

## Problem Based Learning (PBL) in Malaysian Higher Education: A Review of Research on Learners' Experience and Issues of Implementations

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### Abstract

Since its inception about 40 years ago in a medical educational program at McMasters University, problem based learning (PBL) has evolved in many institutions worldwide and extensively applied in myriad fields regardless of geographical boundaries. Over the last ten years, many Asian countries have implemented PBL inspired by the success of this approach in western countries, especially in medical schools. Following this trend, PBL has been adopted in Malaysia within a variety of fields in higher education such as engineering, ICT and multimedia, medical and dental education, physics, and teacher education. As PBL implementation involves significant change in class management and the role of students and teachers, it is pertinent to address the issues that arise during implementation, and any viable and feasible solutions. Since PBL is relatively new to the Malaysian educational landscape, it is also important to document the ways in which learners' experience PBL in terms of their perception, motivation, awareness and opinions. Specifically, this paper aims to document learners' experience in PBL learning and to outline issues related to previous PBL implementation specific to Malaysian higher education settings. Methodology involved identification of journal articles and conference proceedings on the implementation of PBL in Malaysian higher education from bibliographic databases for education and social science research, in particular that focus on implementation issues and learners' experience in PBL. These resources were selected based on specific selection criteria outline at the outset of the study. The study found that Malaysian undergraduate students experiencing PBL in their learning are positive, based on their perceptions, attitudes, opinions and motivation. Scaffolding students, staff training, and a supportive administration are among general issues in PBL implementation recurring in given disciplines. The paper concludes that Malaysian undergraduate students have largely positive perceptions and opinions of, and motivation towards PBL. Strong support from staff and faculty, and students and teachers' readiness appear to be the key ingredients for successful implementation of PBL in Malaysia.

**Keywords:** Problem based learning; higher education; implementation; learners' experience

### Introduction

There is a worldwide concern for the quest of excellence in teaching and learning in higher education and also a requirement for universities and higher education institutions to produce graduates who not only possess knowledge but also skills and competence to apply that knowledge. Therefore, it is argued, there is need for pedagogical change in both undergraduate and graduate programs. A widespread worrying aspect has been that current curricula and pedagogy often fail to prepare students for solving authentic problems encountered in workplace or everyday life. In addition, students need to be equipped with higher order thinking skills and learning abilities as demanded by today's marketplace.

Accordingly, Problem Based Learning (PBL) is seen as an appropriate pedagogical innovation for providing graduates not only with content knowledge, but also necessary skills and competences needed in their future professions. PBL is a curriculum development and innovative teaching approach that simultaneously develops both problem solving strategies and disciplinary knowledge bases by placing learners in an active role of problem solvers confronted with problems that mirror real-world situations (Finkle and Torp, 1995). Casey and Hawson (1993) likewise contend that the focus of cognitive approaches to education should be on the quality of thinking processes, rather than the accuracy of the

answers they produce. Shifts in teaching and learning approaches in higher education based on cognitive and generic skills (Murray-Harvey and Slee, 2005) have contributed substantially to the development of the PBL curriculum in higher education.

Student-centred learning and collaborative learning are among the basic characteristics of PBL. Student-centred learning assumes the idea that student can "learn by doing" and therefore acknowledges that they play an active role in their learning as problem-solvers, and think in critical and creative ways (Barron et al., 1998). Teamwork among students engaged in collaborative learning increases the chances of success and enables the development of communication and interpersonal relationship skills. PBL aligns with the social constructivism theory that emphasize on learning and how to think and understand about a phenomena by interacting with peers in groups. A constructivist classroom setting involves authentic learning activities and a real-world context where students learn how to question things and apply their natural curiosity to the world. Constructivist promotes communication and social skills within a classroom environment that utilises collaboration and exchange of the ideas with others. This will lead students to evaluate their contributions in a socially acceptable manner. As a result, constructivism gives students ownership of what they learn and encourages higher retention, as learners

seek meaning for themselves and not the meaning constructed by their teachers.

