

## **Effect of Open-Ended Laboratory toward Learners Performance in Environmental Engineering Course: Case Study of Civil Engineering at Universiti Malaysia Sabah**

**Authors :** N. Bolong, J. Makinda, I. Saad

**Abstract :** Laboratory activities have produced benefits in student learning. With current drives of new technology resources and evolving era of education methods, renewal status of learning and teaching in laboratory methods are in progress, for both learners and the educators. To enhance learning outcomes in laboratory works particularly in engineering practices and testing, learning via hands-on by instruction may not sufficient. This paper describes and compares techniques and implementation of traditional (expository) with open-ended laboratory (problem-based) for two consecutive cohorts studying environmental laboratory course in civil engineering program. The transition of traditional to problem-based findings and effect were investigated in terms of course assessment student feedback survey, course outcome learning measurement and student performance grades. It was proved that students have demonstrated better performance in their grades and 12% increase in the course outcome (CO) in problem-based open-ended laboratory style than traditional method; although in perception, students has responded less favorable in their feedback.

**Keywords :** engineering education, open-ended laboratory, environmental engineering lab

**Conference Title :** ICEISE 2014 : International Conference on Education and Instructional Systems Engineering

**Conference Location :** Kuala Lumpur, Malaysia

**Conference Dates :** August 25-26, 2014