

Evaluation of Problem-based Learning: A Lecturer's Perspective

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Abstract

Introduction: The exponential growth in medical/dental knowledge and the ever-expanding influence and sophistication of information technologies have placed a burden of responsibilities on dental educators to fashion out a curriculum that can prepare students to face the coming challenges in the new millennium. Consequently, a curriculum reform took place in the Faculty of Dentistry, National University of Singapore in 1997. Problem-based learning (PBL) was first introduced to the Faculty in 1996 as a pilot project to the 4th year. The purpose of this project was to evaluate the 4-year experience in PBL teaching and learning from the lecturers' point of view. **Materials and Methods:** All 12 lecturers, who had been involved in the PBL teaching, participated in this questionnaire survey, which was composed of 17 questions with a 5-digit Likert scale. Data analysis was carried out using the Spearman's correlation, t-test, and the Mann-Whitney U test. **Results:** Six female, 5 male and 1 unidentified lecturers were recruited into this survey with a 100% response rate. In general, lecturers learned more in teaching PBL and significantly took pleasure in the interactive learning and self-directed learning modes inherent to PBL ($P = 0.004$). Compared to the male lecturers, female lecturers had a greater propensity to feel that PBL teaching might not be cost-effective ($P = 0.03$). Senior lecturers felt more fulfilled compared with the younger ones ($P = 0.026$). Those lecturers who enjoyed the interactive learning experience in PBL seemed to like the self-directed learning and felt more fulfilled through teaching PBL compared to the traditional teaching (TT) ($P < 0.01$). They also felt that PBL may be cost-effective ($P < 0.01$). Lecturers did not have difficulties in being a facilitator ($P = 0.04$). Interestingly, lecturers who found difficulties in being a facilitator for the PBL class seemed to learn more in teaching PBL classes than in TT ($P < 0.05$). Overall, lecturers would like to suggest more PBL to be incorporated into the curriculum ($P = 0.02$). Nevertheless, lecturers were concerned about the knowledge gaps in students learning with PBL ($P = 0.01$) and the time constraint of students ($P = 0.002$). **Conclusion:** The results of this study reveal the pros and cons of the current PBL teaching method and may thus provide proper guidelines to shape the further development of PBL in our faculty.

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Introduction

Global, Regional and National Trends in Dental Education

In the last decades, the exponential growth in the sophistication of the medical/dental knowledge and technologies has made the current dental curriculum more cramped and inevitably compartmentalised. This paradigm shift has caused, globally and regionally, a great demand on dental schools to produce dentists who can differentiate the quality of the new information and technologies, practise evidence-based dentistry and subsequently, maintain lifelong learning.¹ For decades in Singapore and many countries in Asia, dental education has been deeply entrenched in tradition, which can be characterised as highly discipline-based, lecturer-centred and examination-

driven. The main structure of the traditional dental curriculum usually comprises didactic lectures, subject-specific tutorials, pre-clinical lab teaching and clinical training. Although we have successfully trained many clinically competent dentists with the traditional dental curriculum, the national calling for the University to produce "well-rounded, mobile graduates capable to deal with real-life interactions and a variety of people in the global village" has made it imperative for dental educators to reappraise the priorities, methodologies, content, and structure embedded in the traditional dental curriculum. In the last few years, dental educators have been facing an increasing burden of responsibilities to fashion out a curriculum that can prepare students to deal with the challenges in the new millennium. As a result, a curriculum

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reform was launched in the National University of Singapore Faculty of Dentistry in 1997. The development in the new dental curriculum involved multidisciplinary clinical teaching, an integrated and competency-based curriculum,² and problem-based learning (PBL).

Shifting of the Teaching and Learning Mode with PBL

The traditional teaching (TT) in most of the dental curriculum in Asia has an emphasis on knowledge transfer, and consequently hinged heavily on one-directional lecturing and one-dimensional evaluation. Lecturers are expected to prepare all the pertinent information and pack them in the easiest way for students to learn, memorise, and “hopefully” apply. Many lecturers enjoy this mode of teaching mainly through the process of preparing the lectures and the intrinsic fulfillment of their personal mission for and/or interest in teaching. Good students usually are defined as those who can quickly grasp, organise, memorise and retrieve the information. The mainly summative evaluation of learning was often carried out in a rather restrictive and structured format with little emphasis on the process of learning and creative thinking. Increasing in importance, in modern dental education, are the values of the learning process and the skills in lateral thinking, team-working, and communication. These are still lacking in TT. Identifying these growing gaps in the TT and enlightened by the strength of PBL,^{3,4} we started incorporating PBL into our 4-year dental curriculum. With the training of facilitators completed in April 1996, PBL was first introduced to the 4th year dental students in 1996 as a pilot project for one term. In 1997, PBL was expanded to three terms for the 4th year dental students. A year later, in 1998, the 3rd year dental students were exposed to PBL. An evaluation study focusing on students' learning was carried out in 1999 and has revealed the strength and weakness of PBL teaching in our faculty. The purpose of this project was to evaluate this 4-year PBL learning and teaching from another perspective, the lecturers' point of view.