### **Review of PBL in Higher Education**

Since its inception about 40 years ago in a medical educational program at McMaster's University, PBL has evolved in many institutions worldwide and has been extensively applied in myriad fields in higher education such as medicine, engineering, science and economics (van Barneveld and Strobel, 2009) and architecture, law and social work (Bould and Feletti, 1991). Its flexibility and diversity make it possible to incorporate PBL in different ways, in variety of subjects, disciplines and in various contexts (Savin-Baden and Wilkie, 2001).

Most reviews to date however have focused on medical education (e.g. Albanese and Mitchell, 1993; Vernon and Blake, 1993; Norman and Schmidt, 2000; and Colliver, 2000) and measured the effectiveness of PBL over traditional or didactic methods. The conclusions from this work include that PBL is equal to traditional approaches concerning knowledge acquisition, but that PBL students exhibit better clinical problem solving skills. One dissenting voice is that of Colliver (2000) who states that there is no convincing evidence that PBL improves knowledge and clinical performance. Dochy et al., (2003) analysed 43 empirical articles of PBL implementations across variety of fields in higher education and found a robust positive effect on students' skills albeit with a negative tendency concerning knowledge acquisition. Van den Bossche's (2000) systematic review also yields a similar result pattern of PBL's positive effects on students' skills, but negative impact on their knowledge. From Asian continent, Khoo (2003) reviewed PBL practices in medical schools across Asia, concentrating on issues of implementation and students' perception towards PBL. She concluded that most schools and students were positive about adapting to PBL, claiming that successful PBL implementation is enhanced by strong support from academic administrators and the training of both faculty and students. Another Asian-focused review paper is by Caesario's (2010). The review paper focuses on learning outcome, and responses and adaptability of Asian medical students towards PBL. Caesario (2010) outlines six issues in PBL implementation; passivity and low participation in discussion, preference for clear instruction over independent learning, tendency to be active in discussion, perception that PBL is time-consuming; poorly-structured problems, and that the environment is not conducive to small group discussion.

### **PBL in Malaysian Higher Education**

In recent years, PBL has become one of the promising innovations in Malaysian higher education teaching and learning settings and has gained considerable prominence. PBL was introduced in the

Malaysian education context, particularly in health sciences, in the early 1970s (Achike and Nain, 2005), yet its growth was slow and scarcely documented. However, by the 1990s, a growing number of medical and non-medical schools began to introduce PBL. For example, the Universiti Teknologi Malaysia (UTM), a public, technology-based university spearheaded PBL within its various engineering schools. Aiming to produce more high-quality graduates, it was argued that an engineering graduate should be equipped with skills in communication, team working, problem solving and life-long learning (Mohd-Yusof et al., 2005). In the University of Malaya (UM), Said et al., (2005) pioneering the implementation of PBL at the Department of Chemical Engineering, inspired by the need for electrical engineering graduates equipped with analytical skills, critical and lateral thinking, technical skills, team work and time management. Favourable outcomes from this pilot implementation encouraged other faculties to initiate PBL in their own courses. For examples, PBL was incorporated in the Faculty of Education to accomplish the goals of preparing future teachers with new competencies and skills. In the University of Science Malaysia (USM), PBL in operation in its medical school. Throughout the 5-year program for both medical and dental surgery degrees, the curriculum is problem-based and community oriented. PBL sessions here are combined with lectures, practical, fixed learning modules and clinical clerkship. For example, a PBL session will last for 2-3 hours and consist of a group of 14-16 students with tutors who aim to facilitate students' learning (Barman et al., 2006). Overall then, PBL in Malaysian higher education is more integrated into engineering and medical schools, than in other subject areas. Since PBL is relatively new to Malaysian undergraduates, the initiators (Mohd-Yusof et al., 2005 and Said et al., 2005) proposed a hybrid PBL approach and a gradual PBL introduction throughout the academic years.

As far as can be determined, there has been no PBL review that specifically focuses on Malaysian higher education. In view of the gap in the empirical literature, the aim of this review is to address learners' experience and general issues of PBL implementation in Malaysian higher education. Since the adoption of PBL require considerable changes from multiple perspectives, it is important to highlight what issues arise during PBL implementation from prior research. Thus, PBL implementation could be improve in the near future. The general aim for PBL adaptation in Malaysian higher education regardless of field is developing a more 'skilled' graduate. Hence, it is essential to address learners' experience during PBL including their perception, motivation and awareness.

