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Perceptions of Second-year Medical Students on Problem- Based Learning in a Malaysian Private University: Face-to-Face vs. Online Mode

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ABSTRACT

Background: Problem- Based Learning (PBL) is a student-centered teaching methodology that enables the students to develop critical thinking, communication, interpersonal, and problem-solving skills through posing challenges based on clinical case scenarios. PBL has been incorporated in second-year of Faculty of Medicine at the Widad University College (WUC) since 2016. Due to Covid-19 pandemic, the traditional face-to-face PBL approach was replaced by online mode. This study was carried out to compare students' perception towards face-to-face versus online PBL modes among second-year medical students. **Methods:** A cross-sectional study was conducted on a total of 20 second-year medical students from September 2000 to June 2021 at the Faculty of Medicine, WUC, Kuantan, Malaysia. A pretested questionnaire, comprising 29 statements and one open-ended question asking for comments on PBL facilitation, was used to determine students' perception. **Results**: A majority of students in both face-to face and online group agreed (65%) that PBL is effective for student learning. When total scores of all responses were considered as a whole, students' perception towards the face-to-face was in favour [Median (IQR) 113.85 (32.00) in face-to-face, 104.90 (33.00) online, p =0.184]. Regarding the students' comments, one was positive feeling on the effectiveness of PBL, two each were related to the selection of PBL group leader

and students' participation, respectively. The remaining four were related to conduct of PBL facilitation among lecturers.

Conclusion: It can be concluded that PBL is effective for student learning whether it is conducted face-to-face or online mode. Students prefer face-to-face mode of conducting PBL. Based on students' comments, there is a need of standardization of PBL facilitation process in the Faculty. The findings from our study would help the Faculty in designing the best PBL delivery method for the students, and improve the quality of PBL facilitation among lecturers. It is recommended to implement Faculty development program on PBL concepts and principles.

Keywords: Problem- Based Learning, PBL, medical students, face-to-face, online, facilitators.

1.0 INTRODUCTION

Problem- Based Learning (PBL) is a student-centred teaching methodology that allows medical students to develop critical thinking, communication, interpersonal, and problem-solving skills. PBL originated in medical education over 40 years ago in the United States, aligned with a graduate entry medical school model. Since then, it has been adapted by medical schools all over the world (Taylor & Miflin, 2008). PBL is a method of learning that challenges the students to 'learn to learn', working cooperatively in groups to reach solutions to real problems (Albanese & Mitchell, 1993).

In PBL, participants are assigned in groups of 8 to 12 students guided by a facilitator and given tasks in the form of real-life problems relevant to those they will face in practice after graduation. Through this approach, students acquire new knowledge and skills, and are expected later to apply such knowledge and skills to reach practical solutions for similar problems (Ding, et al., 2015).

In the Widad University College (WUC) MBBS Programme, PBL is incorporated in second-year courses (semesters 3 & 4). The mode of delivery of PBL has traditionally face-to-face mode where students are tutors meet in a physical room. The pandemic of Covid-19 caused the closure of many educational institutions worldwide. The WUC also had to adopt PBL through online platforms.

There are few published research data that compare the effectiveness of face-to-face and online PBL delivery. Costa and her researchers found that students from Chemistry courses at the University of Barcelona prefer face-to-face implementation to the online modality (Costa, et al., 2023). Face-to-face PBL had the advantages of facilitating greater interaction, better communication, and better student evaluations. However, key challenges reported by students were commuting time, lateness on the part of students and tutors, and difficulties in engaging shy students in the class (Atwa, et al., 2024). In a study by Foo, et al. in 2021**,** the performance of students utilizing the distance learning PBL tutorials was significantly lower than that of students participating in the conventional face-to-face approach in five areas of proficiency including participation, communication, preparation, critical thinking and group skills.

Compared to the face-to-face PBL implementation, the online method presents following difficulties: (i) harder and longer to solve the problems within the members of group and communication with teacher; (ii) harder to supervise the progress of and participation of each student or as a group; (iii) less students' participation and more passive role. Whereas, in face-to-face PBL, more evidences for evaluation are available, such as class follow-up, group discussion, or group-to-group discussions (Costa, et al., 2023). However, online PBL has some advantages such as flexibility, convenience and accessibility (An & Reigeludh, 2008). In addition, students are able to participate from anywhere and at any time without the need to be physically present in a classroom (Chen, 2016).