Materials and Method

In 2000, all 12 lecturers, who have been involved in PBL teaching, participated anonymously in this questionnaire survey, which was composed of 17 questions with a 5-digit Likert scale. Data analysis was carried out using a SPSS 10.0 statistical program. Six female, 5 male and 1 unidentified lecturers responded in this survey with a 100% response rate. The response was dichotomously categorised into positive and negative groups before a binomial test was used to evaluate the overall tendency of responses. The neutral answers were disregarded. Non-parametric Mann-Whitney U test was used to examine the gender difference based on the uneven gender groups and

the small sample size. The Spearman's correlation was used to investigate the significant relationship between the two variables. An alpha level of 0.05 was used to evaluate statistical significance. Nevertheless, due to the small sample size in this pilot study, the statistical probabilities approaching the significant threshold have been given attention in order to detect the developing trends.

Results

General Responses

The descriptive results and the statistical significance of teachers' response were compiled in Table I. When asked to compare the traditional and PBL teaching, lecturers significantly perceived a greater pleasure in the interactive learning format and the self-directed learning style inherent to PBL (both $P = 0.004$). They did not feel less stressful or spend less time in tutoring PBL, nor did they perceive a significant change in their habits of teaching and learning or an increased confidence in solving controversial issues in their clinical or research activities (all $P > 0.05$). Lecturers seemed to have no difficulties in being a facilitator, who might not have the full control of the learning ($P = 0.04$). Tutors learned more in teaching PBL compared with the TT ($P = 0.01$). Overall, lecturers would like to suggest more PBL to be incorporated into the curriculum ($P = 0.02$). Nevertheless, lecturers were concerned about the knowledge gaps in students learning with PBL ($P = 0.01$) and also felt that students may not have enough time to really enjoy it ($P = 0.002$).

Gender and Age Difference

Compared with the male lecturers, the female lecturers have a greater propensity to feel that PBL teaching might not be cost-effective in the long run ($P = 0.03$). Another gender difference revealed in this survey, although it did not reach statistical significance, was that the female lecturers seemed to learn more than the male lecturers in teaching PBL classes ($P = 0.052$). Senior lecturers seemed to feel more fulfilled compared with the younger ones ($P = 0.026$). This tendency was also revealed in the appreciation of the interactive learning and self-directed learning in PBL with $P = 0.057$ and $P = 0.059$, respectively.

Associated Factors

Those lecturers who enjoyed the interactive learning in PBL seemed to like the self-directed learning and feel more fulfilled in teaching PBL compared with the TT ($P < 0.01$). They also have a greater tendency to feel that PBL may be cost-effective in the long run ($P < 0.01$). Interestingly, lecturers who found difficulties in being a facilitator for the PBL class seemed to learn more in teaching PBL classes than in TT ($P < 0.05$). Lecturers, who either gained confidence in solving controversial issues in their practice/

TABLE I: RESULTS OF QUESTIONNAIRE SURVEY

Questions [†]	Median	<i>P</i> value [‡]
I like the interactive learning experience in PBL teaching compared with the uni-directional learning in traditional teaching (TT)	5.00	0.004
I like the self-directed learning highlighted in PBL	4.00	0.001
I found it difficult to be a facilitator in PBL who cannot always have full control of the class as I have in TT	2.00	0.04
I feel that students may not have enough time to really enjoy PBL	4.50	0.002
The PBL teaching has enabled me to learn more compared with TT	4.00	0.01
I feel less stressed facilitating PBL sessions compared with in TT	3.00	1.00
I spend less time in preparation for PBL teaching compared with TT	2.00	0.2
I feel more fulfilled teaching PBL compared with TT	3.50	0.3
Most of my students are better learners in PBL compared with when they are in TT	3.00	0.4
I feel I am a better teacher in PBL teaching compared with in TT	3.00	1.0
I still prefer traditional lectures to the PBL teaching	3.00	1.0
PBL teaching may not be cost-effective in the long run	4.00	0.3
I am concerned about the knowledge gaps in student learning with PBL	4.00	0.01
Teaching PBL has enabled me to think deeper and thus do better in research activities compared with TT	3.00	0.5
PBL teaching has made me more confident in solving controversial issues/problems in my practice/research compared with TT	3.00	1.0
PBL teaching experience has significantly changed my teaching and learning habits	3.50	0.3
I'd like to suggest more PBL to be incorporated into the curriculum	4.00	0.02

Note:

[†] Questions in the survey

[‡] Binomial test evaluating equal distribution of positive and negative responses

research or sensed students to be better learners in PBL classes, tended to suggest more PBL to be incorporated into the curriculum (both $P < 0.01$). Lecturers who perceived themselves as better lecturers had less concern about the knowledge gap of students in PBL learning ($P < 0.01$).

