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ORIGINAL ARTICLE

Perception and Attitude of Undergraduate Medical Students and Lecturers towards the Problem-Based Learning of Universiti Kebangsaan Malaysia Medical Curriculum: An Inter-University Study

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ABSTRAK

Pembelajaran berasaskan masalah (PBL) merupakan pendekatan berpusatkan pelajar dengan menggunakan senario klinikal untuk mencapai objektif pembelajaran. Tujuan kajian ini adalah untuk menentukan persepsi dan sikap pelajar perubatan pra-siswazah dan pensyarah Universiti Kebangsaan Malaysia (UKM) dan Maldives National University (MNU) terhadap PBL dalam kurikulum UKM. Satu kajian keratan rentas telah dijalankan di Fakulti Perubatan UKM dan MNU dari April hingga September 2021, yang mana ia melibatkan pelajar perubatan Tahun 2 dan 3 serta pensyarah. Soal selidik dalam talian yang diuruskan sendiri digunakan untuk mengukur persepsi dan sikap terhadap PBL dalam kurikulum UKM dengan skala Likert lima mata. Soal selidik telah disahkan dengan nilai alfa Cronbach 0.907 bagi pelajar dan 0.703 untuk pensyarah. Data telah dianalisis menggunakan SPSS versi 27.0. Sejumlah 179 pelajar UKM dan 61 pelajar MNU bersama-sama dengan 67 pensyarah UKM dan 8 pensyarah MNU telah terlibat dalam kajian ini. 86.69% dan 69.87% pelajar mempunyai skor positif dalam penilaian persepsi dan sikap. Walau bagaimanapun, tiada perbezaan yang signifikan dalam skor median dan min bagi persepsi dan sikap di antara jantina, universiti, tahun pengajian, dan

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purata gred kumulatif (CGPA) dalam kalangan responden. Bagi pensyarah, skor positif untuk persepsi dan sikap masing-masing adalah 63.62% dan 85.83%. Skor sikap di kalangan pensyarah MNU mempunyai nilai signifikan lebih tinggi daripada pensyarah UKM. Kesimpulannya, kedua-dua pelajar dan pensyarah menunjukkan keputusan positif bagi persepsi dan sikap terhadap PBL dalam kurikulum UKM yang mampu memberi manfaat dan sumbangan dalam meningkatkan pengetahuan, pembelajaran, dan kemahiran insaniah.

Keywords: Kaedah pengajaran-pembelajaran; pelajar perubatan; pembelajaran berasaskan masalah, persepsi, pensyarah; sikap

ABSTRACT

Problem-based learning (PBL) is a student-centred approach by using clinical scenario to achieve the learning objectives. This study aimed to determine the perception and attitude of Universiti Kebangsaan Malaysia (UKM) and Maldives National University (MNU) undergraduate medical students and lecturers towards PBL in UKM curriculum. A cross-sectional study was conducted by using online self-administered questionnaires based on a five-point Likert scale. The questionnaires were validated with Cronbach's alpha of 0.907 and 0.703 for students and lecturers respectively. A total of 179 UKM and 61 MNU students, and 67 UKM lecturers and 8 MNU lecturers were recruited in the study. 86.69% and 69.87% of students had positive scores in perception and attitude assessment respectively. However, no significant differences were observed in median and mean scores for perception and attitude between gender, university, year of study, and cumulative grade point average (CGPA) of the respondents. For lecturers, 63.62% and 85.83% had positive scores for perception and attitude respectively. The attitude score among MNU lecturers was significantly higher than UKM lecturers. In conclusion, both students and lecturers showed positive perceptions and attitudes towards PBL of the UKM curriculum which gave benefits and contribution in enhancing knowledge, learning and soft skills.

Keywords: Attitude; problem-based learning; lecturers; perception, medical students; teaching-learning method

INTRODUCTION

Problem-based learning (PBL) is a novel method in which students attain their educational goals by utilising problems from the provided scenario. PBL was originally developed and put into practice in medical education at McMaster University in Canada during the 1960s under the guidance of Howard Barrows (Aldayel et al. 2019).

There are two types of PBL, which

are Hybrid-Problem based Learning (HPBL) and Pure-Problem based Learning (PPBL). In the PPBL, students will be given a tutor and a guided question. While in the HPBL, guided questions are applied in a lecture which is conducted by a lecturer. Both are useful in students' PBL learning process.

In PBL, students are expected to gain a comprehensive understanding of all aspects within the framework of a medical issue and the ways to manage the problem based on a real patient scenario. They should utilise their current understanding and participate in a proactive learning. This is opposed to passive learning, which is solely based on teacher-designed lectures and instructions (Zahid et al. 2016). In addition, students are expected to develop reflective, critical and collaborative skills by actively engaging in the discussion while analysing the scenario given (Yew & Goh 2016).

In the end, students' learning and understanding are improved with the help of PBL that encourages them to develop self-directed learning habits through practices and reflection after every session. Eventually, PBL serves as an efficient approach for cultivating a competent and skilled practitioners and to encourage a long-term preservation of knowledge and skills acquired through the learning process among medical students (Ibrahim et al. 2018).

Overall, PBL is found to enhance higher-order performances of students as compared to the traditional curriculum (Ibrahim et al. 2018). While PBL proves more efficient in enhancing clinical competence, it appears to have a limited influence on the theoretical knowledge foundation. A previous study displayed that PBL student groups performed less satisfactorily in terms of overall theoretical knowledge outcomes compared to traditional curriculum student groups (Zahid et al. 2016). Another study showed that graduates of PBL curricular retained their knowledge over a longer period and were better prepared for life-long learning (Din et al. 2020).

