

Appreciation of Learning Environment and Development of Higher-Order Learning Skills in a Problem-Based Learning Medical Curriculum

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SUMMARY

This cross-sectional study determined the appreciation of the learning environment and development of higher-order learning skills among students attending the Medical Curriculum at the International Medical University, Malaysia which provides traditional and e-learning resources with an emphasis on problem based learning (PBL) and self-directed learning. Of the 708 participants, the majority preferred traditional to e-resources. Students who highly appreciated PBL demonstrated a higher appreciation of e-resources. Appreciation of PBL is positively and significantly correlated with higher-order learning skills, reflecting the inculcation of self-directed learning traits. Implementers must be sensitive to the progress of learners adapting to the higher education environment and innovations, and to address limitations as relevant.

KEY WORDS:

Learning environment; Higher-order learning skills; E-learning; Problem-based learning

INTRODUCTION

Problem-based learning (PBL) as a methodology promotes enhancement of self-directed learning (SDL) which is often linked to lifelong learning¹ and higher learning skills notably critical thinking². Ozuah et al stated that exposure of learners to different learning methodologies including independent study, discussions, computer-based literature searches and e-learning, was found to significantly enhance lifelong learning³. The need for recognition of the impact of e-learning on the teaching-learning environment and the need to examine the attitudes of faculty and students regarding e-learning has been highlighted by Baker *et al*⁴. It may be anticipated that teachers and learners alike who have adapted to face-to-face teaching may find e-learning uncomfortable and may also assume that it means more work. This is further aggravated in those who lack confidence in their technology skills. These individuals need to be encouraged to adopt e-learning, as any learning methodology associated with self-directed lifelong learning will be associated with some form of e-learning⁴.

The International Medical University (IMU) is a private university with a blended, inter-professional learning environment offering a variety of programmes including Medicine. The learning environment of the IMU Medical programme encompasses learning strategies which include

traditional teacher-centred and student-centred activities as well as online/e-learning activities, with an emphasis on PBL and self-directed learning. The need to know the commitment of an institution in preparing its undergraduate students for lifelong learning in relation to the readiness for PBL, and the effect it has on self-directed learning has been recognised and consequently, research to address the issue has been undertaken⁵. The learning resources utilised by students at the IMU, in addition to PBL, included printed materials, library resources, medical museum resources, laboratory sessions, clinical skills teaching (CSU), communication with peers and subject matter experts, assigned independent reading (AIR), structured independent learning online system (SILOS) and online learning interactive system (OLIS). AIR, SILOS and OLIS are online learning resources designed to promote self-directed learning and comprise computer-assisted learning resources which are deemed to compliment the effectiveness of a PBL curriculum⁶. The asynchronous online learning experience offered by the online resources allows the student to engage in learning activities that will promote self-directed learning through participation in structured activities that are identified by the Faculty⁷. It is well recognised that providing as well as developing connections between a wide variety of learning resources is important in creating better learning opportunities⁸.

As the success of self-directed adult learning depends to an important extent on the appreciation of the learning environment by learners, this cross-sectional study was undertaken to determine the learners' perspectives of the learning environment in relation to learning skills and e-learning. The perceived beneficial effects of a problem-based learning environment providing a variety of learning resources and the various measuring tools used by different researchers to elucidate the SDL readiness in learners have been taken into consideration^{9,10}.

MATERIALS AND METHODS

Study Population

Students attending semesters 1 to 5 of the Phase 1 Medical programme at the International Medical University were included in the study. The number of students who participated in the study is as shown below.

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Student participation

Semester	No. of Students	Participation Rate
Semester 1	181 students	92%
Semester 2	162 students	93%
Semester 3	144 students	96%
Semester 4	122 students	80%
Semester 5	99 students	83%
Total	708 students	

Survey

The students agreed to participate in the study voluntarily and were assured of the anonymous nature of the response. They were briefed on the purpose of the study and on the elements of SDL and learning skills. Collection of data was via a questionnaire distributed to each of the participating students.

