

Perceptions of Undergraduate Medical Students Regarding Problem-Based Learning (PBL) : A Cross-sectional Study from Nepal

Sushma Thapa,¹ Alok Atreya,² Roshani Rajbanshi,³ Inesh Khanal,⁴ Laxman Gnawali⁵

¹Department of Pathology, Nepal Manipal College of Medical Sciences, Pokhara, Nepal, ²Department of Forensic Medicine, Lumbini Medical College and Teaching Hospital, Palpa, Nepal, ³Department of STEAM Education, Kathmandu University School of Education, Lalitpur, Nepal, ⁴Patan Academy of Health Sciences, Lalitpur, Nepal, ⁵Department of Language Education, Kathmandu University School of Education, Lalitpur, Nepal.

ABSTRACT

Background: Problem-based learning (PBL) is a student-centered innovative instructional approach in which students define their learning objectives using triggers from predefined problems in case scenarios. The PBL approach in medicine emphasizes real-world problem-solving and develops students' capacity for clinical reasoning. It also contributes to the development of interpersonal and communication skills, promotes self-directed learning (SDL), improves the motivation and enthusiasm of students for their profession and maintains professional ethics and behavior. This study aims to explore the perceptions of undergraduate medical students in a medical college in Nepal toward the PBL tutorial incorporated into the curriculum of Kathmandu University (KU).

Methods: A mixed-methods cross-sectional study was conducted at the Nepal Manipal College of Medical Sciences, Pokhara, Nepal. Qualitative data were gathered through face-to-face semi structured interviews with 12 preclinical undergraduate medical students (six from first and six from second year) selected via convenience sampling. Quantitative data were collected through an online survey of 200 first- and second-year students. Thematic analysis was used for qualitative data whereas Statistical Package for Social Sciences (SPSS) version 20 for quantitative data.

Results: Three themes were identified via thematic analysis: effective learning, the role of tutors, and learning resources. There were 120 students who responded to the online survey with a response rate of 60%. Male students comprised 53.3% of the respondents. Most students agreed that PBL sessions enhanced collaborative learning (n=93, 77.5%) and decision-making skills (n=80, 66.7%).

Conclusions: Students reported that PBL enhanced their clinical reasoning skills, interpersonal communication skills, decision-making skills and promoted SDL. The findings also highlighted the need for updated case scenarios and proper tutor training, which are essential for successful PBL sessions.

Keywords: Communication skills; collaborative learning; problem-based learning; self-directed learning; medical education.

INTRODUCTION

Problem-based learning (PBL) was originally introduced in the Medical School at McMaster University in Canada in the late 1960s and is now used as a learning method in many medical schools worldwide.^{1,2} Many medical colleges around the globe have adopted this shift from traditional teacher-centered approaches to integrated student-centered PBL.^{1,3} PBL is used either as the

mainstay of an entire curriculum or for the delivery of individual courses which are considered either pure or hybrid models.^{4,6} In a 'pure PBL model,' PBL is the main instructional method implemented throughout the entire curriculum.⁷ In a 'hybrid PBL model,' learning is supported by prior knowledge of students acquired during lectures, tutorial sessions, and skill laboratories before the PBL session.⁸

Correspondence: Sushma Thapa, Department of Pathology, Nepal Manipal College of Medical Sciences, Pokhara, Nepal. Email: sushmathp@hotmail.com, Phone: +9779804352341.

The main objective of this study was to explore the perceptions of undergraduate medical students at a Nepali medical college regarding the PBL tutorial incorporated in the curriculum.

METHODS

Nepal Manipal College of Medical Sciences (NMCOMS), Pokhara is a Kathmandu University (KU) affiliated medical college. It adopts a 'hybrid PBL model,' which is typically embedded within an integrated, system-based curriculum. The four-and-a-half-year Bachelor of Medicine and Bachelor of Surgery (MBBS) course includes the first two years of preclinical sciences, which incorporate PBL programs along with traditional lecture classes. These lectures are related to the topics covered in the PBL programs. In each academic year, a cohort of 100 students is allocated into seven PBL groups, each consisting of 13 to 15 students who participate in collaborative learning. Each group is facilitated by one faculty member, drawn from six different disciplines of integrated preclinical sciences (including community medicine). The programs are conducted in three sessions per week, with each session lasting two hours. During the session, the students are provided with a patient's case scenario containing information from medical interviews, physical examinations, laboratory tests, and therapeutic interventions. The students then proceed to identify and define the problems, develop hypotheses to explain the problems, and explore preexisting knowledge relevant to the issues. During PBL sessions, students use 'triggers' from the problem case scenario to define their learning objectives and subsequently perform independent, self-directed study before returning to the group to discuss and refine their acquired knowledge.

