OBSTACLES TO THE IMPLEMENTATION OF PROBLEM-BASED LEARNING (PBL) IN LOCAL UNIVERSITIES OF HONG KONG

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Problem-Based Learning (PBL), a teaching and learning innovation based on the constructivist theory of learning, fosters creative and independent learning. This paper discusses results of a research set up to explore the obstacles to the implementation of PBL in three local universities in Hong Kong. The research took place in two stages, with interviewing followed by questionnaire administration. A total of 30 PBL tutors from three local universities were interviewed. Interview data indicate that there are three major factors hindering the successful implementation of problem-based learning, namely, resources, staff appraisal system, and student responses to PBL. Based on the interview findings, a PBL Teachers' Experiences Questionnaire was generated. A total of 19 returns (67% response rate) were received. Analysis of the questionnaire data indicated that certain factors played a more important role in PBL implementation: culture of the universities (PBL versus non-PBL); academic rank of faculty members (senior lecturer/lecturer) and their PBL experiences (experienced versus non-experienced).

INTRODUCTION

Studies in higher education have shown that students' difficulties in learning are illustrated by their inability to apply rules or concepts to novel problems. Gunstone and White (1981) described several experimental demonstrations with Physics I students, who had just completed a highly competitive matriculation examination to enter one of Australia's most prestigious universities. They were asked to predict and then explain what would happen when presented with a common physical event. These Physics students could give excellent definitions for the term, but failed to solve problems requiring the concept of Physics.

Studies by Balla (1990a; 1990b) with medical students reflected the same kind of student difficulty in applying knowledge. He observed that medical students often used basic science

knowledge incorrectly or not at all in formulating and revising clinical diagnoses. When these students became practicing clinicians, some of them rarely knew how to apply learned theoretical knowledge to novel clinical situations.

One prominent explanation to account for this type of student behaviour stems from the different views of knowledge and the ways of teaching. In the traditional perspective, declarative knowledge, which refers to content knowledge accrued from research, is taught separately from practice to students in lectures (Biggs, 1999). This perspective on teaching and learning emphasizes the passive nature of the mind (Gilbert & Watts, 1983) where students accumulate knowledge provided by the teacher. Thus, knowledge is detached from the actual real life context, and learners may find it difficult to apply it to novel problem situations.

The aim of education is to get students to develop the functioning knowledge which allows them to integrate academic knowledge base (declarative knowledge), skills required for that profession (procedural knowledge) and the context for using them to solve problems (conditional knowledge) (Biggs, 1999). In order to acquire this integration to achieve the aim of education, the traditional way of teaching and learning has to be put aside. Hmelo *et al.* (1997) argue that Problem-Based Learning (PBL) by its sole nature requires a different way of using knowledge to solve problems. What Hmelo refers to is that kind of functioning knowledge professionals require in real life working situations. The development of this functioning knowledge is the aim of education in general, and higher education in particular.

Problem-based learning is an instructional method that uses real world cases or problems as the starting point of learning. In the process, it is envisaged that students will acquire critical thinking and problem-solving skills. There are varieties of PBL, but basically a typical PBL sequence consists of the following stages: 1) the motivational atmosphere of learning is set up by a real life situation or problem; 2) learners are activated by means of group interaction with peers and facilitators over the case; 3) learners build up knowledge base of relevant materials; 4) the knowledge is applied to treat the case and 5) the case is reviewed.

Problem-based learning came into existence in the 1960's at Case Western Reserve and at McMaster Medical School, and was adopted by several medical schools during the 1970's. Henry and Murphy (1995) predicted that, by the end of the 1990's, about 40% of the Australian medical education programmes will be problem-based. In the Asia-Pacific region, and Hong Kong in particular, problem-based learning was first adopted by the medical school at the University of Hong Kong. There is a variety of PBL models, ranging from the pure form originating in McMaster University to the hybrid models adopted in other institutions. Locally, Tang et al. (1997) reported a modification of the pure model of PBL to fit the learning objectives of the six different courses at the Hong Kong Polytechnic University. These hybrid models of PBL consisted of the skeleton of PBL, but were supplemented by lectures and skill-training sessions to provide the declarative and the procedural knowledge base.

