THE EVALUATION OF PROJECT-BASED LEARNING IN MALAYSIA: PROPOSE A NEW FRAMEWORK FOR POLYTECHNICS SYSTEM

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Abstract

Technical and Vocational Education is one of the various discipline that believed could encourage the country's economic growth. Project-Based Learning or PBL was introduced in the Malaysian polytechnics curriculum in terms to produce creative and innovative graduates Thus, Project-Based Learning was introduced because of the ineffectiveness of the traditional lecture method. This study was a kind of descriptive study intended to examine the perception of students and supervisors regarding the Project-Based Learning at one Polytechnic in Malaysia. A population of 170 would be represented by a sample size of 118 respondents and 43 supervisors to participate in the study. The result found that the significant aspect to be included in Project-Based Learning is effective supervising skills. However, from the data, some supervisors have no proficiency skills of Project-Based Learning. Based on the empirical data which derived from the present study, a new framework for Project-Based Learning is suggested for the polytechnics system.

Keywords: *project-based learning, polytechnics, evaluation*

INTRODUCTION

Malaysia purposes to become the education hub in the region by 2015. Higher education sector has been a significant factor at the forefront in driving the nation's progress and development. This sector plays a key role in shifting Malaysia's position to become a high income economy by 2020. In terms of Higher Education Institutions as of October 2011, there are 20 public universities, 26 private universities, 23 private university colleges, 28 polytechnics, 74 community colleges, 434 private colleges and several branch campuses of foreign universities (www.moe.gov.my/). Technical and Vocational Education is one of the various discipline that believed could encourage the country's economic growth. Since 1969 when the first polytechnics, Ungku Omar was established, the polytechnics system in Malaysia has evolved. With 60,840 students in 2009 to 87,440 in 2012 (Wahab, Zakaria, & Jasmi, 2010), the polytechnics have expanded to become Malaysia's largest public tertiary TVE provider in this country. The demand for knowledge and skilled workers is growing due to the economic reality in 2020. High productivity and innovation are created by highly knowledgeable and innovative workforce – as evident in advanced countries such as the United States of America, Finland, Germany, South Korea and Japan. Thus, Project-Based Learning or PBL was introduced in the Malaysian polytechnics curriculum in terms to produce creative and innovative graduates. It is supposed that students by using PBL are actively involved in authentic inquiry, knowledge construction, autonomous learning, scaffolding, and proposing creative solutions (Chambers, Carbonaro, & Rex, 2007). Nevertheless, the present challenges facing polytechnics such as lack of innovative leadership, heavily centralized system, lack of PhD-qualified lecturers, poor R&D facilities, traditional pedagogies, heavy teaching workload, weak industrial linkages, inadequate funding and poor incentives (as compared to universities) may slow down the transformation pace (Wahab et al., 2010). PBL pressures on the knowledge construction derived from previous knowledge, experience, and interaction with the social environment. In addition, advocates assert that PBL arranges the stu-

dents for the independent, critical thinking and effective teamwork skills as required in the real workplace (David, 2008). In the nutshell, Project-Based Learning was introduced because of the ineffectiveness of the traditional lecture method.

An effective learning, basically, aims to increase and involve students in explore and inquiry activities which contain solving problem tasks and critical thinking need. According to Schneider (2005) and Grant (2002), Project-Based Learning is an instructional approach that emphasizes student-centered learning by assigning project. Project that mean by producing a masterpiece of product was the result from investigation work. Furthermore, Project-Based learning is a pedagogical model that involves students in investigation of real-world problems that culminate in authentic products (Intel Teach Program, 2007). Thus, in appearance, Project-Based Learning tends to be the appropriate approach to nurture higher order thinking. The need of students' with 4C skills (creative, critical, communication and collaboration) has been affected the schools to implement a systematic learning methods. According to Buck Institute for Education (2011) and Lipson, Epstein, Bras, & Hodges, (2007), Project-Based Learning is a systematic teaching method that engages students in learning, real-world problem and life-enhancing skills through creative, scientific, authentic and challenging process. Project-Based Learning is a dynamic model that focuses on teaching by engaging students in higher order thinking. It is also a tangible model that requires real-world task, collaborative investigation, and the production of an artifact or a product (Blumenfeld et al., 1991).

In the traditional approach, teachers usually act as a source of knowledge. Teachers usually assume the students as information recipient. Thus, traditional method is more suitable for theoretical subjects but not for practical studies. In contrast, Project-Based Learning is an approach that transforms teaching from "teachers telling" to "students doing" (EL KAMOUN, Bousmah, & Aqqal, 2011). This learning approach is also suitable in special education. As special need children, they often lack of normal ability in learning. The exceptional children could use Project-Based

Learning to sharpen their mind-hands coordination (Guven & Duman, 2007). Finally, Project-Based Learning goals include: developing students' knowledge, improving students' problem solving skills, enhancing students' self-directed learning (SDL), promoting students' effective collaboration, and boosting students' intrinsic motivation (Hmelo-Silver, 2004).

