Using PBL Approach to Conduct Project Course in Polytechnic of Port Dickson, Malaysia

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Abstract. Methods and approaches of teaching and learning can develop creative and innovative potential, the development of mind, creative thinking and innovative students, and it should be practiced by all teaching staff at present. Teaching approach should also be interesting, friendly, approachable, and fun, free from stress and anxiety, as well as able to shape the learning development and enhance the positive achievements of the students in learning. Problem-Based Learning (PBL) is an approach in the context of student-centered learning (SCL), in which cooperation among students is the key success of this learning method. PBL has a very effective impact as a driver for students to explore the knowledge that they have owned and to develop the learning skills to solve problems. The students would be more confident, able to communicate, share information and have the initiatives to find the desired information. More importantly, this learning method can engage students actively in the learning process. This paper will discuss how PBL method can be used in project course to make teaching and learning environment more creative and innovative with help of CIDOS (Curriculum Information Documents Online System). A pilot project with the PBL approach and traditional method has been implemented in the course of the project which involved three different classes. The end result showed that the PBL approach has helped students to score higher percentage in their final project compared to traditional method.

Keywords: Outcome Based Education (OBE), Problem Based Learning (PBL), CIDOS, Project Course.

1. Introduction

In today's context, a change in the process of teaching and learning in a more creative and innovative way is greatly needed. Lecturers should liberate themselves from conventional way of thinking that has been holding them back in terms of the lesson delivery techniques. Department of Polytechnic Studies has drawn out a few initiatives to make polytechnic as an alternative route to succeed the New Economic Model in line with the National Higher Learning Strategic Plan [1]. One of the strategies to make improvement in teaching and learning is through Migration Project from Traditional Education to Outcome-Based Education (OBE).

Problem Based Learning (PBL) is one of the approaches in the context of OBE learning, where cooperation between students is the key to success of this learning. More important, this learning approach engages the students actively in the learning process besides encouraging them to explore their existing knowledge which will be further enhanced and create the ability to solve problems that they faced.This research paper explains how PBL is used as a migration agent from traditional education to innovative education in teaching the course of Project at Electrical Engineering Department at Polytechnic of Port Dickson in Malaysia.

1.1. Problem Statement

The teaching and learning process at Polytechnic still revolves around lecturers dan strictly based on traditional method. From the pedagogical aspect, the lecturers teaching methods are still similar to the teaching methods employed at secondary school level which focuses more on memorization of facts for the purpose of passing the exams. Recently, there have been frequent discussions regarding the mediocrity in critical thinking and soft skills abilities among our graduates nowadays. People from the industry or employers are evaluating this individual based on his or her uniqueness and complete abilities. This includes leadership abilities, various personal skills and the ability to adapt to the surroundings. In preparing the graduates to face the demand and change from the current skilled workers' market, the higher learning

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institutions should look for a relevant method of delivery that could supply information and knowledge in assisting the graduates to be more accepting towards the current needs.

Polytechnics in Malaysia have started using the new curriculum based on OBE starting January 2010 session. Lecturers at the Polytechnic have started using OBE based curriculm in their teaching and learning activities. However, the implementation stage is still at infancy and there are quite a number of lecturers who still prefering to use the traditional method in this field. The Project Report from Electrical Department [2] showed that learning method of project course is completely lecturer-centered. There were also suggestions in this report on the need to give encouragement to the students to expand their thinking abilities in order to make their end of products to be more creative and innovative.

Besides that, there were also other issues such as limited reference materials that make the students' efforts in searching for information related to the courses that they are studying more difficult and the teaching and learning process would get disrupted when the lecturer is absent from classes. Problem Based Learning (PBL) is one of the approaches in OBE learning that has been identified to mend the week2 weeknesses in teaching and learning process at Polytechnic.

1.2. Research Objective

This research intends to accomplish the following objectives:

- To identify whether the Problem-Based Learning (PBL) method could result in student-centered learning.
- To identify the readiness level of Port Dickson Polytechnic lecturers in using OBE for the teaching and learning process.
- To evaluate the effectiveness of data storage system (CIDOS) which was developed through the PBL method in order the learners to utilize it in their learning process.

2. Fundamental Concept of Outcome-Based Education (OBE)

The OBE emphasizes on the learning outcome that focuses on what we want the students to learn, why we want them to learn it, how could we do it best in assisting the student to learn it and how are we going to evaluate on what they have learnt [3]. In other words, OBE curriculum emphasizes on what the student is capable of doing and those achievements could be measured systematically after going through a program or course of study. In order to implement this approach, Problem-Based Learning (PBL) will be used to achieve Outcome- Based Education (OBE).

2.1. Problem- Based Learning (PBL)

PBL is a learning method that trains the student to learn something through a problem and subsequently use the skills and experience in overcoming problems that would arise in daily life. This approach helps the students to master some skills and capabilities to solve a problem independently. PBL would train the student to be more responsible and active during the learning process. The PBL approach also gives significant effect as an encouraging agent to the student in exploring their existing knowledge which can later expand the learning competence for overcoming the problems faced. This learning approach could engage the student actively in the learning process.

