

# Introduction of problem-based learning in undergraduate dentistry program in Nepal

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## ABSTRACT

**Context:** Problem-based learning (PBL) is a methodology widely used in medical education and is growing in dental education. Initiation of new ideas and teaching methods requires a change in perception from faculty and institute management. Student-centered education is a need of the day and PBL provides the best outlet to it. **Aim:** To introduce PBL, assess feasibility and challenges in undergraduate dentistry program and evaluate the impact on their learning. **Settings and Design:** PBL was used as a teaching methodology on 37 students in 2<sup>nd</sup> year BDS program. The PBL was duplicated as that of MBBS program. PBL was spread over 5 days. Pre- and post-test questions along with different questionnaires were designed for the students and tutors/faculty to be administered after PBL session. **Subjects and Methods:** Case with temporomandibular joint and muscles of mastication and occlusion was designed as a module with five triggers given to students who were divided into five groups over two tutorials facilitated by tutor. Resource sessions were held by involved departments (Oral Biology, Oral Pathology, Oral Medicine and Radiology, Orthodontics, and Oral Surgery). Students were allotted time for search, research and discover to search literature. **Statistical Analysis Used:** Descriptive statistics. **Results:** Pre and post-test comparison showed that the knowledge increased immensely following PBL sessions. Students' assessment by tutors following two PBL tutorials showed a mean score of  $34.9 \pm 4.01$  and  $35.5 \pm 3.86$ , respectively. Students' feedback showed that most of them preferred PBL because they found it interactive, collaborative, goal and research oriented. Students were motivated to learn new topic because learning objectives were formulated by themselves and they developed self-directed learning skills. The tutors learned to design cases. **Conclusions:** PBL encouraged students to use more interactive methods of learning which possibly will make them lifelong learners.

**Key words:** Dentistry, Nepal, problem-based learning, self-directed learning, temporomandibular joint

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## INTRODUCTION

Problem-based learning (PBL) is an approach to learning used in many health science schools worldwide. PBL is

intended to enable students to work in groups to learn a topic in the context of real issues.<sup>[1]</sup> Students' involvement in the process helps them to learn from each other's experiences, refine ideas, consolidate what they know, and rehearse the arguments that will orient them well in clinical years.<sup>[2]</sup> PBL allows basic science knowledge to be made applicable to students' learning needs by relating it

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to a clinical problem. Learning motivation is no longer placed on memorizing facts for a multiple-choice exam.<sup>[3]</sup> Instead, knowledge is gained and understood in order to apply it to the clinical scenario and ultimately serve the future patient.<sup>[4]</sup> The economic environment, lack of full-time teachers trained as experts/tutors, number of students enrolled, the need for specially equipped rooms and well stocked libraries are major challenges for implementation of PBL in developing countries<sup>[5]</sup> like ours.

Dental educators have felt the need for students to develop lifelong learning skills while preparing a career in dentistry.<sup>[6,7]</sup> The focus of PBL approach is on collaborative-cooperative learning, critical thinking, small-group learning, regular self-peer evaluations, and developing skills for lifelong learning.<sup>[8]</sup>

PBL approach was introduced in MBBS program at BP Koirala Institute of Health Sciences (BPKIHS) into an organ system program in 1996.<sup>[9]</sup> In dental education, this pedagogy has not been used in Nepal. Hence, this study was designed to assess the feasibility and challenges of PBL in undergraduate dentistry program in Nepal and to evaluate the impact on their learning.

