Challenges of Problem Based Learning

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Abstract

Background: The cornerstone of problem-based learning (PBL) tutoring is its facilitation skills and is vital to student learning. PBL is a major component in the undergraduate medical curriculum at the Univeristi Kebangsaan Malaysia (UKM).

Objectives: The objective of this study was to identify the knowledge, attitudes and skills of PBL tutors of different status and backgrounds.

Methods: A cross sectional study was carried out on 55 tutors with medical and non-medical backgrounds, of various academic positions, who conducted 94 tutorials. Respondents were 240 semester-1, year-1, UKM medical students of the academic session of 2007-2008. Data was collected at the end of last session of each PBL case tutorial, utilizing an evaluation form.

Results: The majority of tutors possessed knowledge on PBL process and showed positive attitudes towards students learning. Facilitation skills varied among the tutors. However, no significant difference was found between tutors of medical and non-medical backgrounds.

Conclusion: Problem processing or facilitation is a challenging task. This also depends on problem structure or designing of the problem. Every PBL tutor irrespective of their background and status must have adequate training on PBL facilitation skills and designing of problem based on critical evaluation of educational theory.

Keywords: PBL tutors, Knowledge, Attitudes, Problem facilitation, Students' perception

Introduction

Medical education is moving towards a more problem-based model and over the years problem based learning (PBL) has been implemented in several schools and its reputation continues to grow (Berkson, 1993).

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Problem-based learning is an active learning method where a tutor facilitates a small self-directed group to start tackling a problem with a brain storming session. The problem, which could be a clinical problem, community problem or a scientific problem, is posed to the students in a way that challenges their knowledge and skills (Smits *et al.*, 2002). The principal idea behind this is that the starting point for learning should be a problem, a query, or a puzzle that the learner wishes to solve (Davis & Harden, 1998; Harden & Davis, 1999). Learning goals are to be formulated by consensus, and new information is to be learned by self-directed study, which ends with group discussion and evaluation (Smits *et al.*, 2002). Educational objectives of PBL help students to develop their abilities to analyze and solve problems i.e. to develop reasoning or problem solving skills and be able to learn on their own for the rest of their lives (Barrows & Tamblyn, 1980; Marchais *et al.*, 1993; Das *et al.*, 2002; Williams & Beattie, 2008).

The role of the PBL tutor differs considerably from that of a tutor in a conventional teaching format (Smits *et al.*, 2002; Das *et al.*, 2002). Facilitation in PBL incorporates fundamental educational principles that derive from the adult learning theory (Colliver, 2000); PBL is an approach to "learn to learn" under the guidance of a tutor, with critical problems used as the stimulus for learning. It is therefore crucially important to monitor the quality of PBL after its adoption in the curriculum. Moreover, there is debate within the literature as to whether the best PBL tutors are those with medical backgrounds (i.e. the subject experts) or non medical background tutors (Gilkison, 2003). The objective of this study was to identify the knowledge, attitudes and skills of tutors in PBL tutorials at Universiti Kebangsaan Malaysia (UKM) and to explore any differences between tutors of medical and non-medical backgrounds with varying academic status aimed at the continuous process of curriculum development.

Method

Setting
The study was carried out among the first year students at the Faculty of Medicine UKM, during the academic session of 2007-2008. A total of 240 students were enrolled in this session of the MD programme. The MD programme consists of 10 semesters in 5 years duration. The first two years of the programme mainly comprises of preclinical and basic science teaching framework, and the last three years cover the clinical science teaching framework. The preclinical teaching framework uses paper based case write ups as problems and the clinical teaching framework uses real patients' problems. Approximately four modules are covered in each preclinical semester and 2-4 paper based PBL cases laid down under each module.

The setting of this study was in the first semester of the preclinical teaching framework where 10 paper based PBL cases were conducted under four modules namely, cellular biomolecules, tissues of body, membrane receptors and human genetics. The case content or problem structure varied depending on the modules. The PBL group was facilitated by a range of academic staff of varying status from both medical and non-medical backgrounds. These academic staff members are referred to as 'tutors' in this paper. All PBL tutors attended a two-day PBL facilitation workshop and were briefed on specific cases before they conducted the PBL session.

