ORIGINAL ARTICLE

Perception of Undergraduate Pharmacy Students on CBL Learning Environment

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ABSTRACT

Introduction: An effective learning environment is important for proper academic and professional development of students. This can be assessed by exploring the students' perception of the learning environment. This study aims to evaluate students' learning responses and perceptions of their learning environment regarding case-based learning (CBL) implementation in the subject of pharmacology of second-year undergraduate pharmacy students. **Methods:** This is a descriptive cross-sectional study. The sample size is 120 second year students from the Pharmacy programme. The data was collected by using self- administered Dundee Ready Education Environment Measure (DREEM) inventory that consists of 50 items with 5 subscales of learning. **Results:** A total of 148 second-year pharmacy students participated in the survey and the response rate is 85%. The majority of participants were female and the overall mean DREEM score in this study is 137.29, which indicates more positive learning environment than negative. Three items were identified as areas of concern which were an overemphasis on factual learning (mean=1.64), tutors being perceived as authoritarian (mean=1.97) and the presence of a cheating problem in the course (mean=1.86). In this study, no statistically significant association was found between each subscale of the perceptions of the learning environment and cumulative grade point average ($p>0.05$). **Conclusion:** Pharmacy students at UiTM Puncak Alam generally hold predominantly positive perceptions. However, there are identified problem areas that require improvement, emphasizing the need for more effective interventions.
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Keywords: Case-Based Learning; Pharmacology; Learning environment; DREEM; Pharmacy Education

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INTRODUCTION

The undergraduate pharmacy degree places significant importance on pharmacology as it imparts essential knowledge on the selection and prescription of drugs for patients, forming a fundamental understanding of the principles and rationale behind drug prescription (1). Due to the extensive volume of drug-related information that needs to be learned and retained within a limited timeframe, pharmacology poses a significant challenge for students, often leading to apprehension and anxiety towards the subject (2). Traditionally, pharmacology is taught through didactic lectures which are teacher-centred learning. Nevertheless, there has been a shift in the learning approach from passive to active methods in pharmacology teaching. This change involves active participation from students in the learning process through discussions, problem-solving exercises, case studies, role-playing activities, and various other interactive method (3). Incorporating active-learning sessions into a lecture-based pharmacology course promotes student interests and motivation, while enhancing the development of critical and analytical thinking (4). Active learning encompasses various teaching methods, one of which is case-based learning (CBL). This approach involves exposing students with a clinical case, problem, or question to be resolved, along with specific learning objectives and measurable outcomes. By utilizing case scenarios that mirror real-life situations, CBL facilitates active learning and prepares students for potential future experiences. It allows students to experience practical situations that require the application of reasoning skills and relevant theoretical knowledge for effective management (5). Due to the increasing demand for highly skilled pharmacy graduates (6), CBL has gained significant popularity among pharmacy schools worldwide. Moreover, medical and other healthcare fields education have also witnessed a shift from traditional teaching methods to case-based learning over the past few decades (7).

In a study conducted by Hasamnis et al. (8), it was noted that the incorporation of CBL in pharmacology yielded improvements in the quality of learning. Students responded positively to CBL sessions, highlighting its effectiveness. The researchers also concurred that CBL enhances the quality of learning by fostering the development of higher-order skills in medical students and integrating theoretical knowledge with practical application which in return facilitates effective learning outcomes (8). In a study conducted by Baheti et al. (9) a post-test to both the CBL group and the didactic lecture group was administered. The results revealed that the CBL group exhibited significantly higher scores in the post-test compared to the didactic lecture group. This finding serves as evidence highlighting the effectiveness of CBL as a teaching-learning method. Furthermore, the researchers used a pre-validated questionnaire and found that over 80% of the students agreed that CBL enhanced their ability to apply theoretical knowledge to clinical scenarios and improved their understanding of diagnostic and therapeutic skills. Additionally, a majority of the students expressed that CBL played a crucial role in improving their comprehension of pharmacology (9).