An institution-based descriptive cross-sectional study was conducted in the Department of Pathology, NMCOMS, Pokhara, Nepal to explore undergraduate MBBS students' perceptions of the PBL sessions incorporated into the curriculum of KU. The study systematically integrated both qualitative and quantitative findings. In the first phase, qualitative data were collected through interviews. On the basis of these results, specific themes were identified. In the second phase, an online questionnaire survey was conducted.

Students for the qualitative study were selected via convenience sampling. For the quantitative study, utilizing the Raosoft® program with a population size of 200, a confidence level of 95%, and expected response distribution of 80%, the minimum required sample size

was calculated to be 111 (yielding a 5% margin of error).

Inclusion criteria: All first- and second-year MBBS students who had participated in the PBL program and gave consent for their participation in the study.

Exclusion criteria: MBBS students who had not participated in any PBL sessions and those who were unwilling to participate.

Qualitative data were collected through face-to-face semi structured interviews using an interview guide developed based on research questions. Twelve students (six from each preclinical year) were selected via convenience sampling to ensure diversity in gender, ethnicity, and academic performance. Interviews were audio-recorded with consent, transcribed verbatim, and translated where necessary. Since the interviews contained open-ended questions, principles of systematic data organization drawn from grounded theory techniques were used to prepare the transcripts, which were then analyzed using thematic analysis.^{9,10}

The study focused on the following research questions:

1. How do the students perceive the KU-introduced PBL program?
2. How beneficial do they find PBL-based learning experiences?
3. How do they engage themselves in the PBL-based learning process?

For quantitative data collection, the questionnaire was sent to all consenting students from first and second year via Google Forms.

The questionnaire consisted of six parts and assessed students' perceptions across the domains of learning outcomes (7 items), social and communication skills (5 items), student attitudes and engagement in PBL (9 items), tutor role (4 items), learning resources (5 items), self-directed learning (SDL) resource use, preferred study location, and duration (3 items). The questionnaire used a 5-point Likert scale ranging from strongly agree (5) to strongly disagree (1), with a sixth section containing single-answer questions. For analysis, the 5-point Likert scale response was converted into three categories by combining 'Strongly Agree' and 'Agree' into a single positive response, 'Neutral' remained as a separate category, and 'Disagree' and 'Strongly Disagree' were combined into a negative response category.

For the qualitative study, thematic analysis was conducted based on the six-phase framework by Braun and Clarke.¹⁰ For the quantitative study, data were analyzed using Statistical Package for Social Sciences (SPSS) version 20 with descriptive statistics.

Before the study was conducted, ethical clearance was obtained (MCOMS/IRC/716/GA) from the Institutional Review Committee of NMCOMS. Informed consent was obtained from all the participants.

RESULTS

For qualitative data analysis, three themes were identified: effective learning, role of tutors, and learning resources (Table 1). The discussions concerning the challenges of PBL identified two themes: learning resources and learning behavior of students. The discussions on suggestions for improvements identified three themes: tutor quality, quality of case scenarios, and for better learning.

Table 1. Thematic Framework of Student Perceptions of PBL

Theme	Subtheme	Codes	Category
Effective Learning	Benefits	Self-directed learning; Reflective learning; Informative; Longer retention; Knowledge acquisition; Learning through reflection	Benefit
	Skill building	Communication skill; Learning by listening; Discussion skill; Questioning and summarizing	Benefit
Role of Tutor	Effective facilitation	Helpful; Give proper instructions and guidance; Check for deviation; Strict; Extra effort for their group	Benefit
Learning Resources	Case scenario	Gives the feel of seeing patient and feel of becoming a doctor; Capacity development; Help in exploring relevant disciplines; Should reflect a real-world scenario	Benefit
	Other resources	Internet; Standard textbooks; Research articles; Library	Benefit
	Tutor inconsistency	Facilitation quality; Tutor allocation procedure	Challenge
	Ineffective case scenarios	Repetition of case scenario; Topic centered rather than patient centered; Less interesting	Challenge
Learning Behavior of Student	Unfavorable peers	Language barriers; Cultural gap; Difference in personality	Challenge
Tutor Quality	Better tutoring	Expert tutors' tutoring; Well trained tutor; Proper tutoring; Change of tutor; Avoid rush at last hour	Suggestion
Quality of Case-Scenarios	Case scenarios	Upgraded case scenario; Reflect the real-world scenario	Suggestion
For Better Learning	Rearrangement of PBL tutorials	Well planned time scheduling; Rotation of PBL group; Proper assessments; Avoidance of language barrier during discussion	Suggestion