Students were also given inputs about PBL at the beginning of the semester. The PBL tutorials were conducted over a duration of 20 weeks through two-hour sessions held twice a week for each PBL case.

Respondents were 240 students, divided into 20 groups, where each group consisted of 12 students. A total of 55 tutors conducted 94 PBL tutorial sessions for 1st semester students over a period of 20 weeks. Among these 94 tutorials, 30 tutorials were conducted by 30 tutors i.e, each tutor conducted one PBL case tutorial, 28 tutorials were conducted by 14 tutors i.e, each tutor conducted 2 PBL case tutorials, another 24 tutorials were conducted by 8 tutors i.e, each tutor conducted 3 PBL case tutorials and remaining 12 tutorials were conducted by 3 tutors i.e, each conducted 4 PBL case tutorials. Thus total 55 tutors conducted 10 PBL cases through 94 tutorial sessions. As such, a single PBL group was facilitated by more than one tutor over the 20 weeks duration.

Data were collected about the tutors performance throughout these 94 tutorial classes. The students evaluated their tutor by filling in a tutor evaluation form at the end of every PBL case i.e. at the end of second session of each PBL tutorial. The students' rating of tutors' performance was averaged for the tutors who facilitated the same group of students for more than one PBL case. The number of the students participating in each tutorial group was 12. The minimum number of students completing the instrument per group was four.

Instrument
The tutor evaluation form consisted of a range of items on PBL, categorized under the domains of knowledge, attitudes and skills. The rating scales used against these items were ranged from 1-5, where 1 was for 'strongly disagree', and 5 was represented 'strongly agree'. At the end of each PBL case, students were asked to indicate their perception against each of the items in order to evaluate their tutors' performance.

Analysis
The background of the tutors in the present study and their academic status were identified. Students' rating against each item for each tutor was analysed per tutorial group. For simplification of presentation, students' response regarding 'agree' and 'strongly agree' were combined together and presented here as agreed. Similarly, 'disagree' and

'strongly disagree' were presented as disagreed. The combined ratings were then presented as number and percentage distribution. Average score per tutorial group against each item for each tutor was computed, which represented the competence of individual tutor in different items.

As such, students' responses were available for 55 tutors and their corresponding groups. The highest and the lowest rankings of each items regarding the tutors performance was also computed and presented as number and percentage distribution. Fisher exact test outcomes were used to differentiate between the lowest and highest scoring tutors.

Results

The response rate per tutorial group in the present study varied from 58% to 100% for each group of students. The average response rate was 91%.

Table 1 shows the distribution of the tutors background and their academic status. Of a total of 55 tutors, 41 (74%) were from the medical background (medical degree /doctor) and 14 (26%) were from a non-medical background (basic science PhD degree). In terms of academic status, there were 24% professors, 29% associate professors, 20% senior lecturers, 20% lecturers and 7% trainee lecturers.

Table 1: Distribution of academic status and background of PBL tutors n=55

| Academic status | Background | | | | Total n (%) |
| | Medical | | Non-medical | | |
	n	(%)	n	(%)	
Professors (P)	11	(20)	2	(4)	13 (24)
Associate Professors (AP)	11	(20)	5	(9)	16 (29)
Senior Lecturers (SL)	9	(16)	2	(4)	11 (20)
Lecturers (L)	6	(11)	5	(9)	11 (20)
Trainee Lecturers (TL)	4	(7)	0	(0)	4 (7)
Total	41	(74)	14	(26)	55 (100)

Table 2 represents the tutors' knowledge on the PBL process, where the lowest rank and highest rank achieved tutors were categorized based on the rating of students. Regarding tutors with a medical background, students perceived that 60-100% tutors understood the PBL process, while 58-100% of tutors with a non medical background were perceived to have understood the PBL process. Among tutors with a medical background, one tutor of professor status (9 % professor) fell under the lowest ranking, while 6 tutors of lecturer status (100% lecturers), 5 tutors of senior lecturer status (56% senior lecturers), 6 tutors of professor status (56% professors), 2 tutors of trainee lecturer status (50% trainee lecturers) and 3 tutors of associate professor status (27% associate professors) fell under the highest ranking. Similarly, distribution of non medical background tutors is shown in table 2.