The evaluation of the medical education system includes an assessment of the learning environment as an indicator of effectiveness. The World Federation for Medical Education (10) recognizes the learning environment as a crucial aspect to be evaluated. This environment has the potential to impact students' behaviour, academic performance, and overall satisfaction with their learning experience. Therefore, exploring the learning environment becomes an essential factor to improve the quality of a curriculum. (11). One of the instruments that can be used to assess the learning environment from students' perspectives is the Dundee Ready Education Environment Measure (DREEM) which is mainly used in the medical and health professions. DREEM has been widely used as an assessment tool by healthcare students to assess their learning environment (12).

Currently, there is limited number of research investigating the impact of the learning environment on undergraduate pharmacy students in Malaysia, specifically in the context of pharmacology courses, utilizing the Dundee Ready Education Environment Measure (DREEM) (13–15).

The main objective of this study is to assess the learning outcomes and perceptions of the learning environment among second-year undergraduate pharmacy students at UiTM Puncak Alam, focusing on the implementation of CBL in pharmacology subjects. Furthermore, this study aims to identify the strengths and weaknesses associated with the integration of CBL as an instructional approach in pharmacology courses. Additionally, this study will investigate the potential relationship between students' perceptions of the learning environment and their cumulative grade point average (CGPA).

MATERIALS AND METHODS

Study design and setting

This study is a cross-sectional study using a self-reported validated questionnaire online survey and conducted in a cohort of second year undergraduate pharmacy students at the Faculty of Pharmacy at Universiti Teknologi MARA (UiTM) Selangor, Puncak Alam Campus. The students have participated in 2 CBL sessions each in 3 pharmacology subjects which have been offered in their semester 2, 3 and 4.

Study population

The participants in this study consisted of second-year pharmacy students from UiTM Puncak Alam. A sample size of 120 respondents was determined using the Raosoft sample size calculator. The sampling for this study is by quota sampling, a non-probability sampling.

Instrument

Data were collected using a self- administered DREEM questionnaire (16) which consisted of 50 items with 5 subscales (Table I); each is scored 0–4 on a five-point Likert scale (4= strongly agree, 3= agree, 2= unsure, 1= disagree, and 0= strongly disagree). However, nine out of 50 items (numbers 4, 8, 9, 17, 25, 35, 39, 48, and 50) were negative statements and had to be scored in a reverse manner. The base for the overall DREEM score is 200. The DREEM can also be used to identify more specific strengths and weaknesses within the education environment. For this purpose, it is necessary to evaluate the response to individual items being reviewed. Items with a mean score of ≥ 3.5 are true positive points. Any item with a mean score of ≤ 2 should be examined more closely, since this indicates a problem area. Items with a mean of 2–3 are aspects that could be enhanced. The questionnaire generates an overall "score" for the course. The statements may also be subdivided to provide an indication of student perceptions of five major domains of educational environment (Table II).

Table I : DREEM inventory subscales

Subscales	No. of item	Maximum score
Students' perceptions of learning	12	48
Students' perceptions of teachers	11	44
Students' academic self-perception	8	32
Students' perceptions of atmosphere	12	48
Students' social self-perception	7	28

Table II : The interpretation of the DREEM for the total score, subscales scores and item scores

	Scores	Interpretation
Total DREEM score (out of 200)		
	0-50	Very poor
	51-100	Plenty of problems
	101-150	More positive than negative
	151-200	Excellent
DREEM subscales score		
Students' perception of learning (out of 48)	0-12	Very poor
	13-24	Teaching is viewed negatively
	25-36	A more positive perception
	37-48	Teaching highly thought of
Students' perception of teachers (out of 44)	0-11	Terrible
	12-22	In need of some retraining
	23-33	Moving in the right direction
	34-44	Model teachers
Students' academic self-perceptions (out of 32)	0-8	Feelings of total failure
	9-16	Many negative aspects
	17-24	Feeling more on the positive side
	25-32	Confident
Students' perception of atmosphere (out of 48)	0-12	A terrible environment
	13-24	There are many issues which need changing
	25-36	A more positive attitude
	37-48	A good feeling overall
Students' social self-perceptions (out of 28)	0-7	Miserable
	8-14	Not a nice place
	15-21	Not too bad
	21-28	Very good socially
DREEM individual item score (n=50)		
	Mean score <2	Problem areas
	Mean score 2-3	Could be enhanced or improved
	Mean score ≥ 3.5	Real positive points

Ethical consideration

This study was approved by Research Ethics Committee (REC) of UiTM (REC (PH) / 02/2022). Participation in the study is entirely voluntary and participants have the right to withdraw from the survey at any point during the questionnaire without facing any penalties or consequences.

