History of Problem Based Learning in Nepal and Experiences at Kathmandu Medical College

Pradhan B[1], Ranjit E[1], Ghimire MR[2], Dixit H[3]
[1]Lecturer, [2]Medical Officer, [3]Professor
Kathmandu Medical College Teaching Hospital

Abstract

Problem Based Learning has been practised in Nepal for 30 years with some additional inputs every ten years as another medical institution of Nepal adopted it. The institution to introduce it in Nepal was the Institute of Medicine but its practise there is more as familiarisation about a method of learning medicine and making a diagnosis. As from 2012 the utilisation of Problem Based Learning in the MBBS medical education field is expected to increase as the two deemed and two full universities in Nepal are using this method to varying degrees. There are firm advocates for utilising PBL in the medical colleges of Nepal. There are many who would like to stick to the traditional methods saying that PBL is not in extensive use. The fact is that the traditional form of medical education and the PBL method have their positive and negative points and is the source of much debate. We in Nepal have not gone the full stretch with PBL. What we are practising here is mostly the hybrid form.

Key words: BPKIHS, IoM, KMC, KUSMS, McMaster, PBL

History of Problem Based Learning (PBL) in the World

The origin of PBL is that it was introduced by Barrows in the McMaster University, Toronto, Canada in mid 1960s. The rationale for this strategy centered on the argument that, based on their research on clinical reasoning, it was more effective to teach medical students through solving problems than through the established traditional methods of medical education. PBL is now accepted as a process of acquiring new knowledge based on recognition of a need to learn.

The first PBL medical curriculum in North America was established at McMaster in 1969. The University of New Mexico was the first to adopt a medical PBL curriculum in the US and the Mercer University School of Medicine in Georgia was the first US medical school to employ PBL as its only curricular offering[1]. Now it is in use in many disciplines. It is used varyingly in many of the medical schools all over the world.

Address for correspondence
Dr. Binita Pradhan
Lecturer
Kathmandu Medical College and Teaching Hospital
Sinamangal, Kathmandu
E-mail: binita_pradhan02@yahoo.com

The medical schools of Glasgow, Liverpool and Manchester adopted it as early as 1990.

As of 2005, PBL as a method of learning was in use in the United Kingdom in nine out of fifty two medical schools[2]. Students at the Hull York Medical School (HYMS), where it is being implemented, feel that PBL facilitates the delivery of an integrated curriculum. Basic and clinical sciences can be learnt together and socio-economic aspects of health can also be considered in the light of their influence.

Neville[3] whilst doing a review of PBL in 2008 noted that since the PBL oriented curriculum was first pioneered in 1969, it had been fully or partly adopted by no less than sixty medical schools all over the world within the first twenty years. In conclusion he felt that "Proponents and detractors continue to dispute the merits of the cognitive foundation of a PBL approach, but, despite this, there is evidence that graduates of PBL curricula demonstrate equivalent or superior professional competencies compared with graduates of more traditional curricula." This same author quotes Norman who suggested that perhaps working in small groups helps PBL graduates to acquire better communication and interpersonal skills[4].

Introduction of PBL in Nepal

When the Institute of Medicine (IoM) started the very first medical degree course in 1978, the course was based on what was claimed as the innovative method of learning medicine. Dr. Melville Kerr, who had previously worked at McMaster and later at the Foothills Hospital, University of Calgary as Professor of Obstetrics and Gynaecology came to IoM in 1978 as a WHO Consultant to provide expertise in medical education. Starting the basic medical course at IoM had many teething troubles from what the degree awarded would be called, to its duration. Initially it was proposed to be awarded as Medical Science Diploma of General and Community Medicine (MSDDGCM), but ultimately came to be designated as MBBS. Though envisaged initially to be of four years, the six month addition was made to make it compatible with such degrees elsewhere. That the course itself was System Based, Integrated and Community Oriented was a novel introduction at that time. The novelty of the PBL component remained almost static for a number of years because the standard practice, which became a routine over the years, was to do two cases as a method of learning medicine in both the first and second years. The assessment was a written examination in which there was a common paper in which questions were asked from all the different subjects of the Basic Sciences. It required the student to be knowledgeable in all areas. The practical examination was however held separately for each subject.

