Factors Influencing Problem-Based Learning: Students’ and Teachers’ Perspectives

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Abstract

Aim: Problem-based learning (PBL) is a widely accepted teaching and learning method being used in most accredited medical schools. Phramongkutklao College of Medicine routinely utilized this powerful method. This paper involves the use of problem-based learning in teaching malaria session during parasitology course. From our experience, there is a number of contributing factor to the success of PBL. The objective of this study is to critically explore students and teachers’ perspectives on factors influencing PBL at our institution.

Methods: A cross-sectional study was performed on 204 medical students and 25 medical educators. Demographic data and perceptions toward PBL were obtained using electronic standardized questionnaire in 5 score rating scale. The questions were divided into 6 categories: objective and content, stress and anxiety, teachers’ role, group work attitude, self-preparation and self-assessment. Independent T-test was used to compare means between students’ and teachers’ perspectives. Exploratory factor analysis (EFA) was used to explore loading factor of each factor.

Results: The Cronbach's alpha revealed that the questionnaire was generally reliable (0.78). Objective and content (p-value 0.003), students’ preparation (p-value 0.005) and student assessment (p-value 0.026) had significantly different view between students and teachers while the other topics shared parallel view by both groups. In addition, student assessment (λ = 0.84), student’s preparation (λ = 0.83) and attitudes in group work (λ = 0.82) have high impact over PBL.

Conclusions: It can be concluded that, both students and teachers had generally good attitude toward PBL. We concluded that good attitude and preparation in problem-based learning session from both students and teachers are vital to good quality and successfulness in implementation of problem-based learning.

Keywords: Problem-based learning (PBL); Students’ perspectives; Teachers’ perspectives
Introduction

Problem-based learning (PBL) is one of widely accepted educational method in medical education. It represents the shift from the traditional perspectives on education which focus on teachers’ teaching to a focus on student-centered learning. The core concepts of PBL involves the following compartments (Wilson, 1996):

1) Authentic situations lead to development of clinical problem-solving capabilities.
2) Students work in small group to solve the given problems and focusing on students’ responsibilities for their own learning.
3) Teachers act as facilitator.

Moreover, there were additional characteristics of PBL which were conjugated to original characteristics through modifications in its history. These characteristics included the joining of theory and practice, emphasizing on learning process of students, transformation of teachers’ assessment to students’ self-assessment or peer assessment and focus on communication and interpersonal skills (De Graaf and Kolmos, 2003).

Medical education is tasked with making healthcare professionalism for undergraduate students in parallel with the rapid changing of technology, changes in demographics, environmental changes and globalization. It was aimed to make medical students became active and independent learner.

Thus, PBL is a good educational material which would bring about various skills important for healthcare professionalism. It cultivates not only learning skills, but also skills and attitudes in teamwork, sharing a group, listening, recording, co-operation, respecting colleagues' views, critical evaluation of literatures, self-direct learning and use of resources and presentations skills (Wood, 2003).

In addition, PBL helps medical students adapt theories learnt in classroom or by any means of study to a real world practices. With always updating medical information, self-study becomes increasingly vital for medical education. Entirely, these skills fulfill levels of Bloom's taxonomy from remembering to evaluation and can engines medical students to develop the top hierarchy of the Bloom’s taxonomy pyramid, the creation of new knowledge.

In the PBL, teachers perform various roles from designer of problems to facilitator of learning. The facilitator role is the most important. Teachers can observe learning processes of the students in their action. They can observe how students acquire for new knowledge, employing prior knowledge, motivation of learning, team collaboration and pitfalls. Moreover, teachers can intervene the learning processes of students in order to keep their learning in line with learning objectives and stimulate their learning by asking questions, offering examples and feedbacks to students (van Berkel, Scherpber and Hillen, 2010). Teachers who can fulfill these roles during the PBL sessions can greatly enhance students’ achievement.

As a result, PBL has been widely used as a teaching approach in various accredited medical schools since its first implementation in 1966 at the McMaster University in Canada (van Berkel, Scherpber and Hillen, 2010). Phramongkutklao College of Medicine in Bangkok, Thailand, was among those medical schools. We utilize the PBL as one of the method of teaching in various topics to our preclinical medical students with relatively positive outcomes. The students can achieve knowledge effectively when combine PBL with didactic lecture-based learning. However, the successfulness of PBL depends on various influential factors from both students and teachers.

The objective of this study was to demonstrate both students and teachers' perspectives on factors influencing PBL and to compare between students’ and teachers’ perspectives on these factors at our institute.
Methods

1. Study design

A cross-sectional study was designed to assess the factors affecting PBL from both students’ and teachers’ perspectives at Phramongkutklao College of Medicine.