Data collection

The data collection was conducted for 2 weeks from the 27th of May 2022 to the 10th of June 2022. A Google Form was utilized to collect the data which was distributed to the students following the completion of the CBL session. The participants responded to the questionnaire, which took approximately 15 to 20 minutes to complete. The study involved a total of 148 student participants.

Statistical analysis

The data was analyzed using the Social Package for Social Science (SPSS) version 27. The mean scores and standard deviation for each subscale were calculated. A chi-square test was used to analyze the association between the learning environment and Cumulative Grade Point Average (CGPA). A value of $p<0.05$ was considered statistically significant.

Table III : Perceptions of undergraduate pharmacy students on CBL learning environment 2022

Characteristics		Frequency	(%)
Gender	Male	30	20.3
	Female	118	79.7
	Total	**148**	**100**
Age	18-20	3	2.0
	21-23	136	91.9
	24-26	9	6.1
	Total	**148**	**100**
Cumulative Grade Point Average	1.0 – 1.5	0	0
	1.51 – 2.0	0	0
	2.01 -2.5	4	2.7
	2.51 – 3.0	11	7.4
	3.01 – 3.5	107	72.3
	3.51 – 4.0	26	17.6
	Total	**148**	**100**
Academic entrance	Matriculation	15	10.1
	Foundation	78	52.7
	Diploma	55	37.2
	Total	**148**	**100**

RESULTS

Out of a total of 174 second-year pharmacy students, 148 students participated in the survey, resulting in a response rate of 85%. The majority of the participants were female, accounting for 79.7% of the respondents. Regarding age distribution, a significant portion of the participants fell within the range of 21 to 23 years old, comprising 91.9% of the total sample (Table III). In terms of educational qualifications, more than half of the participants had completed a foundation program (52.7%), followed by a diploma (37.2%), and matriculation (10.1%).

The overall DREEM mean score was 137.29 out of 200 which indicates the respondents generally held more positive perceptions than negative on their learning environment (Table IV). Specifically, the mean score for students' perception of learning was 33.48±5.462, the mean score for students' perception of teachers was 31.79±5.6, the mean score for students' academic self-perceptions was 21.32±3.892, the mean score for students' perception of the atmosphere was 32.26±6.212, and the mean score for students' social self-perceptions was 18.43±3.336.

Based on the guideline (Table II), 1 out of 12 items in

Table IV : Total and subscale results of DREEM survey of undergraduate pharmacy students'perception of learning environment 2022

Total DREEM score			137.29		
Subscales of DREEM	**Min[a]**	**Max[b]**	**Mean score**	**SD**	**Problematic items[c]**
Students' perception of learning (12 items)	0	48	33.49	5.462	1 (item no 8)
Students' perception of teachers (11 items)	0	44	31.79	5.600	1 (item no 4)
Students' academic self-perceptions (8 items)	0	32	21.32	3.892	0
Students' perception of atmosphere (12 items)	0	48	32.26	6.212	1 (item no 3)
Students' social self-perceptions (7 items)	0	28	18.43	3.336	0

[a] the minimum individual DREEM item score that can be obtain.

[b] the maximum individual DREEM item score that can be obtain.

[c] refer to Table IV for individual item.