Many years later the Paediatrics Post Graduate course at IoM was the first to introduce PBL methods in teaching learning activities. It is accepted elsewhere also as being a good method of education.

The next institution in Nepal to come forward for implementation of PBL was BP Koirala Institute of Health Sciences (BPKIHS) at Dharan. They had started with the traditional course in 1994 and supplemented it with PBL in 1998. The first and second year students at BPKIHS were given eight PBL sessions of six days duration each over the course of eighteen months. Feedback was obtained by way of a questionnaire. The students felt it was beneficial whilst the reaction of the faculty was that it was not as difficult to implement as feared[5]. Later there were twelve PBL themes, each of one week duration, organized during the course of the two years of phase one of the MBBS course. In addition, the cardiovascular system is completed with four PBL themes. In this, the Basic Science subjects are integrated around an organ-system and interfaced with clinical disciplines. It is estimated that 20-25% of the MBBS curriculum is covered by the PBL method[6]. The university is considering adoption of total PBL for the entire curriculum. Now they do fifteen themes and a list of this with the systems concerned is given in Table 1.

Table 1: Themes of PBL (KU)

Systems	Problems - Cases Of Different Systems
Respiratory S.	1. Asthma 2. Pulmonary TB 3. Occupational lung disease
CVS	1. Hypertension 2. Myocardial infarction 3. Congenital heart disease
Hepato-Biliary	1. Viral hepatitis 2. Obstructive jaundice 3. Cirrhosis of liver.
Endocrine	1. Diabetes mellitus
Blood	1. Thalassaemia 2.AIDS
Renal System	1. Chronic renal failure
Nervous System	1. Epilepsy 2.Meningitis
Musculo Skeletal	1. Poliomyelits
Special Senses	1. Cataract 2. Glaucoma

Presently there are, therefore, eighteen PBL cases which are done as exercises.

Subsequently in the development of medical education in Nepal came Kathmandu University School of Medical Sciences (KUSMS). Kathmandu Medical College (KMC) received temporary and permanent recognition from Kathmandu University (KU) in December 1997 and April 2004 respectively. When KU was initially given the guide lines for the MBBS course, it had in the initial stages a traditional type of course being conducted at all the affiliated colleges. (MBBS – Cur 1998). Later when the KUSMS came into being, the KU authorities instituted PBL method of teaching from the very start. Thus KU had two streams of instructions for the MBBS course. For its own stream at Dhulikhel it had at first the input of some non-medical experts from Harvard University in 2001. These expatriates were at KU for just two years. Then a new set of teachers took over. After this the programme was guided till 2008, by Prof. KY Sohn who had done his graduation and post graduation from McMaster University. Most of the local teachers involved in the teaching / learning (T/L) activities were medical and it was felt that they had better rapport with the students.

The reasons may be that;

a. Students who had depended on teachers as sources of information took to medical personnel more easily as this is what they aspire to become.
b. All students were resident at a campus with a hospital that was nearby and the centre of teaching learning activity.

c. Other programs such as of nursing, physiotherapy and laboratory technicians were going on concurrently.

Thus the programme continued on and most of the academic work was done by medical officers and lecturers with some input from senior faculty with Basic Sciences background. Though there was some hesitancy, affiliated colleges were told about and encouraged to start PBL. At a meeting with the principals of the affiliated colleges at KMC in 2003, the Dean briefed them about what was going on at KUSMS but told the assembled principals that they would, in the course of a few years have to decide on their courses of action about PBL. In the subsequent years, though the basic sciences curriculum was revised in 2006, the implementation of methods of teaching was separate at KUSMS and the affiliated colleges. It was only after the revision in 2011 that PBL introduction was taken more seriously at the affiliated colleges.

Patan Academy of Health Sciences (PAHS) started the implementation of PBL with almost a decade of preparation. It has now, just two batches each of sixty students in its course of five years duration. The number of students is therefore more manageable because of the smaller intake. A total of 33 cases are covered in the first year and 33 in the second year. All the few basic sciences and the clinical science teachers are involved.

Role of Nepal Medical Council

In 1990, with the influx of medical colleges in Nepal, the investors and would be starters of the same, requested the Nepal Medical Council (NMC) for the curriculum approved by it. As NMC at that time had no such document, it officially at an executive board meeting 'adopted' the one which was being taught at the IoM[6]. Later the NMC made a core curriculum for the MBBS course in Nepal.