In the present study, all twelve students acknowledged that the PBL program was effective for acquiring skills such as communication, presentation, collaborative learning, cognitive thinking, and clinical reasoning. They also regarded the PBL program as a better learning method than lectures. The following comment from one student is a good example: *"Participation in the PBL program has greatly helped me in the improvement of my communication skills and I have nowadays little hesitancy during the seminar presentations. It has helped me boost up my confidence."* He added, *"I believe that such ability is useful after becoming a doctor."* However, some students stated that they were hesitant in stating their opinion in front of the group members and had difficulty getting along with other peers during PBL sessions. One of the students added *"I thought of interacting but feel hesitant to talk as I am always worried about saying something wrong."*

Some students (5 out of 12) preferred the “hybrid PBL model”, whereas others preferred PBL without prior lecture exposure.. One of the students provided the following comment: *“If the PBL topics are there after it is covered in the lecture classes, then, it helps us in additional enhancement of our understanding.”* Another student added, *“If the topics are already taught in the lectures, then we tend to remember more and retention is more. So, this is helping us during our sessional and university exams when dealing with the problem-based questions”*. However, one student had a contrasting opinion to the rest, saying, *“If the topic is not discussed in the traditional lecture classes, then it is more interesting as we tend to explore more and discuss more.”*

In the current survey, some of the students highlighted that *“I learned about searching PubMed and looked for more sources which helped me in the expansion of my knowledge. It would not have been possible just reading a textbook.”* Another student added *“It is hard to understand physical examination just by reading in a paper, but with the use of videos in the internet, it has become much easier to follow and understand about it.”*

For the quantitative study, a self-administered questionnaire was distributed among 200 first- and second- year students, of whom 120 responded (response rate of 60%). The majority (54.2%) were from the second year. Male students comprised 53.3% of the respondents (Table 2).

Table 2. Demographic characteristics of survey respondents. (N=120)

Year	Female n (%)	Male n (%)	Total n (%)
First	28 (50.9)	27 (49.1)	55 (45.8)
Second	28 (43.1)	37 (56.9)	65 (54.2)
Total	56 (46.7)	64 (53.3)	120 (100)

In the present study, 92 (76.7%) students agreed that PBL sessions helped them acquire medical knowledge, 96 (80.0%) agreed that PBL enhanced their self-learning skills, and 91 (75.8%) agreed that their problem-solving skills improved. Additionally, 93 (77.5%) agreed that PBL enhanced their collaborative learning and 80 (66.7%) agreed that PBL enhanced their decision-making skills during their MBBS preclinical course (Table 3).

Table 3. Student perceptions of learning outcomes and skills development. (N=120)

Domain	Item	Agree n (%)	Neutral n (%)	Disagree n (%)
Learning Outcomes	PBL tutorials helped me acquire medical knowledge	92 (76.7)	16 (13.3)	12 (10.0)
	My self-learning skills improved through PBL tutorials	96 (80.0)	11 (9.2)	13 (10.8)
	PBL tutorials helped increase my basic sciences knowledge	93 (77.5)	11 (9.2)	16 (13.3)
	PBL tutorials helped me develop problem solving skills	91 (75.8)	17 (14.2)	12 (10.0)
	PBL tutorials encouraged collaborative learning	93 (77.5)	14 (11.7)	13 (10.8)
	PBL method helped me improve my decision- making skills	80 (66.7)	29 (24.1)	11 (9.2)
	PBL method helped me identify my strength and weakness	82 (68.3)	23 (19.2)	15 (12.5)
Social & Communication Skills	My communication skills improved during and after PBL tutorials	99 (82.5)	12 (10.0)	9 (7.5)
	My social networking status has been enhanced by PBL tutorials	77 (64.2)	22 (18.3)	21 (17.5)
	My responsibility at group discussions got enhanced through PBL tutorials	93 (77.5)	16 (13.3)	11 (9.2)
	I understood more about social aspect of clinical practice and roles of clinicians	90 (75.0)	14 (11.7)	16 (13.3)
	I believe PBL as an interactive method of learning	97 (80.8)	13 (10.8)	10 (8.4)

A majority of them (n=99, 82.5%) agreed that PBL improved their communication skills. Most of the students (75%)

agreed that their responsibility during group discussions, their understanding of the social aspects of clinical practice increased, and they believed that PBL was an interactive method of learning (Table 3).