At Universiti Kebangsaan Malaysia (UKM), PBL was introduced to the Faculty of Medicine back in 1987. However, only in the academic year of 2005/2006, PBL was started to be implemented as one of the main teaching methods (Mohamad et al. 2011). In the Faculty of Medicine of Maldives National University (MNU), medical students have benefited from the sharing programme between both universities. MNU is using the same PBL curriculum developed by UKM.

PBL is conducted throughout the preclinical years 1 and 2, with eight basic medical science modules under the biomedical strand for different scenarios in medical disciplines of each year. In each module, a minimum of two PBL subjects are covered, and typically, each subject involves two weekly sessions, each lasts of two hours. In the first session, students are required to understand the triggers, identify cues, make hypotheses and identify learning points along with the discussion. In the second session of the PBL, students either as an individual or in the group, present the theory and

mechanisms related to the scenario, share the knowledge, and actively engage in discussion with guidance by a facilitator who is not a content-expert for the topic (Mohamad et al. 2011).

All facilitators are required to attend a prerequisite course in facilitation before they start conducting a PBL session (Salam et al. 2011). They should play a collaborative-facilitative role that differs from the traditional teaching format to ensure students receive maximum benefit from PBL activity. They should act as a catalyst during the discussion and perform vital roles in preserving group dynamics and harmony. However, shifting roles from typical teaching to facilitating may make discomfort and inconvenience among certain facilitators (Mohamad et al. 2009).

Although many researchers have been analysing the efficiency of PBL in medical faculties, the majority only evaluated its validity and reliability (Niwa et al. 2016). In addition, previous studies were not able to differentiate whether the problem-solving abilities occurred through PBL or as a result of the standard lectures delivered (Klegeris & Hurren 2011). Another knowledge gap was also identified whereby most research only focused on either pre-clinical or clinical students before and after the PBL curriculum was completed, without comparison between both groups. Furthermore, not many studies examined the lecturers' perception and attitude towards PBL. Therefore, the objective of this study was to evaluate the level of perception and attitude among medical students and lecturers of UKM and MNU towards the PBL. This study may be beneficial for future improvements of the current PBL.

MATERIALS AND METHODS

Study Design, Study Setting and Study Population

A cross-sectional study was performed in UKM and MNU during the academic year 2020/2021. The study subjects comprised of the students in the second and third-year medical undergraduates and lecturers who were currently involved in PBL as facilitators from both institutions, UKM and MNU. The first group consisted of second-year students who had successfully finished all eight basic medical science modules during their first year but had not completed all modules in year 2. This included modules like Cellular Biomolecules, Tissues of the Body, Membrane and Receptor, Metabolism, Human Genetics, Infection and Immunity, Musculoskeletal and Mechanisms of Disease. The other group comprised of third-year students who had completed all PBL packages in all basic medical science modules in the first and second year of study. The second-year modules included Blood and Lymph, Respiratory system, Cardiovascular system, Gastrointestinal system, Urinary system, Neuroscience, Reproductive system and Endocrine system. The facilitators were lecturers from various department in the Faculty of Medicine of UKM and MNU with experience in conducting

at least five PBL sessions and still actively conducting PBL (Oderinu et al. 2020). Written informed consent was attained by a declaration as part of the questionnaire. Respondents who did not give their consent were excluded from the study. Participation was voluntary and they had the choice to withdraw from the study. All information was kept confidential and restricted for solely use within this research.

Sampling

The convenience sampling method was used to select respondents from a list that consisted of year 2 and 3 Medical students and lecturers from UKM and MNU. The calculated sample size was 194 students (135 from UKM; 59 from MNU) and 67 lecturers (58 from UKM; 8 from MNU) that was determined using the Krejcie-Morgan (Krejcie & Morgan 1970) formula for one specific population. The power of the study was 80% with a precision level of 0.05.

The exclusion criteria for the student comprise those who repeat academic years regardless of the year of study. Lecturers who had never attended the PBL training course, and/or conducted less than five PBL sessions since the year 2018, were excluded. Lecturers who did not attend the training course were excluded to avoid the element of non-standardisation of PBL process.

At the beginning of the study, there were 252 students (197 from UKM; 61 from MNU) and 82 lecturers (72 From UKM; 10 from MNU) who were eligible to be enrolled in the study. However, about 18 students (all from UKM) and seven lecturers (five from UKM; two from MNU) did not meet the selection criteria thus were excluded from the study. The end total respondents were 240 students (179 from UKM; 61 from MNU) and 75 lecturers (67 from UKM; 8 from MNU). The sample size was more than the minimum requirement.

Research Instrument and Validation

An online self-administered anonymous questionnaire was administered based on extensive literature reviews. Methodologies of some pertinent previously published studies were reviewed, and relevant questions that could examine the purposes of this study in a similar context and among the same group of people were chosen to be applied in the questionnaire. The questionnaire items were validated through a pilot study that involved a total of 17 UKM and 6 MNU medical students from the second and third year in the academic year 2020/2021 together with 10 UKM and 2 MNU lecturers. The internal validation of the questionnaire was good with Cronbach's alpha of 0.907 for students and 0.703 for lecturers. The questionnaire included socio-demographic profile, level of perception and attitude assessment towards PBL of UKM curriculum. These items were answered on a five-point Likert scale, ranging from (i) strongly disagree, (ii) disagree, (iii) neutral, (iv) agree, (v) strongly agree. The higher the score, the better the perception and attitude towards the PBL.