It has been said that 'PBL is not just a learning method or tool but rather 'curriculum concept', encompassing scope and sequence, syllabus, course outline, learning materials, course of study and planned experiences"[2]. Consequently it is obligatory for NMC too, to see that it is properly implemented in Nepal.

As Kathmandu University had introduced PBL from the very start at KUSMS in Chaukot and Dhulikhel it has been presumed that they have become proficient in the implementation of it. After a few years however, some members of the Nepal Medical Council raised the issue that there could not be two sets of examinations for the Phase I and Phase II of the MBBS course of KU. To them it did not seem rational. The concept of having even just two streams was new to members of NMC. Their insistence was that assessment had to be the same for all the students appearing in the examinations for that particular course at any one time. After the passing of this dictum by the NMC, the KU had no option but to follow and implement it. The direction soon came to all the affiliated medical colleges from KU. So from the start of the academic session in August 2011 the affiliated colleges of KU were asked to implement PBL because of NMC's insistence to have it in place and functioning. With this major decision PBL usage in Nepal has increased enormously.

Whilst one must concede that the NMC guidelines are rather liberal in letting universities or their affiliated colleges to adapt the core curriculum to suit their situation, the fact remains that the NMC is using outdated traditional methods of inspection of counting 'heads and beds' rather than the rational accreditation methods. Though claimed to be as such, what is being practised is not accreditation or the proper assessment of a medical college. The NMC is supposed to see that what should have been taught – has it been taught? If we follow this objective we do not need so much in the way of senior faculty for an institution implementing PBL. Do they, the NMC inspect and assess KUSMS, PAHS and affiliated colleges with the same eyes that they do for the private colleges? It is not necessary to be too strict in following the guidelines laid down for faculty if one is being tutored in the method of Problem Based Learning. Medicals / non-medicals can be involved in the academic activities if they have been properly trained[7]. The more worrying fact is NMC has just one set of rules for traditional teaching of medicine and is applying the same for those doing it in PBL fashion.

PBL has gone through much transformation since it was first introduced by Barrows and Tamblyn in 1980 with the central structured philosophy of promoting student centered, multidisciplinary education and lifelong professional practice[8]. PBL is being implemented in varying degrees at various places. The reactions to it can be ardent, lukewarm or even cold.

PBL at KMC

Round about 2003/4 at a meeting of the medical colleges held at Kathmandu Medical College at Sinamangal, the Dean of KU told the gathered principals that they would have to decide in a few years as to which course they would follow. Following this meeting, those of us at KMC, whilst following a system wise, integrated community

oriented method decided to introduce some form of PBL during the course of the first two years in our college.

It was with the intention of introducing the PBL curriculum at our institution that KMC developed links with Linkoping University in Sweden. As a result of this, a number of our students and faculty have been travelling to and fro from Linkoping to Kathmandu since our agreement for mutual co-operation was signed in November 2006. The Medical Education Department of KMC, by conducting workshops also tried to make the younger faculty members aware of the Seven Steps of PBL which they would be responsible to make the students conscious about. Following this, at the end of January 2009 a workshop with the theme "Modern Trends in Medical Education" was organised at Kathmandu by KMC and KU with the support of all the existing medical colleges of Nepal. A paper by K. Swahnberg was on 'Tutorship: Redefining the teacher role' has been published in a monograph brought out on the occasion.

At that same workshop Wijma B dwelt on the concept of Freire that 'building knowledge is something which cannot be given from above, but grows from bottom up in groups where members share their experiences." This is said to be happening when a PBL curriculum is being implemented. The themes in the Linkoping PBL curriculum were said to be as given below[9].

Table 2: PBL Themes in the Linkoping curriculum

No	Themes & Systems	Duration
1	Life cycle – Endocrine – Reproduction-Neoplasia	16 weeks
2	Gastroenterology – Nutrition -Metabolism	11 weeks
3	Circulation – Respiration – Kidney - Erythrocyte	20 weeks
4	Immune system – Dermatology-Infectious Diseases	13 weeks
5	Neurology – Sense organs – Psychiatry - Locomotion	21 weeks
6	Disease mechanisms – Diagnostics - Treatment	10 weeks
7	Professional attitudes – Public Health	18 weeks

Note: Two to three themes per term.

