

The Effectiveness Of Cooperative Problem-Based Learning (CPBL) Towards Lecturer's Conducted

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Abstract

Cooperative Problem Based Learning (CPBL) is an approach combining two different learning approaches of Cooperative Learning (CL) and Problem-based Learning (PBL), which highlights on a teaching method approach used by Student Centred Learning (SCL). The objectives of this research are (i) to examine the outcomes of CPBL application conducted by new trained lectures and (ii) to identify problems faced by them in conducting CPBL. There are four elements evaluated in this study which are (a) the students' motivation, (b) problem solving skills, (c) mastery of team working and (d) self-directed learning. This study applies method of data generation through qualitative questionnaires, interviews and observations toward undergraduates' students and lecturers. The interview results are organized into three stages - (a) beginning of the semester, (2) in the middle of the semester and (3) at the end of the semester. Significantly, this study offer wider reviews on new learning application that help lecturers to train students in some of skills likes problem solving and design to develop the students as a productive and dynamic future engineer.

Introduction

In the conduct the students in future engineering have facing with grand challenging in engineering education. There have four main factor challenging are global sustainability, energy, global poverty and healthy with infrastructure. So as lecturer must prepare all the engineering students' to familiar with solving the problem and should be built around developing skills focus on shaping analytic skills, design skills and problem-based learning skills. An engineering educator must teach methods and not solution.

In CPBL model, lecturer as facilitator has their own roles to conduct the class. The roles as facilitator is an important to make this teaching approach can achieve the outcome objective. Until now, the model has only been conducted by the researcher, while the implementation and success have been reported through several research papers (Khairiyah et al., 2005; Khairiyah & Syed Helmi, 2008; Mohammad Zamry et al., 2010; Nor Farida et al., 2010; Khairiyah et al., 2010). The time has come for the approach to be disseminated to other lecturers in engineering courses so that it can be tested and utilised by other engineering lecturers. The dissemination of CPBL teaching approach can be improves through the production of an interactive teaching guide that can assist these lecturers who are interested to adopt such new and effective teaching approach. The production of this guide will not be successful if the difficulties faced by new implementers of CPBL to attain the desired outcomes are not identified. Hence, this research is important to identify problems and process of transferring new teaching approach to lecturer who do not have strong background in education and pedagogy.

Background of the Study

Based on challenging in engineering education is parallel with Malaysia New Economic Model (NEM) as a means to upgrade and bring the country to the next economic level in higher income, inclusiveness and sustainability to get the quality of life. As a part of this effort, one of the KPI of the Ministry of Higher Education (MOHE) is to improve the delivery technique used in institution of higher learning, to shift from the traditional one-way lecturer to students centred learning (SCL) technique. Since December 2010, the MOHE organized a series of seminars on SCL to disseminate best practices in teaching with cases, Problem-based Learning (PBL), Project-oriented Project-based Learning (POPBL) and modular based teaching. At the international level, there are very strong movement to transform higher education, especially in engineering education.

Compared with many pedagogical approaches PBL has emerged relatively recently, being popularized by Barrows and Tamblyn following their research into the reasoning abilities of medical students at McMaster Medical School in Canada. This new method they proposed involved learning in way that used problem scenario to encourage students to engage themselves in the learning process, a method to become known as Problem-based Learning (PBL). PBL provides a forum in which these essential skills will be developed. The principle supporting the concept of PBL is older than formal education itself, namely, learning is initiated by a posed problem, query or puzzle that the learner wants to solve (Boud&Feletti, 1991). Problem-based instruction addresses directly many of the recommended and desirable outcomes of an undergraduate are think critically and be able to analyse and solve complex, real world problems; find, evaluate, and use appropriate learning resources; work cooperatively in teams and small groups; demonstrated versatile and effective communication skills, both verbal and written; use content knowledge and intellectual skills acquired at the university to become continual learners (Barbara, Susan & Deborah, 2001).