Table 2. Tutors' knowledge on PBL process

| Knowledge on PBL process | Medical background tutor | | | Non-medical background tutor | | | p value |
	Lowest rank with status*	Highest rank with status*	Mean	Lowest rank with status*	Highest rank with status*	Mean	
Understood PBL process	60%	100%	88%	58%	100%	92%	
	Status n (%)	Status n (%)		Status n (%)	Status n (%)		
	P 1 (9)	L 6 (100)		AP 1 (20)	P 2 (100)		0.490
		SL 5 (56)			L 4 (80)		
		P 6 (55)			SL 1 (50)		
		TL 2 (50)			AP 1 (20)		
		AP 3 (27)					

*P=Professor, AP=Assciate Professor, SL=Senior Lecturer, L=Lecturer, TL=Temporary Lecturer

Table 3: Tutors' attitude to show interest in students' learning

| Attitude | Medical background tutor | | | Non-medical background tutor | | | p value |
	Lowest rank with status*	Highest rank with status*	Mean	Lowest rank with status*	Highest rank with status*	Mean	
Showed interest in students learning	30%	100%	88%	64%	100%	92%	
	Status n (%)	Status n (%)		Status n (%)	Status n (%)		
	AP 1 (9)	L 4 (67)		SL 1 (50)	L 3 (60)		0.459
		P 6 (55)			P 1 (50)		
		TL 2 (50)			SL 1 (50)		
		SL 4 (44)			AP 1 (20)		
		AP 3 (27)					

P=Professor, AP=Associate Professor, SL=Senior Lecturer, L=Lecturer, TL=Temporary Lecturer

Table 3 reveals the tutors' attitude and interest in students' learning, which shows that 30% to 100% tutors from medical background and 64% to 100% from non-medical background tutors showed interest in students learning. The number, percentage and status distribution of lowest and highest ranked tutors of both background are shown in this table.

Table 4 demonstrates the students' responses about skills in facilitation of the PBL tutorial by their tutor. A total of eight items were investigated, which included providing a good introduction, probing for information, providing information upon request, focusing on learning issues, encouraging being more critical, creating a comfortable learning environment, encouraging to participate in group discussion and providing feedback. An average of more than 70% of tutors from both backgrounds were found to possess all of these skills except that of providing information upon request. This study revealed that 20%-100% medical and 0%-100% non-medical background tutors provided information. Table 4 also represents the number, percentage and status distribution of lowest and highest ranked tutors against different skills in both backgrounds.

Discussion

We consider student feedback an important exercise to improve the tutor skills in PBL. In this study we examined the student perceptions of the knowledge, attitude and skills of PBL tutors of different academic positions and of medical and non-medical backgrounds. Irrespective of the tutors' background and status, the present study revealed that the most of tutors possessed knowledge on PBL process (table 2) and showed positive attitudes towards students learning (table 3) (mean 88% for tutors with medical backgrounds and 92% for those with non-medical backgrounds). In terms of skills, the mean ratings indicate that tutors with a medical background performed better in probing students for information, focusing on learning issues, encouraging students to be more critical and also to participate in active group discussion. On the other hand, tutors with non-medical backgrounds performed better at skills in performing good introduction, non provision of information upon request and creating a comfortable non-threatening learning environment. The lowest ranking rating among tutors with non-medical backgrounds was much better than their medical counterpart in all skills except the skill of assisting the group to focus on learning issues (table 4). The range of lowest and highest rank rating against these skills is also closer among tutors with non-medical backgrounds than those with medical backgrounds. This means that facilitation skills of non-medical background tutors are more consistent and follow a more facilitative-collaborative manner than those of their medical counterparts.