Table V : The mean item scores of undergraduate pharmacy students' perception of the learning environment 2022

Item	Mean score
Students' perception of learning (12 items)	
I am encouraged to participate in during CBL sessions	3.16
The teaching is often stimulating	2.98
The teaching is student centred	2.79
The teaching helps to develop my competence	2.98
The teaching is well focused	3.01
The teaching is sufficiently concerned to develop my confidence	2.89
The CBL time is put to good use	3.01
The teaching over-emphasis factual learning	**1.64**
I am clear about the learning objectives of the course	3.02
The CBL session encourages me to be an active learner	2.97
Long term learning is emphasised over short term	2.75
The teaching is too teacher-centred	2.31
Students' perception of teachers (11 items)	
The tutors are knowledgeable	3.48
The tutors are patient with students	3.21
The tutors ridicule the students	2.73
The tutors are authoritarian	**1.97**
The tutors have good communications skills	3.14
The tutors are good at providing feedback to students	2.91
The tutors provide constructive criticism here	2.55
The tutors give clear examples	3.07
The tutors get angry in class	2.82
The tutors are well prepared for their classes	3.20
The students irritate the tutors	2.72
Students' academic self-perceptions (8 items)	
Learning strategies which worked for me before continue to work for me now	2.70
I am confident about my passing this year	2.57
I feel I am being well prepared for my profession	2.41
Last year's work has been a good preparation for this year's work	2.68
I am able to memorise all I need	2.12
I have learned a lot about empathy in my profession	2.89
My problem solving skills are being well developed here	2.81
Much of what I have to learn seems relevant to a career in pharmacy	3.15
Students' perception of atmosphere (12 items)	
The atmosphere is relaxed during CBL session	2.74
This school is well timetabled	2.89
Cheating is a problem in this course	**1.86**

The atmosphere is relaxed during CBL session	2.79
There are opportunities for me to develop interpersonal skills	2.97
The atmosphere is relaxed during CBL session	2.80
I find the experience disappointing	2.54
I am able to concentrate well	2.63
The enjoyment outweighs the stress of studying medicine	2.55
The atmosphere motivates me as a learner	2.89
I feel able to ask the questions I want	2.84
I feel comfortable in class socially	2.76
Students' social self-perceptions (7 items)	
There is a good support system for students who get stressed	2.64
I am too tired to enjoy this course	2.16
I am rarely bored on this course	2.46
I have good friends in this school	3.11
My social life is good	2.76
I seldom feel lonely	2.32
My accommodation is pleasant	2.99

students' perception of learning, 1 out of 11 items in students' perception of teachers and 1 out of 12 items in students' perception of the atmosphere were interpreted as the problem areas. To sum, 3 out of 50 items were interpreted as a weakness in the implementation of CBL as a learning instruction in pharmacology courses. Another 47 items can be categorized as an area that could be enhanced.

Females had a higher mean DREEM score (15.71±1.926) compared to males (15.37±2.773) and females also score higher in all subscales than males. Students aged around 24 to 26 years old had a lower mean DREEM score (15.56±1.810) compared to other age ranges; 18 to 20 years old (15.67±4.041) and 21 to 23 years old (15.65±2.110). Students with a diploma as their academic entrance had the highest mean DREEM score (15.75±1.818) compared to students with foundation (15.62±2.320) and matriculation (15.40±2.165).

The student's perception of the learning subscale mean score was 33.49±5.462 which can be interpreted as a more positive perception. The item with the highest mean score was 'I am encouraged to participate in during CBL sessions' and only 1 item in this subscale score less than 2, 'the teaching over-emphasizes factual learning' (Table V). The item that scores less than 2 can be identified as a problem area and need improvement. The students' perception of teachers' subscale mean score was 31.79±5.6 which can be interpreted as moving in the right direction.

There was 1 item score of less than 2 in this subscale, which is 'the tutors are authoritarian'. The students' academic self- perceptions subscale mean score was 21.32±3.892 which can be described as feeling more on the positive side. All the items score in this domain are between 2 to 3.49. The students' perception of atmosphere subscale mean score was 32.26±6.212. The score shows that the students felt a more positive atmosphere of the CBL implementation in Pharmacology courses. However, the item 'cheating is a problem in this course' score less than 2. The students' social self-perceptions subscale mean score was 18.43±3.336 and can be interpreted as not too bad.