Questionnaire

The questionnaire which was constructed by the authors comprised two parts. Part A included personal particulars of the students and Part B included items on SDL, learning skills, and the utilisation of IMU learning resources. The rating of the items was based on a five-point Likert scale of one (Strongly Disagree) to five (Strongly Agree). An open-ended item was also included for students to comment on related issues that may not have been covered by the closed-ended items.

Data Analysis

Data analysis included comparing the mean scores for appreciation of SDL and appreciation of IMU resources. Pearson correlation was used to determine the relationship between PBL and the learning skills and between PBL and e-learning resources.

Learning Resources at IMU

For the purpose of this study, the IMU resources were classified into traditional and e-learning resources.

Traditional Resources

These resources included the library and medical museum resources, printed materials, problem-based learning sessions, laboratory sessions, clinical skills training sessions, and communication with peers and with subject experts.

E- Resources

i) Assigned Independent Reading (AIR)

Assigned Independent Reading (AIR) is an application of the IMU E-Learning System. The AIR topics which are integrated in nature are selected to reflect the learning sessions undertaken during the respective body system addressed in each semester. Printed materials and online resources were identified as references for the process of retrieving and analysing information. Specific instructions were given with respect to the subject matter and achievement of the IMU learning outcomes. Students had to undertake the assignment independently and submit the portfolio online.

ii) Structured Independent Learning Online System (SILOS)

The Structured Independent Learning Online System (SILOS) is an application of the IMU E-Learning System which comprises a bank of questions for online formative assessment. Although the question bank is for self-assessment and reinforcement, students can consult lecturers should they see the need to do so.

iii) Online Learning Interactive System (OLIS)

The Online Learning Interactive System (OLIS) is a virtual learning environment which comprises topics relevant to each body system. An individual topic is organised into objectives, content, reference, and formative assessment components.

RESULTS

Preference for learning resources

Students ranked (ranking scale of 1 to 5), printed materials the highest (mean 4.4) and assigned independent reading (AIR), the lowest (2.4). Ranking of other resources, in descending order was, library resources (4.0), clinical skills (CSU) (3.9), communication with peers (3.8), communication with subject matter experts (3.7), museum resources (3.5), problem-based learning (PBL) and laboratory sessions (3.3), structured independent learning online system (SILOS) (3.2) and online learning interactive system (OLIS) (2.9). Although PBL, CSU and OLIS have positive correlation coefficient with semesters, only the correlation between PBL and semesters is significant (Table I).

Learning skills in relation to appreciation of PBL

The majority (95 – 97%) of students perceived that decision-making, problem-solving and critical-thinking skills are beneficial for PBL. They also perceived that these skills were benefited from undergoing the PBL sessions. Among these skills, the appreciation of problem-solving skill was ranked highest.

The relationship between learning skills and appreciation of PBL as a learning method is as shown in Figure 1. Learners highly appreciating PBL as a learning method perceived that the most beneficial learning skill for self-directed learning was problem-solving (mean 4.15) followed by critical-thinking (mean 4.12), and decision-making (mean 4.06). The correlation between PBL and learning skills shows that the appreciation of PBL is significantly correlated to problem-solving (0.237), critical-thinking (0.191) and decision-making (0.174) (Table II).

E-learning resources in relation to appreciation of PBL

Students of all semesters ranked SILOS as the most beneficial e-resource for self-directed learning, followed by OLIS and AIR.

Learners highly appreciating PBL as a learning method also perceived that the most beneficial resource for self-directed learning was SILOS (mean 3.41) followed by OLIS (2.92) and AIR (2.46). Appreciation of PBL is positively and significantly correlated at 0.01 level to AIR (0.310), OLIS (0.285) and SILOS (0.191) (Figure 2 & Table III).