## SUBJECTS AND METHODS

Following the ethical approval from Institutional Review Committee of our institute, the study was conducted on 37 students from a batch of 40 students of Bachelors of Dental Surgery (BDS) 2nd year program of College of Dental Surgery, BPKIHS, Dharan, Nepal. The study was conducted in October 2013. Three students missed the PBL session as they were in the supplementary group yet to join the 2<sup>nd</sup> year batch. In order to assess the need of PBL in BDS program, focused group discussion was carried out separately among students and faculty of the institute. There was a felt need of this methodology of teaching in the dental discipline as the students were already exposed to PBL in their 1<sup>st</sup> year BDS in basic medical science subjects and they opined that this methodology would help them understand the subject matter better. Verbal consent from Academic Dean, BDS phase I program Coordinator and Head of Department of Oral Biology were obtained. Faculty/tutors being involved in tutorials were first exposed to PBL teaching in the medical college during PBL sessions of the 1<sup>st</sup> and 2<sup>nd</sup> year MBBS program. Separate orientation classes were held for the students of 2<sup>nd</sup> year BDS and tutors. The case for the PBL session was designed by a core group of faculty of different specialties along with PBL expert and the topics covered were temporomandibular joint (TMJ), muscles of mastication and occlusion. The departments involved were Oral Biology, Oral Pathology, Oral Medicine and Radiology, Orthodontics, and Oral and Maxillofacial Surgery. Each department formulated their specific learning objectives for the module. The total time

period for the PBL was 5 days (40 h). Self-study instructions were designed to motivate and guide the students toward reaching learning goals. A total of five triggers were designed and distributed over two tutorial sessions. The five-step format was followed comprising of background, learning issues, instructions, product, and review. Students were divided into five work groups. Workgroup instructions were designed and given to each group. Each work group was guided by a tutor, and the team followed group dynamics. They discussed with the tutors to check whether the learning goals are reached. Before the initiation of PBL, a pretest was conducted comprising of 14 questions on the topics being covered. Resources sessions comprising of structured interactive sessions and laboratory exercises were also held along with the tutorials. On the last day of the module, students presented seminars on a topic allotted to them by lottery method. Four different questionnaires were used for evaluation of the module. To have the students' feedback on PBL session, questionnaire form developed by Dolmans and Schmidt<sup>[10]</sup> was used which was modified to our context. Student feedback on tutors was carried out by using the questionnaire developed by Dolmans and Ginns,<sup>[11]</sup> tutor feedback on group interaction and student assessment by tutors on each day of tutorials were administered following the PBL session along with the post test. A faculty meeting was also conducted to share the experience/feedback of this PBL approach by the tutors and resource faculty.

## RESULTS

Pre and post-test comparison showed that the knowledge increased immensely following PBL sessions as shown in Table 1. Students' feedback on PBL module [Tables 2 and 3]

**Table 1: Pretest/posttest response: The frequency of correct response in both the tests**

Questions	Pretest	Posttest
What type of joint is TMJ?	1	36
Temporalis is a depressor muscle	8	28
The nerve innervating lateral pterygoid	3	31
TMJ has two cavities	17	34
Malocclusion may contribute to TMDs	15	37
Trauma to teeth can lead to change in occlusion and lead to TMDs	19	37
The most important feature of TMDs	14	36
Palpation of TMJ reveals pain and irregularities during condylar movements in TMDs	14	37
Intraoral appliances are used in TMDs	16	36
"Spray and stretch" therapy is a form of trigger point therapy	13	37
Cause of anterior disc displacement with reduction	13	34
Tricyclic antidepressants have proven to be effective in managing chronic orofacial pain	12	37
In TMJ disk disorder, the preferred initial course of therapy	14	31
Surgical therapy of TMJ disk disorder begins with joint lavage (arthrocentesis)	14	33

