

INCREASING THE EFFECTIVENESS OF PROBLEM BASED LEARNING: ONLINE POSSIBILITIES

Zoraini Wati Abas (Ed.D)

Sushela Devi (Ph.D)

Ammu Radhakrishnan (Ph.D)

*Faculty of Medical Sciences, International Medical University
Sesama Centre, Plaza Komanwel, Bukit Jalil,
57000 Kuala Lumpur, Malaysia*

INTRODUCTION

PBL was introduced to Malaysia in the late 80s and was first implemented by the Universiti Sains Malaysia (USM) for their second year undergraduate medical students. The International Medical University (IMU) started implementing PBL in 1992. This educational strategy fits in with the educational philosophy of the IMU which is to promote life long learning among its students and to achieve a more student centred approach to learning in medicine. The main objectives of the PBL sessions at the IMU are to integrate topics and subjects, promote self-directed learning, to enable students to work in groups, to measure and retain knowledge and to communicate effectively. This fits in with the general views on PBL.

The IMU has encouraged the use of IT for teaching and learning among its faculty and students and continuously puts aside funds to provide adequate IT infrastructure as well as for the development of content for the medical and clinical students. In addition, it is developing an online distance learning program for nursing sciences and has conceptualized and begun work on a virtual medical university.

It is thus not surprising that the possibility of implementing parts of PBL online has been brought up a few times in the last three years informally. This study was then designed to determine not only whether PBL was presently effective but also in what way and what might the reaction should the IMU decide to implement part of the PBL online.

RESEARCH METHODOLOGY

The objective of the study was to determine the effectiveness of PBL at the IMU and to gauge the response by faculty and students towards enhancing the effectiveness of the PBL via online discussions. Data was collected from students via a questionnaire specifically designed for the study. In addition, some of the Medical Science faculty members who were also PBL facilitators were interviewed to gather their perceptions relating to the effectiveness of the PBL sessions. The questionnaire was constructed based on information obtained from the literature review. It was further improved following comments from the IMU Research Committee. The questionnaire was next piloted with ten students from two senior batches of the medical students to be sampled at the IMU.

It was noted that in the pilot, the students took about 20 minutes to fill up the questionnaire at the end of which a discussion was held with the respondents with the purpose of improving the study in general and the questionnaire in particular. The students were asked which items in the questionnaire were ambiguous and to suggest items they would add given the objectives of the study. The best way to administer the questionnaire so as to obtain the maximum number of respondents was also discussed.

With the various suggestions received from the respondents of the pilot studies, the questionnaire was modified to ensure clarity. A few more items were added so that the objectives of the research would be better addressed. The questionnaires were then administered to the students who had just finished one plenary and were waiting for the next plenary to begin. These were students in their fourth semester of the IMU medical curriculum.

The questionnaire comprises two types of questions. The first type is designed to obtain information related to the student's personal particulars such as semester intake, ownership of a PC, Internet access, access to e-mail and their computer literacy skills. In addition, items to determine their preferred method of learning and their preferred learning resource were also asked. In addition, further information on PBL sessions were obtained such as whether or not PBL had met the course objectives such as in helping them to enhance their problem solving skills, presentation and communication skills, as well as in the development of critical thinking skills. Questions on whether the sessions allowed them to apply basic sciences to clinical situations and whether the PBL sessions had enabled them to work as a team were also included. In addition, their perceptions on the qualities of a good facilitator were also sought.

Another part of the questionnaire included items designed to obtain information related to the possibility of online discussions as a way to supplement face-to-face PBL sessions. The questionnaire included a scenario to give the students an idea of how the online PBL sessions might be implemented. Motivating factors that would make the students favourable to the idea of participating in online PBL sessions were also asked. The data collected was then analyzed using the Statistical Package for Social Science (SPSS).