Several studies acknowledge the positive effects of PBL on various aspects of student learning (Albanese & Mitchell, 1993). Basically, these include areas such as knowledge retention, integration of basic science knowledge, acquisition of self-directed learning skills and enhancement of intrinsic interest. Albanese and Mitchell (1993) conducted a meta-analysis of all the PBL studies conducted between 1972 and 1992, and the following major conclusions emerge:

- PBL students are more capable of integrating basic science knowledge into the solutions of clinical problems, but they do worse on examinations of basic science declarative knowledge
- PBL students acquire more self-directed learning skills than do students in a conventional curriculum
- PBL students are intrinsically motivated to study the subject matter
- Knowledge retention increases in PBL students and/or graduates

The positive effect of PBL on student learning has been well documented, but the weakest link appears to be the assessment methods (Tang, Lai, Arthur & Leung, 1999). Teaching and learning operate within a system consisting of the three central components of course objectives, teaching method and assessment. To facilitate desirable learning outcomes, these three components have to be appropriately aligned. This is what Biggs (1996) refers to as "constructive alignment". In relation to this, there has been a growing volume of literature looking into the effect of inappropriate assessment on learning in PBL-based courses. A study by Lai, Tang and Taylor (1997) reported that when PBL was implemented within a traditional assessment system, most students felt insecure with the PBL approach. The examination results were poor and the course evaluation questionnaire indicated quite a low score on most of the items. On the other hand, if assessment is constructively aligned with the aims and philosophy of PBL, quite a different picture emerged. Lai et al. (1999) provide insight into the effective use of portfolios as a means of assessing student performance. Findings of this study indicate that students in the PBL class scored higher in the portfolio component of assessment than the non-portfolio component, and the different approaches students used in preparing portfolios were aligned with the aims of PBL.

Apart from the traditional non-aligned assessment system, there are other obstacles affecting the effectiveness of PBL on student learning. Thompson and Williams (1985) state that there are several barriers to the acceptance of problem-based learning in established medical schools: institutional complacency resulting from longstanding educational traditions and a lack of reward for teachers who develop academic competence in education at the expense of biological research and clinical care. In Hong Kong, another recent study by Lai and Tang (2000) reported the effects of quality assurance systems on the implementation of the PBL teaching strategy to courses in three local universities. Twenty-one PBL tutors were randomly selected for interview. Findings of the study indicate that the quality assurance system within most institutions does affect the implementation of PBL.

This paper is an extension of the same study by Lai and Tang (2000), and focusses on discussing the results of a PBL Teachers' Experiences Questionnaire developed from the qualitative interview data. The questionnaire served to find out whether the culture of the universities (PBL versus non-PBL) and the experiences of faculty members (experienced versus non-experienced) do have a differential effect on the implementation of PBL.

METHOD

The University Grants Committee of Hong Kong allocated a teaching development grant to promote and support PBL in health-science curricula. As a result, a PBL consortium team consisting of academic staff and representatives from the Educational Development Centre of three tertiary institutions was formed in 1997. Under the management and coordination of this team, research funding to develop and implement PBL in their respective curricula was

allocated to nine PBL sub-project teams in three universities involving a total of 30 PBL tutors. To evaluate the effectiveness of PBL implementation, two meta-projects focussing on student learning and faculty perceptions were operated by the PBL consortium team. This paper reports the findings of the latter project on faculty perceptions.

The project consisted of two stages. Stage one involved semi-structured interviews aiming at identifying the teaching orientation of the participants, any problems encountered during the implementation of PBL, and the participants' evaluation of the effectiveness of the main PBL project (that is, enhancement of teaching and learning through PBL). Twenty-one faculty members from the participating tertiary institutions who had participated as problem-based learning tutors were interviewed. The interviews were taped-recorded, transcribed by the research assistant of this project and analysed by the author of this paper.

The interview data revealed four types of constraints hindering the successful implementation of PBL: university reward system, teaching evaluation mechanism, resource allocation and student responses to PBL. The major findings of this part of the project were presented at the First Asia-Pacific PBL Conference (Lai & Tang, 2000). Based on these data, a PBL Teachers Experiences Questionnaire was developed and distributed to all the 30 PBL tutors including those who had participated in the interviews. A total of 19 returns (63% response rate) were received.

RESULTS AND DISCUSSION

The questionnaire consisted of a demographic section which aimed to identify the culture of institutions (PBL or non-PBL), the academic rank, and the teaching and PBL experience of the respondents. Findings from this section indicated that there were approximately equal numbers of respondents from PBL and non-PBL institutions. Of these participants, about 40% were at the rank of senior lecturers or above, and the rest were lecturers/Assistant Professors. 30% of the respondents had a tertiary teaching experience of over 10 years but only 10% of them had over 5 years of experience with PBL.

In order to analyse the questionnaire data from the various perspectives, the demographic data set was used to stratify the respondents into different groups: culture of the universities, academic rank of the respondents, and their experience with PBL.