A majority of the students (n=84, 70.0%) agreed that topics from PBLs should also be incorporated into traditional classes. For the smooth running of the PBL sessions, the students agreed that they contributed equally to the group discussions (n=111, 92.5%), gave feedback to others (n=80, 66.7%) and enjoyed participation (n=92, 76.7%) during the PBL tutorials (Table 4).

Table 4. Student attitudes and engagement in PBL. (N=120)

Item	Agree n (%)	Neutral n (%)	Disagree n (%)
PBL can substitute lectures	46 (38.3)	32 (26.7)	42 (35.0)
Topics from PBLs should be incorporated in traditional classes as well	84 (70.0)	25 (20.9)	11 (9.2)
I attend PBL session on time	109 (90.8)	5 (4.2)	6 (5.0)
I contribute equally in group discussions	111 (92.5)	6 (5.0)	3 (2.5)
I give feedback to others	80 (66.7)	31 (25.8)	9 (7.5)
The number of PBLs we are having is sufficient	79 (65.8)	20 (16.7)	21 (17.5)
I already had idea of having PBL sessions before joining the medical field	29 (24.2)	19 (15.9)	72 (60.0)
I enjoy the participation during PBL tutorials	92 (76.7)	18 (15.0)	10 (8.3)
Language barrier hinders the smooth running of PBL tutorials	48 (40.0)	35 (29.2)	37 (30.8)

Regarding orientation to the PBL program, most of the students reported that they were properly oriented towards the PBL sessions, which helped them contribute to the discussions. One of the students stated that *“During the first PBL session, we didn’t have any idea about PBL, but now after the instruction we know what to do and how to discuss our topics.”*

PBL facilitation is performed by tutors, and most of the students agreed that tutors gave reasonable instructions (n=91, 75.8%). They also added that the assessment performed by tutors was satisfactory (n=83, 69.2%) and agreed that tutors’ feedback was helpful in the improvement of their performance (n=97, 80.8%) (Table 5).

Table 5. Student satisfaction with the tutor role and learning resources. (N=120)

Domain	Item	Agree n (%)	Neutral n (%)	Disagree n (%)
Tutor Role	Tutors give reasonable instructions about the PBL process	91 (75.8)	14 (11.7)	15 (12.5)
	The assessment of the students by tutor is satisfactory	83 (69.2)	21 (17.5)	16 (13.3)
	I am satisfied with tutoring of tutors in PBL sessions	80 (66.7)	22 (18.3)	18 (15.0)
	Tutors feedback was helpful to improve students' performance	97 (80.8)	12 (10.0)	11 (9.2)
Learning Resources	I am satisfied with the PBL case-scenario provided during PBL sessions	91 (75.8)	22 (18.3)	7 (5.9)
	The PBL case-scenario helped me in exploring relevant disciplines (subject)	96 (80.0)	14 (11.7)	10 (8.4)
	The required learning materials for PBL sessions are available sufficiently	67 (55.8)	34 (28.3)	19 (15.8)
	The learning material used in PBL sessions helped me in exploring my expectations	74 (61.7)	30 (25.0)	16 (13.3)
	PBL helped me identify proper site of internet access for learning resources	93 (77.5)	19 (15.8)	8 (6.7)

A majority of the students (n=91, 75.8%) agreed that the PBL case-scenario was satisfactory, and 80.0% (n=96) of the students agreed that it helped in exploring the relevant disciplines. Ninety-three (77.5%) students agreed that PBL sessions helped them identify proper sites of internet access for learning resources (Table 5).

In this survey, the majority of the students (n=83, 69.2%) reported that they used both books and the internet as the main source of learning resources for self-directed learning, followed by the internet alone (n=22, 18.3%), books alone (n=7, 5.8%), lecture notes (n=4, 3.3%), and medical journals (n=4, 3.3%). Most of them studied for 2 hours (n=47, 39.2%) for SDL (Table 6).