The tutor's role in PBL is neither to act as authoritarian information provider nor passive onlooker assuming PBL as self-directed curriculum; rather, a tutors' role is very active in terms of the process and in keeping the students' discussion alive, being non-threatening and motivating by non directive stimuli (Barrows & Tamblyn, 1980; Barrows, 1985). In the present study, more than 50% of the tutors from medical and non-medical backgrounds, provided information upon request from students which is against the PBL philosophy (table 4).

Table 4. Distribution of tutors' skills in facilitation of PBL tutorials

Skills	Medical background tutor			Non-medical background tutor			p value
	Lowest rank with status*	Highest rank with status*	Mean	Lowest rank with status*	Highest rank with status*	Mean	
Performed a good introduction	50% Status n (%) P 1 (9) AP 1 (9) SL 1 (11)	100% Status n (%) SL 3 (33) L 2 (33) TL 1 (25) P 2 (18) AP 1 (9)	82%	64% Status n (%) SL 1 (50)	100% Status n (%) P 1 (50) AP 1 (20) L 2 (40)	86%	1.000
Probed for information	30% Status n (%) AP 1 (9)	100% Status n (%) P 2 (18) L 1 (17) SL 1 (11) AP 1 (9)	82%	45% Status n (%) SL 1 (50)	100% Status n (%) L 2 (40) AP 1 (20)	73%	1.000
Provided information upon request from students	20% Status n (%) AP 1 (9) SL 1 (11)	100% Status n (%) L 1 (17)	65%	0% Status n (%) L 1 (20)	100% Status n (%) L 1 (20)	55%	1.000
Assisted the group to focus on learning issues	52% Status n (%) AP 1 (9)	100% Status n (%) L 3 (50) SL 3 (33) P 3 (27) AP 2 (18)	86%	43% Status n (%) AP 1 (20)	100% Status n (%) P 1 (50) L 1 (20)	74%	0.371
Encouraged the group to be more critical	36% Status n (%) AP 1 (9)	100% Status n (%) L 3 (50) P 5 (45) SL 3 (33) AP 3 (27)	85%	50% Status n (%) AP 1 (20)	100% Status n (%) P 1 (50) L 2 (40)	79%	0.386
Assisted the group in creation of comfortable learning environment	58% Status n (%) P 1 (9)	100% Status n (%) L 3 (50) P 4 (36) TL 1 (25) AP 2 (18) SL 1 (11)	88%	71% Status n (%) AP 1 (20)	100% Status (%) P 2 (100) SL 1 (50) L 1 (40)	91%	0.515
Encouraged the students to participate in group discussion	10% Status n (%) P 1 (9)	100% Status n (%) P 5 (45) SL 3 (33) L 2 (33) AP 3 (27) TL 1 (25)	86%	71% Status n (%) AP 1 (20)	100% Status n (%) P 2 (100) L 3 (60) AP 2 (40)	78%	1.000
Provided feedback	60% Status n (%) P 1 (9)	100% Status n (%) SL 3 (33) TL 1 (25) P 2 (18) L 1 (17) AP 1 (9)	83%	64% Status n (%) SL 1 (50)	100% Status n (%) P 1 (50) L 2 (40) AP 1 (20)	83%	1.000

*P=Professor, AP=Associate Professor, SL=Senior Lecturer, L=Lecturer, TL=Temporary Lecturer

This finding may reflect the fact that the mindset of many tutors was still in the "teacher centered" or information provider mode rather than student centered mode (Zubair & Eng, 2003; Benor, 2000). However, 20% of tutors of non-medical background with the status of lecturers were ranked 0% meaning that they did not provide information upon request from students (Table 4), which is more directive towards PBL philosophy. Gilkison (2003) and Dolmans *et al.* (2003) reported that content expert tutors tend to use subject matter expertise more and tend to provide information, where as non-content expert tutors tend to use their process facilitation expertise more. Our study also showed that more tutors with medical backgrounds provided information than tutors with non-medical backgrounds, which has similarities with studies done by Gilikson and Dolmans *et al*. Readiness to attend any staff development programme, adequate training and actual realization of the notion of PBL can help tutors to change their mindset to student centered mode.