Cooperative Learning (CL) and Problem-based Learning (PBL) are said to be the teaching methodologies used in response to the challenges posed by today's educational outcomes (Jonassen, 2006; Felder & Brent, 2007; Duderstadt, 2008). In CL, students work together in a small group to accomplish a shared learning goal and to maximize learning (Johnson, et al., 2006). In PBL, besides promoting the construction of knowledge, it also contributes to the development of problem solving skills and attitudes deemed important for engineering practice (Duderstadt, 2008). Today's students need to be engaged in constructing their own knowledge structures and learning environments through interaction and collaboration. Prince (2004) recommended that CL and PBL be integrated to exploit the natural synergy between them.

Cooperative Problem-based Learning (CPBL) is an innovative approach in teaching and learning. It is based on the Problem-based Learning (PBL) approach originated from McMaster University which is suitable for a group of 6-10 students. Through years of research and trials in classes with engineering students, CPBL has taken its new form with three distinctive phases (see Figure 1) that facilitate the teaching and learning of a big group of 60 students (Khairiyah et al., 2010). This class size is more realistic to the engineering courses in most of the Malaysian universities compared to the conventional PBL that caters for 6-10 students in a small group tutorial. CPBL model is a combination of PBL and Cooperative Learning (CL) to emphasize learning and solving problems in small student teams (consisting of 3-5 students) in a medium sized class, of up to 60 students for one floating academic staff or facilitator. The model requires the problem to be realistic, if not real, with a scenario that serves to contextualize and immerse students in the problem. e-learning may also be integrated into the learning environment to include activities to reach the desired educational objectives, such as creating realistic problems to encourage immersion, facilitating students and providing scaffolding, as well as providing additional platform for discussion and peer teaching. The framework,

designed based on constructive alignment (Biggs, 1996; Biggs & Tang, 2010), serves as scaffolding for guiding students in going through CPBL.

From the CPBL cycle shown in Figure 1, the framework can be used to visualize the CPBL process to assist students in learning new content and finding a solution for the given problem. It is for supporting students to grasp the overall requirements of the whole process, as well as the significance of each step in terms of the outcomes and activities in each block as they go through each of the three phases in the CPBL cycle. Phase 1 consists of the problem identification and analysis stage. Phase 2 is the learning, application and solution formulation stage. Phase 3 is the generalization, internalization and closure stage. The teaching and learning activities, assessment and rationale for each block must be explained step by step as students undergo the process from one block to the next in each of the three main phases for students who are new to CPBL to develop the necessary skills.

