

Research Article

Dental Students' Perception of Problem-Based Learning Implemented During Clinical Years

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Abstract: *Introduction:* Problem-Based learning (PBL) pedagogy is one of the most significant development in education and has been introduced worldwide into many dental school's curricula since 1990s. The research that has been carried out on PBL in dentistry especially with application of knowledge in clinical learning is still limited. *Aims:* The aim of the study was to assess the undergraduate dental students' perception of PBL implemented during their clinical years and analyse if PBL plays a role in application of their knowledge to improve – diagnostic, clinical reasoning and treatment planning skills. *Methodology:* Following ethical approval, using purposive sampling, a total of 18 students from fifth year dental undergraduate who attended the PBL sessions were asked to participate in focus group interviews. Transcripts of the audio-recordings were coded and analysed using thematic analysis. *Results:* The five major themes identified: PBL transition, Clinical learning including diagnostic, clinical reasoning and treatment planning skills, Strengths, Weaknesses and Improvements in PBL process considering positive and negative aspects. Overall, students had positive perception about the PBL process and also agreed that it helps in clinical learning such as diagnostic and treatment planning aspect. Although some concerns were raised such as PBL was stressful, time consuming, difficult to correlate in twinning programme, and complex PBL cases. *Conclusions:* The implication of this research findings will be useful for PBL and curriculum committee to modify PBL curricula and to develop PBL problems in order to benefit future dental students and also to achieve the intended clinical learning objectives.

Keywords: Problem based learning, clinical learning, dental education, clinical reasoning.

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INTRODUCTION

Problem-based learning (PBL) has been suggested as the most significant development in education and has been promoted as the curriculum of choice as compared to traditional or teacher-led education (Polyzois, I., *et al.*, 2010). PBL is defined as an approach in which a problem serves as the stimulus for active learning. The objective of PBL is to enhance adult learning skills by engaging students in self-direction, problem-solving, nurturing clinical reasoning, enhancing teamwork and communication skills, promoting lifelong learning and better preparing students for their professional careers (Bassir, S.H., *et al.*, 2014). In dental education, content knowledge and clinical skills are not the only necessary components that students need to learn. They also need more general skills such as critical thinking, problem-solving, interpersonal communication and collaboration with

other health care professionals to provide holistic, individualized care to their patients (Imai, P.H., 2014; Gwee, M.C., 2009). PBL pedagogy became popular in dental education in the 1990s, and a well-planned hybrid PBL programmes are likely to foster the types of knowledge, skills, and attributes dental professionals will need in the future (Imai, P.H., 2014; Townsend, G., & Winning, T. 2011; Winning, T., & Townsend, G. 2007).

In dental education, the PBL format incorporates the basic science and clinical learning objectives which will assess students to develop the methods to diagnose and treatment aspects of oral disease in clinical training (Fincham, A.G., & Shuler, C.F. 2001) There are mixed reviews reported in literature about the PBL intervention, but overall there has been favourable effect with PBL learning method on students' perceived preparedness and confidence to

practice dentistry (Polyzois, I., *et al.*, 2010; Bassir, S.H., *et al.*, 2014; Bengmark, D., *et al.*, 2012; Yiu, C.K.Y., *et al.*, 2011). In meta-analysis research, PBL pedagogy is considered superior to the traditional lecture-based teaching in dental education in China (Huang, B., *et al.*, 2013). The key to successful implementation of PBL is the PBL problems, these problems should be designed with complex, open-ended and multidisciplinary approaches to encourage students to learn and build extensive and flexible knowledge. If problems are not realistic they will not stimulate students' constructive and contextual learning (Dolmans, D.H.J.M., *et al.*, 2005; Telang, A., 2014; Hmelo-Silver, C.E., 2004; Jacob, S.P. 2011).

A study by Ali *et al.*; dental student's perception about PBL for constructive learning reported significant association between PBL method and development of professional attitude and skills among dental students (Ali, M.F., *et al.*, 2019). Similarly, in another study, clinical dental undergraduates agreed that PBL is effective in making them understand concept and process of PBL to integrate knowledge into clinical practice (Masud, M., *et al.*, 2018).