Procedure and Data Analysis

The questionnaire, along with an informational document and consent form, were disseminated to medical students and lecturers at UKM and MNU through Google Forms using the messaging app WhatsApp™. The study was conducted from April 2021 till September 2021. Data were managed using the SPSS Version 27.0 statistical software. For the student group, questionnaire variables were the type of university (UKM or MNU), year of study (second or third year), gender and cumulative grade point average (CGPA) (four categories). Where else variables for lecturers were types of university (UKM or MNU), gender and years of experience conducting PBL (three categories). The total score of the Likert scale was averaged to evaluate the mean scores for perception and attitude among the groups. Higher score indicated better perception and attitude towards the PBL. Descriptive analyses included frequencies of scores 3-4 for each item, representing positive agreement. Independent t-test and one-way ANOVA were applied to determine the mean differences of perception and attitude between different groups for selected variables that were normally distributed. Skewed data were verified with the Mann-Whitney U test and Kruskal Wallis test to compare the medians between variables. The data was considered statistically significant when p-value was less than 0.05.

Ethics Approval

Ethics approval was attained from Universiti Kebangsaan Malaysia (UKM PPI/111/8/JEP-2021-395). All methods were conducted based on relevant guidelines and regulations. Consents from the administration of both universities (UKM and MNU) were also obtained. Participants were provided with information sheets detailing the study objectives, and written consent was obtained from all respondents before they completed the questionnaire. Participation in this study was entirely voluntary.

RESULTS

The Kolmogorov-Smirnov test for the perception of students was D (240) = 0.101, p<0.001, while for attitude of lecturers was D (75) = 0.129, p = 0.003 (Table 1). Data were normally distributed except for the perception

TABLE 1: Kolmogorov-Smirnov test for normality of data.

	n	Mean	Std. Deviation	Test Statistic, D	p value
Perception of students#	240	4.31	0.54	0.101	<0.001*
Attitude of students	240	3.89	0.59	0.053	0.098
Perception of lecturers	75	3.71	0.54	0.091	0.200
Attitude of lecturers#	75	4.28	0.45	0.129	0.003*

n = number of subjects; #not normally distributed, * significant value < 0.05

score of students and attitude score of lecturers (Figure 1).

Demographic Characteristics

(i) Student

A total of 253 medical students were eligible for this study. However, only 240 students fulfilled the selection criteria and were enrolled (Table 2). The majority of the students were aged between 20 to 25-year-old (n=234; 97.5%) compared to those less than 20-year-old (n=6; 2.5%). Male students constituted 27.9% whereas female students constituted 72.1% of the samples. Of these, 179 (74.6%) were from UKM and 61 (25.4%) were from MNU. Most of them were in year 2 (n=137; 57.1%) followed by year 3 (n=103; 42.9%) medical students. For CGPA of latest semester, 66 (27.5%), 98 (40.8%), 51 (21.3%) and 25 (10.4%) of the students achieved <3.00, 3.00≤x<3.33, 3.33≤x<3.67 and ≥ 3.67, respectively. About 100 (41.7%) students were Malays, 32 (13.3%) were Chinese, 32 (13.3%) were Indians and 76 (31.7%) were other ethnic groups.

(ii) Lecturer

A total of 82 medical lecturers were eligible to be included in this study. However, seven of them were excluded because they did not fulfil the selection criteria. The majority of the lecturers were within the 40 – 49-year-old group (n=35; 46.7%) followed by 30-39-year-old (n=24; 32.0%) and more and equal to 50-year-old (n=16; 21.3%) (Table 2). About 57.3% (n=43) were female lecturers whereas 42.7% (n=32) were male lecturers. And 89.3% (n=67) were from UKM and 10.7% (n=8) were from MNU. Approximately

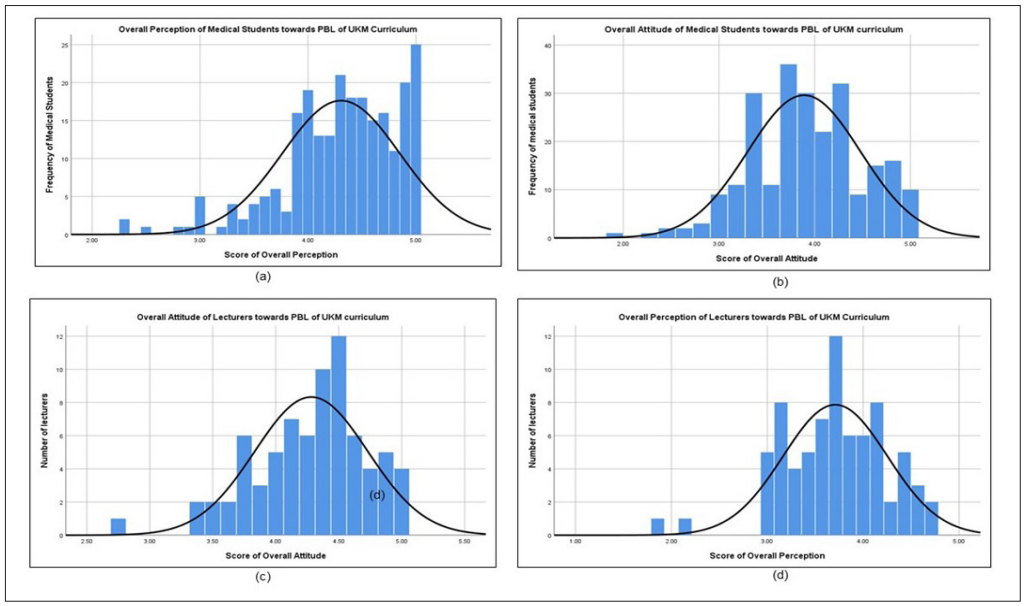

FIGURE 1: Histogram of overall perception (a) and attitude (b) of medical students as well as overall perception (c) and attitude (d) of lecturers towards PBL of UKM curriculum