Table 6. Patterns of self-directed learning resource utilization. (N=120)

Category	Frequency (n)	Percentage (%)
Learning Resources for Self-Directed Learning		
Books	7	5.8
Both books and internet	83	69.2
Internet	22	18.3
Lecture notes	4	3.3
Medical journal	4	3.3
Preferred Place for Self-Directed Learning		
Home	42	35.0
Library	18	15.0
Both	56	46.7
Others	4	3.3
Duration for Self-Directed Learning		
1 hour	23	19.2
2 hours	47	39.2
3 hours	27	22.5
>4 hours	23	19.2

DISCUSSION

Many medical colleges worldwide have adopted PBL in their curriculum after conducting research in their own environment.^{11,12} The teaching-learning system practiced in Nepal is traditional and incorporates didactic learning at its core.¹³ However, PBL was first introduced in 1980 by the Institute of Medicine, Tribhuvan University, as a part of an integrated Medical Basic Sciences curriculum. Later, the BP Koirala Institute of Health Sciences (BPKIHS), Dharan, implemented the program in 1998.¹⁻³ PBL was introduced to the first cohort of MBBS students at Kathmandu University School of Medical Sciences (KUSMS) with support from Harvard University in 2001.^{1,2} Beginning in 2011, all affiliated medical colleges of Kathmandu University (KU), including NMCOMS partially transitioned their teaching/learning activities to this form as per the Preclinical Sciences revised version of the 2011 MBBS curriculum of KU.¹⁴

The KU-based MBBS curriculum also introduced a new methodology for teaching-learning systems in the preclinical years, i.e., PBL, along with didactic lectures.¹⁵ The present study is based on students' perceptions of PBL sessions in a system-based hybrid curriculum of KU. The discussions are organized into different categories: students' views of PBL, the role of tutors, and learning resources.

The qualitative findings in this study align with the established rationale for PBL in medical education, particularly its emphasis on skill acquisition across communication, presentation, and clinical reasoning domains. Similarly, in the quantitative study, the students agreed that PBL sessions helped them acquire medical knowledge and enhanced their self-learning skills. The rationale for the PBL approach in medicine is that its emphasis on real-world problem-solving develops students' capacity for clinical reasoning, and that it facilitates the acquisition of both basic and clinical sciences in a manner that enables knowledge

retention and transfer to clinical tasks.¹ It also helps increase knowledge retention, better understand basic science topics, integrate basic and clinical sciences, and improve problem-solving skills.^{16,17} In addition, it contributes to the development of interpersonal and communication skills, and presentation skills, promotes SDL, enhances students' motivation and enthusiasm toward their profession and maintains professional ethics and behavior.^{11,18}

Consistent with these theoretical benefits and our findings, several studies have shown significantly greater positive responses to questions concerning self-learning skills and clinical reasoning skills.¹⁹⁻²⁴ Similar to the current study, several previous studies have shown that PBL sessions help medical students increase their knowledge of basic sciences, improve their problem-solving skills and improve their integration of basic sciences with clinical sciences.^{25,26} This may be because PBL is a student-centered teaching methodology that enhances students' clinical judgment of real case scenarios. Studies have shown that students who participated in PBL sessions demonstrated a better ability to apply basic science knowledge to a clinical case and demonstrated greater skills in the areas of hypothesis generation, and communication skills.^{24,27} Some studies have reported that PBL is time-consuming and does not impact knowledge acquisition, with benefits more evident in the application of knowledge rather than its acquisition.^{19,28} These concerns were not prominently reflected in our students' perceptions.

In the present study, the students agreed that their social networking status and decision-making skills were enhanced by PBL tutorials similar to other previous studies.²⁶ Similarly, PBL sessions help in the development of student skills, including decision-making and analytical skills, inspire students to work as team members, feel confident about tackling unfamiliar problems, and improve their expression skills.²⁹⁻³¹ Deep learning can also occur when students work together in small groups and when SDL is used, where independent thinking is encouraged.³²

Proper orientation and training for the PBL program are crucial for effective learning. The lack of proper student training may explain their poor contribution during PBL sessions.³² In our study, most students reported being properly oriented towards the PBL sessions, which helped them contribute to the discussions. However, a previous study revealed that a high percentage of students recognized PBL as an interactive method of teaching and contributed to group discussions even

though prior student training was absent.²⁶ As the roles and responsibilities of a doctor have changed over time, so have the tools used in medical education.¹⁵ The literature has shown how medical education has "shifted" from the teacher-centric transfer of medical knowledge to a more competency-based, skill-oriented, student-centered, and active learning approach.³³ To improve this situation, we should emphasize the importance of active learning in medical education and provide introductory sessions before the PBL program.