Providing feedback is an important skill for tutors in the PBL curriculum. Evaluation studies have repeatedly shown that students rated many tutors as ineffective in skills of providing feedback (Baroffio *et al.*, 2007). This differs with our study findings. Here, an average of 83% tutors from both the backgrounds provided feedback to students, which is a very good number. The lowest ranking tutors of medical and non-medical background were also quite good in providing feedback, with ratings of 60% and 64% respectively (table 4).

In this study, some tutors of senior position were found to rank lowest in some skills. The lowest rank was obtained by a tutor of professor status from a medical background in the knowledge domain and in four items of the skills domain. Further, tutors with associate professor status obtained lowest scores in the attitude domain and in four items of the skills domain. On the other hand, among tutors with non medical back grounds, associate professors and senior lecturers were found to score lowest in knowledge, attitudes and some items of the skills domain. As PBL facilitation differs from the conventional teaching format, tutor performance can be different where PBL is conducted by traditionally trained tutors; although these tutors may be excellent in conventional teaching format.

Facilitation in PBL is dependent not only on the capability of problem facilitation, but also on the quality of problem structures that lead the students to the interaction directed towards learning issues. Munshi *et al*, (2008) highlighted that the most leading factor that affected the PBL process is the high quality of the problems presented to the students. The problem should be designed in explicit language so that issues embodied can be easily identified and students able to generate corresponding hypotheses and learning issues on their own with very little or no tutor assistance (Fosi-Mbantenkhu, 1996). Sweenev (1999) clearly pointed out that the PBL concept should be clear to all and every body should understand the same thing by PBL, otherwise it may frequently induce discomfort, confusion, antipathy, lack of co-operation and general disbelief in PBL. Interaction in PBL has proved to be effective if it is followed through critical evaluation of educational theory, hence its use should be considered when implementing training and educational strategies (Benavides-Caballero *et al.*, 2007). Therefore every PBL tutor irrespective of their status and background should have adequate training on PBL which is methodologically sound and practical.

Small sample size for the non-medical tutors compared to tutors with medical background was a limitation of this study. This number become even smaller when divided according to status. However this is consistent with the existing proportion of academic staff in the faculty.

The most dominant factors that affect the PBL curriculum are the quality of problems and tutors' skills in process of problems (Munshi *et al.,* 2008). Teaching-learning is a process of human arrangement involving the learner, the tutor in design and process of problem and the learning group in capacity of dynamic relationships, which are really challenging tasks. The challenges faced by the tutors range from handling group dynamics to ensuring that the learning outcomes outlined are achieved (Azer, 2005). Tutors must have appropriate training in group dynamics and be able to foster a climate which is open, trustful and supportive for learning (Salam, 2004). In fact learning has no end, whatever the category of tutors, there will be more to know, more to master and more issues to address (Benor, 2000) in order to meet the challenges of development of science and technology.

Conclusion

Irrespective of the background and status, the majority of tutors possessed knowledge on the PBL process and showed positive attitudes towards students and their learning. In terms of skills in facilitation, although there was variation of skills among the tutors, there was no significant difference between tutors of different status and from medical and non-medical backgrounds. Despite the fact that this study

gives an insight into tutoring behaviour, students ratings may give rise to bias, which may be due to personal like or dislike or may be due to lack of adequate training, or may be misinterpretation of the evaluation instrument in constructing meaning or it could be due to the fact that different people have different perceptions about PBL which requires further research. However, the findings are important and have direct implications for faculty development. Skills of problem development and problem facilitation are the key elements for an effective PBL curriculum. Policy makers and educational managers should put extensive efforts into developing tutors' skills in developing and facilitating problems by encouraging the faculty to develop strategies that stimulate student reflection.

References

Azer, S. (2005) Challenges facing PBL tutors: 12 tips for successful group facilitation, *Medical Teacher*, 27, pp. 676–681.