Atwa and co-researchers examined the differences in perceptions and preferences among students and tutors in the Arabian Gulf University regarding online and face-to-face PBL modes. In the study, students reported more positive perception towards the online mode compared to the face-to-face mode of conducting PBL tutorials than tutors. The online mode of conducting PBL tutorials might be as effective as the face-to-face mode for meeting teaching objectives and students' learning outcomes (Atwa, et al., 2024).

Perceptions and preferences are attributed by many factors, including age, educational level of student, and learning environment. By knowing the students' perception, educators can design the best mode of PBL delivery for students. The aim of this research was to compare perception of second-year medical students on PBL conducted face-to-face and online modes.

2.0 MATERIALS AND METHODS

A cross sectional descriptive study was carried out from September 2000 to June 2021 at the Faculty of Medicine, WUC, Kuantan, Pahang, Malaysia. Twenty second-year medical students were included for the study. Face-to-face PBL sessions were conducted (before the Covid-19 lockdown) for semester-3 courses, namely locomotor & nervous, respiratory, cardiovascular, and renal & urinary systems. Online-based PBL sessions were conducted (post lockdown) for semester-4 courses including digestive & biliary, endocrine, reproductive and hemopoietic systems.

Each group of PBL consisted of 10 students. Students were grouped according to the attendance serial number and remained in the same group throughout the semesters. Lecturers from all basic medical science disciplines were assigned as PBL facilitators and students had different facilitators throughout the semesters.

All together 14 PBL tutorials were assigned. Seven in the semester-3 and seven in the semester-4. Each PBL tutorial has 2 sessions, one week apart, each lasting 2-3 hours. In the first PBL session, students were given triggers as case scenario and then asked to find out the problems, formulate questions and set learning issues. The first session was followed by subsequent searching of relevant information in learning resources such as textbooks, journals and medical websites. In the second session, students presented the new information according to their learning issues, discussed the information, and made possible diagnosis and conclusion. At the end of the second session, students were evaluated by lecturer using a standardized form focusing on four key areas such as involvement & communication skill, team work, understanding & reasoning, and skills in acquisition of knowledge and its applications. A score from 1 to 10 was given for each of these areas, with 10 being the highest. The final score was the average of sum of the scores of both sessions.

A pre-tested, validated structured questionnaire (Barman et al., 2006; Naw May Emerald et al., 2013) comprising 30 statements assessing the PBL was used. Twenty-nine statements were 5-point Likert-type questions, ranging from ‘strongly disagree’ to ‘strongly agree’. The last item of the questionnaire was an open-ended question asking for comments on PBL facilitation. Questionnaires were distributed via online after a brief introduction regarding to the aim of the study and questionnaires. Participation was voluntary. Students were informed prior to starting the survey that all data collected was non-identifiable and would only be used for research purposes. Data were analysed by SPSS for Windows version 24. The Wilcoxin

signed-rank test was used to compare differences between students' perception towards face-to-face PBL mode and online PBL. The *p* value of less than 0.05 was considered significant. The Ethical clearance for the study was obtained from the WUC Research and Ethics Committee.

3.0 RESULTS

A total of 20 second-year medical students participated in the study. There were 14 female (70%) and 6 (30%) male students.

With face-to-face PBL mode, majority of students agreed (≥75%) that PBL motivates students for self-learning (statement 1), enhances to formulate learning issues (statement 2), allows in-depth understanding of the topics (statement 3), is effective for achieving learning objectives (statement 4), provides critical thinking skill (statement 6), and enhances the practice of identifying learning issues (statement 18). However, with online method, 75% agreement was achieved with statement 2 only.

Students' perception was found to be equal percentage in both face-to-face and online modes on three statements. These included the statement 5 (PBL provides problem solving skill-65%), statement 26 (Enough learning resources are available in library-20%), and statement 29 (PBL is effective for student learning-65%). For remaining 26 statements, students perceived more to face-to face than online mode: 5% more on nine statements (table 1), 10% more on four statements, 15% more on five statements (table 2), and 20% more on eight statements (table 3). As stated in the table 3, students in face-to-face mode rated 20% higher agreement on 6 statements (4, 6, 8, 15, 16, and 18), than those in online mode. Also, the disagreement statements of 10 and 12 were found to be 20%.