TMJ: Temporomandibular joint; TMDs: Temporomandibular disorders

**Table 2: Responses on students' feedback on PBL session on a 3-point Likert scale**

Items	Disagree	Neutral	Agree
<b>Theme 1: Influence of the discussion in the tutorial group</b>			
Determines to a large extent what I will study	2	0	35
An important stimulus for my learning activities during self-study	0	2	35
The learning issues generated are the most important starting point for my learning activities during self-study	0	3	34
I study to a large extent independently from the learning issues generated	11	14	12
<b>Theme 2: Influence of content tested</b>			
The learning issues generated in the tutorial group are tuned to the subject matter expected to be tested	2	5	30
I take a look at the questions included in the tests to get an idea of how deeply I should study particular subject-matter	3	0	34
The questions that are included in the tests to a large extent determine what I will study	3	2	32
I do not spend any time on studying particular issues, if I am convinced that these issues will not be tested	22	12	3
The closer the date the test will be administered to us, the less time I spend on studying the learning issues generated in the tutorial group	28	3	6
<b>Theme 3: Influence of resource sessions</b>			
Topics covered during lectures influence which topics I select for self-study	2	6	29
Resource sessions are an important source of information to decide which topics I will study more extensively	0	0	37
<b>Theme 4: Influence of the tutor, in general</b>			
Stimulate my learning activities	0	0	37
Stimulate students to make use of different sources of information	0	0	37
Have an important influence on the selection of learning issues	0	4	33
<b>Theme 5: Influence of reference literature</b>			
I usually confine myself to the reference literature cited in the course book when searching for relevant literature	16	11	10
I hardly review literature beyond the sources that are include in the course book	6	9	7

PBL: Problem-based learning

**Table 3: Responses to open ended questions on students' feedback on PBL session**

Questions and responses	Frequency
How does PBL compare to other forms of learning you have experienced?	
Stimulates research and finding solutions by understanding the problem in depth	11
Promotes group discussion	9
Self-learning, interesting, enjoyable, interactive	8
Longer retention of knowledge	7
Practical way of learning	4
In what ways, if any, has PBL changed your view of learning?	
Research and discussion helps in learning	19
Self-study is necessary	11
Learnt to refer other literature apart from text	6
Learning requires interaction, coverage of more topics in lesser time frame, practical way of learning	4
In what ways has PBL helped to prepare you for your assessments?	
Familiar with search engines/internet resources	11
Focused way learning, how to discuss in groups and learn, active learning	6
Helped develop new ideas	5
Self-directed learning, achieve learning objectives	4
What do you believe you have learnt as a result of this PBL?	
Importance of team work, cooperation and interaction	14
Understood and learnt a new topic (TMJ)	13
Use search engines/internet resources	10
How to learn, how to diagnose and solve a particular problem, how to conduct group discussion, practical way of correlating and learning, developed confidence	5
How to do self-study, develop new ideas, developed communicating skills including making presentation	4

PBL: Problem-based learning; TMJ: Temporomandibular joint

showed that most of them preferred PBL because they found it interactive, collaborative, goal and research oriented. For interpretation purpose, the 5-point Likert scale was brought down to 3 that is, agree, neutral, and disagree. Students evaluated tutors ( $n=5$ ) through a questionnaire under five themes. The data showed that there was overall agreement on each theme of active learning, contextual learning, and intra-personal behaviors as a tutor as shown in Table 4. Students' assessment by tutors following two PBL tutorials showed a mean score of  $34.9 \pm 4.01$  and  $35.5 \pm 3.86$ , respectively. Tutors questionnaire ( $n = 5$ ) on group interaction was divided into explanatory questions, cumulative reasoning and handling conflicts. In explanatory questions, all the tutors agreed that students were more interactive based on the observation that students asked a question for obtaining good understanding of the subject and were not satisfied with just one explanation. Except for one neutral tutor, all agreed that the probing questions were asked by group members to scrutinize students' observations. In cumulative reasoning section, all the tutors agreed that the group members built on the idea put forward, observations put forward were supported by arguments, students explanation lead to additional explanation by other students, and that conclusions were drawn from group discussion. In the section of handling conflicts, all agreed that contradictory ideas were discussed in the group and students responded to disagreement. There was no disagreement on any of the items of the questionnaire. However, one tutor felt that