LITERATURE REVIEW

PBL as a mode of instruction is understood to be one by which students identify issues raised by specific problems to help develop underlying concepts and principles (Spencer & Jordan, 1999). The PBL mode of learning may be described as one of the most significant developments in education. It was first implemented in McMaster University, Canada in the 60s and soon after four other medical schools in other parts of the world adapted its model to meet their own needs and expectations. From its origins at McMaster University, the use of PBL has spread to universities in several parts of the world and has been adapted to suit their respective curricula.

PBL is consistent with the current philosophical view of higher learning particularly constructivism. There are three primary constructivist principles according to Savery and Duffy (1995). These are that understanding comes from our interaction with the environment, cognitive conflict stimulates learning and that knowledge evolves through social negotiation and evaluation of the viability of individual understanding. In addition, the PBL form of instructional strategy seems to fit with the current psychological precepts of learning (Norman & Schmidt, 1992). In the field of medical education it is believed that there are differences in the effects of PBL as compared with the more traditional lecture based curricula (Wolfram & Herzig, 1999). Wolfram and Herzig had also found that PBL students are better prepared to apply basic science concepts in clinical settings. In addition, graduates of the PBL curricula may retain knowledge over a longer period of time as stated by Eisenstaedt, Barry and Glanz (1990). In addition, students who are products of PBL are found to be better prepared for life long learning (Shin, Haaynes & Johnston, 1993).

One of the essential ingredients as stated by Albanese (2000) of the PBL sessions is cooperative learning (CL). CL situations are situations where individuals perceive they can reach their goals if and only when other group members do so. The small group format in PBL sessions fits in with

this. Qin, Johnson and Johnson (1995) found that in cooperative efforts learners exchanged ideas and corrected each others faults more frequently and effectively than those who competed against others. This closely describes the mode of PBL sessions held at the IMU.

Faculty members at the IMU are continually trying to improve the effectiveness and the quality of PBLs in both its medical and clinical schools. An earlier survey conducted at the IMU found that only 65 % of the 419 students who responded felt that PBL was useful and had acknowledged that the benefits of PBL include promoting teamwork, stimulating thought, enhancing communication and presentation skills (Nadarajah, Ponnudurai and Chen, 2002). Thus, one of the possible areas for exploration in order to improve the quality, enhance cooperative learning and perhaps facilitation is to conduct some of the PBL discussions online. Much has been said about the value of online discussions, especially among students in higher learning institutions. At the IMU, the possibility of PBL being conducted online has been informally brought up for discussion from time to time. No decision has been made as to whether to implement it but the scarcity of space as student numbers go up has prompted the need to look into PBL online.

Online discussions, much like face-to-face discussions can be designed in such a way as to promote a more student-centred learning environment. Moderated discussions comprising a small group of individuals can be conducted online. It can be designed to meet the social and some of the educational aspects of small group learning like reasoning, problem solving and group leadership. As Prendergast (1998 & 1999) stated learners who share knowledge can link their learning with their experience and help their peers become active learners by contributing to group learning, develop the ability for team work and communicate effectively. This seems to be very much in agreement with the IMU objectives for PBL.

This study at the IMU was conducted in order to find out what the students thought about face-to-face PBL and whether having PBL sessions online would increase the effectiveness of our PBL system, as perceived by the students and the faculty.

SURVEY AMONG STUDENTS

A total of 125 out of a total of 142 fourth semester medical students at the IMU responded to the questionnaire. The response rate was 88.03 %. The students were asked to respond to a set of three questions to determine their IT profile. It was found that the majority, that is, 80.5 % of the students surveyed had a personal computer (PC) at home. And, 67.7 % of the students have Internet access at home and 99.2 % or 124 out of the 125 students who responded have an e-mail account. This particular group of students are IT savvy or computer literate (see Table 1). It is expected that IT savvy students will tend to favour the use of the computer, at least for part of their learning activities.