The selection of tutors is one of the critical components of PBL; however, implementation is difficult due to limited teaching staff resources. The tutoring ability of teachers should be enhanced through effective faculty development programs.²⁰ Our findings indicate that while most students were satisfied with tutor guidance and assessment, a minority expressed concerns that suggested variability in tutor performance. This contrasts with a study in Saudi Arabia where approximately half of the students agreed that tutor feedback was helpful in improving their performance.²⁶ This suggests tutor feedback quality may have been consistently positive in our setting. Furthermore, proper tutor training is an essential step for the success of PBL sessions.^{18,34,35} Inadequate tutor skills have been reported as a barrier to effective feedback.³⁶ In addition, tutor feedback is an essential element in the process of students' learning and development.^{36,37} Tutor training should include an introduction to the PBL process, the roles of students and tutors, methods of encouraging student contribution during sessions, provision of effective feedback, and objective evaluation.²⁶ Some students highlighted that tutor should rotate among groups to ensure uniform exposure to the different faculty members/disciplines.

The high level of student satisfaction with PBL case scenario in our study suggests that the case scenarios were generally appropriate and helped students explore interdisciplinary connections. However, the development of case scenarios that involve students is critical for effective PBL.²⁰ Focus group discussion (FGD) participants suggested that better case scenarios should include the use of visual materials and simulated patients.²⁰ Updated case scenarios that reflect real-world clinical situations are recommended (Table 7).

Table 7. Student-Derived Recommendations for PBL Enhancement.

Domain	Recommendations
For Better Learning	• Well planned time scheduling • Rotation of PBL group • Proper assessment • Avoidance of language barrier during discussion
Quality of Case-Scenarios	• Should upgrade case scenarios • Should reflect real-world scenario
Tutor Quality	• Expert tutor tutoring • Proper training e.g. faculty development workshop

For effective understanding and acquisition of in-depth knowledge, adequate learning resources are crucial. In the modern era, the use of the internet as a learning resource has emerged. More students were inclined toward the combined use of the internet and books in our study. Other studies have revealed that students use the internet (52.4%) and textbooks (21%) as learning resources.³⁸ A study by Al-Drees et al. on students' perceptions of PBL tutorial sessions in a system-based hybrid curriculum in Saudi Arabia reported that the majority of the students used the internet (93.1%) and books (64.4%) as learning resources.²⁶

This cross-sectional study could not assess longitudinal changes in students' perceptions as they progressed into clinical practice. Another limitation was the small sample size obtained through convenience sampling and the single-center study design with limited survey instruments. The convenience sampling for the qualitative component may have introduced selection bias. Additionally, this study did not systematically investigate the underlying causes of non-uniform participation among PBL group members; future research using direct observational or group-dynamics methodologies is needed to explore this further. Furthermore, because the online survey was anonymized and did not collect identifying information, we were unable to determine the reasons for non-response among the 40% of students who did not complete the questionnaire, and non-verbal cues observed informally during the face-to-face qualitative interviews were not systematically recorded as data. Future studies could incorporate structured observation protocols or brief non-respondent follow-up surveys to better characterize these dynamics.

CONCLUSIONS

PBL was perceived as an effective learning strategy in the preclinical curriculum of the KU-MBBS program. The study highlighted the significant role of PBL in a system-based hybrid curriculum, which improved student knowledge and various learning skills. In terms of student perceptions, PBL was found to develop clinical

reasoning; enhance interpersonal and communication skills, presentation skills, and decision-making skills; promote SDL and students' motivation and enthusiasm for their profession; and maintain professional ethics and behavior.

COMPETING INTERESTS

The authors declare that they have no competing interests.

REFERENCES

1. Atreya A, Gnawali L, Menezes RG, Nepal S. Enhancing medical education in Nepal through problem-based learning (PBL) and collaborative action research strategies. *BMC Med Educ.* 2025;25:689. doi: <https://doi.org/10.1186/s12909-025-07267-8>
2. Dixit H, Vaidya S, Pradhan B. PBL implementation of Kathmandu University curriculum - Is it quo vadis? *J Nepal Med Assoc.* 2013;52(192):652-658. doi: <https://doi.org/10.31729/jnma.2445>
3. Mansur DI, Kayastha SR, Makaju R, Dongol M. Problem based learning in medical education. *Kathmandu Univ Med J (KUMJ).* 2014;10(4):78-82. doi: <https://doi.org/10.3126/kumj.v10i4.11002>
4. Wood DF. Problem based learning. *BMJ.* 2003;326(7384):328-330. doi: <https://doi.org/10.1136/bmj.326.7384.328>
5. Lee YM, Mann KV, Frank BW. What drives students' self-directed learning in a hybrid PBL curriculum. *Adv Health Sci Educ Theory Pract.* 2010;15(3):425-437. doi: <https://doi.org/10.1007/s10459-009-9210-2>
6. Telang A. Problem-based learning in health professions education: An overview. *Arch Med Health Sci.* 2014;2(2):243-246. doi: <https://doi.org/10.4103/2321-4848.144363>

