

Design and Development of Problem-Base Asynchronous Collaborative Learning

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ABSTRACT

This paper describes the initial stages of designing and developing Problem-Base Learning (PBL) in engineering education via asynchronous collaborative learning (ACL) at Open University Malaysia (OUM). PBL development is aim at developing total integrated approach to the learning system to induce active self-managed learning and online forum participation among learners. PBL approach is vital for open universities as self-managed learning dominate the learning mode. This paper will elaborate on the OUM learning system in teaching engineering education and suggest new approach of designing the curriculum based on PBL to encourage student-centred learning through ACL via Learning Management System (myLMS) platform of OUM.

Keywords: Problem-base learning, asynchronous collaborative learning, engineering education

(1) INTRODUCTION

Distance learning education has been widely accepted as an alternative for continuous education due to its flexibility. It differs from the part-time mode as distance learning have minimum contact hours while part-time mode classroom hours remain the same as full-time mode except the lecture is conducted in the evening during weekday or weekend. As such distance learning education provides greater flexibility for adult learner. OUM adopted blended pedagogical approach of learning [1]. It consists of three key elements:

- a. Face-to-face tutoring
- b. Self-managed learning (SML)
- c. Online Interactions.

Table 1 describe the breakdown of actual hours for the three credit hours courses on the respective blended learning modes.

Table 1: Blended Learning Mode

Blended Learning Mode	Hours
Understanding the course	5
Self-Managed Learning	60
Face-to-face Tutoring	10
Online Interactions	10
Assignment/s	20
Revision	15
Total	120

Face-to-face tutoring comprises 8.33% of total actual hours per course. Self-managed learning weighs 50% of the total learning hours. This excludes the online interactions and assignment hours, which indirectly form part of self-managed learning. It clearly shows that distance education emphasize on the self-managed learning.

ACL tool is part of myLMS features similar to e-mail facilities. It allows learners to pose questions to tutors and accessible by other learners to achieve collaborative learning. It was shown that SML and online interactions via ACL among the learners of OUM were less encouraging, as reflected in online monitoring report of myLMS that monitor the learner activity. As such research team was formed, namely Collaborative Online Learning Team, to improve the rate of ACL participation among the learners via myLMS platform.

1.1 Learning Management System

myLMS is an e-learning platform developed by OUM. It supports and enhances online learning at OUM. It enables tutors and learners to bring the face-

to-face classroom into virtual environment. Through myLMS, tutors and learners can access course materials and references, communication tools and collaborative tools such as online discussion forum for the purpose of teaching and learning [1]. The online discussion forum allows the learners to write to tutor or another learner, with or without attachment. The forum is open to all learners enrolled for the same courses. As such, any learners from different centre can participate in the forum to give the ideal to achieve the objective of ACL.

(2) PROBLEM-BASE LEARNING APPROACH

PBL was invented by McMaster University medical school 30 years ago. It is a total integration approach to the learning system where the learning process moves towards student-centred learning to produce competent graduate. Typical essential characteristics of PBL methodology [2] are described as follows:

- a. Problems are designed to emulate real-world problem.
- b. Problem used are complex and cover multiple objectives.
- c. The problem is introduced first, before any learning occurs.
- d. Student work in collaborative groups to gain multiple perspectives on possible solutions.
- e. Student must have the responsibility of self-directed learning.
- f. What student learned during their self-directed learning must be applied to the problem with reanalysis and resolution.
- g. Analysis of what has been learned with the problem and a discussion of what concept and principles have been learned is essential.
- h. Self and peer assessment should be carried out at the completion of each problem.
- i. Examinations must measure student progress towards the goals of PBL.

The PBL characteristics are aim at developing student problems solving skills, self-managed skills, teamwork skills and effective communication skills through ACL. Fig. 1 shows the flow chart of PBL process. It was modified from [3]. As the PBL problem is open ended, the design option is important in selecting the best combination base on the analyse results, relate to cost and efficiency of the system designed.