TABLE 2: Demographic data of the student and lecturer groups

	Variable		Frequency (%)
Student (n=240)	Age group (year)	< 20	6 (2.5)
		20 – 25	234 (97.5)
	Gender	Male	67 (27.9)
		Female	173 (72.1)
	University	UKM	179 (74.6)
		MNU	61 (25.4)
	Year of study	Year 2	137 (57.1)
		Year 3	103 (42.9)
	CGPA	< 3.00	66 (27.5)
		3.00 ≤ x <3.33	98 (40.8)
		3.33 ≤ x < 3.67	51 (21.3)
		3.67	25 (10.4)
Lecturer (n=75)	Age group (year)	30 – 39	24 (32)
		40 – 49	35 (46.7)
		50	16 (21.3)
	Gender	Male	32 (42.7)
		Female	43 (57.3)
	University	UKM	67 (89.3)
		MNU	8(10.7)
	Years of conducting PBL	< 5	19 (25.3)
		5 – 10	21 (28)
		> 10	35 (46.7)

UKM=Universiti Kebangsaan Malaysia; MNU=Maldives National University; CGPA=cumulative grade point average

46.7% (n=35) lecturers had more than 10 years of experience conducting PBL followed by 28.0% (21) lecturers with 5 to 10 years of experience and 25.3% (19) lecturers with less than 5 years of experience. Most of them were Malay (n=58; 77.3%), followed by other races (n=9; 12.0%), Chinese (n=6; 8.0%) and Indian (n=2; 2.7%) lecturers.

Perception and Attitude of Medical Students

(i) Perception

All the items were rated at high scores indicating that the students' group had a positive perception towards PBL (Table 3). Since the perception among the students' group was skewed, their median with interquartile ranges (IQR) were used. Most of the tested perception variables had median values between 4 and 5 with perception percentages between 79.2% and 92.5%. These showed a high level of agreement among students that the PBL sessions enhanced in-depth understanding of the topics (92.5%), stimulated self-learning (89.6%) and critical thinking (88.8%).

Female students rating scored higher than male students. Both scores of males (*Mdn*=4.30) and female students (*Mdn*=4.40) were found to be at the positive end (Table 4). However, no significant differences

TABLE 3: Students' perception and attitude towards PBL of UKM curriculum

Variable	Perception	
	Median (IQR)	No (%) of response agreeing (4 and/or 5)
PBL effectively stimulates my self-learning	4.50 (3.00-5.00)	215 (89.6)
PBL effectively improves my problem-solving skills	4.00 (3.00-5.00)	208 (86.7)
PBL improves my presentation skills to become better	5.00 (3.00-5.00)	213 (88.8)
PBL really improves my confidence level to voice out opinions	4.00 (3.00-5.00)	206 (85.9)
PBL effectively stimulates critical thinking	4.00 (3.00-5.00)	213 (88.8)
I feel PBL is a good platform to exchange knowledge	5.00 (3.00-5.00)	213 (88.8)
PBL effectively enhances in-depth understanding of the topics	4.50 (3.00-5.00)	222 (92.5)
PBL is remarkably interesting	4.00 (3.00-5.00)	198 (82.5)
I feel that PBL is more interactive and dynamic than concept lecture	4.00 (3.00-5.00)	202 (84.2)
Facilitators are extremely helpful during PBL	4.00 (3.00-5.00)	190 (79.2)
Overall perception	4.40 (3.30-5.00)	86.7%
	Attitude	
	Mean ± SD	**No (%) of response agreeing (4 and/or 5)**
I always participate very actively in discussions	3.97 ± 0.85	173 (72.1)
PBL enhances my voluntary spirit	4.06 ± 0.80	176 (73.3)
PBL enables me to act as a leader to lead group discussions	3.76 ± 0.99	145 (60.4)
I am more motivated to study a topic if it is conducted through PBL	4.08 ± 0.89	189 (78.8)
PBL effectively improves my interpersonal relationship	4.14 ± 0.77	199 (82.9)
PBL effectively improves my decision-making skills	4.04 ± 0.85	188 (78.3)
I am greatly confident with the accuracy of knowledge discussed in PBL	3.66 ± 0.92	151 (62.9)
I can better imagine clinical scenarios through PBL	4.11 ± 0.88	188 (78.3)
I often use lesser time to revise PBL topics	3.23 ± 1.15	100 (41.7)
I can easily memorize the facts discussed during PBL.	3.68 ± 1.04	147 (61.3)
PBL helps me to identify my own strengths and weaknesses	4.07 ± 0.85	188 (78.3)
Overall attitude	3.89 0.59	69.87%

PBL = problem-based learning; IQR = interquartile range, SD = standard deviation

were displayed between male and female students in terms of perception towards PBL of UKM Curriculum, U (N_{male}=67, N_{female}=173)=5412.5, z= -0.796, p=0.426.

MNU students had a higher median score (Mdn=4.50) of perception towards PBL compared to UKM students (Mdn=4.30). Though, the differences were not significant, U (N_{UKM}=179, N_{MNU}=61)=6678.0, z= -1.205, p=0.477. The median score

TABLE 4: Students' perception and attitude towards PBL of UKM curriculum according to variables

Perception			
Variables		**Median (IQR)**	**Tests**
Gender	Male	4.30 (3.00-5.00)	Mann Whitney U= 5412.5; p= 0.426
	Female	4.40 (3.30-5.00)	
University	UKM	4.30 (3.20-5.00)	Mann Whitney U= 6678.0; p= 0.477
	MNU	4.50 (3.32-4.99)	
Academic year	Year 2	4.30 (3.27-5.00)	Mann Whitney U= 4896.5; p= 0.228
	Year 3	4.40 (3.22-5.00)	
CGPA	< 3.00	4.40 (3.00-5.00)	Kruskal Wallis H= 1.169; p= 0.760
	3.00 ≤ x < 3.33	4.30 (3.29-5.00)	
	3.33 ≤ x < 3.67	4.40 (3.36-5.00)	
	≥ 3.67	4.50 (3.04-5.00)	
Attitude			
Gender	Male	3.97 ± 0.60	t=1.377; p=0.170
	Female	3.86 ± 0.58	
University	UKM	3.87 ± 0.56	t=0.743; p=0.458
	MNU	3.94 ± 0.65	
Year of study	Year 2	3.88 ± 0.59	t=0.055; p=0.956
	Year 3	3.89 ± 0.59	
CGPA	< 3.00	3.80 ± 0.69	F= 0.760; p=0.517
	3.00 ≤ x < 3.33	3.91 ± 0.54	
	3.33 ≤ x < 3.67	3.93 ± 0.59	
	≥ 3.67	3.95 ± 0.47	