The tables below compared and contrasted the characteristics and/or responses of three different groups: PBL/non-PBL based institutions; senior lecturers/lecturers; experienced/inexperienced PBL tutors.

Culture Of Universities (PBL Versus Non-PBL)

From the cross-tabulation of the questionnaire results, the major reasons for implementing PBL in PBL and non-PBL institutions were shown in Table 1.

Table 1
Major Reasons for Staff to Implement PBL

Questionnaire Item	PBL-based institution	Non-PBL based institution
Matches my philosophy of teaching and learning	88.8%	100%
Faculty/Department encourages faculty members to implement it	80%	12.5%
Available research funding for implementing PBL in the course	9.9%	75%

Table 1 indicates that staff from both kinds of institutions share a common belief that PBL matches their philosophy of teaching and learning. The positive pattern might be due to the fact that the respondents participated in PBL teaching/research on their own accord. Thus, it can be conjectured that majority of these staff members approve of the PBL approach.

As far as the support system is concerned, there is a significant difference between the two groups. For the PBL-based institutions, continuous faculty/departmental support encouraged faculty members to implement PBL whereas motivation and support received by faculty members of the non-PBL university seemed to have been generated from the research funding they received. Hence the support would be short-lived and ad hoc. Other than the duration of support involved, the type of support provided also differed. PBL-based universities provided a PBL-friendly quality assurance system for evaluating the teaching performance of the faculty members. In addition, the departments reduced the workload of students and teachers to make room for PBL innovations. These phenomena and offers were not provided to faculty members of non-PBL universities.

Academic Rank Of Faculty Members (Senior Lecturer/Lecturer)

Cross tabulation of the results of the questionnaires showed that there was a difference between lecturers and senior lecturers in terms of their teaching conceptions and perceptions of departmental support regarding the PBL implementation (Table 2).

Table 2
Major Differences in Teaching Conceptions

Questionnaire Item	Senior Lecturers	Lecturers
Teaching is a transmission of syllabus concepts	75%	22.2%
Teaching is a transfer of knowledge and skills acquired by the discipline	86%	44%
It is necessary to provide a PBL-friendly QA mechanism to measure the performance of teachers implementing PBL	88.8%	100%
It would be more effective if the whole faculty/department adopts PBL	87.5%	70%
Students find PBL course difficult as it is different from previous learning experience	62.5%	91%
I think the current quality assurance mechanism can adequately measure my teaching performance in general	80%	55.5%

Table 2
Major Differences in Teaching Conceptions

Questionnaire Item	Senior Lecturers	Lecturers
Students feel very frustrated learning with PBL approach	25%	55.5%
PBL is one of the teaching approaches which could help students learn more effectively and develop critical thinking ability	70%	100%

Results from Table 2 were categorised into two themes: teaching conception or quality assurance. From these two themes, common patterns and differences were then identified.
In general, it was noted that faculty members of a more senior academic rank of this research group tended to adhere to the more traditional way of teaching and they were awarded by the evaluation system. This may be due to the fact that the current teaching evaluation system in the local universities may not be PBL-user friendly, thus it is envisaged that teaching performances of those using the traditional transmission teaching mode would be rewarded. By the same token, it was understandable why the majority of senior lecturers holding the traditional teaching conceptions agreed that the current quality assurance mechanism could accurately reflect their teaching performance in general.

In contrast, new faculty members of a more junior academic rank seemed to be more acceptable to change to a more PBL mode of teaching as evidenced by the fact that most of them agreed that PBL was one of the teaching approaches which could help students learn more effectively and develop critical thinking skills. However, it was conjectured that these faculty members had a difficult time working through the system when trying to implement the PBL approach. Thus, half of them found that the student factor affected the PBL innovations.

Differences in the views of the two groups regarding PBL implementation could be described as external and internal. The internal factor for the 'senior lecturer' group seems to be related to their views and conceptions of teaching which are quite different from the philosophy of PBL. The 'lecturer' group, on the other hand, was influenced by the external student factor.

Though these groups had different viewpoints in some aspects, they did share some other common views. Both groups agreed that certain factors had to be built into the system in order to facilitate successful implementation of PBL. These factors included a PBL user-friendly quality assurance mechanism to reward or evaluate the teaching of faculty members, and a full support of PBL by the departments.

PBL Experience

A final comparison of the viewpoints of faculty members with different years of experience of PBL was done. The cross tabulation of results of the two groups - less than 1 year and 1 year or above - revealed the following major differences (Table 3).