Although clinical learning in dentistry is more focused on performing clinical skills procedures and few studies supports the implementation of PBL for students to do better in clinical learning as well as in clinical performance (Callis, A.N., *et al.*, 2010; Wang, G., *et al.*, 2008; Rich, S.K., *et al.*, 2005; Bate, E., *et al.*, 2014; Dolmans, D., & Gijbels, D. 2013; Lohman, M.C., & Finkelstein, M. 2002). The PBL enhances the clinical reasoning skills, but still there is gap between theory to practice and with the incorporation of more practical experience in the preclinical phase and PBL tutorials in clinical phase might help to bridge this gap (Prince, K.J.A.H., *et al.*, 2000). The clinical scenarios in PBL process might help students to discuss treatment plans with their faculty and also explain to their patients (Binshabaib, M., *et al.*, 2019). There is a need to develop a conceptual framework for clinical reasoning in dentistry, grounded on empirical evidence to direct the future evolution of dental education (Khatami, S. & MacEntee, M.I. 2011).

There are conflicting findings in the dental literature, there is some evidence of PBL curricula in improving clinical and diagnostic reasoning ability but further research is required to understand the role of PBL in learning the clinical knowledge and skills needed in oral health care professions. In our dental school, PBL is implemented in clinical years and we wanted to know the students' perception on role of PBL in clinical learning.

The aim of this study was to assess dental students' perception of PBL implemented during their clinical years. From this research question, we wanted

to explore and analyze if PBL during clinical years would help students to apply their knowledge to improve their diagnostic, clinical reasoning, and treatment planning skills.

METHODOLOGY

Following approval from the Internal Review Board, this qualitative study was conducted using focus group discussions to obtain the insights of students' experience of the PBL process in learning clinical knowledge. We used purposive sampling to select fifth year undergraduate students who had completed six PBL sessions, to participate in the three focus group interviews. Students who dropped an academic year and failed one subject were excluded from the study. Each group had six participants: Group A, Group B, and Group C with total of 18 participants in the study.

Focus Group Discussion

The focus groups interviews were organized with predetermined questions. Prior to the study, a detailed description of the study purpose was presented and information sheet was provided to the participants. Informed consent was obtained from the students allowing us to audio-record the sessions and use the quotes for research purposes. The session started with brief introduction and clarifying doubts, first focus group discussion (Group A) lasted around one hour, group B around 50 minutes and group C 45 minutes. The interviews were audio-recorded and all recordings were transcribed by one researcher.

Data Analysis

Thematic analysis is one of the common methods used in qualitative research analysis, which includes experiences, meanings, and detecting themes within the rich data text and works both to reflect reality and to unravel the surface of reality (Braun, V. & Clarke, V. 2006). All three focus group sessions were analysed by one researcher only using the thematic analysis method. After transcribing all the focus groups discussions, the transcript of first group was read thoroughly several times to obtain general clarity and then the data were segmented into small sections and labelled the text as codes by one researcher. The coded data was used to identify the possible themes to link the underlying meaning. The themes identified were categorized reflecting both the positive and negative aspects of student's experience and opinion. Using the themes identified, the second and third group transcripts were coded and these themes were reviewed using an iterative process until no new themes emerged.

RESULTS

The data findings were categorised and five major themes were identified. *Table 1* represents the five major themes with their positive and negative aspects.