It must be noted that this arrangement of PBL themes at School of Health Sciences at Linkoping was not for just the first two years but for the duration of the whole course. It would be difficult to duplicate here as there was total involvement of all faculty throughout the whole course.

What we introduced were just two themes - one in each of the first and second years. PBL was first introduced in KMC Basic Sciences curriculum in 2008 with the case of 'fever and cough" during the respiratory block. In 2009 the PBL block was repeated with a case of "fever with chills" during the CNS block and the learning objective were basic sciences learning needs on meningitis. In 2010, the programme was conducted with a case of "Genetic Disorder" during the Genetic block. In 2011 two cases of "Sugar in adults and children" was dealt with in the Endocrinology block. Student's response to these efforts on our part was very lukewarm in the sense that barely half the class attended as they were getting the regular lectures and the PBL exercise was just for change.

Teaching for the MBBS first year students through Problem-based Learning could be started only in the second semester as the curriculum for 2011 had undergone some major changes and the finalized copy of the syllabus was not received from Kathmandu University till the middle of the first semester. The PBL sessions were carried out in conjunction with lectures, the latter covering the portion of the syllabus not covered through PBL. Cases were assigned for the respiratory, haemopoietic and cardiovascular systems according to the assigned number of hours by the KU curriculum. Cases were chosen from an existing library with contributions from KU, KMC and IoM. Cases were edited for content to add data for diagnosis like ECG, X-rays, spirometry, laboratory reports, histological slides etc. The learning objectives were identified and matched with the revised KU curriculum to isolate the topics that were not covered through PBL and hence would be required to be covered through lectures. Each case was dealt with in three sessions followed by a concluding session. Self study sessions were allocated for each PBL case during the college hours as well. At the completion of each system, MCQs type of quiz was held to check for participation of students.

In order to acquaint the students for the PBL, an orientation session on PBL was provided to MBBS first year students before initiating PBL. The orientation introduced the concept of PBL to the students and attempted to prepare the students on how they need to organise for PBL.

All teaching faculty took part in the tutoring of PBL sessions. The senior professors were however not obligated to do PBL sessions and their participation was voluntary. Fifteen groups of 10 students went through PBL under a total of 15 tutors. There was active and dependable participation of PG students also. All tutors

either had previous experience of conducting PBL sessions or had participated in a workshop on PBL held at Basic Sciences, Duwakot at the beginning of the new academic session of 2011-12.

The assessment of the students at the end of the first year is still to take place. The query is whether the students are taking it more seriously as the matter covered in PBL is not taken in the class lectures. A worry of the teachers is that students will ignore some of the basic science subjects. This may be for some individual papers but will, certainly not apply to everyone. The general impression is that it will be difficult for anyone to fail.

The experience of the last six months has helped and guided us in the planning of the T /L activities of the second year. The cases for the second year and arrangements for the same are being worked out.

Presently we are in the process of building up library of PBL themes for use in the course. This is partly to ensure interest in the students. The numbers of PBL cases per system that we intend to use during the course of the duration of two years or four semesters that preclinical subjects are taught in Table 3.

Conclusion

The perceived advantages of PBL is that it supports four perceived goals as has been expressed by Barrows and Dwinnell and quoted by Ferretti SM *et al* [10]:

- fostering clinical thought processes i.e. problem solving skills
- enhancing acquisition, retention and use of knowledge
- encouraging self-directed learning
- motivating students to learn concepts instead of merely memorising facts

Some of the conclusion at an institution with 150 students per year was that students:

- must take full responsibility for their own level of understanding
- must direct their own learning with faculty providing only supportive infrastructure are helped to find relevant information by faculty who facilitate discussion but do not teach what to learn[11] .

Eshach & Bitterman quote Colliver as having reached the conclusion that there is no convincing evidence that PBL, despite the additional investments in time, money and manpower, improves the knowledge bases and clinical performances of medical students as perhaps might be expected. Other authorities (Norman & Schmidt) felt that students in medical schools, who are selected based on high standards, all have the approved prerequisite skills, regardless of the curriculum they are in, to succeed in their studies[12] .