Table I: Preference for learning resources

	Library	Museum	Laboratory	PBL	CSU	AIR	OLIS	SILOS material	Printed (SME)	Comm (Peer)	Comm
Pearson Correlation	-.094*	-.180**	-.109**	.202**	.034	-.182**	.018	-.096*	-.124**	-.101**	-.057
Sig. (2-tailed)	.013	.000	.004	.000	.398	.000	.628	.011	.001	.008	.132
N	700	701	701	703	624	699	700	693	697	698	699

* Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Comm (SME) : Communication with subject matter experts; Comm (peer) : Communication with peers

Table II: Appreciation of PBL in relation to learning skills

		Critical Thinking	Decision Making	Problem Solving	PBL
Critical Thinking	Pearson Correlation	1	.555**	.570**	.191**
	Sig. (2-tailed)	.	.000	.000	.000
	N	705	704	705	701
Decision Making	Pearson Correlation	.555**	1	.668**	.174**
	Sig. (2-tailed)	.000	.	.000	.000
	N	704	705	704	700
Problem Solving	Pearson Correlation	.570**	.668**	1	.237**
	Sig. (2-tailed)	.000	.000	.	.000
	N	705	704	705	701
PBL	Pearson Correlation	.191**	.174**	.237**	1
	Sig. (2-tailed)	.000	.000	.000	.
	N	701	700	701	705

** . Correlation is significant at the 0.01 level (2-tailed)

Table III:Appreciation of PBL in relation to e-learning resources

		PBL	AIR	OLIS	SILOS
PBL	Pearson Correlation	1	.310**	.285**	.191**
	Sig. (2-tailed)	.	.000	.000	.000
	N	703	698	699	692
AIR	Pearson Correlation	.310**	1	.477**	.433**
	Sig. (2-tailed)	.000	.	.000	.000
	N	698	703	696	690
OLIS	Pearson Correlation	.285**	.477**	1	.562**
	Sig. (2-tailed)	.000	.000	.	.000
	N	699	696	703	691
SILOS	Pearson Correlation	.191**	.433**	.562**	1
	Sig. (2-tailed)	.000	.000	.000	.
	N	692	690	691	703

** . Correlation is significant at the 0.01 level (2-tailed)

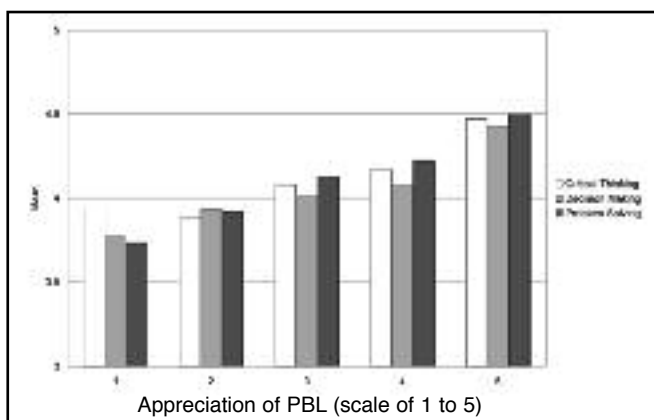


Fig. 1: Relationship between learning skills and appreciation of PBL .

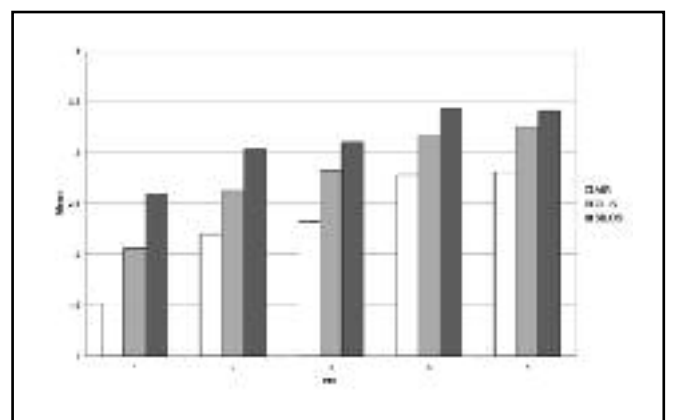


Fig. 2: Relationship between appreciation of PBL and e-learning resources.