Discussion

It is not surprising to see that the lecturers took greater pleasure in PBL teaching compared with the TT, in which they may have gone through the same subject(s) many times and had limited two-way inter-stimulation with students. The setting of PBL allows lecturers, who may not be tutoring his/her own specialised areas, to participate as a learner. Being a learner, or being forced to be a learner, PBL-tutors experienced deeper joy, fulfillment and excitement. This process might have activated the lecturers' prior knowledge and re-learn the subjects in a new environment more conducive to deeper probing, elaboration, and discussion. It has been refreshing and enriching for lecturers, especially those who have not been exposed to PBL before. That maybe why the seniors lecturers were more excited and felt more fulfilled compared to the younger lecturers. Overall, the learning spirit of the lecturers

has been rejuvenated and thus, open a new chapter in their teaching career. Apparently, tutors had no difficulties in being facilitators and, interestingly, those who found it difficult actually learned more. It is a reasonable speculation that a paradigm shift in learning has taken place in those who had the willingness and have made an effort to be changed through participating in PBL, although the whole group did not perceive the significant changes in their teaching and learning habits.

It is interesting to explore the reason(s) why the female lecturers have learned more than the male lecturers. The traditional and/or oriental style in teaching has set a well-established unwritten role for lecturers to play, inside or even outside the classrooms. In general, lecturers are not encouraged, by the society at large, to say "I do not know" or even admit the ambiguities and uncertainties that may be intrinsic to some issues/questions raised by students. It seems to be difficult to unshackle the psychological framework, the good lecturers' definition, that has been built in the minds of oriental lecturers for decades, if not centuries. This social stigmatisation may be even more profound in the males, who have been deeply molded as the strong figure in society. As admitted by one of the PBL

tutors, it is difficult for a senior male lecturer to refrain from jumping out of the silent and humble seat. Thus, they would be prompted to play a more dominant role in tutoring. As a result, they might have a greater tendency to become the “givers” instead of the learners and, consequently, they learned less than the female tutors.

On the same token, the phenomenon has also given some hints about why the female lecturers perceived PBL as less cost-effective in the long run compared with the TT. It has been observed that female lecturers seemed to have a greater tendency in losing track of the time. As female lecturers tended to allow students to spend more time in meandering through the hills and valleys of learning, the group tutored by them might not be able to finish the learning issues on time. That may be why the female lecturers have a greater tendency to regard PBL as “not cost-effective” than their male colleagues, although they have actually learned more than their male counterparts.

The two identified weakness in our PBL are “time constraint” and “knowledge gap”. Lecturers are still concerned about whether students have the time, in the very cramped 3rd and 4th-year curriculum, to really enjoy and learn enough in the PBL setting. The “time” factor was the concern for the TT as well, so it should not be a discouraging factor for the implementation of PBL. However, the “knowledge gap” issue, which may have a link with the “time” factor and the motivation/attitude of students, is a real concern. As lecturers did not perceive students as better learners in PBL compared with the TT setting ($P = 0.4$), it is fair to say that students have not developed from a passive learning mode, in which they have been immersed and succeeded, to a more active and self-directed learning attitude, at least in the initial years of PBL exposure. Taking into consideration the high failure rate in the last 5 years, at least 10%, in the final professional examination, students’ pressure in fulfilling the clinical schedules must have been increasingly high in the 3rd and 4th years. Learning more in PBL does not help them at all in avoiding the delayed graduation and the consequential societal stigmatisation. With these observations, we should not give up at this stage and, instead, should continue the trends to incorporate PBL in the earlier stage of the dental training and mobilise some time and credit for their learning in PBL. As lecturers who viewed themselves as better lecturers in teaching PBL have less concern about the “knowledge gap” issue, we should continue the training for

PBL tutors, identify and value the changes in their teaching habits, and allow lecturers to mature in the new teaching mode.

Lastly, due to the small sample size in this pilot survey, we could not identify the causal factors for reasons why lecturers in general would like to suggest more PBL in the curriculum. However, two factors were found to be associated with it. Those lecturers who were enabled by teaching PBL to solve the controversial issues in their clinical practice or research activities would tend to suggest more PBL. Those lecturers who sensed their students being better learners would suggest more PBL as well.

Based on the above analysis and results, there are three strategies we have identified and could be recommended to the Faculty of Dentistry to consider for further development of PBL in the new curriculum:

1. To continue the trend in building the thinking spirit and learning culture among our teaching staff and take substantial steps to refine training and incentives for PBL tutors.
2. To continue moving the major PBL sections towards the earlier years in the dental curriculum and giving credits to students’ PBL learning.
3. To further polish the periodic evaluation system with a more sophisticated instrument to monitor and guide the direction of changes in terms of learning attitude and culture established in students as well as lecturers.

In conclusion, the results of this study have revealed the pros and cons of the current PBL teaching, highlight the major challenges and trends of development, and thus provide some strategies to facilitate the further development of PBL in our faculty.

REFERENCES

1. Greene J C. Science and the shifting paradigm in dental education. *J Dent Educ* 1997; 61:407-11.
2. Chambers D. Competency-based dental education in context. *Eur J Dent Educ* 1998; 2:8-13.
3. Barrows H S, Tamblyn R M. Problem-based learning: an approach to medical education. New York: Springer, 1980.
4. Nooman Z M, Schmidt H G, Ezzat E S, editors. Innovation in medical education: An evaluation of its present status. New York: Springer, 1990.