7. Masek A, Yamin S. Problem based learning model: A collection from literature. *Asian Social Science*. 2010;6(8):148-156. doi: <https://doi.org/10.5539/ass.v6n8p148>
8. Azer SA. What makes a great lecture? Use of lectures in a hybrid PBL curriculum. *Kaohsiung J Med Sci*. 2009;25(3):109-115. doi: [https://doi.org/10.1016/S1607-551X\(09\)70049-X](https://doi.org/10.1016/S1607-551X(09)70049-X)
9. Corbin JM, Strauss A. Basics of qualitative research (3rd ed.): Techniques and procedures for developing grounded theory. Thousand Oaks, CA: Sage Publications, Inc.; 2008. doi: <https://doi.org/10.4135/9781452230153>
10. Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol*. 2006;3(2):77-101. doi: <https://doi.org/10.1191/1478088706qp063oa>
11. Yew EHJ, Schmidt HG. Evidence for constructive, self-regulatory, and collaborative processes in problem-based learning. *Adv Health Sci Educ Theory Pract*. 2009;14(2):251-273. doi: <https://doi.org/10.1007/s10459-008-9105-7>
12. Usmani A, Sultan ST, Ali S, Fatima N, Babar S. Comparison of students and facilitators' perception of implementing problem based learning. *J Pak Med Assoc*. 2011;61(4):332-335. [\[Full Text Link\]](#)
13. Atreya A, Rajbanshi R, Menezes RG, Acharya A. Evaluation of undergraduate forensic medicine education in Nepal: a critical analysis using Schwab's five commonplaces and Schubert's curriculum images. *BMC Med Educ*. 2025;25:147. doi: <https://doi.org/10.1186/s12909-025-06741-7>
14. Kathmandu University. Evaluation scheme for MBBS program [Internet]. Dhulikhel (Nepal): Kathmandu University; 2011 [cited 2026 Jan 14]. [\[Full Text Link\]](#)
15. Gautam N, Dhungana R, Gyawali S, Dhakal S, Pradhan PMS. Perception of medical students regarding TU-IOM MBBS curriculum and teaching learning methods in Nepal. *Kathmandu Univ Med J (KUMJ)*. 2022;20(78):219-224. doi: <https://doi.org/10.3126/kumj.v20i2.51404>
16. Rakhudu MA, Davhana-Maselesele M, Useh U. A model of collaboration for the implementation of problem-based learning in nursing education in South Africa. *Curationis*. 2017;40(1):1-10. doi: <https://doi.org/10.4102/curationis.v40i1.1765>
17. Azer SA. Challenges facing PBL tutors: 12 tips for successful group facilitation. *Med Teach*. 2005;27(8):676-681. doi: <https://doi.org/10.1080/01421590500313001>
18. Chan EA. Reflecting on the essence of our problem-based learning discussions: the importance of faculty development and our continuous quest for applications of problem-based learning. *Kaohsiung J Med Sci*. 2009;25(5):276-281.
19. Emerald NM, Aung PP, Han TZ, Yee KT, Myint MH, Soe TT, Oo S. Students' perception of problem-based learning conducted in phase1 medical program, UCSI University, Malaysia. *South East Asian J Med Educ*. 2013;7(2):45-48. doi: <https://doi.org/10.4038/seajme.v7i2.140>
20. Lin-Aung H, Masumoto D, Linn Z, et al. Students' perception of problem-based learning at a Japanese medical school: an exploratory sequential mixed method. *Int J Med Educ*. 2022; 13: 322-334. doi: <https://doi.org/10.5116/ijme.6399.dee1>
21. Yan Q, Ma L, Zhu L, Zhang W. Learning effectiveness and satisfaction of international medical students: introducing a hybrid-PBL curriculum in biochemistry. *Biochem Mol Biol Educ*. 2017;45(4):336-342. doi: <https://doi.org/10.1002/bmb.21046>
22. Musal B, Taskiran C, Kelson A. Opinions of tutors and students about effectiveness of PBL in Dokuz Eylul University School of Medicine. *Med Educ Online*. 2003;8:4345. doi: <https://doi.org/10.3402/meo.v8i.4345>
23. Alkhuwaiter SS, Aljuailan RI, Banabilh SM. Problem-based learning: dental students' perception of their education environments at Qassim University. *J Int Soc Prev Community Dent*. 2016;6(6):575-583. doi: <https://doi.org/10.4103/2231-0762.195512>
24. Callis AN, McCann AL, Schneiderman ED, Babler WJ. Application of basic science to clinical problems: traditional vs. hybrid problem-based learning. *J Dent Educ*. 2010;74(10):1113-1124. doi: <https://doi.org/10.1002/j.0022-0337.2010.74.10.tb04966.x>
25. Aldayel AA, Alali AO, Altuwaim AA, Almutairi AA,