Table 1: Results of thematic analysis

Theme	Discussion within theme	
	Positive	Negative
PBL process	<ul style="list-style-type: none"> - PBL stimulates critical thinking - strengthen basic knowledge - More observant and prepares in advance to following academic years - Develop team work and communication skills - Solve problem together and share knowledge - Multidisciplinary approach - knowledge learned in PBL can apply in clinical cases 	<ul style="list-style-type: none"> - In year 3 –hard, messy, blur and lack of experience - Sometimes stressful and headache - Hard to correlate due to twinning programme
Clinical Learning	<ul style="list-style-type: none"> - Learn to do comprehensive dental care for the patient - Formulate differential diagnosis and treatment plan steps 	<ul style="list-style-type: none"> - PBL doesn't help alone - Cases are too complex - Lot of gap between PBL and clinical sessions - PBL and clinical learning still grey area
Strengths – PBL	<ul style="list-style-type: none"> - Good strategy to learn the clinical knowledge - Learn patient as a whole rather than single dimension - Helps you to make better practitioner and confident to speak to the patient - PBL – is future for students 	
Weaknesses – PBL	<ul style="list-style-type: none"> - Time consuming & too hectic for year 5 - PBL cases are vague, recycled and rare - Doesn't help from exam point of view 	
Improvements – PBL	<ul style="list-style-type: none"> - PBL sessions can be increased and should be spaced out throughout the curriculum - PBL cases- incorporate routine clinical cases along with rare cases - Feedback from the lecturer to clarify concepts and doubts 	

3.1 PBL Process

Overall students' enjoyed the PBL process and most of the participants mentioned that PBL helps to strengthen the basic knowledge and stimulates critical thinking to solve the given problem. However, few students felt stressful and lack of experience. Another aspect they felt difficult is to correlate the transition in learning method in twinning programme.

- *I thought PBL is great and fun experience.*
- *For me PBL really makes you to think and once u started thinking, lot of efforts places inside the discussion group and makes easier for us to remember.*
- *PBL help to improve us to think the analytical what is happening about the case scenario.*
- *For me the PBL is definitely stimulates to think, everyone will think inside the group for a problem*
- *Sometimes a bit hard and stressful for us that we are not prepared for this kind of problems.*

The students found that the PBL sessions influences them to be more observant to analyse the patient case as a whole rather than just focusing on chief complaint. The also liked the idea of solving the case scenario problem before exposure to the clinic, which prepares them in advance to face the real cases/patients.

- *I feel it helps us as individual when you face the problem in the future how you are going to deal*

with, we won't panic. It is very good strategy to deal with the cases in future.

- *Actually the PBL teaches you how to look from different point of view*

During all three focus group discussion, students mentioned PBL helps to develop and work in as a team to share knowledge and learn news ideas, also helped them to develop their confidence to communicate with the patient.

- *I feel PBL is as good as we are working as a group, we contribute different ideas and we can learn from others. Because sometimes we actually don't know what others think of that part of the case, so we can learn, it is good discussion for us....for students'.*
- *I feel that I am able to explain to the patient about diagnosis and treatment plan and also why it should be done. I felt it helped better in communicating the patient and gain his trust to do the treatment.*
- *PBL is something like; is a pathway of sharing knowledge and experience through clinical cases. Whether they gain doing their cases or them studying on their own, like that they share every information which are more likely for us to learn and instead of conducting those theory class is quite dull to me or for some of us.*

3.2 Clinical Learning

In dentistry development of clinical hand skills for students is considered crucial and it is also an important part of the curriculum. The students agreed the PBL sessions helps them to learn the multidisciplinary approach and to do the comprehensive dental care for the patient and also the factual knowledge acquired during solving PBL problems help them to apply in clinical cases.

- *PBL cases also taught us one thing that particular case will not found in just single textbook, it integration of several subject and textbooks, that was something we have to pick up and learn by ourselves specially.*
- *I think PBL help us to train the students to tackle the clinical scenario, multiple discipline, ...So in PBL, we need to think which problem first and how the consequences and the sequence of the treatment plan can arrange. So PBL helps the students in managing or to make the comprehensive dental care for the patient*

Few students didn't agree with the fact that through PBL, knowledge can be applied in clinical cases. They felt exposure to more clinical cases and incorporation of theory classes from the lecturer would be more ok.

- *I still prefer if there is a lecture teaching than the PBL*
- *For me PBL really it doesn't help in clinical cases.*
- *I feel if I do more clinical work, it will help me more to understand*

During discussion, students' highlighted that offering a diagnosis and treatment plan could be learned better through PBL especially in subjects like Oral Medicine and Radiology, Conservative Dentistry and Endodontics and Prosthetic Dentistry, where they have to study differential diagnosis and plan various treatment options for a given case.