The crux of the matter now is that many now realize that PBL means different things to different people. Even Barrrows felt that when it becomes more teacher centered than student cantered, then it is in fact problem solving. Another feeling expressed is regards the word 'problem'. To many, PBL is problem solving and they refer to it as case-based learning[13].

It may be noted that there is now no discrepancy in the MBBS course that is being conducted at KUSMS and at its affiliated colleges. Going over the development of medical education in Nepal one sees that all the institutions involved in medical education are doing a system wise, integrated community oriented programmes. As far as PBL is concerned the degree of it varies in the different institutions as listed below:

IoM: The initial core curriculum was based on what was being done at McMaster University and introduced in

Table 3: Semester wise distribution of PBL Themes

Year -1	System	Pbl no	Year -2	System	Pbl no
Semester One	Musculo Skeletal	2	Semester Three	Gastro Intestinal	3
Semester One	Genetics / Immune	3	Semester Three	Hepatobiliary	1
Semester One	Autonomic Nervous	1	Semester Three	Renal	3
Semester Two	Haemopoietic	2	Semester Four	Reproductive	2
Semester Two	Respiratory	3	Semester Four	Endocrine	3
Semester Two	Cardiovascular	3	Semester Four	Central Nervous S	4
			Semester Four	Special Senses	3
Total		**14**			**19**

N.B. Sem:- Semester.

1980s. It envisaged integrated teaching. Though initially two cases of PBL were discussed for each of the two years of MBBS this figure was reduced to one case per year over the course of one week.

At IoM Affiliated Colleges: At KIST the curriculum followed is of TU and so the current practice is to have one PBL problem per year discussed over the course of one week.

BPKIHS: The MBBS curriculum is integrated and incorporates the organ system and need based approach. It is community oriented and partially problem based[6]. Twelve PBL themes over two years covering about 20-25% percent of the course in this fashion[3]. The PBL practise starts with a trigger on the first day followed by a specific resource session related to the PBL and discussions on second day. The pattern of tutorial and resource session follows to end with a final presentation by students and end of topic on the sixth day. In another study the students found PBL to be enjoyable, facilitated integration, helped in both self-directed learning and problem solving skills[14].

At KUSMS: The KU MBBS (Part I) of March 2002 emphasises the teaching of Basic Sciences in a system wise and integrated fashion. By now it is established that the KU MBBS curriculum is as per the SPICES model:

- Student centered rather than teacher centered
- Problem-based rather than information gathering
- Integrated rather than discipline based
- Community based rather than hospital based
- Elective oriented rather than standard programme oriented
- System based rather than apprentice based.

Number of PBL cases was 3/4 per system block. Each case was given three sessions of two hours and two hours for preparation. The time factor was overall twelve hours per case. The overall pattern is over the duration of sixteen weeks per semester which is 7+2+7 and 4+6+6 in the first year. In the second year it is 6+2+4+4 in the third semester and is 7 + 9 in the fourth. The detail is as shown in Table 4.

It is estimated that at an average of twelve hours per case it amounts to a total of 490 hours which is estimated to be about 25% of actual learning time.

KU at Affiliated Colleges: At Manipal College of Medical Sciences (MCOMS) the students expressed that a combination of didactic lectures and PBL sessions was helpful to the students[15].

PAHS: Here the course duration is not only longer by six months but they also use the method to teach the whole curriculum. They call it 'Case based learning'. To get to this point they have had regular input with some faculty from outside the country, that from Calgary being just one of those involved[16]. However there is more involvement of clinical faculty than non medicals.

One of the difficulties in the implementation of PBL is that it takes the involvement of a large number of faculty members and can be quite costly. To get over this difficulty some institutions have done some research. The study compared "achievement of content knowledge and student satisfaction in tutor less and physician facilitated small groups in a 2nd year medical school course, and found no significant difference in these two groups." It was also found that students in groups with tutors worked longer than those without tutors[17].

Table 4: Semester wise distribution of PBL themes at KU.