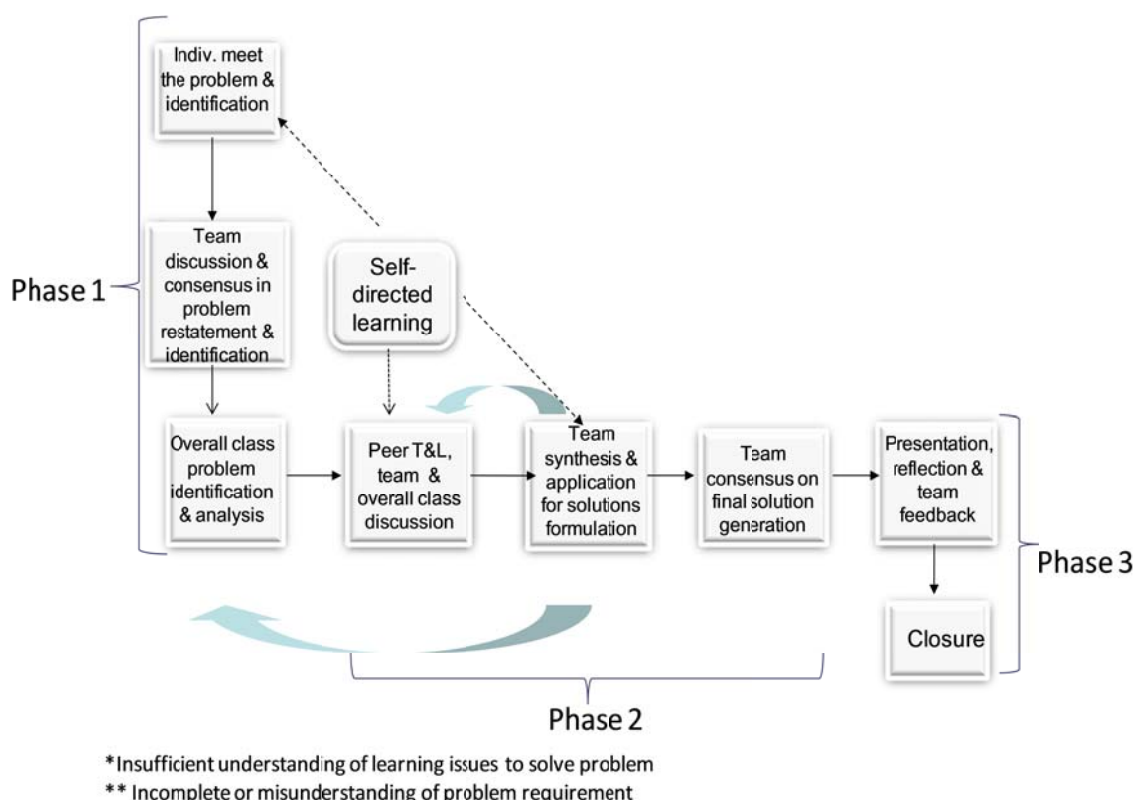


Figure 1: Phases of CPBL (Khairiyah et al., 2010)

In Phase 1, the problem is analyzed by establishing the following categories of information:

- existing knowledge or information that is known or given in the problem (the spring board for the problem)
- further data and information needed to solve the problem (learners have the knowledge but lack the data or information)
- learning issues or new knowledge that must be learned to solve the problem.

In Phase 2, the outcome is to have learners develop the skill to learn new material and apply them to formulate the solution. Learners have to evaluate different approaches to solve the problem and justify the choices made. Learners individually prepare peer

teaching notes in the form of explanations of what is understood, ideas or concepts that needs to be verified and questions on hazy points on the learning issues that have been assigned by their teams. Other than promoting accountability, students learn to construct new knowledge by extracting important concepts and information, explaining what they understand, and inquiring about what do not fully understand to develop abilities to learn through questioning. Peer teaching is essential in developing skills to learn in students, especially on technically challenging material, where they would easily give up if they were to study alone. Students explain what they understand to teach team members while learning together, and discuss the questions or unclear concepts before coming to class for the overall class peer teaching and learning session.

The overall class peer teaching discussion is a 2-hour session monitored by the facilitator where each student understand that they need to be prepared to participate in the discussion as part of the learning community to gain most and maximize their learning. Each team is expected to come to class with a list of questions or ideas on concepts that they want to verify with other teams. A quiz on important learning issues may be given as formative assessment to enable students to gauge their understanding, and indicate to the facilitator if additional scaffolding, like tutorials or mini lectures, should be given. During the rest of Phase 2, all collated information and knowledge is shared and critically reviewed, before the relevant ones can be synthesized and applied to solve the problem. This step can be iterative, where students need to re-evaluate the analysis of the problem, pursue further learning, reporting and peer teaching. Usually, at this point students actively participate in e-learning forum designated for the problem – asking questions, giving opinions and views, discussing the concepts in order to solve the problem. The electronic forum is monitored by facilitator and if necessary, will join in the discussion to probe, motivate and bring students to the right path whenever they are off-track. For problems lasting more than 2 weeks, a simple progress report or progress check on each team is recommended midway through the duration of the problem. The aim is to provide feedback to ensure that students do not stray too far from what is required, and prevent last minute work.