UKM=Universiti Kebangsaan Malaysia; MNU=Maldives National University; CGPA=cumulative grade point average; IQR=interquartile range; SD=standard deviation. The values of all variables were expressed either in the median (interquartile range) or mean ± standard deviation.
U = Mann Whitney value; H = Kruskal Wallis value; T = T-test value; F = Anova value

of perception of year 3 students (*Mdn*=4.40) was higher compared to that of year 2 students (*Mdn*=4.30). However, the differences were not significant, U *($N_{Year\ 2}$*=137, *$N_{Year\ 3}$*=103) =4896.5, *z*= -0.711, *p*=0.228. Similarly for the median scores based on CGPA performances in which there was a trend of higher scores among students with higher CGPA. However, the trend differences, H(3)=1.169 were not significant, *p*=0.760.

(ii) Attitude

All the items were rated at high scores indicating that the students' group had a positive attitude towards PBL (Table 3). Since the perception among the students' group was normally distributed, their mean (M) and standard deviation (SD) were used. The mean value of all the elements was recorded between 3.23 and 4.14 with percentages between 41.7% and 78.8%. Most of the students rated a high level of agreement on their improvement in the interpersonal relationship (82.9%), decision-making skills (78.3%), motivation to study a topic if conducted through PBL (78.8%) and ability to identify strengths

and weaknesses (78.3%).

Both mean scores of males (3.97 ± 0.60) and female students (3.86 ± 0.58) were found to be at the positive end with male rating scores higher than female students (Table 4). There were no significant differences between male and female students in terms of attitude towards PBL of UKM Curriculum (t =1.377; p=0.170).

MNU students recorded a higher mean score (3.94 ± 0.65) of attitude towards PBL compared to UKM students (3.87 ± 0.56). However, the differences were not significant (t=0.743; p=0.458). There were also no significant differences among the year of studies (t=0.055; p=0.956), by which year 3 students attained higher attitude scores (3.89 ± 0.59) than year 2 students (3.88 ± 0.59).

Similarly for the mean scores based on CGPA performances in which there was a trend of higher scores among students with higher CGPA. However, the trend differences were not significant (F=0.760; p=0.517).

Perception and Attitude of Lecturers
(i) Perception

All the items were rated at high scores indicating that the lecturers had a positive perception towards PBL (Table 5). Since the perception among the lecturers' group was normally distributed, their mean and SD were used. The mean values of all the elements were recorded between 3.20 and 4.49 with percentages between 29.3% and 94.7%. Most of the lecturers agreed and strongly agreed that PBL helped students to develop better confidence levels (94.7%), improved students' problem-solving skills (90.7%) and enhanced in-depth understanding of the topics (81.3%).

Both mean scores of males (3.71 ± 0.58) and female lecturers (3.71 ± 0.52) were also found to be slightly positive (Table 6). No significant differences were observed between male and female lecturers in terms of perception towards PBL of UKM Curriculum (t=0.017; p=0.986).

MNU lecturers recorded a higher mean score (3.77 ± 0.55) of perception towards PBL compared to UKM lecturers (3.70 ± 0.55). However, the differences were not significant (t=0.324; p=0.747). There was a trend of decreasing perception scores among lecturers with greater years of experience. However, the means differences were not significant (F=0.259; p=0.773).

(ii) Attitude

All the items were rated at high scores indicating that the lecturers had a positive attitude towards PBL (Table 5). Since the attitude among the lecturers' group was not normally distributed, median (*Mdn*) and IQR were used. The median value of all the elements was recorded between 4.00 and 5.00 with percentages between 65.3% and 98.7%. Most of the lecturers agreed and strongly agreed that they often encouraged students to participate actively in PBL (98.7%) and think critically before providing a solution (94.7%). Moreover, majority of them (90.7%) also rated a high agreement on the importance of the presence of a

TABLE 5: Lecturers' perception and attitude toward PBL of UKM curriculum

Perception		
Variables	**Mean ± SD**	**No (%) of response agreeing (4 and/or 5)**
PBL effectively improves students' problem-solving skills.	4.47 ± 0.70	68 (90.7)
PBL helps students to develop better confidence level.	4.49 ± 0.65	71 (94.7)
I think PBL really enhances in depth understanding of the topics.	4.21 ± 0.83	61 (81.3)
I find PBL is useful only if students have prior knowledge about the topic.	3.56 ± 1.23	44 (58.7)
I prefer to conduct PBL over lecture.	3.37 ± 1.12	37 (49.3)
I think PBL is very time-consuming. (Inverse)	3.20 ± 1.09	31 (41.3)
Conducting PBL is much more complicated than conducting a lecture. (Inverse)	2.65 ± 1.29	22 (29.3)
Overall perception	3.71 ± 0.54	63.62%
Attitude		
Variable	**Median (IQR)**	**No (%) of response agreeing (4 and/or 5)**
I think facilitator is particularly important and necessary to be present during PBL.	5.00 (2.80-5.00)	68 (90.7)
I often motivate and encourage students to participate actively.	5.00 (4.00-5.00)	74 (98.7)
I often provide feedback to students on their strengths and weaknesses.	4.00 (3.00-5.00)	62 (82.7)
I always encourage students to think critically before I provide a solution.	5.00 (3.00-5.00)	71 (94.7)
I often help to build up group dynamics.	4.00 (2.80-5.00)	66 (88.0)
I do not have any difficulty at all in conducting PBL.	4.00 (2.00-5.00)	62 (82.7)
PBL enables me to adopt better guidance skills.	4.00 (3.00-5.00)	63 (84.0)
I tend to mix up the methods of conducting PBL with lectures. (Inverse)	4.00 (1.00-5.00)	49 (65.3)
Overall attitude	4.38 (3.48-5.00)	85.8%

PBL= problem-based learning; SD= standard deviation; IQR= interquartile range.

facilitator during PBL sessions.