Based on Barrows' theory [4], in general, the characteristics of PBL are such as student-centered learning, students are responsible for their own learning, the learner is always motivated in finding a solution, the student cooperate in the process of solving a problem, whereas the lecturer would take up the role of facilitator and assist the student in making the right decision. Eventhough the PBL implementation differs from one institution to another, but the three basic principals used in the implementation process are the same everywhere, in which the problem is the main stimulator in PBL learning and the lecturer acts as a facilitator and working in group would be the stimulator in cultivating interaction in groups.

2.2. Introduction to CIDOS

CIDOS or Curriculum Information Document Online System[5] is known as academic management system based on the *Moodle* platform which was developed for online teaching and learning by the

Curriculum Development and Evaluation Division, Department of Polytechnic Studies for the lecturers to use. The registered user can download and share information, organise forum, evaluate and give feedback related to academic process when he or she uses CIDOS. Students can access and search for information related to their studies online anytime. Lecturers with their own intelligence and creativity could develop various forms and shapes of learning materials to be used for teaching and learning process through CIDOS. In this research, CIDOS is used as the E-learning portal to assist the learning of Project Course via online. The information relevant to the project is uploaded in CIDOS for the purpose of learning.

3. Research Methodoly

This research is using the ADDIE(Analysis, Design, Development, Implement, Evaluate) Cognitive-Constructivist [6] learning model to solve the problem that involves cognitive roles in processing information obtained from given problem. This model is chosen because it has the foundation to all the other design models. Similar elements were found in most of the other design models such as ASSURE Model, Dick Model and Carey.

3.1. Research Implementation

This research involves a complete cycle which begins with course of Project 2(E4006) in semester 5 and followed by Project 3 (E-5006) in semester 6. A total of 6 classes from semester 5 were going through Project 2 (E4006) in Disember 2010 session. From these classes, three classes from three types of programs were chosen to be compared in this research. One class was chosen from (DTK5) to use PBL learning method, whereas the other two classes (DET5 & DKE5) were to use traditional method. The groups of students from DTK5 were exposed to PBL learning method from the beginning of the semester. The students were divided in 6 small groups and there were 5 students in each group. 3 lecturers have cooperated as facilitator in the teaching and learning process of this course project.

3.2. Research Instrument and Research Sample

This research was conducted in 2 categories; student and lecturer. For the student's category, the questionnaire was specially developed to make the researcher able to gather information relevant to the effectiveness of PBL and web resources in learning this project. The respondents are all the 26 students who were taking this course of project based on PBL from DTK5. Whereas for the lecturer's category, the questionnaire was speacially developed to evaluate the lecturer's comprehension in OBE approach in teaching and learning.

## 4. Research Finding/ Outcome – Student`s Category (OBE)

This part emphasizes on the implementation of course of project based on PBL. The finding from the first phase showed that students are keener in using the PBL method in solving the problem that arises as a group. (Observation *by PBL project supervisor*). Students are more creative and innovative in making the project's progress report presentation. (*Finding from* project's *progress report presentation*).The student's motivation scored high when he or she is given an opportunity to discuss a problem in group (*PBL class*). The reference resources prepared for PBL learning were fully utilized by the students.

The First Phase achievement analysis ended at project E4006. Graph 1 shows the analysis of result obtained for course of project which was evaluated on 3 different classes (DTK5- PBL method, DKE5 & DET5- Traditional method) for December 2010 session. The outcome of this result indicates that the achievement by DTK5 class is far better compared to the other two classes. The total number of students who've obtained grade 4.00 from DTK5 are more as compared to the two classes.However, the result obtained by students studying in semester 6 session was highly promising in which all the students who have taken the course project based on PBL obtained excellent results in their final project as shown in the graph 2.
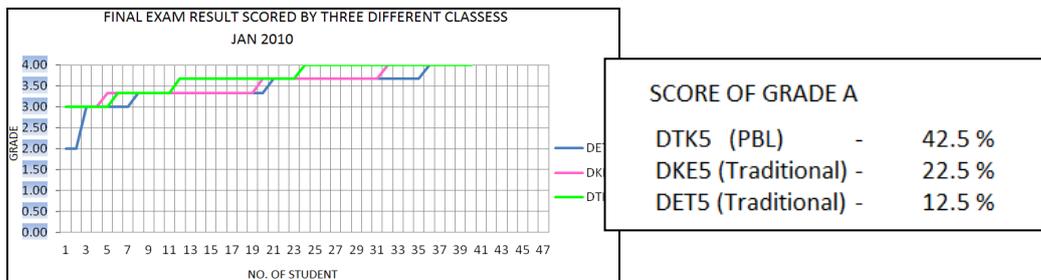
Graph 1: The Comparison of Grades for 3 different Classes – Semester 5

