

Active Learning in Engineering Education: Case Study in Mechanics for Engineering

Chawannat JAROENKHAEMMEESUK^{a,1}, Rui M. LIMA^b, Kathleen HORGAN^c,
Diana MESQUITA^d, and Tuangyot SUPEEKIT^a

^a*Faculty of Engineering, Mahidol University, Nakhon Pathom, 73170, Thailand*

^b*Algoritmi Centre, Department of Production and Systems, School of Engineering,
University of Minho, Campus de Azurém, 4800-058, Guimarães, Portugal*

^c*Mary Immaculate College, V94 VN26, Limerick, Ireland*

^d*Research Centre for Human Development (CEDH), Faculty of Education and
Psychology, Universidade Católica Portuguesa,
4169-005, Porto, Portugal*

Abstract. A task force on outcome-based approaches (OBE) to develop higher education was focused on by the Ministry of Higher Education, Science, Research and Innovation (MHESI) and Mahidol University (MU). MU had already started emphasizing student outcomes in its quality reviews and considered OBE a logical next step in advancing higher education. Active learning, in the concept of 'teach less, learn more', is a teaching method that involves engaging students in the learning process through activities such as discussion, boardgame, project-based solving, and collaborative activities. It was claimed that academic attainment could be enhanced by active learning. In the field of engineering education, active learning has been shown to be an effective way to enhance student learning and improve outcomes. This paper gives a comprehensive study case of the subject "Mechanics for Engineer" including how the instructor created the active learning activities for each module, the indicators used to assess students' learning outcomes, an analysis of the results of using active learning, and the reflections of stakeholders. The presented activities in this paper consist of 3D equilibrium & Application: Think-Pair-Share, Vector addition - Board game, and Structural analysis - Project-based learning. Additionally, the case study explored reflection to analyze the challenges and issues that arose during the implementation of active learning and discuss strategies for addressing them.

Keywords. Engineering Education; Outcome-based approaches; Active learning; Project-Based Learning

¹ Corresponding Author, Mail: chawannat.jar@mahidol.ac.th