- *So it helped in both our knowledge and widen what we know and that means we don't only focus on certain lesion, we got to know about more lesions and also differential diagnosis. So when we apply that knowledge clinically, we know how to use and how to differentiate between all the lesions.*
- *I would say in case like Oral medicine and Radiology, diagnosis is the primary importance and it helps better through PBL.*

A majority of the students agreed that PBL does help in learning diagnosis and treatment planning aspects, but a few of them disagreed with this because the PBL cases used during the session are not seen during routine clinical sessions. Some indicated they

couldn't get connected to the cases as they were too complex. Students indicated there was still a grey area in correlating PBL and clinical learning; however, they agreed that PBL prepared them beforehand to face the real cases in clinics.

- *For me personally I felt, it is the combination of PBL and study myself. I don't think PBL alone could have helped me in diagnosis in clinic.*
- *The problem shouldn't be so far from the...because we wanted to learn, the purpose of it...and it shouldn't be far from what we expected.*

3.3 Strengths – PBL

Overall, most students agreed the PBL learning approach with the idea of solving the problem was good way to learn clinical knowledge. The students felt they are analysing the patient in all dimensions rather than a single dimension only addressing the chief complain. Some said it was like the future for students in preparing them before they start the clinical session, develop soft skills, and also to become better practitioners as dental professionals.

- *I feel it helps us as individual also when you face the problem in the future how you are going to deal with, we won't panic. It is a very good strategy to deal with the cases in future.*
- *So I feel PBL is more towards the soft skill, shaping and grooming us.*
- *its' not the theory part where we learn the definition part and memories lot of things...*
- *During the PBL I learned to think as a better practitioner...like it makes me role player.*

3.4 Weaknesses – PBL

Overall, there were mixed reactions when students were asked about the weaknesses of PBL. The majority of the students indicated PBL was time consuming and some indicated PBL cases were too vague and didn't help them in their routine clinical sessions.

- *It is a bit time consuming and hectic, I am not saying PBL is a waste of time, but both have to be considered.*
- *PBL cases are vast topics, most of the topics like some of us are still like lack of exposure.*
- *Sometimes the learning outcomes we receive are finally we come up with the learning outcome doesn't really relate or not related to the case that we see.*

3.5 Improvements – PBL

Most of the students suggested incorporating more PBL sessions but they should be spaced out and compacted. The PBL problems should include routinely seen clinical cases along with complex cases.

- *May be the sessions should be spread out, it allows students to gain knowledge over a period of time. So the experience that gain is better and better from the PBL sessions.*

- *Maybe the cases in PBL should be combined like few routine cases and complex cases.*

DISCUSSION

The present study is based on qualitative method by conducting focus group discussion for year 5 students who have been part of PBL process from year 3 to year 5. The main aim behind this study was to know student's opinion on does PBL helps in clinical learning.

The themes emerged in this study are PBL process, clinical learning, strengths, weaknesses and improvements and which are categorized into positive and negative aspects.

PBL process: The students of all focus group discussed and agreed that PBL process stimulates critical thinking and they have positive perception about PBL learning method. These findings add to the existing studies where most of the students' have a good perception, positive attitude toward PBL and also critically analyses the problem (Fincham, A.G. & Shuler, C.F.2001; Huang, B.,*et al.*,2013; Ommar, N.2011; Saalu, L.C.,*et al.*,2010; Pau, A.K.H.,*et al.*,2003; Tu, M.G.,*et al.*,2012; Anderson, V. & Reid, K.2012; Townsend, G.,*et al.*,2012).

One of the positive finding in this study was PBL helps to develop the team work and communication skills, which supports with other studies stated in the literature (Jacob, S.P.2011; Masud, M.,*et al.*,2018; Ommar, N.2011; Thammasitboon, K.,*et al.*,2007; Lum-Peng, L. & Ai-Yen, C.1999; Nango, E. & Tanaka, Y.2010). However, students also felt that PBL in year 3 was quite difficult to understand and also lack of experience and sometimes stressful.