DISCUSSION

The positive correlation between PBL as a learning process and the semester indicates the increasing appreciation of PBL as a learning strategy as the students progressed through the semesters. This may be as a result of the inculcation of adult learning traits and higher-order learning skills that is inherent in PBL. Students who appreciated PBL as a learning strategy perceived that higher-order learning skills were beneficial, with a positive correlation. Critical thinking, decision-making and problem-solving skills are higher-order learning skills which are closely inter-related. Richard Paul¹¹ defined critical thinking as the ability to reach sound conclusions based on observation and information, which together with problem-solving are needed to make meaningful decisions and to improve the quality of decision-making. It was found that those who were exposed to learning methods including independent study, discussions, and computer literature searches, were found to engage in significantly higher levels of learning¹². Learners in this study ranked printed materials as the most appreciated resource, and this may have contributed to the development of higher-order learning skills as appreciation of printed materials and reading was reported to contribute significantly to development of critical thinking¹³. While higher-order learning skills may be inculcated in students through provision of sufficient knowledge and extensive deliberate practice, it should be noted that transferring of the acquired skill to different situations may be a challenge^{14,15}.

Sendag & Odabashi² studied the effects of online PBL on the acquisition of critical thinking and problem-solving skills and found that learning through online PBL had a significant effect on increasing these skills. This corroborates the findings of our study in which students highly appreciating PBL perceived that it was beneficial for acquiring these learning skills. The importance of higher-order learning skills in the development of lifelong learning was further highlighted by Tagawa¹⁶. Learning activities undertaken by students at IMU included communication with faculty and with peers. These activities may have exerted a positive effect on their perception of critical thinking skills, as connecting with others, fostering relationships, and sharing have been reported to be important for critical reflection¹⁷. The positive correlation between appreciation of PBL as a learning strategy and development of learning skills indicates the inculcation of these skills through the IMU-PBL curriculum in which the students are exposed to PBL from semester 1 onwards. The importance of PBL as a delivery tool in a medical curriculum and the crucial role that the quality of the PBL triggers play have been highlighted by Munshi *et al*¹⁸.

E-learning resources were perceived as the least beneficial for problem-based learning as compared to traditional resources. This phenomenon has been reported in an earlier study¹⁹ and other researchers have stated that difficulties may be encountered when implementing e-learning strategies. The difficulties may be attributable to students' lack of technology knowledge, encountering constraints relating to IT network access, or network crashes during learning sessions²⁰. Additional contributory factors may be the lack of awareness in students that there is a need for student commitment in developing autonomous self-learning skills, low appreciation of media support services, and the reluctance to adapt to

newer teaching strategies⁷. Thus it is highly recommended that training or repeat training sessions be provided, taking into account the importance to accommodate differing levels of IT skills²¹. However, Kulier *et al*²² reported to the contrary that an e-learning course on clinical teaching was effective and well-accepted. E-learning should not be perceived as a daunting task and must be appreciated for the many advantages that it represents, including the content that is reliable, reusable, and can be updated and is convenient for the learner²³. Acceptance of e-learning can be further enhanced by taking into consideration the key success factors for e-learning programmes which include the operational infrastructure for effective delivery of web-based learning and the design and quality of learning materials²⁰, providing encouragement, and addressing inconveniences promptly⁴.

Implementation of e-learning is imperative as, based on Geoffrey Moore's Technology Adoption Life Cycle, Stacey stated that e-learning has proven its effectiveness and is moving into the mainstream, to which organisations must be aware and devise ways to implement it²⁴. To this end, enhancement of e-learning for students at the IMU include orientation sessions during the first week of enrollment into the Phase 1 Medical programme, reinforcement sessions at the beginning of each system course and provision of different e-learning activities. In addition, IMU has established a Working Group to monitor and address, as relevant, the constraints that may impede the implementation of e-learning. Importantly, having identified student perspectives on e-learning, the constraints must be addressed promptly for its successful implementation. Equally important is to nurture in students, the awareness that engaging in self-directed learning activities and fully utilising the variable opportunities provided in a learning environment during their undergraduate studies is to their advantage for lifelong learning²⁵.

CONCLUSION

Based on the findings of this study, it may be stated that providing a relevant learning environment with a variety of resources enhances the higher-order learning skills that will better equip the learners to engage in lifelong adult learning. Additionally, the study illuminates the need for providers of education to be mindful of the behaviour and responsiveness of individual learners when they are challenged to be more independent and adapt to an innovative learning strategy. The learning environment must be conducive and providers of education must ensure appropriate encouragement and support to enable learners for successful pursuit of their lifelong learning.

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