There were no significant differences among gender, U *(N_{male}*=32, *N_{female}*=43) =603.5, (z=-0.91; p=0.363), with similar median scores (*M*dn=4.38) for both groups (Table 6). Similarly, for the mean scores based on years of experience conducting PBL, the trend differences were not significant (Kruskal Wallis=3.979; p=0.137).

MNU lecturers (*M*dn=4.69) recorded a higher median score of attitudes towards PBL compared to UKM lecturers (*M*dn=4.38). The differences were significant, U *(N_{UKM}*=67, *N_{female}*=8) =106.0 (z= -2.794; p=0.005). MNU lecturers had a significantly better attitude towards

TABLE 6: Lecturers' perception and attitude towards PBL of UKM curriculum according to variables

	Variables		Mean ± SD	Tests
Perception	Gender	Male	3.71 ± 0.58	t=0.017; p=0. 986
		Female	3.71 ± 0.52	
	University	UKM	3.70 ± 0.55	t=-0.324; p=0.747
		MNU	3.77 ± 0.55	
	Year of experience	< 5 years	3.78 ± 0.48	F=0.259; p=0. 773
		5 – 10 years	3.71 ± 0.44	
		> 10 years	3.67 ± 0.63	
	Variables		**Median (IQR)**	**Tests**
Attitude	Gender	Male	4.38 (3.24-5.00)	Mann-Whitney
		Female	4.38 (3.40-4.98)	U=603.5; p=0.363
	University	UKM	4.38 (3.43-5.00)	Mann-Whitney
		MNU	4.69 (4.13-4.88)	U=106.0; p=0.005*
	Year of experience	< 5 years	4.50 (3.63-4.88)	Kruskal Wallis
		5 – 10 years	4.25 (3.39-4.96)	=3.979;
		> 10 years	4.38 (3.25-5.00)	p=0.137

UKM=Universiti Kebangsaan Malaysia; MNU=Maldives National University; SD=standard deviation; IQR=interquartile range; *Significant differences between the subjects of the variable (p<0.05).

PBL than UKM lecturers.

DISCUSSION

Medical education faced the setback of limitation in learning experience exposure because of the COVID-19 pandemic. As a strategy to provide exposure to clinical scenarios during the preclinical years, PBL enhances students' knowledge and preparation before clinical years. Therefore, assessment of the current adaptation of PBL of UKM curriculum in UKM and MNU medical faculties is crucial to assess the advantages of the method and to recognise the areas of weakness for enhancement. The present study investigated the perception and attitude of UKM and MNU undergraduate medical students and lecturers towards PBL of UKM curriculum and compared among different characteristics of interest. Cronbach's alpha for all instruments items was above 0.70, Therefore, the questionnaire was demonstrated to be a dependable instrument for this research. Our findings showed that the majority (86.69%) of UKM and MNU medical students perceived that PBL was an acceptable and effective learning strategy. This finding aligned with previous studies, which stated that students' perception of PBL was more positive than negative (Aldayel et al. 2019; Ibrahim et al. 2018; Ommar 2011; Yadav et al. 2018; Zahid et al. 2016). In this present study, 92.5% of the students agreed that PBL enhanced in-depth understanding of the topics, which was supported by several studies (Barman et al. 2006; Emerald et al. 2013; Zahid et al. 2016). According to Klegeris & Hurren (2011), PBL offered more comprehensive understanding

of the course content compared to traditional didactic lectures. This is because PBL provides a chance for hearing different perspectives and gain knowledge from each other (Ommar 2011) and enables student groups to share their knowledge (Aboonq 2015). Consistent with these findings, our study has also shown that PBL is a good platform to exchange knowledge (88.7 %).

According to Emerald et al. (2013), 80.9% of the medical students from UCSI University perceived that PBL motivated them to self-learning. This statement was in line with the observation of the current study as most (89.6%) of UKM and MNU medical students agreed that PBL effectively stimulated self-learning.

PBL enhances the educational process by emphasising the cultivation of self-directed learners among students, in contrast to traditional lectures that promote a more passive, instructor-dependent approach (Yadav et al. 2018). During the students' pursuit for self-directed, independent learning, they integrate fresh information with their existing knowledge, subsequently refining and enhancing it (Zahid et al. 2016). Moreover, most of the students also agreed that PBL had a positive impact on enhancing their problem-solving abilities and critical thinking. These findings were supported by several studies (Al-Drees et al. 2015; Aldayel et al. 2019; Borhan 2012; Emerald et al. 2013). In the current study, 88.7% of the students perceived that their presentation skills became better and 85.9% of them were more confident to voice out opinions. Even for only one PBL task, students were able to learn, not only on the content but also developed presentation skills and improved communications (Borhan 2012).

About 84.2% of the medical students preferred PBL over lecture as PBL was more interactive and dynamic than concept lecture. Several studies proved that PBL-based curriculum students carried out significantly better than didactic lecture-based curriculum students particularly in the clinical examination and theoretical knowledge base (Zahid et al. 2016) and PBL strategies could significantly enhance students' achievement (Salari et al. 2018). According to Klegeris & Hurren (2011), students felt that PBL surpassed to the traditional lecture format in terms of understanding of course content and retaining of information.