Table 3
Major Differences of Groups with Different PBL Experience

PBL experience	PBL experience (< 1 year)	PBL experience (> 1 year)
My conception of teaching has not changed after PBL implementation	83.3%	25%
PBL implementation further confirmed my belief in students' ability for self-learning	100%	100%
It is necessary to provide a PBL-friendly quality assurance mechanism to measure performance of teachers implementing PBL	83.3%	100%
It could be more effective if the whole faculty/department adopts PBL	67%	83.3%
Students find PBL course difficult as it is different from previous learning experience	67%	84%
I am getting sufficient support from department/faculty to run PBL courses	16.7%	75%
The student feedback has affected my decision to implement PBL in the future	50%	58%

The majority of faculty members with less than one year experience in PBL found it rather difficult to change even with PBL training. Moreover, most of them got insufficient support from the departments. It was conjectured that these lecturers, with insufficient support, found that a hybrid model of PBL or PBL to be introduced into small sections of the course was a more feasible option. However, all these ideas were insignificant for experienced PBL teachers.

Despite all the above different viewpoints, inexperienced and experienced PBL teachers shared the following common views. Basically these basic viewpoints centred on quality assurance mechanism, the student factor and their teaching belief. The two groups agreed that a user-friendly PBL instrument and a departmental supportive environment were favourable factors for the implementation of PBL. On the other hand, the student factor also played an important role. Taking the pre-entry characteristics of the students into consideration, PBL should be implemented in a progressive way so that students who entered this type of course for the first time would not find it too difficult to manage. If managed properly, both groups believed that PBL should be able to facilitate students to self-directed learning.

CONCLUSIONS

The differential analysis of the results of the questionnaire indicates that there are four factors affecting the implementation of PBL in institutions. These factors are, namely, resource, quality assurance, student factor and teaching conception of faculty members. Analysis shows that PBL and non-PBL based institutions differ mainly in the type of support provided for the PBL innovation, namely, full continuous departmental support in the former, and ad hoc research funding support in the latter. In terms of the difference of viewpoints between faculty members of different academic ranking, the senior lecturer group indicated that the teaching conception and quality assurance evaluation system affected the implementation of PBL, whilst the lecturer group indicated that the external student factor played an important

role in the successful implementation of PBL. Irrespective of the experience of PBL tutors, all agreed that the quality assurance evaluation mechanism, student factor and teaching belief played an important part in PBL implementation. However, those faculty members with less experience in PBL found it quite difficult to take up the PBL teaching approach and they believed that it was impossible to run PBL as an individual course.

To sum up, the questionnaire, which was designed from the themes emerged from the interviews conducted in the early phase of this study, confirmed that student factor, teaching conception, and qualitative assurance and/or resource support were the basic hurdles affecting PBL implementation.

To alleviate the above problems, the quality assurance/resource and the student factor should be dealt with first. In terms of their nature, these two factors could be classified as internal operational and external. The quality assurance/resource factor (internal operational) includes issues such as the evaluative reward system of teaching and appropriate deployment of funding to substantiate staffing (workload, timetable and training) and physical resource (space, references). All these have to be sustained at an appropriate level for PBL to take on its shape.

With all these internal factors in place, we still have to consider the external student factor, which is a rather deep-rooted problem. The student factor has to be considered in the light of the educational system in Hong Kong. The local education system in Hong Kong is based on the elite system in the 70's to 80's where only 3% of secondary school leavers were able to enter the two local universities. With the expansion of the tertiary sector in the mid 90's when the number of universities increased from two to seven, 18% of secondary school graduates could now have a chance to secure a university place. Competition for university places in the current situation is still rather keen. In order to sustain a good reputation, secondary schools have to strive for excellence by trying to better the performance of their students in public examinations (currently the O-level and the A-level) which seem to encourage memorisation and surface reproduction. To attain this, most secondary school teachers tend to adopt a level one teaching approach focussing mainly on the transmission of knowledge (Biggs, 1999). As a result, teaching and learning become (public) examination-oriented, and most secondary school graduates are used to the didactic mode of teaching before they enter the universities. This presage factor means most of the university students find it difficult to adapt to, and even resent, problem-based learning which requires them to study independently and to be involved in group work. Hence to address this student factor, PBL would have to be best introduced gradually at the tertiary level involving full support and commitment from all levels. Some forms of hybrid PBL models might have to be considered, at least at the introductory phase so as to gradually reduce the gap between students' previous learning experience and the type of learning nominated by PBL. Hence if PBL is to be successful to its full intent, a more holistic approach should be adopted to introduce PBL in the elementary and secondary levels so that students will be better prepared and facilitated to develop the learning approach incurred by PBL. In fact, PBL may only be truly successful if it becomes a norm rather than an exception in both teaching and learning.

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