TABLE 1: Availability of PC and Internet Facilities at Home

	Yes n (%)	No n (%)	Total n (%)
Do you have a PC at home?	99 (80.5)	24 (19.5)	123 (100)
Do you have Internet access at home	84 (67.7)	39 (31.5)	124 (100)
Do you have an e-mail account?	124 (99.2)	1 (0.8)	125 (100)

TABLE 2: Evaluation of PBL by Students

	Strongly Disagree n (%)	Disagree n (%)	Agree n (%)	Strongly Agree n (%)
a. The PBL cases met course objectives	-	17 (13.8)	97 (78.9)	9 (7.3)
b. The PBL cases were relevant to the week's study	-	21 (17.1)	93 (75.6)	9 (7.3)
c. The PBL cases stimulated me to find out more	-	28 (23.0)	82 (67.2)	12 (9.8)
d. The PBL cases helped me to develop my critical thinking abilities	1 (0.8)	38 (30.4)	77 (61.6)	9 (7.2)
e. The PBL cases taught me how to apply basic sciences in clinical situations	2 (1.6)	49 (39.2)	66 (52.8)	8 (6.4)
f. PBL helped to enhance my problem-solving skills	2 (1.6)	44 (35.8)	68 (55.3)	8 (6.5)
g. PBL helped me to improve my communication skills	2 (1.6)	25 (20.2)	88 (71.0)	9 (7.3)
h. PBL helped me to improve my presentation skills	1 (0.8)	31 (24.8)	83 (66.4)	10 (8.0)
i. PBL taught me how to work in a team	3 (2.4)	42 (33.9)	73 (58.9)	6 (4.8)
j. Every member in my PBL group contributed to the discussions	18(14.5)	56 (45.2)	44 (35.5)	5 (4.0)
k. PBL has helped me to retain what I learn longer	5 (4.0)	41 (33.1)	76 (61.3)	2 (1.6)
l. PBL has taught me how to learn independently	4 (3.2)	35 (28)	78 (62.4)	8 (6.4)
m. There is enough time given for the PBL sessions	9 (7.2)	20 (16)	83 (66.4)	12 (9.6)
n. The PBL sessions are well-facilitated	16 (12.9)	44 (35.2)	60 (48.0)	3 (2.4)
o. The facilitator guided my learning	13 (10.6)	36 (29.3)	67 (54.5)	6 (4.9)
p. The facilitator taught me	11 (8.8)	51 (44.0)	49 (42.2)	4 (3.4)
q. The facilitator met my expectations	16 (13.2)	47 (38.8)	54 (44.6)	3 (2.5)
r. The facilitator is well-prepared	16 (13.0)	51 (41.5)	50 (40.7)	5 (4.1)

Students were asked to evaluate the PBL based on their experience at the IMU. The respondents have had at least three semesters of PBL sessions. The questionnaire was administered in the second month of the fourth semester. It is expected that they would be able to give a more qualified feedback compared to students in the earlier batches.

Based on the findings (see Table 2), it appears that the respondents in general had rated the effectiveness of PBL at the IMU quite highly on many accounts. Over 80 % of the respondents agreed or strongly agreed to the following about PBL at the IMU:

??The PBL cases met course objectives (86.2 %)

??The PBL cases were relevant to the week's study (82.9 %)

More than 70 % of the respondents agreed or strongly agreed to the following about PBL at the IMU:

??PBL helped me to improve my communication skills (78.3 %)

??The PBL cases stimulated me to find out more (77.0 %)

??PBL helped me to improve my presentation skills (74.4 %)

More than 60 % of the respondents agreed or strongly agreed to the following about PBL at the IMU:

- ☒ The PBL cases helped me to develop my critical thinking abilities (68.8 %)
- ☒ PBL taught me how to work in a team (63.7 %)
- ☒ PBL has helped me to retain what I learn longer (62.9 %)
- ☒ PBL helped to enhance my problem-solving skills (61.8 %)

On whether PBL had cases taught them how to apply basic sciences in clinical situations, 59.2 % of those who responded had either Agreed or Strongly Agreed with the statement.

On the facilitation of PBL, 50.4 % of the respondents agreed or strongly agreed that the PBL sessions were well-facilitated. Out of the total, 59.4 % felt that the facilitator had guided the learning. And, 45.6 % felt their facilitators had taught them. Only 47.1 % of the respondents felt that the PBL at IMU had met their expectations. However, the group felt that less than half, that is, 44.8 % of the facilitators were well-prepared for their sessions. And, less than half, that is 39.5 % of the group felt that every member in their respective PBL groups had contributed to the discussions.