2. Study population

First, we included all medical students in this study. The first, second and sixth year students were excluded because the first and the second year medical students had not yet enrolled in PBL classes. Sixth year students were excluded because they were usually assigned to rotate in affiliated hospitals resulting in most of their absence during our study timeframe. Second, we randomly select teachers from both preclinical and clinical departments. Then, the subjects were divided into two groups which were medical students and teachers. The first group; medical students in third, fourth and fifth year who had experienced the PBL topic ‘malaria’ during their third year class. The second group; teachers both from pre-clinical and clinical departments - was staffs who took part as facilitators. The selection process was shown in Figure 1.

3. Data collection

We used an electronic standardized questionnaire which included three parts: short answer questions for obtaining demographic data, 5-score rating scale questionnaire for obtaining both students’ and teachers’ perspectives toward
factors influencing successfulness of PBL and lastly, the comment part for students and teachers to fill comments about gaps in problem-based learning at our college. The 5-score rating scale questionnaire itself was divided into 6 topics representing factors that had influence over PBL. The factors and all questions in each factor were listed in Figure 2.

Figure 2 - Questionnaire involving six factors

| Factor 1: Objective and content | 1. I think that there should be clear objective of learning |
| Factor 2: Stress and anxiety | 1. Group learning is less stressful than learning individually. |
| Factor 3: Role of teachers | 1. I prefer the role of facilitator than lecturer |
| Factor 4: Attitude toward group working | 1. Group working consumes more time than working individually. |
| Factor 5: Students preparation | 1. Basic knowledge about 7-jump step leads to successful problem-based learning |
| Factor 6: Student assessment | 1. Students have developed their skills in active learning |

4. Data analysis and interpretation

We used a reliable statistic program to evaluate the perspectives of students and teachers toward factors affecting PBL. The reliability of the questionnaire was verified by the Cronbach’s coefficient with the cutting point for reliability at 0.70. Independent T-test was used to compare between students’ and teachers’ perspectives toward 6 factors influencing PBL. Significant factors would be considered at p-value 0.05 and 95% confidential interval (CI). Exploratory factor analysis (EFA) was applied to demonstrate importance each factors had to the perspectives of students and teachers. Loading factor of 0.80 or higher would be considered to have high impact over students’ and teachers’ perspective.

Results/Analysis

1. Background

From the collection of data, the student group comprised of 204 medical students. Mostly were male students (52.94%). Majority of students third year (43.14%) following by fifth year (30.88%) and fourth year (25.98%). The teacher group consisted of 25 teachers. Mostly were male (68.00%) and were from preclinical department (88.00%). During the past 5 years, most teachers had enrolled in PBL sessions more than once (68.00%). The baseline
characteristics were displayed in Table 1 and 2.

### Table 1 - Baseline Characteristics of Student

| Characteristics     | n (%)       |
|---------------------|-------------|
| Gender              |             |
| Male                | 108 (52.94) |
| Female              | 96 (47.06)  |
| Year                |             |
| Third               | 88 (43.14)  |
| Fourth              | 53 (25.98)  |
| Fifth               | 61 (30.88)  |

### Table 2 - Baseline Characteristics of Teachers

| Characteristics                          | n (%)       |
|------------------------------------------|-------------|
| Gender                                  |             |
| Male                                     | 17 (68.00)  |
| Female                                  | 8 (32.00)   |
| Department                              |             |
| Pre-clinic                              | 22 (88.00)  |
| Clinic                                  | 3 (12.00)   |
| Experience as facilitator in PBL classes |             |
| 0-1 time                                 | 8 (32.00)   |
| >1 time                                  | 17 (68.00)  |

2. Reliability of the questionnaire

All of 6 topics of this questionnaire were used for pilot study in 30 medical students first. The Cronbach’s alpha value was 0.78 which can be considered reliable.

3. Comparison between students’ and teachers’ perspectives

There were 3 factors of which students and teachers had significant different perspectives upon at 95% CI. These 3 factors were ‘objectives and contents’ \((p\text{-value} 0.003)\), ‘students’ preparation’ \((p\text{-value} 0.005)\) and ‘student assessment’ \((p\text{-value} 0.026)\). The overall comparison between students’ and teachers’ perspectives was shown in Table 3.

### Table 3 - Comparison between Students' and Teachers' Perspectives on PBL

| Factors                          | Total Score | Mean ± SD | P-value |
|----------------------------------|-------------|-----------|---------|
|                                  | Students    | Teachers  |         |
| Objective and content            | 15          | 13.50 ± 1.87 | 14.20 ± 1.00 | 0.003* |
| Stress and anxiety               | 15          | 11.82 ± 1.93 | 11.76 ± 1.85 | 0.438 |
| Role of teachers                 | 10          | 7.70 ± 1.45  | 7.68 ± 1.73  | 0.480 |
| Attitudes toward group working   | 25          | 19.83 ± 3.36 | 18.92 ± 3.04 | 0.098 |
| Students' preparation            | 40          | 33.75 ± 4.93 | 36.36 ± 2.91 | 0.005* |
| Student assessment               | 35          | 28.12 ± 5.04 | 30.24 ± 5.71 | 0.026* |
4. Loading factors of each factor

EFA revealed that factors which had high impact over students’ and teachers’ perspectives were ‘attitudes in group work’ ($\lambda = 0.82$), ‘students’ preparation’ ($\lambda = 0.83$) and ‘student assessment’ ($\lambda = 0.84$). The overall impact factors of all factors influencing students’ and teachers’ perspectives toward PBL was demonstrated in Figure 3.

