Project/Problem Based Learning in the Field of Materials, Food, and Chemical Engineering at Helsinki Metropolia University of Applied Sciences

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ABSTRACT

Project/problem based learning (PPBL) has been applied at the department of Biotechnology and Chemical Engineering, Helsinki Metropolia University of Applied Sciences, for a few years now. The authors’ experiences from the PPBL with their first year Bachelor students are discussed in this paper. The problem based learning concept in connection with practical solutions for organizing the courses are contemplated critically. The authors found, that the new way to pursue studies in material, biotechnical and chemical engineering has meant a significant change for both students and educators. A positive response from the students could be seen in the form of augmentation of motivation and activity. Team skills have improved, as well as independent study capacity. Cooperative teaching and being more of a facilitator than a traditional instructor, also challenges the role conceptions for the educators.

Keywords: Bachelor, Cooperative, Learning, Practical Skills, Problem, Project

INTRODUCTION

Abandonment of studies and lack of engineering practice and abilities of graduated engineer students has been a central problem in engineering education all over the world for a long time. Technical universities such as MIT, Stanford, Aalborg and Chalmers have, among many others, detected the problem several years ago and together designed a new educational program worldwide. The program is based on the needs from the employable industry and is structured according to the outline of the engineer’s work process: conceive-design-implement-operate, the CDIO model (Crawley et al. 2014). A natural tool for teaching these skills was found to be
project- or problem based learning projects. Mills and Treagust (2003), among others, discuss the effectiveness and relevance of these methods for engineering education.

Within the degree programme of Biotechnology and Chemical Engineering at Helsinki Metropolia University of Applied Sciences, the amount of student drop outs had been be around 50% in the past. This phenomenon has caused problems in many aspects for the university, not to speak about the student point of view.

To solve the problem broad measures have been taken to make the student stay and graduate without exceeding the time limit, rise the throughput speed, improve the overall performance and the quality of the graduated student’s engineer abilities and skills. One of the more comprehensive changes that has been done, is to form broader study modules (5, 10 or 15 ECTS) with several teachers cooperating and include problem based learning projects to one third of the total credits (80 out of total 240 ECTS).

In this paper we will describe our experiences from the Project Problem Based Learning (PPBL) courses running for first year students, and the cooperative teaching within larger modules.

**STRUCTURE OF THE PROBLEM BASED LEARNING PROJECTS**

The chosen approach for the projects is closer to the engineering method than the scientific method seen in Figure 1 (Science Buddies, 2015). Especially at the third and fourth steps, the requirement specifications and brainstorming steps the differences were emphasized.

During the first year of studies the students perform three different projects. The aim of the first introductory project during the second autumn period is to get familiar with the PBL

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*Figure 1. Comparision of the scientific and engineering approach for problem solving (Science Buddies, 2015)*
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