On the whole, the feedback to the above statements was generally positive. However, the more important question is whether the %ages should be higher. For example, shouldn't all students, that is, 100 % of them achieve critical thinking abilities or know how to work in a team? Or, shouldn't all students be contributing to the PBL discussions? And, if so, would having part of the PBL discussions online to complement face-to-face discussions help to increase the %age to most, if not all, the statements in Table 2?

In asking students on how they felt about PBL being online, the following scenario was placed before the items so that students clearly understood what PBL online meant.

"Imagine you are attending a face-to-face PBL. You arrive for PBL1, read the trigger, select a leader and discuss the learning issues. You then go to the library and look up the various learning issues and report back at the PBL2 session. You go through your learning issues and discuss them. In some cases there has not been any critical analysis that has gone into discussing the learning issues because of the time factor and the need to assimilate the information quickly by your colleagues. There is no time for reflection.

Imagine another scenario where you can also have your PBL online. This online PBL session will not replace your face-to-face PBL sessions. The online session will be conducted in an asynchronous manner (threaded online discussions). This is an online threaded discussion where postings or messages are not done in real time. It simply means that when a student types and sends a message to the discussion group, their PBL peers can respond at a later time. Members of the same PBL group will be able to view each other's online postings and respond accordingly. The facilitator moderates the discussions. All members of the PBL group read the trigger and the learning issues are posted by each student at PBL1 online. At the end of the session at some appointed time (perhaps 2-3 days later) the facilitator goes through the learning issues, organizes and summarizes the issues and posts them online at the end of PBL1 week. The PBL will be conducted over two weekends.

Tasks involved for the student:

1. You post your discussion about your learning issue
2. Give a critical analysis of somebody else's discussion. For instance, what certain words mean, whether what has been discussed is related to the trigger, what has been left out etc. The facilitator will then give his/her feedback at the end of PBL2.

This scenario gives the student time to go away, digest the topic and ask the relevant questions: Why? What? How? When? And Where?

The students also are able to go back to various learning issues discussed online throughout the semester and re-look at topics or issues they have not understood. At the same time the student has a record of the discussions and comments from his/her peers."

Table 3 is a summary of students' responses to online discussions for PBL. Only 37.4 % of the respondents agreed or strongly agreed that online PBL discussions would be a good addition to the current face-to-face discussions. A total of 26 % felt (agreed or strongly agreed) that online discussions in PBL would improve student participation. Almost 40 %, that is, only 39.9 % of the respondents believe (agreed or strongly agreed) that PBL online will result in improved facilitator guidance. And, 39.8 % of the group could either agree or strongly agreed that PBL online would be more effective in meeting PBL objectives. These findings seem to imply that the IMU should be cautious in introducing PBL online because the majority of the students would still prefer to have face-to-face PBL sessions. On the other hand, if PBL online is believed to be able to increase the effectiveness of PBL, the benefits of having PBL online to complement existing face-to-face PBL sessions need to be well-promoted with the students buying the idea. And, motivating factors will need to be in place to ensure that online discussions will, indeed, succeed and that they will increase the effectiveness of the PBL discussions.

TABLE 3: Student's Response to Online Discussions

	Strongly Disagree n (%)	Disagree n (%)	Agree n (%)	Strongly Agree n (%)
a. a good addition to current face-to-face PBL sessions	19 (15.4)	58 (47.2)	37 (30.1)	9 (7.3)
b. improve student participation	30 (24.4)	61 (49.6)	26 (21.1)	6 (4.9)
c. result in improved facilitator guidance	23 (18.7)	51 (41.5)	43 (35.0)	6 (4.9)
d. more effective in meeting PBL objectives	17 (13.8)	57 (46.3)	42 (34.1)	7 (5.7)

All but seven students responded to the question on how often they would like the PBL to be online. Among those who responded, 45 students indicated that PBL should not be online at all. Forty-five students (38.1 %) had indicated that they would not like to have any online PBL discussions (see Table 4). The remaining students, that is, 61.9 % expressed that PBL discussions can be online from as infrequent as once a month (16.1 %) to as frequent as once a week (22 %). Another 23.7 % said they would like to have PBL online twice a month. These are summarized in Table 4.