In Phase 3, the outcome is to have learners evaluate the final solution from each team, and internalize and generalize the concepts and skills learned. The teams submit the final product, whether it is a report, presentation or other deliverables. If there is insufficient time for all teams to present, presentation of solution from one or two teams would be sufficient to start the ball rolling to discuss solutions obtained. The facilitator should probe the students during the discussions to determine acceptable solutions, and justify their choice of the best solution for the problem. During the closure, the facilitator comments on the possible solutions, as well as identify the best solution. Mistakes or misconceptions in important concepts, and difficulties or good practices in process skills or team-working may also be analyzed and reviewed. Connections between concepts and applications in other areas are discussed. This is necessary to widen the views and generalize the knowledge transfer for other types of applications, thus strengthening students' understanding. It is also important to tie up loose ends to avoid feelings of dissatisfaction among students.

To support the development of students' team working skills and improve their learning process, a team-based post-mortem on how the process that they went through and the team performance must be conducted in class. Confidential peer rating and written feedback from each team member to his/her team mates, (eg: what is good and what needs to be improved) is also given during a class session. Reflection may be assigned individually or team-based. Initially, prompting questions are provided as scaffolding for students to do a good reflection. In submitting individual reflections and the team feedback, students are guided to internalize what they have learned and develop metacognitive skills. Metacognitive skills are essential for life-long learning and for

students to understand themselves as a learner, and as part of a community. By the end of the semester, most students learn internalize not just knowledge, but also the process that they went through to develop their skills. In addition, as part of continuously improving themselves, they were also able to identify aspects that need improvements.

Problem Statement

In this study to determine the Effectiveness of Cooperative Problem-Based Learning (CPBL) towards lecturer's conducted.

Research Objectives

This study embarks on the following objectives:

1. To examine the outcomes of CPBL application conducted by new trained lectures
2. To identify problems faced by them in conducting CPBL.

Besides that there are four elements evaluated in this study which are

- (a) The students' motivation,
- (b) Problem solving skills,
- (c) Mastery of team working and
- (d) Self-directed learning.

Methodology

The research design is based on ethnography research where detail observation and interview will be carried out to identify problem faced by engineering lecturers who are new to the CPBL approach. There are four phases in this study:

Phase 1 – provide workshop and guidance to lecturers in conducting CPBL

Phase 2 – implementation of CPBL and data collection

Phase 3 – data analysis to identify problems and suggestions to improve CPBL

Phase 4 – produce the interactive guideline based on the data analysis

About 6 lecturers from two difference universities will involve in the research. Before the data collection, engineering lecturers who are interested in CPBL will be given a four 2-day workshops on CPBL which includes Active Learning, Cooperative learning, the CPBL process and problem crafting, and facilitation and assessment in CPBL. During the new semester, the lecturer will apply CPBL to their teaching. Researchers will assigned to their classes to observe the teaching. Field notes and video recording will be taken during the observation. This is to understand the issues, problem and difficulties faced by the lecturers during the conduct of CPBL. To triangulate the data and verify the observation, the lecturers and some students will be interviewed. The lecturers will be asked about the problems and difficulties that they faced during the teaching while the students will be asked about their perception of the new teaching approach that they are experiencing. All the data will be analysed using Grounded Theory constant comparative method to identify the core problems and difficulties faced by the lecturers in implementing the new teaching approach.

The effectiveness of the use of CPBL among these lecturers will also be assessed based on the students' achievement through their test results and case studies,

students' motivation, problem solving skills, teamworking skills using questionnaires and reflection sheets. At the end of semester, lecturers and students, there will be focus group to identify problems and some suggestions that can help to improve the teaching approach. This will run for two semesters consecutively. The result of the Phase 3 will be used to produce the interactive guideline. The lecturers will then be asked to review the guideline and further improvement can be made based on their evaluation.

Conclusion

From this research, the relevancy of CPBL model developed has not been conducted by other technical and engineering lecturer expert the researcher. It is very important to test idea on other lecturers who do not have a good background of pedagogy and educational basis. The variety of teaching methods in learning process that can give big impact toward students achievement. The CPBL model it's can be suitable of any different engineering field with the difference level of difficulties.

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