Figure 3 - Loading factors of each factors toward students’ and teachers’ perspectives

Discussion

From our study, students’ and teachers’ perspectives toward ‘objective and contents’, ‘students’ preparation’ and ‘student assessment’ were significantly different.

In ‘objective and contents’ factor, students considered that there were too wide scope and unclear objectives of learning in PBL classes which affected students’ successfulness during PBL classes. Course objectives help students check whether they cover the topics intended to be studied or not(Dolmans and Schmidt, 1994). Most students agreed that narrowing of learning scope into ‘what is needed for physicians’ and clear objectives of learning help them cover the crucial points required for health care providers. In contrast, teachers thought that scope and objectives of learning of PBL were wide, clear and general enough for students to learn.

For ‘students’ preparation’, there were different views from students and teachers. Most students viewed that there were not sufficiently prepared for PBL classes. They listed lack of time, lack of resources and lack of guidance as the contributors to their insufficient preparation. Insufficient preparation made students anxious about the depth and level of their knowledge(Rowan, McCourt and Beake, 2008). However, teachers viewed that students had sufficient preparation and responsibility for PBL classes and could processed well during the learning. This teachers’ view is parallel to another study(Abrandt, Castensson and Dahlgren, 1998).
‘Student assessment’ also acquired different view from students and teachers. Most students concerned whether they developed knowledge and skills required for health care professionalism after PBL. They were anxious that team members who did not possess high responsibility could not contribute as much as they had agreed. This finding was similar to prior study (Rowan, McCourt and Beake, 2008). They were not confidential enough about their coverage of crucial points required as mentioned earlier. They also felt the needs for wrapping up overall knowledge from teachers in order to perform well in summative assessment. However, this view was not shared by teachers. They thought that most students acquired enough knowledge following the end of PBL sessions. Teachers thought that students had develop skills such as communication and critical thinking skill unknowingly during PBL classes and students could perform well in summative assessment.

In our study, ‘attitudes toward group work’, ‘students' preparation’ and 'student assessment' were important factors influencing PBL in both students’ and teachers’ perspectives.

‘Attitudes toward group work’ included time consumption, individuals' learning effectiveness, individuals’ role fulfillment, individuals' acquisition of new knowledge through discussion and individuals' empathy toward other team members. Both students and teachers understood that core concept of PBL is group work. Thus, a successful PBL requires a fully co-operating team work. Previous study indicated that a productive learning group requires students with high motivation, unity and interaction (Das Carlo, Swadi and Mpofu, 2003; Rowan et al., 2007).

‘Students' preparation’ was important as prepared PBL would enhance smooth learning process. Groups with students readily prepared for PBL classes tend to perform well (Hmelo-Silver, 2004). Some of the dimension of this factor were parallel to the ‘attitudes toward group work’ as it included students’ motivation, students’ unity and students’ interaction and participation. These three dimensions indicated students’ prior agreement and roles assignment before the beginning of PBL classes in order to process in the classes smoothly. Other dimensions consisted of enough preparation time, basic knowledge of ‘PBL 7-jump’ step and basic knowledge about resources. These dimensions indicated students' preparation of knowledge before the start of PBL sessions.

‘Student assessment’ also played a vital role for successful PBL. Feedbacks were important for further development of students in both students’ and teachers’ perspectives. Student were assessed in seven dimensions which were active learning skill, communication-discussion skill, resources finding skill, critical thinking skill, recognition of knowledge acquired, confidence and English language skill. Teachers’ feedback would allow students whether they reached requirements, going off-track from the objectives and reflection on processes of learning (Rowan, McCourt and Beake, 2008).

There were some limitations to our study. We were inability to gather all responses from every medical student due to tight learning and activities schedules.

Conclusion

Good attitudes and well preparations from both students and teachers, clear scope and objectives of PBL sessions and feedbacks are important factors for PBL successfulness. A successful PBL can brings about benefit to enrolling medical students which include both knowledge and skills associate with medical education field.

Take Home Messages

PBL should be utilized along with didactic lecture because students can build up various important skills during learning processes during PBL classes. On the other hand, improvement in flaws in PBL sessions are required in
order to empower this method of learning to further success.

Notes On Contributors

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Figures 1 - 3. Source: the author.

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**Appendices**

None.

**Declarations**

The author has declared that there are no conflicts of interest.

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**Ethics Statement**

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