Finally, the Project-Based Learning is significantly more effective that traditional method in terms to promote creative knowledge and skill of the students. In the nutshell, Project-Based Learning was introduced because of the ineffectiveness of traditional learning. It provides students with real-world learning, engages students' in investigation task, enhances students' inquiry process and produces a tangible artifact. Many teachers perceive Project-Based Learning was benefit for the students, it was believed that it would motivate the students beyond academic content (Bradley-Levine & Mosier, n.d.). However, Project-Based Learning or PBL, teaches students not only about the content but also important skills in ways students have to be able to function like adults in our society. Those important skill means were communication skills, organizational and time management skills, research and inquiry skills, self-assessment and reflection skills and critical thinking (Goodman, 2010).

Zimmerman (2012) summarizes the advantages of Project-Based Learning from the students' perspective: (1) project is relevant to student's life and personally meaningful; (2) project is an exploration into an authentic problem; (3) in project, students are having a voice in selecting the problem; (4) project is a learning strategy that encourages students to monitor their own progress; (5) project fulfills the curriculum objectives; (6) project begins with driving question, and (7) project encourages students to revise their research and to reflect on their progress.

In PBL, the involving of students and supervisors was important and crucial as project' participants. However, supervisors are responsible to monitor the adequacy of resources, information, learning contexts, project time, and tasks (Mergendoller & Thomas, 2000). PBL uses authentic content and purpose with a major emphasis on higher-order thinking and problem-solving. The role

of the supervisors is to monitor the progress of the project. The supervisor should also facilitate the transfer of learning and to help the students who encounter problems while doing the project.

RESEARCH METHOD

This study was a kind of descriptive study intended to examine the perception of students and supervisors regarding the Project-Based Learning at one Polytechnic in Malaysia. Specifically, this study utilized a case study method which focused on one polytechnic and to evaluate the effectiveness of "Project-Based Learning" approach in that polytechnic. Case study is widely used in organizational studies and across the social sciences (Cassell & Symon, 2004). The research design was based on the research objectives and the conceptual framework. The variables in this study were supervisors' readiness and students' problem solving skills.

Population and Sample

The population for this research study were students and supervisors. The first population was final-project course (J5012) supervisors in the Mechanical Engineering Department in the selected polytechnic. The second population was final-year students who took the final-project course (J5012). In 2011, the selected polytechnic has 5,787 students with 374 academic staff and 74 non-academic staff. Specifically in 2012, 168 students registered for the final project (course J5012). Sample size was determined by using table of sample size by Krejcie & Morgan (1970). According to Krejcie and Morgan, a population of 170 would be represented by a sample size of 118 respondents. However, only 43 supervisors were willing to participate in the study.

Data Collection

The present study was considered to gain inputs from the students and the supervisors regarding the effectiveness of Project-Based Learning at one of the polytechnics in Malaysia. However, this section study aimed to propose a new framework for polytechnic system in Malaysia. The instrument for this study consisted of a set of

questionnaire. The questionnaires were distributed during the class and the students were given 30 minutes to answer the questionnaires. The questionnaire was designed to get students' and supervisors' responses about supervisors' readiness and students' problem solving skill during the Project-Based Learning implementation in terms to support a proposal framework for polytechnic system.

Data Analysis

The present study, a kind of descriptive statistics such as frequency, percentage, mean and standard deviation were used to analyze the variables. The data were analyzed with SPSS version 17 for Windows (Statistics Package for the Statistical Analysis). The questionnaire was consisted of five-point Likert scale. It was designed to measure various dimensions, and the interpretation of mean scores of each variable used in accordance with the range of scales.

RESULTS

Extended a new framework for the Project-Based Learning in the Polytechnic system

To understand the implementation of Project-Based Learning, the evaluation of those was prepared with CIPP model. The Project-Based Learning has been implemented at Polytechnic Malaysia since 2007. However, there was a dubious and problematic of its implementation. Since 2007, several evaluation studies have been conducted to evaluate the effectiveness of Project-Based Learning in the Polytechnic system. The previous findings of the studies show that Project-Based Learning has positive outcomes to the student's achievement. It was found that by using Project-Based Learning, students' performed significantly better.