The objective of implementing PBL to the OUM learning system is to induce active self-managed learning and ACL participation among the learners via myLMS platform. The next section will discuss the methodology of developing the PBL.

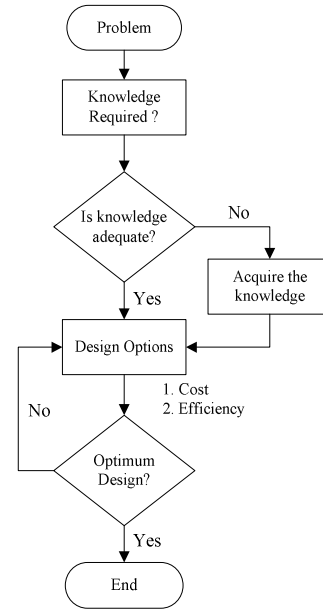


Fig. 1 PBL Process

(3) METHODOLOGY

We choose one of the courses at the introductory level, circuit theory for developing PBL assignment to improve the frequency of learner participation in ACL. One assignment with two types of problem was given to the student. Part A being conventional, examination based problem while the part B being PBL based. The learners were told to discuss the assignment online via myLMS for both type of assignment. Any discussion using e-mail or face to face is not counted and no mark will be given. This is to compare and observe the frequency the learners participate in the ASL with respect to part A and part B.

3.1 Case Study

Circuit theory is an introductory course to electrical engineering. The introductory course was chosen to develop the PBL assignment is to cultivate learners interest in ASL and to train the learners familiarise with the myLMS at the early stage of the programme. This is to ensure learner initiative in self-managed learning in the later stages of education as self-managed learning mode weigh 50% of total credit hours per course at OUM.

Two types of problem were presented to the learners:

- (A) Fig. 2 show three resistors connected in series with 24V dc supply. Find the voltage drop across each resistor. [4]

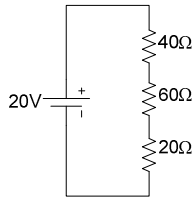


Fig. 2 Simple Series Circuits

- (B) A circuit board within a stereo amplifier requires the use of three different voltages at the circuit nodes. The voltages needed are 4V, 16V and 24V. Criteria such as weight, cost and size dictate that these voltages be supplied with a single voltage source. Heat constraints dictate that the supply must dissipate less than 5W. Assuming no loading effect from the balance of the network, design a voltage string that will satisfy the requirements. [4]

The knowledge needed for Case A by the learners is a simple Ohm's law to solve the problem. Fig. 3 show the simplify version of Fig. 1.

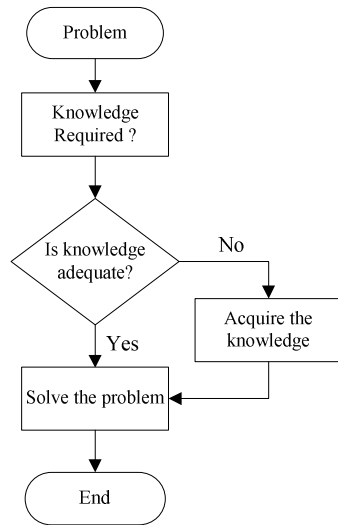


Fig. 3 Problem Solving Process

To develop PBL, the assignment was restructured from problem-solving to PBL assignment as in Case B. Both gave the same result but second assignment requires broader thinking to solve the problem. It is seen that the student successfully solve Case B will find Case A to be relatively easy but not vice-versa. With that, we expect active ACL participation among the learners for case B as collaborative learning will help the learners to achieve the desire result effectively.

(4) CONCLUSION

This paper has presented the initial stages of designing PBL in teaching engineering program via distance learning mode. PBL is seen to be very promising in enhancing student self-managed learning and active ACL participation via myLMS. As PBL is seen to influence their SML in the positive way, the challenges remain in encouraging them to be more active in learning the subject in the collaborative online manner.

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