-time teaching. Such constructivist methods are deemed to be student-centred, placing more responsibility on the student for their own learning as they actively construct and reconstruct their own reality, while the teacher acts as facilitator in the process. Two approaches are slowly emerging as preferred in civil engineering education: problem-based learning and project-based learning. While they share commonalities, differences exist. Problem-based learning focuses on knowledge acquisition while project-based learning emphasises the application and integration of knowledge [3, 4]. However, widespread acceptance of such innovative education strategies is not yet a reality [3] and the relevance and effectiveness of both approaches in engineering education is still open to question [5]. The body of literature on the topic continues to grow. This paper investigates recent evidence in civil engineering education and identifies trends that may be helpful in the successful reimagining of programme ethos and curricula. The study considers application context (e.g. final year capstone project, first year design project), data type (e.g. student feedback, tutor reflection), measure of effectiveness model (e.g. qualitative/quantitative analysis). Dominant benefits and limitations are identified.

### REFERENCES

- [1] MacLeod, I., *150 Years of Engineering Education in Scotland, A Critique*. Transactions of The Institution of Engineers and Shipbuilders in Scotland. Vol. 151. 2007-2008.
- [2] Gann, D., Salter A. *Interdisciplinary Skills for Built Environment Professionals: A Scoping Study*. The Ove Arup Foundation, London, 1999.
- [3] Perrenet, J., Bouhuijs, P. and J. Smits, *The Suitability of Problem-based Learning for Engineering Education: theory and practice*. Teaching in Higher Education. Vol. 5(3), 686-691. 2012.
- [4] Prince, M.J., Felder, R.M. *Inductive Teaching and Learning Methods: Definitions, Comparisons, and Research Bases*. Journal of Engineering Education. Vol. 95(2). 123-138. 2006.
- [5] Mills, J.E., Treagust, D.F. *Engineering education - is problem-based or project-based learning the answer?* Australasian Journal of Engineering Education, Vol. 3(2). 2-16. 2003.