Table 1: Students' responses to face-to-face and online PBL modes (5% difference)

	Statements	Face-to-face PBL mode Number (%)	Online PBL mode Number (%)
Agree/ Strongly Agree	2. Enhances to formulate learning issue from the giving problems	16 (80)	15 (75)
	3. Allows in-depth understanding of the topics	15 (75)	14 (70)
	19. Have experience of group leadership	12 (60)	11 (55)
	20.Takes too much time for preparation of presentation. (time consuming)	11 (55)	10 (50)
	21.Some students dominate while others are passive in the discussion	14 (70)	13 (65)
	23. Time allotted for each PBL sessions is enough.	15 (75)	14 (70)
	25. Didactic lectures are more effective than PBL sessions.	4 (20)	3 (15)
	28. Internet access is good in campus.	3 (15)	2 (10)
Disagree/ Strongly disagree	27. Enough learning resources are available from internet.	12 (60)	13 (65)

Table 2: Students' responses to face-to-face and online PBL modes (10% & 15% difference)

	Statements	Face-to-face PBL mode Number (%)	Online PBL mode Number (%)
Agree/ Strongly Agree	1. Motivates students for self-learning	16 (80)	14 (70)
	7. Communication skill is improved	12 (60)	10 (50)
	9. Creates voluntary spirit in students.	12 (60)	10 (50)
	11. Gives complete coverage of knowledge to the topic concerned	14 (70)	12 (60)
	13. Obtain new information from PBL session	17 (85)	14 (70)
	14. Get practice for lifelong learning	15 (75)	12 (60)
	17. Enhances the practice of co-operative and collaborative learning	14 (70)	11 (55)
	22. Some PBL triggers are difficult.	10 (50)	7 (35)
	24. Lecturers effectively facilitated the PBL sessions.	14 (70)	11 (55)

Table 3: Students' responses to face-to-face and online PBL modes (20% difference)

	Statements	Face-to-face PBL mode Number (%)	Online PBL mode Number (%)
Agree/ Strongly Agree	4. Effective for achieving learning objectives	15 (75)	11 (55)
	6. Provides critical thinking skill	17 (85)	13 (65)
	8. Communication skill is improved between students and teachers	12 (60)	8 (40)
	15. Get practice to generate hypothesis	12 (60)	8 (40)
	16. PBL is effective without having lecture of same topic	6 (30)	2 (10)
	18. Enhance the practice of identifying learning resources	15 (75)	11 (55)
Disagree/ Strongly disagree	10. Enhance the habit of active participation in group	1 (5)	5 (25)
	12. Easy to memorize the facts after PBL sessions	2 (10)	6 (30)