- Alhussain HA, Alshammari FM. Problem-based learning: medical students' perception toward their educational environment at Al-Imam Mohammad Ibn Saud Islamic University. *Adv Med Educ Pract.* 2019;10:95-104. doi: <https://doi.org/10.2147/AMEP.S189062>
26. Al-Drees AA, Khalil MS, Irshad M, Abdulghani HM. Students' perception towards the problem based learning tutorial session in a system-based hybrid curriculum. *Saudi Med J.* 2015;36(3):341-348. doi: <https://doi.org/10.15537/smj.2015.3.10216>
27. Bijli N, Shankarappa M. Indian medical students' perspectives on problem-based learning experiences in the undergraduate curriculum: one size does not fit all. *J Educ Eval Health Prof.* 2013;10:11. doi: <https://doi.org/10.3352/jeehp.2013.10.11>
28. Hartling L, Spooner C, Tjosvold L, Oswald A. Problem-based learning in pre-clinical medical education: 22 years of outcome research. *Med Teach.* 2010;32(1):28-35. doi: <https://doi.org/10.3109/01421590903200789>
29. Shamsan B, Syed AT. Evaluation of problem based learning course at College of Medicine, Qassim University, Saudi Arabia. *Int J Health Sci (Qassim).* 2009;3(2):249-258.
30. Albarrak AI, Mohammed R, Abalhassan MF, Almutairi KN, Alshammari FM, Aljohani MA. Academic satisfaction among traditional and problem-based learning medical students: a comparative study. *Saudi Med J.* 2013;34(11):1179-1188.
31. Downing K, Ning F, Shin K. Impact of problem-based learning on student experience and metacognitive development. *Multicultural Educ Technol J.* 2011;5(1):55-69.
32. Dent JA, Harden RM, Hallock JA. A practical guide for medical teachers. 3rd ed. Edinburgh: Churchill Livingstone/Elsevier; 2010.
33. Gukas ID. Global paradigm shift in medical education: issues of concern for Africa. *Med Teach.* 2007;29(9-10):887-892. doi: <https://doi.org/10.1080/01421590701814286>
34. Dalrymple KR, Wuenschell C, Rosenblum A, Paine M, Crowe D, von Bergmann HC, et al. PBL core skills faculty development workshop 1: an experiential exercise with the PBL process. *J Dent Educ.* 2007;71(2):249-259. <https://doi.org/10.1002/J.0022-0337.2007.71.2.TB04273.X>
35. Aarnio M, Lindblom-Ylänne S, Nieminen J, Pyörälä E. How do tutors intervene when conflicts on knowledge arise in tutorial groups? *Adv Health Sci Educ Theory Pract.* 2014;19(3):329-345. doi: <https://doi.org/10.1007/s10459-013-9473-5>
36. Al-Haqwi AI, Al-Wahbi AM, Abdulghani HM, van der Molen HT. Barriers to feedback in undergraduate medical education: male students' perspective in Central Saudi Arabia. *Saudi Med J.* 2012;33(5):557-561.
37. Al-Haqwi AI. Importance and process of feedback in undergraduate medical education in Saudi Arabia. *Saudi J Kidney Dis Transpl.* 2012;23(5):1051-1055. doi: <https://doi.org/10.4103/1319-2442.100949>
38. Kibret S, Teshome D, Fenta E, Hunie M, Taye MG, Fentie Y, et al. Medical and health science students' perception towards a problem-based learning method: a case of Debre Tabor University. *Adv Med Educ Pract.* 2021;12:781-786. doi: <https://doi.org/10.2147/AMEP.S316905>