**Table 4: Students' (n=37) feedback on tutor performance on a 5-point Likert scale (converted into 3-point scale)**

Items	Disagree	Neutral	Agree
Constructive/active learning: the tutor stimulated us...			
To summarize what we had learnt in our own words	0	0	37
To search for links between issues discussed in the tutorial group	0	0	37
To understand underlying mechanisms/theories	0	3	34
Self-directed learning: The tutor stimulated us...			
To generate clear learning issues by ourselves	0	2	35
To search for various resources by ourselves	1	2	34
Contextual learning: the tutor stimulated us...			
To apply knowledge to the discussed problem	0	0	37
To apply knowledge to other situations/problems	0	3	34
Collaborative learning: the tutor stimulated us...			
To give constructive feedback about our group work	0	5	32
To evaluate group cooperation regularly	0	3	34
Intra-personal behavior as tutor			
The tutor had a clear picture about his strengths/weaknesses as a tutor	0	5	32
The tutor was clearly motivated to fulfill his/her role as a tutor	0	0	37

one or more students contradicted each other. Overall, PBL approach exposed students to a new method of learning and were satisfied to have explored this method. Students were motivated to learn new topic because learning objectives were formulated by themselves and they developed self-directed learning skills. The tutors felt that this new teaching-learning approach benefitted them as they were aptly trained for a new teaching-learning method. Nonetheless, their interaction with students increased, and integration of subjects provided them different perspectives to the same disease. There was the possibility of immediate feedback and evaluation of learning objectives. The tutors/faculty also learned to design cases for PBL. The tutors were of the opinion that PBL method is suitable for a common disease like TMJ disorder. Such a teaching-learning activity may also be implemented for an integrated approach to other common problems which would avoid duplication from many departments.

## DISCUSSION

PBL is a student-centered approach with a focus on collaborative-cooperative learning and student reflection on the way they think. This approach has been incorporated into medical schools in the 1960s and has gained popularity in medical schools around the world.<sup>[9]</sup> PBL pedagogy was not used to dental education until the Swedish University; Malmö Dental School introduced it to undergraduate courses in 1990.<sup>[12]</sup> Many other dental schools then started adopting this approach.<sup>[4,6,7,13]</sup> In the present study, we have tried this innovative learning methodology in a resource constraint

country like Nepal and assessed its feasibility and challenges of initiating something new in the curriculum. The constraints in our setting can range from lack of conducive learning environment to the challenge of meeting the dental manpower need of the country. The spectrum of constraints also consists of limited experts, lacking financial resources, limited reading materials, and need for frequent trainings of tutors

This probably is the first time PBL has been implemented in dental subjects in Nepal. This study has provided some important directions for future implementation of this teaching-learning methodology in dentistry in the country. One of the main reasons for being able to initiate PBL in dentistry was because it is already being practiced in medical college since 1996 hence, was not very difficult to convince the authorities for the same and some of the resources could also be shared. From the various feedbacks and assessment forms used in the study, it is evident that students have been encouraged to learn in a different way and have realized that such teaching-learning approach not only increases their knowledge, skills in the subjects but other aspects of learning like communication, leadership, presentation skills, group dynamics are learnt in the process. The tutors/faculty teaching the subjects also realized that mere monolog will not make the students understand the subject, and they will have to adopt adult learning methods. Another important contribution of the PBL was horizontal and vertical integration of subjects.

This study has given baseline information for initiating PBL in dentistry program in Nepal. The data of this study has given a proof to produce evidence to the management of our institute about the benefits of initiating this teaching methodology. In 2014, management had agreed to incorporate PBL as one of the teaching methods in dentistry and has also been incorporated in the newly revised curriculum. Students have now understood where the knowledge gained in basic dental subjects is going to be implemented in diagnosing and managing patients in future.

Other faculties in other disciplines in dentistry are also motivated to teach using PBL. The limitations of the study are that calibration of tutors was not conducted and actual knowledge and skills gained over a long period of time was not assessed.

## CONCLUSION

PBL has been implemented for the first time in dentistry in Nepal. It appears as a feasible methodology with regards to students and faculty. It is most beneficial to the students because they develop self-directed/lifelong learning skills. The faculty also benefits because their interaction with students

increase and integration of subjects provide them a different perspective to the same disease and management used by different departments.

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### Conflicts of interest

There are no conflicts of interest.

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