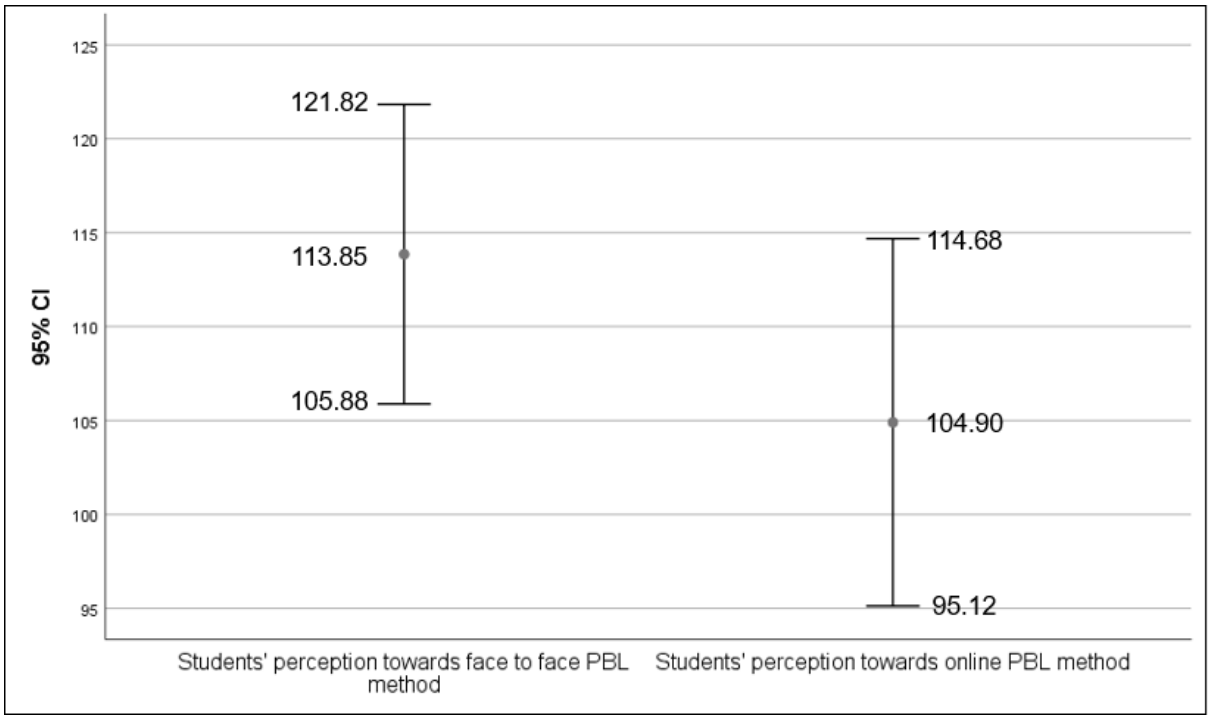

Figure (1): Students' perception towards face-to-face and online PBL methods

As shown in the figure 1 & table 4, when total scores of all responses were considered as a whole for comparison, students' perception towards face-to-face is in favor. However, it is statistically insignificant (p =0.184).

Table 4: Differences between students' perception towards face-to-face PBL mode and online PBL mode (n =20)

Variable	Median (IQR)		*Z* statistic	*p* -value*
	Perception towards Face-to-face PBL mode	Perception towards online PBL mode		
Total scores	113.85 (32.00)	104.90 (33.00)	-1.329	0.184

*Wilcoxin signed-rank test

Table 5 shows students' responses to the open-ended question. Out of nine responses, one was positive feeling on the effectiveness of PBL, two each were related to the selection of PBL group leader and students' participation, respectively. The remaining four were related to conduct of PBL facilitation among lecturers.

Table 5: Students' comments

Issues related	Quotes by the students
Effectiveness of PBL	"*PBL session is very effective for me to focus and highlight some of the common cases in each system. I am fully understood the topic covered by PBL*"
Selection of group leader	"*Suggest to distribute leadership among members*"
	"*The lecturer selects the favourite student to lead the PBL group*"
Students' participation	"*I have personally asked for talking or open for discussion by the lecturer, even the student who didn't talk at all in PBL group discussions*"
	"*Some students are dominated while others are passive*"
Facilitator	"*During the early phase of PBL, it's a bit difficult as each lecturer has different way on conducting the PBL session. Some lecturers want us to do it simple manner as we just in preclinical year but some want it to be more systemic way and complex. If all lecturers conduct a fixed way, students become more easier to follow the subsequent PBLs*"
	"*Suggest to have a same lecturer than rotating lecturers. It is because lecturers conduct PBL differently. Some requires clinical approach and some requires systemic so it is confusing what to do each PBL*"
	"*Should include how the PBL should be conducted in the module guide book. So, even with different lecturers the method will be the same*"

	"*As different lecturers have different PBL styles (some focus on clinical while some are more concern about pre-clinical), it is hard to fulfill what each lecturer wants*"

4.0 DISCUSSION

The Covid-19 pandemic has led to closures of schools, training institutes and higher education facilities worldwide. There was a paradigm shift in the way educators deliver quality education through various online platforms. This transitioning from traditional face-to-face learning to online learning was an entirely different experience for the learners and the educators, which they must adapt to with little or no other alternatives available (Pokhrel & Chhetri, 2021). The present study compares the perception of second-year medical students on PBL tutorials conducted face-to-face and online modes. A pretested questionnaire comprising 29 survey questions together with one open-ended question was used to determine the students' perception.