Yet, the finding data, based on the present research, could be used to suggest a new framework for Project-Based Learning in the polytechnic system in Malaysia. The significant aspect to be included in Project-Based Learning is effective supervising skills. However, from the results, some supervisors have no proficiency skills of Project-Based Learning. The respondents also believed that supervisors with education-based were better than engineering-based supervisors in terms of supervising skills. The second crucial aspect was effective collaboration among the team participants. However, some students stated there was a lack of collaboration among the group members during the project. Therefore, this situation resulted less quality of the project.

Table 1.   Supervisor' readiness perceived by students (n = 118) and supervisors (n = 43)

	Items	Perceived by students		*Perceived by supervisors*	
		M (ME)	*Interpretation*	*M (ME)*	*Interpretation*
1.	My supervisor has the appropriate technical knowledge with regard to my project.	4.07 (.06)	Agree	4.21 (.09)	Strongly Agree
2.	My supervisor has supervised me effectively.	4.10 (.08)	Agree	4.28 (.09)	Strongly Agree
3.	My supervisor and I have determined the objectives to be achieved in the project.	4.25 (.06)	Strongly Agree	4.44 (.08)	Strongly Agree
	Total (Item L8 to L10)	4.14		4.31	

Table 2.   Problem Solving Skills perceived by the students (n = 118) and supervisors (n = 43)

Items	Perceived by Students		Perceived by Supervisors	
	M (ME)	*Interpretation*	*M (ME)*	*Interpretation*
1. Through Project-Based Learning, students 'problem solving skills has increased.	3.75 (.08)	Agree	3.86 (.11)	Agree
2. While there are problems during in the project, students discuss with the supervisor.	4.09 (.06)	Agree	4.09 (.13)	Agree
3. Critical and creative thinking are needed to solve the problem.	4.25 (.05)	Strongly Agree	4.47 (.09)	Strongly Agree
4. Project-Based Learning has increased students' ability to work in group in solving the problem.	3.90 (.09)	Agree	4.00 (.12)	Agree
5. Together with the group, I share my idea with the group in the project.	4.30 (.06)	Strongly Agree	4.14 (.10)	Agree
6. With my group, I manage the information that we get during the project	4.20 (.08)	Agree	4.16 (.09)	Agree
Total (Items L16 to L21)	4.08		4.12	

The next important issue to be addressed in the Project-Based Learning was effective communication between the students and the supervisors. From the data, some supervisors convinced that students' communication between the students and their supervisors was important skill in the Project-Based Learning. The fourth aspect to be included was creative thinking. Project-Based Learning purposes to improve students' higher-order thinking skills in solving the problems. Nevertheless, some supervisors believed that their students were less creative in resulting the idea for their project. Finally, the last important aspect was problem solving skill. Furthermore, Project-Based Learning emphasizes on the students' problem solving skills by involving the real world problem. From the result data, some students were overly rely on their supervisors to solve the problems in the project. At least, a new framework for the Project-Based Learning could be constructed with those five domains.

DISCUSSION

Based on the empirical data which derived from the present study, a new framework for Project-Based Learning is suggested for the polytechnics system. The study concluded that there were eight critical elements that significance Project-Based Learning in the polytechnic. The five elements are (1) knowledge about Project-Based Learning, (2) supervision, (3) collaboration, (4) communication, and (5) creativity, that been performed at Table 3. The first element is the enhancement of the students' and supervisors' knowledge of Project-Based Learning. The project coordinator should embrace briefing sessions with students and supervisors to expose them to theory and practice of Project-Based Learning. Next, the improvement of the supervisors' supervising skills is absolutely important. It is significant for the institution to train its lecturers to develop both the technical skills and supervising skills.

Effective teamwork among the group fellows is the next vital part to be advanced. Working in intact group is critical to sustain students-centered learning. Derived from the findings, collaboration plays key role in carrying out the project. The fourth element is communication skills of the students and their supervisors. Puny communication expertise were found to be detrimental to the project. During the project, some students had problem to communicate with their supervisors. The final element is the students' creativity. The students are expected to have critical thoughtful and creativity in the project. This can be revealed in their final products. The supervisors complained that their learners' projects were not innovative.