Facilitators provided a positive learning environment (Yadav et al. 2018) and facilitated PBL sessions by encouraging the generation of particular learning concerns to facilitate self-directed study (Salam et al. 2011). From the medical students' point of view, 79.2% believed facilitators were helpful during PBL. However, Kandi & Basireddy (2018) found students provided unfavorable responses about the role of the facilitators as they felt that facilitators were not attentive during PBL sessions. This can be explained by the greater quantity of PBL groups in comparison to the number of available facilitators, leading each facilitator to oversee multiple groups. By inviting feedback from students, facilitators can make relevant changes to the sessions

(Aslami et al. 2018) and thus improve both parties' experiences on PBL.

In the current study, both female and male students had a similar level of perception towards PBL of the UKM curriculum. Nevertheless, in the other study, male students reported a significantly higher perception than female students regarding PBL improving problem-solving skills (Aldayel et al. 2019). There were also no significant differences of perception between UKM and MNU students which can be clarified by the high efficacy of curriculum being delivered to the students despite being in different settings. Even though there was a consensus that there were no significant differences of perception between Year 2 and 3 students, other authors argued that Year 3 students preferred PBL more than Year 2 students (Ommar 2011). In another study, Year 2 students had more positive perceptions than Year 1 students as they encounter PBL twice (Krejcie & Morgan 1970). Students recruited in the current study with different CGPA achievements had statistically insignificant differences in their perception of PBL. Nevertheless, according to Aldayel et al. (2019), significant differences could be seen between different CGPA groups regarding PBL enhanced the integration between basic and clinical sciences. Furthermore, majority (69.87%) of UKM and MNU medical students had a positive attitude towards PBL of the UKM curriculum. For instance, majority of the students reported that PBL improved their interpersonal relationships and leadership skills. PBL enables students to act as a leader to lead the group discussion (Aldayel et al. 2019). Studies conducted by Ommar (2011) and Klegeris & Hurren (2011) proved that PBL helped in developing an interpersonal relationship or modified their attitudes. More than half of the students in the recent study showed that they were more motivated to study a topic if it was conducted through PBL, which was in line with another study (Aldayel et al. 2019). It was suggested that students perceived lectures as a convenient means of acquiring knowledge, while they considered exploring their learning goals and studying through PBL to be a more time-intensive process (Hande et al. 2015). Students perceived that it was easier to memorise the facts, thus requiring lesser time to revise the topics in PBL. On the contrary, Emerald et al. (2013) found that majority of their students disagreed with the statement that they can easily memorise the facts. Research has indicated that PBL involves more time to solve complex problems, which results to a lack of available time for covering the course the material or content (Hande et al. 2015). However, Yadav et al. (2018) proved that majority of the students believed that they used the lesser time to revise PBL topics.

Inconsistent with other studies (Al-Drees et al. 2015; Aldayel et al. 2019), most of our students believed that PBL assisted them in recognising their strengths and weaknesses. Students recruited in the current study perceived that they could better imagine clinical scenarios through PBL. Likewise, a study conducted by Ikegami et al. (2017) proved that PBL

presented a better achievement rates for visualisation authentic patients. PBL helps in the preparation of clinical thinking (Ibrahim et al. 2018). The well-designed PBL scenarios emphasise common medical problems to assist in nurturing students' enthusiasm for their profession from the very beginning of their career (Yadav et al. 2018).

An important outcome in this study was that 72.1% of the students participated actively during PBL discussions, similarly, found in other studies (Emerald et al. 2013; Lin et al. 2013). PBL enhanced their voluntary spirits. In contrast, less than half of the students in another study contributed actively in discussions, as some students lead while others were passive during discussions (Aldayel et al. 2019). Poor participation of certain students could be attributed to four main factors like content knowledge, proficiency in English, the effectiveness of facilitators and students' perception of these roles and social relationships between group members (Barman et al. 2006).

In the current study, there were no significant differences in students' attitudes among gender (male and female), as supported by Khan & Mohakud (2018). Both UKM and MNU students did not have significant differences in attitude towards PBL of UKM curriculum, which might be due to the high efficacy of curriculum delivery despite being in different settings. In line with Abdalla et al. (2019), this study proved no significant differences of attitude towards PBL among students with different years of study (Year 2 and Year 3).

Meanwhile, the majority (63.62%) of UKM and MNU lecturers had a positive perception towards PBL of the UKM curriculum. 94.5% of them felt that PBL helped students to develop better confidence levels while 90.6% of them agreed that PBL improved students' problem-solving skills. PBL facilitators may impact the self-confidence of the students during a PBL activity through constructive feedback and praise (Seibert 2021). According to Aboonq (2015) and Rahman et al. (2004) majority of the medical lecturers agreed and completely agreed that PBL helped students to perform problem-solving. Facilitation skills in stimulating students to the depth and breadth of knowledge were achieved by asking challenging questions (Mohamad et al. 2009). Moreover, other studies suggested that most of the faculty members perceived that PBL probed a deeper understanding of concepts (Abdelkarim et al. 2018; Kukkamalla et al. 2011), which supported our findings that 81.4% of the lecturers agreed that PBL enhanced their in-depth understanding of topics.

In the present study, only about half (49.4%) of the lecturers preferred to conduct PBL over lecture. This might be because they perceived that conducting PBL was more complicated than conducting a lecture. Some educators found that PBL facilitation was difficult and frustrating (Wood 2003). The facilitation of PBL requires transition from teacher-centred to student-centred instruction (Mohamad et al. 2009). In PBL, the teacher is a facilitator to assist the learning process through questioning and coaching,

rather than to provide a ready answer (Khoon 2018). However, Singh et al. (2014) reported that 83.9% of the faculties were in the favour of the implementation of PBL than traditional teaching and wanted to become PBL facilitators than a traditional teachers. Furthermore, more than half (58.7%) of the lecturers in the present study perceived that PBL was very time consuming, which was in agreement with Abdelkarim et al. (2018). In comparison with didactic lectures, PBL sessions take a much longer time to complete a topic.