Based on our findings, 65% of students in both face-to-face and online modes agreed that PBL is effective for student learning (statement 29), which means that students accept that PBL is valuable in improving teaching and learning process regardless of mode of delivery of PBL. When total scores of all responses were considered as a whole, as shown in the table 4, the students' perception towards face-to-face mode was more in favour (113.85 in face-to-face vs. 104.9 in online). But the difference is statistically not significant (p=0.184). The finding of students' preference to face-to-face mode in our study supports the results of a previous study (Costa, et al. 2023). The majority of chemistry students preferred the face-to-face PBL method to the online method in terms of students' satisfaction and engagement. Face-to-face PBL had the advantages of facilitating greater interaction, better communication, and better student evaluations (Costa et al., 2023). Foo et al., 2021 found that the performance of medical students from the University of Hong Kong in the distance learning group had significantly lower scores than that of students in the conventional face-to-face approach. However, face-to face PBL mode has disadvantages. The key challenges listed by both students and tutors for face-to-face PBL tutorials were commuting time, lateness on the part of students and tutors, and difficulties engaging shy students in the class (Costa et al., 2023).

On the contrary, Atwa et al. (2024) found that third and fourth-year medical students prefer online PBL tutorials (69.4%) compared to face-to-face PBL (31.6%). Students preference on online PBL was also reported in previous studies (Zhang, 2014, Sayyah, et al., 2017). Online PBL tutorials have several advantages such as flexibility, convenience, and accessibility (An & Reigeluth , 2008). Gürsul & Keser examined the effects of the online and face-to-face PBL environments in mathematics education on student's academic achievement. They found out that the ranked mean scores of achievement level of the students at the online PBL group had significantly higher than the students in the face-to-face PBL group, 7.70 and 3.30, respectively (Gürsul & Keser, 2009). The effectiveness of both face-to-face and online PBL tutorials may depend on various factors, such as the discipline of study, level of education, and the learning objectives of the content area (Quin et al., 2016).

In the present study, nine students provided comments to the open-ended question. Out of nine comments, two students have expressed their dissatisfaction with the dominating role of some students during PBL sessions. Regardless of PBL modes, more than 60% of students agreed that some students dominate while others are passive in the discussion (70% in face-to-face vs. 65% online). The facilitator should motivate the leader to encourage other members, including the quieter students, to participate actively in the PBL process. In addition, the facilitator should provide constructive feedback to the students at the end of each session because it contributes to their progress in learning throughout the medical program (Barman et al., 2006).

Two students have expressed dissatisfaction with the facilitator's selection of the PBL group leader. To achieve a successful group facilitation, PBL tutors should possess several skills including active listening, critical reflection, and the ability to create a healthy environment that allows every member in the group to participate in the discussion, and to ask open ended questions that enhance group discussion (Maudsley, 1999). The successful PBL educator should provide participants with clear objectives for the session, encourage participants to work in small groups and create a mechanism, encourage participants to discuss the main challenges they face in the construction of a mechanism, and provide feedback to participants on their performance (Azer, 2005).

Students' comments on open-ended question indicate the differences in way of PBL facilitation among lecturers even though they were regularly involved in PBL tutorials. Perhaps an ideal solution for this issue is to train more expert PBL facilitators through regularly arranged Faculty development programs on PBL concepts and principles. Faculty members

who have also training in PBL facilitation are more likely to be better PBL tutors (Maudsley, 1999). Barman et al. (2006) stated that intervention strategies for improvement of PBL include more regular briefings on the philosophy and principles of PBL, and the appropriate way of conducting PBL sessions. It is recommended that reviewing the triggers and the resource materials regularly by the review committee.

Our study had limitations in the design and numbers of participants. It is a cross sectional design without randomization and comparison was subjected to bias. Only twenty participants included in the study might cause our findings statistically insignificant. This limitation highlights the need for further research study with larger sample size and randomization. In addition, the present study was conducted in one private medical university college. In the future, additional studies including students from other medical universities need to be carried out to assess the comparison of students' perception on face-to-face and online PBL tutorials.

5.0 CONCLUSION

A majority of second-year medical students in both face-to-face and online modes agreed that PBL is effective for student learning. When total scores of all responses are considered as a whole, the students' perception towards face-to-face mode is more in favour. Based on students' comments, there is a need of standardization of PBL facilitation process in the Faculty. These valuable information would help the Faculty in designing the best PBL delivery method for the students, and improve the quality of PBL facilitation among lecturers. It is recommended to implement Faculty development program on PBL concepts and principles.

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