Students with a high score of CGPA had the lowest mean score on perceptions of learning (32.81±4.833), perception of the atmosphere (31.04±6.321) and academic self-perceptions (20.50±4.198) while students with a middle score had the highest mean score on the perception of learning (33.65±5.685), social self-perceptions (18.45±3.376) and perception of the atmosphere (32.54±6.278). Meanwhile, students with a low score of CGPA had the lowest mean score on the perception of teachers (31.75±6.238) and social self-perceptions (18.25±1.708) but had the highest mean score on academic self- perceptions (22.25±2.217). However, there was no significant association between the perception of the learning environment and CGPA (P>0.05) (Table VI).

DISCUSSION

The effectiveness of an implemented curriculum can be measured by assessing the educational setting,

Table VI : The association between perception of learning environment subscales and CGPA among pharmacy students 2022

Subscales	Cumulative Grade Point Average (CGPA)				P-value
	Low score	Middle score	High score	Total	
Students' perception oflearning	33.00±1.155	33.65±5.685	32.81±4.833	33.49±5.462	0.968
Students' perception ofteachers	31.75±6.238	31.76±5.673	31.92±5.396	31.79±5.600	
Students' academicself-perceptions	22.25±2.217	21.47±3.865	20.50±4.198	21.32±3.892	
Students' perception ofatmosphere	32.00±2.160	32.54±6.278	31.04±6.321	32.26±6.212	
Students' social self-perceptions	18.25±1.708	18.45±3.376	18.35±3.429	18.43±3.336	

and it can have an impact on students' behaviour, academic achievements, and satisfaction with their learning experience (11). To produce competent pharmacists equipped with the necessary skills, educational institutions should provide effective learning environments that promote proper academic and professional growth of the students. In this study, we assessed the perceptions of undergraduate pharmacy students at Universiti Teknologi MARA (UiTM) in Puncak Alam on the CBL learning environment. 148 self-administered questionnaires answered by the pharmacy students in the second year were analyzed. DREEM tool was used to evaluate the learning environment in health professions.

The survey achieved a high response rate of 85%. This noteworthy response rate suggests that participants were motivated to share their opinions regarding the CBL learning environment and to help identify any potential areas that could be enhanced. The majority of the participants were females (79.7%). Female students dominate the larger proportion of undergraduate pharmacy students in Malaysia and most other countries compared to male. According to Jonathan's study, the gender disparity in enrolment between males and females in public universities is growing. Although male enrolment is increasing, however, it is at a slower rate compared to females (17).

Based on our research findings, the student's perceptions of the learning environment regarding the implementation of CBL can be characterized as generally positive, as indicated by an overall mean score of 137.29 out of 200. However, a higher learning environment score (155) was noted in a study conducted by Taylor's University in Malaysia (8). Lower mean scores were also reported in various medical school such as in India (118), Habib medical school in Uganda (127.5), College of Dentistry at Mustaqbal University (130.87) and Faculty of Dentistry at King Abdul Aziz University (125) (18-21). These mean scores although lower compared to the current findings but still fell within the positive range. the highest mean overall score was observed in the College of Medicine, King Saud University, which was 171 (22).

In contrast to our study's findings, research conducted among medical students in Korea and University of Nairobi revealed a negative perception of their learning environment, as evidenced by total mean scores of 94.65 and 93.3 out of 200, respectively (23,24). The disparity in mean overall scores may be attributed to variations in curriculum types and program durations. However, it is worth noting that only a limited number of studies are available that specifically report on pharmacy students' perception of their educational environment (14,25).

The observed high overall DREEM score in this study indicates that students have a positive perception of their learning environment, which has the potential to positively impact their learning outcomes. An important application of the DREEM questionnaire is the analysis of individual items, which allows for the identification of specific strengths and weaknesses within the educational environment (26). Analysing the advantages and disadvantages of the learning environment is crucial in improving the educational experience of students within their curriculum (27). The item "the tutors are knowledgeable" received the highest mean score of 3.48, which aligns with the findings of a study conducted by Dutta et al. (28). Items with individual mean scores below 2 can be considered as areas of concern. In this study, three items across three different subscales had individual mean scores below 2, indicating problematic areas. These three items signify weaknesses in the implementation of CBL in the pharmacology course and highlight the need for improvement in those specific areas. The aspects that require improvement include an overemphasis on factual learning (mean=1.64) within the subscale of students' perception of learning, tutors being perceived as authoritarian (mean=1.97) within the subscale of students' perception of teachers, and the presence of a cheating problem in the course (mean=1.86) within the subscale of students' perception of atmosphere. A