### **Methods**

The methods used for eliciting reviews on PBL included searching through several bibliographic databases for education and social science research

(Educational Resources Information Center (ERIC), Web of Science (for Science Citation Index, Social Science Citation and Art and Humanities Citation Index), Scopus and PsycINFO) and searches of key research journals. Subject headings and keywords based on 'problem based learning' were combined with 'Malaysia' and 'higher education'. These produced a number of titles which were searched manually to trace potentially relevant papers, on the basis of abstract and descriptors. The selected publications were also used to assist in identifying other sources. Next, the snowball method was employed, i.e. reading selected publications which led to the identification of further relevant sources. Rickinson (2001) posits this method as a means to achieve comprehensiveness in a literature search, in which the search process is continuous until no new citations emerge.

### Selection Criteria

The following criteria were defined at the outset of the study to select suitable articles for inclusion in the review; Focus on empirical studies of PBL intervention in Malaysian higher education context, focus on studies of undergraduate students in higher education context, the outcome measure of any study to be learners' experience of PBL in terms of perception, motivation, and awareness and identification of types of intervention or learning environment which fulfill the PBL characteristics cited by Barrows (2000), such as tutor/lecturer as facilitator of learning, learners' responsibility to be self-directed and self-regulated in their learning, the design of problems as the driving force for enquiry. With regards to the criteria, 15 articles were identified (from journals and conference's proceedings) within various disciplines concerning medical science (Azila et al., 2001; Achike and Nain, 2005; and Barman et al., 2006), physics (Sulaiman, 2010 and Atan et al., 2005), engineering (Mohd-Yusof et al., 2004; Mohd-Yusof et al., 2011; Nopiah et al., 2009; Salleh et al., 2007 and Said et al., 2005), mathematics (Tarmizi and Bayat, 2010 and Sharifah and Lee, 2005), and multimedia and ICT (Neo and Neo, 2001; Sulaiman, 2004 and Yassin et al., 2010).

### Result and Discussions

#### Learners' experience in learning through PBL

From the reviews, Malaysian undergraduate students from across disciplines reported good experience associated with learning through PBL. The favourable experiences could be linked from the skills and acquired knowledge and highly valued group collaboration and discussion in PBL. From medical fields, Barman et al., (2006) investigated how dental medical students perceived the PBL process in terms of interest, enthusiasm and personal satisfaction. The study showed that 70 percent of students wanted to retained PBL ways of learning for the subsequent semester, since PBL fosters their in-depth

understanding, link basic science knowledge to clinical appraisal skills and develop group interaction skills. Azila et al., (2001) compared students' responses from PBL with ordinary subject-based tutorials. Students in PBL class agreed that discussion in PBL encouraged them to seek information and improved their understanding, integration and application of knowledge. Furthermore, they also felt that subject-based tutorials were much more efficient for obtaining information.

Physics and mathematics students valued their PBL experiences from knowledge, skills attitudes and motivations perspective. Atan et al., (2005) probed physics students' perception of learning through PBL and Content Based Learning (CBL) by means of formative and subjective questionnaires. Comparing the responses of students to both approaches, it was found that students of PBL outperformed their CBL peers in terms of achievement and exhibited more positive attitudes towards learning in PBL (acquisition in skills of meta-cognitive reasoning, and proficiency in problem solving). Tarmizi and Bayat (2010) employed quasi-experimental research as means to assess students' performances in statistics learning and motivation towards PBL learning at three different time intervals (after conventional learning, first-stage PBL and second-stage PBL). Motivation of students was measured by means of a questionnaire which comprises 36 items. The study showed a significant positive effect on students' motivation levels following PBL intervention. Sharifah and Lee (2005) research focused on students' activities and perceptions of PBL in a Mathematics Method course. The students agreed that the aspects of PBL that most contributed to their learning were discussion, group work, analysis and making sense of problems. They also enjoyed working cooperatively, improving their communication skills and adopting a more holistic outlook in their learning.