TABLE 4: Frequency of PBL Online

	Frequency (n=118)	%
Once a month	19	16.1
Twice a month	28	23.7
Every week	26	22.0
Not at all	45	38.1
Total	118	100

TABLE 5: Motivating Factors for PBL Online

	Least Important N (%)	Somewhat Important N (%)	Important N (%)	Most Important N (%)
a. part of continuous assessment	32 (26.9)	37 (31.1)	31 (26.1)	19 (16.0)
b. availability on the Internet	22 (18.5)	33 (27.7)	41(34.5)	23(19.3)
c. interesting discussion taking place	10(8.3)	26 (21.7)	59 (49.2)	25 (20.8)
d. active participation from your peer group	9(7.6)	57 (46.3)	42 (34.1)	7 (5.7)
e. allows flexibility	6 (5.0)	20 (16.8)	67 (56.3)	26 (21.8)

Table 5 comprise the motivating factors for PBL online. Students were asked to rate each of the five factors based on the order of importance on a four-point Likert scale, that is, from least important to most important. The responses to the question would help determine the primary factors that would motivate students to accept online discussions in addition to their current face-to-face discussions. Based on the table above, the order of importance (based on the combined %age of the important and very important categories) from high to low are as follows:

- ~~1~~ Allows flexibility (78.1 %)
- ~~2~~ Interesting discussion taking place (70.0 %)
- ~~3~~ Availability on the Internet (53.8 %)
- ~~4~~ Part of continuous assessment (42.1 %)
- ~~5~~ Active participation from peer group (39.8 %)

It is interesting to note that there were 119 respondents to this question. In contrast, 45 out of 118 students who had responded to the previous item had stated that PBL discussions should not be online. Yet, in this item, students seem to indicate that they would go online provided certain motivating factors were present (see Table 5).

INTERVIEWS WITH FACULTY

Four senior faculty members were interviewed to obtain their initial perceptions of online discussions in supplementing the current face-to-face PBL discussions. Only one was opposed to

the idea. However, they generally cautioned that PBL sessions could include online discussions if the objective was to complement the regular face-to-face sessions. There are a few advantages in doing this. For example, online discussions will improve the written skill of students although not their verbal communication. Online activities are a good approach to building up self-confidence among students although it will require facilitators to spend more time online to moderate or to provide input in guiding the discussions. Hence, the IMU's objectives in having PBL play a significant role can be met whereby students can become better communicators, at least in writing. These opinions of these four faculty members may not be representative of the whole medical faculty but can be considered to be the opinion of some of the group

CONCLUSION

The more important question is, "Would online PBL sessions help increase the effectiveness of PBL sessions at the IMU?" Online teaching may help improve the quality of PBL sessions in so far as they allow all the students to participate in the discussion groups. Although majority of students feel that the PBL sessions enable them to acquire presentation skills, critical thinking skills, communication skills there are still some students who feel that they have not acquired these skills. Perhaps these students have a particular 'mind set' or learning style that may be addressed by online education. Online sessions would enable the shy students to come out of their shells and take part in an interactive environment where they are heard.

The results indicate that while 45 from the total of 125 students had not wanted to have any PBL online discussions, 119 seem to want online PBL sessions to support face-to-face discussions should motivating factors be present. It is thus necessary to repeat the study with other batches of students and to ask them to carefully consider the questions as it would have a great implication on their future method of studying and learning.

Why this perception amongst our students? Having PBL sessions online is a dramatic change in the university's current curriculum and one of the reasons why the students may have this perception is that they have difficulty to embrace change. On personal communication with some of the students they feel 'unsure' of tackling something new but they feel that they would be more open to online possibilities if there was good facilitation.

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