Our findings agreed with (Orfan et al. 2021) whereby there were no significant differences of perception among gender (male and female), university (UKM and MNU), years of experience conducting PBL (< 5 years, 5-10 years, >10 years). Both genders experienced similar mechanics in conducting PBL. Additionally, both universities acquired similar methods of PBL conduction. Despite different years of experience, there was standardisation in facilitation as they had similar workshops before conducting PBL.

Moreover, the majority (85.3%) of UKM and MNU lecturers had a positive attitude towards PBL of UKM curriculum, similarly, found in one recent study conducted in Takhar University, Afghanistan (Orfan et al. 2021). In the present study, most of the lecturers (98.7%) often motivated and encouraged students to participate actively during PBL sessions. Likewise, Mohamad et al. (2009) suggested that most of the UKM students agreed that facilitators did probe them for further information to guide students for deep learning. In the current study, 68% of the lecturers perceived that facilitator was important and necessary to be present during PBL. Facilitators help to stimulate the creation of certain learning issues for self-study and differentiate between major and minor learning issues (Salam et al. 2011). Facilitators encourage students to elaborate their reasoning until they recognise the limitations of their knowledge which necessitates in creating learning issue (Hmelo-Silver 2004). In contrast, another research argued that there was no notable difference in terms of knowledge, motivation, group dynamic and critical thinking skills, between PBL with and without facilitator (Chuan et al. 2011). However, issues like students' attendance, responsibility in information sharing, critical thinking, dominance and passivity must be dealt when PBL is conducted without a facilitator (Chuan et al. 2011).

In PBL, the facilitator should be able to motivate students, know when to intervene, promote critical and creative thinking, determine the appropriate extent of information dissemination, and effectively manage group dynamics and challenges (Borhan 2012). These statements aligned with the findings in this research in which 88 % of the lecturers helped to build group dynamics. In addition, more than half (62%) of the lecturers in the present study reported that they often provided feedback to students on their strengths and weaknesses, which was inconsistent with prior studies (Al-Drees et al. 2015; Aldayel et al. 2019; Borhan & Yassin 2013). Reflection

provides students with a chance to reflect on their learning methods, and how they can enhance their role as a team members, to improving collaboration and the effectiveness of group tasks (Borhan & Yassin 2013). Constructive feedbacks are provided on various aspects, including information gathering, group communication, team behaviours, data analysis, progress toward consensus, and appropriate use of resources. Immediate feedback can encourage reflection of students' efforts, skill level, and knowledge which can boost their confidence (Seibert 2021).

In the present study, 88.0% of the lecturers did not have any difficulty at all in conducting PBL, and only 34.7% of them tended to mix up methods of conducting PBL with lectures. On the other hand, senior faculty members in another study did not show a strong inclination towards PBL and were still in favour of didactic lectures (Usmani et al. 2011). Therefore, staff training is considered crucial as PBL necessitates a major change in teaching and learning processes, approaches and principles (Borhan 2012). The need for comprehensive feedback and standardised training among facilitators are vital. It is to improve the competency and productivity of PBL discussions and indirectly reduce variability in the delivery of sessions (Abdelkarim et al. 2018; Salari et al. 2018).

There were no significant differences in lecturers' attitudes among gender, inconsistent with another study conducted in Takhar University (Orfan et al. 2021). Both genders experienced similar mechanics in conducting PBL and there was no gender discrimination related to PBL. However, MNU lecturers have a significantly higher attitude towards PBL than UKM lecturers. This might be contributed by the fact that PBL was only being implemented in MNU for 3 years thus the exposure was still new to MNU lecturers. While in UKM, PBL was practised about 15 years ago. We predicted that the longer exposure period might be the cause of lecturers in UKM being having a more neutral attitude towards PBL. Furthermore, our study also reported no significant differences in lecturers' attitudes between different years of experience, was also supported by Orfan et al. (2021) and Abdelkarim et al. (2018). This was attributed to standardisation in facilitation as they had similar workshops before conducting PBL. There were several limitations involved in this study. Firstly, this study used self-reported information provided by the respondents. The interpretation among all respondents may differ. Moreover, the low number of medical students enrolled in a new medical school of MNU that was just about 3 years of establishment. The limited number of sample size from MNU may be a limitation in satisfying the full potential statistically.

Because of the current COVID-19 pandemic, most of the PBL sessions were conducted online, which might influence the overall experience of both students and lecturers towards PBL. Furthermore, all the students experienced PBL with different facilitators during each session and thus

they might not undergo a similar PBL experience, vice versa for the lecturers. Therefore, we suggested that a further longitudinal study to be carried out in UKM and MNU medical faculties to conclude more valid outcomes. Interviews should be incorporated in future data collection.

Despite the limitations, this study was still beneficial especially to the UKM curriculum settings as it served as the precursor study in investigating the local curriculum particularly the PBL.

CONCLUSION

In the present study, both students and lecturers showed positive perceptions and attitudes towards PBL of the UKM curriculum. In conclusion, PBL is a beneficial learning and teaching method as it made a significant contribution to enhancing the knowledge, learning and soft skills of the students. The facilitators in PBL can be the lecturers who are not content expert but already had experience in conducting PBL. They played an essential role, and should be trained via proper workshops to facilitate PBL well to achieve its goals. However, universities should be prepared to adapt to the current trend of online learning to improve the experience of PBL of both students and lecturers.

AVAILABILITY OF DATA AND MATERIALS

The original contributions presented in the study are included in the article/ Additional files, further inquiries can be directed to the corresponding author

CONFLICT OF INTEREST

The authors declared that they have no conflict of interests.

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