Critical Elements of the Project-Based Learning
a. Project-Based Learning knowledge
   1. Providing early exposure about Project-Based Learning
   2. Introducing the function of e-SOLMS
b. Supervision
   1. Developing supervisors' supervising skills
   2. Improving the supervisors' communication skills and changing students' negative attitudes
c. Collaboration
   1. Developing students' collaboration / teamwork skills
   2. Developing interpersonal skills for students and supervisors
d. Communication
   1. Enhancing students' and supervisors communication skills
e. Creativity
   1. Nurturing students' creativity since the first semester
   2. Conducting brain storming activities regularly

Based on the findings of the study, a new framework is proposed. Project-Based Learning was perceived as appropriate approach for the final project course in the polytechnic. Therefore, the project coordinator should hold a briefing class for introducing the Project-Based Learning's concept to the students and supervisors. With respect to the project module, some students performed a problem to understand the module. Thus, it is suggested that the Project Module be reviewed by experts (including industrial experts) to improve and develop the module' contents.
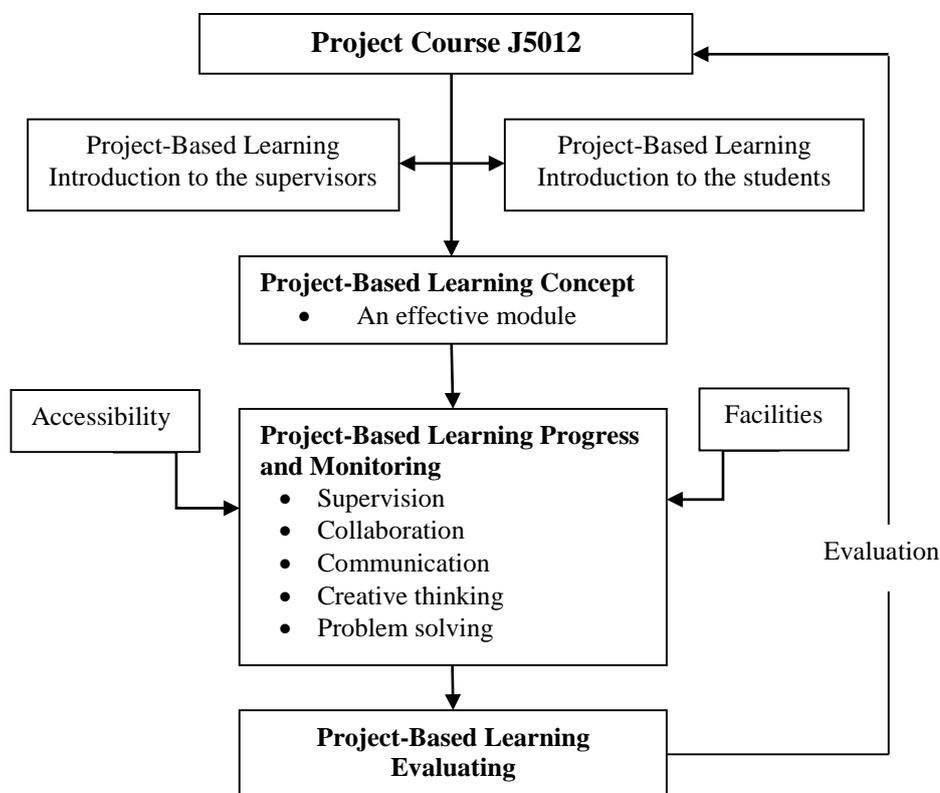
According to its concepts, Project-Based Learning was kind of constructivism approach that engages students in real-world project by involving the students to develop and apply their skills and knowledge. However, from the findings, some students had difficulty in solving the problem due to lacking of technical knowledge. They should refer to the experts in industry of manufacturer. Therefore, in project implementation, the supervisors should reinforce their supervising skills, enhance their collaboration and communication skills and nurture students' creativity and problem solving skills. In the final stage, the product evaluation is required to assess the quality of the Project-Based Learning implementation.

Figure 1 illustrates the new framework for the Project-Based Learning based on the empirical data of the study. There are five new elements which emerged from the present study. The new elements are basic knowledge, supervision, collaboration, communication, and creative thinking and accessbility Thus, a new framework for Project-Based Learning is deemed necessary to incorporate the new elements. As a main contribution of this study, the new framework is a new addition to the knowledge corpus of Problem-Based Learning for the polytechnic system in Malaysia

Commonly, the students and supervisors perceived that Project-Based Learning approach was appropriate for the Project Course J5012. This implies that the polytechnic should carry on the implementation of Project-Based Learning. In case of project-Based Learning progress, students and supervisors revealed the main problems in project such as lack of communication with group, inadequate facilities, and inadequate funding. Schneider (2005) emphasized that the students may have difficulty in Project Based Learning, for example, difficulty to find a project idea, to manage time, to collaborate with peers, and to produce quality product. The strategic finding from the present study is that most of the students perceived that Project-Based Learning has upgraded their experience and improved their knowledge. It implies that Project-Based Learning was appropriate for

project course J5012. Further, an essential characteristic of Project-Based Learning is that it focuses on doing something that enhance one's hands-on experience (Moursund, 2002).

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