(Source: Examination Result- E 5006- Dec 2010 session)
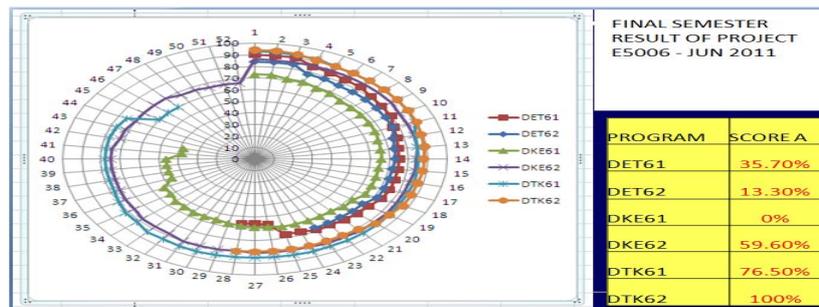
Graph 2: The Comparison of Grades for 6 different Classes- Semester 6

(Source: Examination Result- E 5006- June 2011 session)

4.1. The Evaluation on the Usage of E-Learning Portal (CIDOS)

Graph 3 shows the usage of CIDOS by students involved in PBL based course project. Students were found to be using the CIDOS to the maximum in week 12 for the purpose of finding solutions for the problems in their project. The data storage source was prepared with all the solutions. The activity in week 12 shows the highest frequency because of the information searching activity in the data storage. Starting from week 18 to 20, students are not involved with the filling and updating of information. Whereas, the activities shown during this period of time are checking and observation by the facilitator or project supervisor for evaluation of the outcome from the students' groupwork. Graph 4 shows how a variety of observation reports similar to respondents' activities and daily activities could be generated through CIDOS. The purpose of this observation is to train each and every individual in the group to use the data storage for searching the required information. Thus, students don't have to be completely dependent on the lecturers and the self-learning process could be implemented.
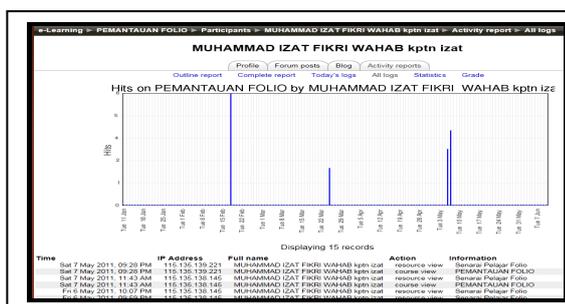
Graph 3: CIDOS Usage Activities
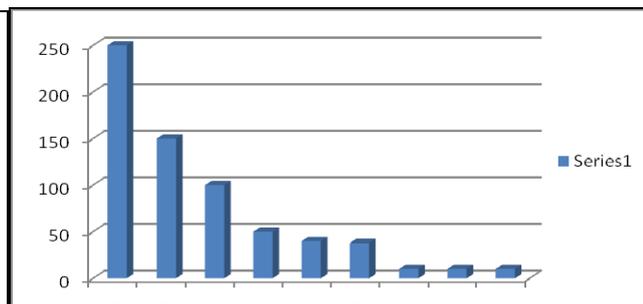
Graph 4:CIDOS Observation Activity

4.2. Research Outcome – Lecturer's Category (OBE)

A total of 189 samples of questionnaire were distributed to lecturers from 6 departments; Civil Engineering(39), Electrical Engineering(36), Mechanical Engineering(47), Commerce(30), General Studies(21) and Mathematics,Science & Computer(17) at Port Dickson Polytechnic.

4.3. Comprehension Level Analysis

Analysis from the finding reveals that the level of comprehension among Port Dickson Polytechnic lecturers regarding the OBE concept and method is mediocre or average with the minimum score of 3.60. Table 4.2 shows the lecturers' comprehension level analyzed according to departments. From the scores, it is clearly evident that Civil and Electrical departments have highest level of comprehension as compared to other departments which are lower in terms of their comprehension.

Table 4.2: Comprehension Level of Analysis according to Departments.

DEPARTMENT	MIN	LEVEL
CIVIL ENG	3.82	HIGH
ELECTRICAL ENG	3.85	HIGH
MECHANICAL ENG	3.71	AVERAGE
COMMERCE	3.39	AVERAGE
GENERAL STUDIES	3.14	AVERAGE
MATH & SCIENCE	3.17	AVERAGE
TOTAL VALUE	3.60	AVERAGE

5. Discussion and Conclusion

Problem- Based Learning (PBL) that was carried out for this group of students could create an interesting and realistic learning environment. The outcomes of the project created by the students undergoing project based on PBL approach can be described as having more creative and innovative characteristics as compared to the previous projects. The competition and cooperation between students are stimulating in designing and implementing innovative projects following to their groups. The result of discussion between group members and project's problem solving activities during the presentation could give confidence to the students in producing a more creative and innovative project by this group. The facilitator is merely playing the role of a guide and evaluator during the implementation of this course of project. The facilitator's absence once in a while (official purpose) would not disrupt the implementation of the project because students could contact and obtain information through forum when they are faced with problems and use the URL links provided in CIDOS to search for information especially those relevant to their project. PBL gives positive effect as an encouraging agent for the students to explore knowledge that they already owned and expand it's capabilities in learning to solve problems that they face using the knowledge. Students feel more confident, able to communicate, share information and have the initiatives to search for the required information. More important this learning method would be able to engage the learners actively in the learning process.

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