In engineering program, equipping engineering graduates with skills and enhance knowledge acquisitions are among the seminal aims of PBL implementation. Mohd-Yusof et al., (2004) introduced PBL in the 8<sup>th</sup> to 11<sup>th</sup> weeks of a chemical engineering course, aiming to enhance their generic skills. Data from student learning journals and questionnaires indicated that while there was a feeling of anxiety at the outset of the case study, chemical engineering students generally perceived PBL in a positive way, for example, in terms of the knowledge they gained, and their increased skills in problem solving, self-directed learning team-work and self-confidence. Salleh et al., (2007) adopted a PBL curriculum in an engineering course which aimed to address generic skills that correspond to those required of competent and marketable graduates. In the study, students' perceptions were that they benefited in the content area, gained more of theory and practice, enjoyed the experience of working as team members and

enhanced their study skills. Both facilitator and tutors felt happy due to students playing a more active role during learning, which not only improved their mastery of content knowledge, but also inculcated generic skills. Similarly, Napiah et al., (2009) introduced PBL into a Statistical Engineering course to overcome lack of problem-solving and knowledge application in mathematics and basic statistics among engineering students. This study likewise showed students' positive attitude towards working in teams since for them, teamwork increases cooperation and trust between participants. They also agreed that PBL helped to develop their skills and confidence in group projects.

There are two research evidences explicitly describe student appreciation of group work in PBL. Neo and Neo (2001) assessed students' perception of group project work and motivation in project development in a multimedia-supported PBL class. Findings from focus group interviews and supported by the mean score percentage indicated that at least two thirds (more than 70%) of students reported positive attitudes towards the PBL learning environment (e.g. highly motivated, enjoy being challenged, able to make creative input), an improved ability to think critically (PBL emphasis on thinking critically and enhanced understanding) and the ability to function well as team (e.g. learning more, developing common ideas, achievable goals). Sulaiman et al., (2004) incorporated PBL-ICT strategies into a traditional-based curriculum undergraduate course. The authors investigated students' perceptions of the effect of collaboration in PBL utilizing the Web learning environment of an undergraduate course. A special Web-based PBL learning context was developed and collaboration defined as student-instructor and student-student collaborative processes in terms of satisfaction and enjoyment. Analysis of findings revealed highly positive responses from students, in particular, their enjoyment of and satisfaction in the PBL process through engagement in the group task and scaffolding provided by the facilitator.

### **Issues in implementing PBL in Malaysian higher education**

A number of issues have emerged concerning PBL implementation within a variety of fields in Malaysian higher education. Since conventional pedagogic and didactic methods are entrenched in Malaysian higher education, embarking on innovative and student-centred and active learning as devoted in PBL requires significant change, both physically and cognitively. For the purpose of the current review, the implementation issues are divided into two parts; before implementation and during implementation.

### **Before PBL implementation**

Prior to PBL implementation, it is essential to obtain support from the administrators and prepare the academic staff for their new role in PBL class. Likewise, Achike and Nain (2005) identify two factors need to consider before embarking on PBL practices; open mindedness of faculty members in acceptance of PBL and academic staff training. Staff training is seen as particularly important since PBL requires a major change in teaching and learning processes, approach and principles. In a PBL class, a lecturer changes the role from knowledge provider to the facilitator. As a PBL facilitator, a lecturer should know how to motivate students in groups, when to intervene, how to encourage students to think critically and creatively, to which extend they should be given the information, and deal with the group dynamic and issues. Top-down support is also an essential factor for successful PBL implementation. Malaysian higher education system is highly centralized, hence the supports, funding, and approvals come from the administrative people. Therefore, collaboration with the administrative division is very much necessary.

Preparing students with the necessary knowledge and skills to be successful in PBL is important, since present Malaysian undergraduate students have a minimum of 11 years of traditional schooling at primary and secondary levels. Salleh et al. (2007) argue that the Malaysian school system is exam-oriented and therefore less favourable to deep understanding and skills development as demanded in a PBL class.