Baroffio, A., Nendaz, M.R., Perrier, A., & Vu, N.V. (2007) Tutor training, evaluation criteria and teaching environment influence students' ratings of tutor feedback in PBL *Advances in Health Sciences Education : Theory and Practice,* 12, pp. 427-439.

Barrows, H.S. (1985) *How to Design a Problem-Based Curriculum for the Preclinical Years,* New York: Springer Publishing Company.

Barrows, H.S., & Tamblyn, R.M. (1980) *Problem-based learning: An approach to medical education,* New York: Springer Publishing Company.

Benavides-Caballero, T.J., Insfran-Sanchez, M.D. & Viniegra-Velazquez, L. (2007) Small group discussion to promote self learning, *Revisita Medica del Instituta Mexicano del Seguro Social*, 45, pp. 141-148.

Benor, D.E. (2000) Faculty development, teacher training and accreditation in medical education: twenty years from now, *Medical Teacher,* 22, pp. 503-512.

Berkson, L. (1993) Problem-based learning: Have the expectations been met? In: Bouhuijs PAJ, Schmidt HG, van Berkel HJM (eds.), *Problem-Based Learning as an Educational Strategy,* Maastrict: Network Publication, pp. 43-65.

Colliver, J.A. (2000) Effectiveness of Problem based learning Curricula: Research and Theory, *Academic Medicine*, 75, pp. 259-66.

Das, M., Mpofu, D.J., Hasan, M.Y. & Stewart, T.S. (2002) Student perceptions of tutor skills in problem-based learning tutorials, *Medical Education*, 36, pp. 272-778.

Davis, M.H. & Harden, R.M. (1998) Problem based learning: a practical guide, *Medical Teacher*, 21(2), pp. 130-140.

Dolmans, D.H., Gijselaers, W.H., Moust, J.H., De Grave, W.S., Wolfhagen, I.H. & Vander Vleuten, C.P. (2003) Trends in research on the tutor in PBL: conclusions and implications for educational practice and research, *Medical Teacher,* 24, pp. 173-180.

Fosi-Mbantenkhu, J. (1996) *How to Design Problems for Problem-based Curriculum,* PBL Consultancy.

Gilkison, A. (2003) Techniques used by 'expert' and 'non-expert' tutors to facilitate problem-based learning tutorials in an undergraduate medical curriculum, *Medical Education,* 37, pp. 6-14.

Harden, R.M., & Davis, M.H. (1999) The continuum of problem based learning, *Medical Teacher,* 20(2), pp. 317-322.

Marchais, J.E.D., Dumais, B., Jean, P., Vu, N.V. (1993) An attempt at measuring student ability to analyze problems in the Sherbrooke problem-based curriculum: A preliminary study. In: Bouhuijs, P.A.J., Schmidt, H.G., van Berkel, H.J.M. (eds.), *Problem-Based Learning as an Educational Strategy*, Maastrict: Network Publication.

Munshi, F.M., El Zayat, El.S.A. & Dolmans, D.H. (2008) Development and utility of a questionnaire to evaluate the quality of PBL problems, *South East Asian Journal of Medical Education,* 2(2), pp. 32-40.

Salam, A. (2004) Problem-based learning: an educational strategy for interactive learning: experience from Universiti Sains Malaysia, *Medical Teacher*, 26, pp. 279-280.

Smits, P.B.A., Verbeek, H.M.A. & de Buisonje, C.D. (2002) Problem-based learning in continuing medical education: a review of controlled evaluation studies, *British Medical Journal*, 324, pp. 153-156.

Sweenev, G. (1999) The challenge for basic science education in problem-based medical curricula, *Clinical and Investigative Medicine,* 22, pp. 15-22.

Williams, S.M., Beattie, H.J. (2008) Problem-based learning in the clinical setting – a systemic review, *Nurse Education Today*, 3, pp. 146-154.

Zubair, A., Eng, K.H. (2003) *Basics in Medical Education,* Singapore: World Scientific Publishing Co. Pte. Ltd.