study conducted by Bavdekar et al. at a Medical College in Mumbai, India, revealed similar problem areas to those identified in this study (29). Additionally, another study conducted in an Institute in Pakistan highlighted that the perception of teaching overemphasizing factual learning and teachers being seen as authoritarian were also identified as problematic areas (21). Given the common concerns regarding these three items, it is advisable for teachers to actively seek feedback and constructive criticism from students after CBL sessions, allowing them to gain insights from the students' perspective (30).

The perception of tutors being authoritarian, as indicated by an item in the questionnaire is influenced by factors such as tutors' age, education, and experience (31). A study conducted by a medical school in South Korea also encountered a similar issue with this item (32). Addressing the problem of tutors displaying authoritarian behaviour is crucial, as it has the potential to demotivate students. Tutors should foster active student participation and establish an environment where students feel at ease asking questions without fearing judgment for their lack of knowledge. Faculty members are encouraged to contribute to this process by organizing training programs for tutors to enhance their communication skills with students. Moreover, they can promote the adoption of innovative teaching-learning strategies that are in line with the most recent advancements in healthcare education.

The other area to improve in the implementation of CBL in the pharmacology course is "the teaching overemphasizes factual learning." It is important to note that any educational program should include a component of factual learning. However, placing excessive focus on factual information may inadvertently discourage students from utilizing deeper learning strategies, which can have a detrimental impact on their overall learning abilities. In a study conducted by Raza et al., the implementation of CBL aimed to assist students in strengthening their skills and enhancing their understanding of the concepts covered in class, thereby increasing their motivation to learn (34). Consequently, it is crucial for students to grasp the underlying principles and key concepts of their learning material, as this understanding serves as a driving force for sustained motivation to learn. Notably, a study by Ezeala and Moleki, focusing on students enrolled in medicine and pharmacy programs, also identified a similar issue with regards to this particular item (25).

To address the concern highlighted in the item "cheating is a problem in this course," it is essential to establish an institutional culture of integrity. This involves clearly defining institutional policies, promoting student engagement and introducing new assessment techniques (35). This finding aligns with a study conducted in India (36). Among the remaining 47 items, scores ranged from 2 to 3, indicating areas that could benefit from improvement. None of the items scored above 3.5, which typically signifies excellence or strength, as seen in a study conducted in Uganda (19). In contrast, a study conducted at a Dental Institute in India reported several items with a mean score greater than 3.5 (37). Therefore, it is necessary to make further improvements in the implementation of CBL to achieve scores higher than 3.5, which indicate excellent or positive aspects of the curriculum.

In the present study, no statistically significant association was found between students' perception of the learning environment and their cumulative grade point average (CGPA). A majority of the students (79.7%) obtained moderate CGPA scores and exhibited a more positive perception of their learning environment and atmosphere. These findings were in agreement with a study conducted by Sidahmed et al. (38).

Interpreting DREEM findings in the context of the integration of CBL into a course involves assessing various aspects related to the learning environment. Positive scores suggest strengths, while negative scores point to weaknesses that may need to be addressed to enhance the overall educational experience. These insights can inform strategies for improving the integration of CBL and creating a more effective and supportive learning environment for students.

One the limitation of this study was that the DREEM questionnaire was solely completed by second-year undergraduate pharmacy students, and there was no participation from students in other academic years. As a result, the findings of this study may not fully represent the entire population of undergraduate pharmacy students at UiTM Puncak Alam.

CONCLUSION

The findings of this study indicate that undergraduate pharmacy students at UiTM Puncak Alam hold predominantly positive perceptions of the implementation of CBL in the pharmacology course. However, three specific problem areas were identified from the study. No significant association was observed between students' perceptions of the learning environment and their CGPA. As a result, it becomes imperative for educational institutions to introduce improved and more effective interventions. It is also recommended that continuous evaluations of the learning environment be conducted to gauge the impact and effectiveness of the implemented improvements.

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