Oldfield and MacAlpine (1995) commented "In a new situation, students must have concept introduced to them in absorbable and achievable steps, they must receive understandable feedback at each stage and their confidence must be build from experience". Likewise, Segers et al., (2003) and Thomas (2000) relate the effectiveness of PBL approach rely upon providing range of supports and scaffolding to help learners learn how to learn. Lack of experience of methods adopted in PBL such as cooperative group working, taking responsibility for one's own learning, searching for relevant information, communicating, etc. can increase stress and worry among students (Kelly and Finlayson, 2007).

From the review, there are two proposals on how to prepare Malaysian undergraduate students towards PBL; Give more motivation, encouragement and guidance for students not 'accustomed' to PBL at the beginning of the semester (Mohd-Yusof et al., 2011) and introducing PBL gradually throughout the academic year and having fewer PBL-devised problems in the first year of a course (Said et al., 2005) so that students will gradually familiar with PBL learning. This is proven from Mohd-Yusof et al. (2004) research. Here, PBL evaluations indicated that the popularity of PBL increases with experience: from only 60% of the students preferring PBL over

traditional methods after one semester, to 83% indicating a preference for PBL after the second semester. This suggests that the students are better able to cope with PBL demands, the more experience they have of it and from the lecture-based chemistry module that runs concurrently with the laboratory module. There is further evidence from this evaluation, that some students feel an initial sense of frustration when confronted with a new approach. Such frustration is less evident at the end of second semester.

### During PBL implementation

PBL is all about group learning, in which students make sense of learning by interacting with the peers in the group. Several group issues were reported from the previous implementations. Azila et al., (2001) reported the difficulty students face in conducting PBL discussion in English, which is a second language for them. This of course, will affect learning since students are not able to express their thoughts thoroughly as in their first language. In Malaysian higher education institutions however, most science, medicine and engineering clusters use English language as the medium of instruction as this is a national strategy for internationalization and for exposing Malaysian graduates to the challenges of globalization. However, from the semi-structured focus group interview conducted by Sulaiman (2010) to elicit physics students' perceptions of learning through PBL, it was reported that some students see PBL as an opportunity to improve their English proficiency in communication and discussions.

Another recurring group issues reported from the previous PBL implementations in Malaysian higher education is passive participation in group discussions and free riders, students who draw largely on other people's work. A study by Yassin et al., (2010) of a PBL-ICT strategy for the interdisciplinary integration of educational courses of three cohorts of Post Graduate Diploma in Education found evidence of free riders. To counter this, while students were given a group assignment for Cycle 1, the same assignment was repeated as an individual exercise for Cycle 2, to ensure that each student take responsibility for their own learning. Passive participation in group discussions were largely contribute by the inexperience of group learning skills among the Malaysian students, since their schooling background is devoted to traditional learning. A PBL facilitator could not expect that the students will develop the group learning skills by their own. Edwards and Hammers (2004) address this issue by suggesting that scaffolding should be introduced so that learners develop skills associated with effective group collaboration. Studies suggest that PBL is more demanding of tutors since students expect more feedback and guidance from them. Furthermore, students expect facilitators to be subject specialists, be

prepared before attending the sessions and be more interactive (Barman et al., 2006). To some extent, they also perceive the success of a PBL session to depend on facilitators' expertise. From the review, Mohd-Yusof et al., (2004) proposed a Cooperative Problem Based Learning (CPBL) framework to assist students to get the feedback and support from peers, rather than solely relying on the facilitators.

### Conclusion

The paper aims to shed light on learners' experience and issues related to PBL implementations. From the learners' experience, regardless of the discipline boundaries, students in PBL class informed about the skills they archived in participating in PBL like the interaction, problem solving, self-confidence, self-directed, critical thinking, and team working. Apart from skills acquisitions, PBL also fosters their in depth understanding, enhanced their theoretical knowledge, and promote deep approach to learning. Group working in PBL is seen as the way for students to actively participate in learning process, hone their skills to seek for the information, hone their cooperation and trust among peers in the groups and inculcated their ability to function well as a team. Strong support from staff and faculty, and students and teachers' readiness appear to be the key ingredients for successful implementation of PBL in Malaysia.

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