Clinical learning: Students agreed the PBL sessions helped them in clinical learning to analyses the cases through multidisciplinary approach and able to apply knowledge learned during PBL process during clinical sessions. The two aspects - differential diagnosis and treatment plan, during their posting in Oral Diagnosis and Radiology, Conservative Dentistry and Endodontics and Prosthetic Dentistry department, PBL sessions were helpful and guided them. This could be also due to the PBL problems/ scenarios used for them more towards the above subjects. These findings from our study supports the data from systematic reviews, that PBL could increase the abilities of dental students to apply their knowledge in clinical situations, produces better critical reasoning, and improves student knowledge and clinical performance (Polyzois, I.,*et al.*,2010; Bassir, S.H.,*et al.*,2014). A review paper by Wosinki *et al.*,. concluded that role of facilitators and their training is important to guide the team work of students in order to achieve them its goal and also students should be securely introduced to PBL and

experience the development of their clinical reasoning through PBL process (Masud, M.,*et al.*,2018). PBL approach gives confidence and sense of responsibility to students to be a contributor in making treatment plans and prepare themselves for future encounters which occurs in clinical rotations (Ali, M.F.,*et al.*,2019).

Prince *et al.*, (2000), medical students studying suggested there was difficulty in bridging the gap between the theoretical and clinical phase of the curriculum which was quite similar to our research finding where some students raised the concern of gap between PBL and clinical sessions (Prince, K.J.A.H.,*et al.*,2000).

Strengths and Weaknesses: During the discussion, students feel that PBL process is a good strategy to learn the clinical knowledge and while managing the patient they think holistically rather than focusing only in one dimension. It also helped them in communication part while dealing with the patient about their oral health problems. However, if there are benefits through PBL, there are also some weaknesses which they addressed such as PBL sessions are time consuming, complex PBL case scenarios and sometimes doesn't help during final exam. Systematic review of the literature – 'PBL in dental education' by Bassir *et al.*,. (2014) showed PBL had favorable effects in enhancing students' confidence, increasing student ability to apply factual knowledge to clinical situations, and better prepared students to practice dentistry.^[2] There was also a criticism mentioned in few studies, that PBL is time-consuming and lack of structure in conducting as well as it produces difficulty when PBL trained students encounter the traditional exam-centered system (Polyzois, I.,*et al.*,2010; Wang, G.,*et al.*,2008; Saalu, L.C.,*et al.*,2012; Lum-Peng, L. & Ai-Yen, C.1999).

Improvements: There were some suggestions from students: to conduct more PBL session, to incorporate routine clinical cases in PBL problems, and incorporate feedback from lecturers on their PBL product discussion or post PBL lecture to clarify further doubts.

Overall our study findings showed that students were positive about the PBL process and it plays a role in developing soft skills especially communication with the patient, learning the diagnostic and treatment plan aspects, and analyse clinical cases in multidisciplinary approach. Therefore, the establishment of PBL case scenarios should be more clinically orientated which will help students to achieve their intended clinical learning objective.

LIMITATIONS

The limitations to this study are, the focus groups discussion participants were only year 5 students and focus group discussion and data analysis was carried out by only one researcher that may reduce the results reliability. If the study sample involved third, fourth and fifth year students would have been helped to compare at different clinical stage and may enhance the credibility of the results. But the focus group discussion will make participants to interact with each other and share their insight views and ideas about the topic.

The present study focused on students' experience with PBL and application of factual knowledge in clinical learning mainly addressing diagnosis, clinical reasoning, and development of treatment plans.

The further research work considering the facilitators perceptions on PBL and which may help to develop the clinical framework and to know how clinical learning objectives are being achieved. It would also be interesting to look further into designing the quality PBL cases, as it is one of the key element in successful PBL implementation.

CONCLUSION

Overall, students enjoyed the PBL process and had positive comments about the idea of learning through PBL. It also plays a role in developing soft skills especially communication with the patient, clinical learning such as diagnostic and treatment plan aspect. Although some concerns were raised such as PBL was stressful, time consuming, difficult to correlate in twinning programme, and complex PBL cases. The implication of the research findings will be helpful for PBL committees and faculty for improving PBL curricula and developing PBL problems in order to benefit future dental students and to achieve the intended clinical learning objectives.

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