YEAR - 1	SYSTEM	PBL No.	YEAR - 2	SYSTEM	PBL No
Semester - One	Basic Concepts	3 cases	Semester -Three	Gastro-intest	3 cases
Semester - One	Aut. Ner. Sys	1 case	Semester -Three	Hepatobiliary	1 case
Semester - One	Mus.Skl.+ Int	4 + 1 cases	Semester -Three	Renal & Elec	3 cases
			Semester -Three	Meta. & Endo	3 cases
Semester - Two	Haemopoietic	3 cases			
Semester - Two	Respiratory	4 cases	Semester -Four	Repro. + Breast	4 cases
Semester - Two	Cardiovascular	4 cases	Semester -Four	CNS +Sp.senses	5 cases
Total No.		**19 cases**			**19 cases**

It may be said that we at KMC are having a hybrid type of programme that includes lectures which have not or cannot be dealt with in the PBL case themes. This is obvious that whilst an institution like PAHS has a total of 33 + 33 cases over the course of two years, others have much less. IoM has, as has been already stated barely 1 + 1 PBL case themes over the course of its two years during the time the students are doing basic sciences. This has been the finding at the Aga Khan University, in Karachi and the author feels that a hybrid type of programme may be suitable in 3rd World context[18]. Another finding of the same paper in developing countries the demand seems to be for medical personnel, preferably faculty to act as facilitators or tutors.

Our feeling at KMC is that our non-medical faculty with the support of clinicians has on the whole been doing a good job in the introduction of PBL as the method for medical education at our institution. We are fortunate and the reason may be that our faculty had had some exposure to PBL though in a very meagre fashion. The workshops we had with faculty from School of Health Sciences, Linkoping University, Sweden has helped too. Our experiences in the implementation of PBL seriously during the course of the last academic year have made us aware of the great effort that will have to be made. The realization grows that faculty must be well exposed and prepared for the proper implementation of PBL. What changes will we effect for next year? BPKIHS and Patan Academy of Health Sciences have been active in this regard in Nepal[7]. The Aga Khan University in Pakistan is an institution that has been an active proponent too[19]. However as the saying goes, something is better than nothing. As the examinations of the first year are yet to take place we feel that our academic guidance is in the right path. WE are not however confident as to whether our faculty has been able to do a good job.

Acknowledgements

We, the authors would like to thank the under-mentioned who answered many questions regarding the practice of PBL at their individual institutions:

Dr. Shambhu Upadhaya	Patan Academy of Health Sciences
Dr. Bharat Mani Pokheral	Institute of Medicine
Dr. Tirlok Pati Thapa	KIST Medical College
Dr. D.I. Mansur	KU School of Medical Sciences
Dr. Nirmal Baral	BP Koirala Institute of Health Sciences

In addition we would like to thank also Dr. Sunil Kumar Joshi, Dr. Abhinav Vaidya, Dr. Pushpa Raj Sharma, Dr. Ramesh Adhikari, Dr. Keshav Paudel, Dr. Smrity Mool and Dr. Archana Shakya for their help in supplying information on PBL activities in different institutions in Nepal.

References

1. Donner RS, Bickley H. Problem-based learning in American medical education: an overview. Bull Med Libr Assoc. 1993;81(3):294-8.
2. Problem-based learning at HYMS- A Guide for Students by Students. 2004-2005.
3. Neville AJ. Problem-based learning and medical education forty years on. Med Princ Pract. 2009;18:1-9.
4. Norman G. Problem-based learning makes a difference. But why? CMAJ. 2008;178:61-2.
5. Bhattacharya N. Student' perception of problem-based learning at the BP Koirala Institute of Health Sciences. Nepal. Medical Education. 1998;32:407-10.
6. Dixit H, Sharma SC. The MBBS Programme in Nepal. J Nepal Med Assoc. 2002;41:341-58.
7. Baral N, Paudel BH, Das BKL et al. Preparing tutors for problem based learning: An experience from BP Koirala Institute of Health Sciences, Nepal. Kath Univ Med J. 2010;8(1):141-5.
8. Savery JR. Overview of Problem-based Learning: Definitions and Distinctions. Interdisciplinary J Problem-based Learning. 2006;1:9-20.
9. Wijma B. Interwoven themes and strands: Guiding student learning in a problem based learning curriculum. In: Dixit H, Joshi SK, editors. Modern trends in medical education. Kathmandu: Kathmandu Medical College; 2009.
10. Ferritti SM, Wayne AK, Lawrence LG, Curry JJ. Lake Erie College of Osteopathic Medicine's Preclinical Problem-Based Learning Pathway Program: An Alternative Medical School Curriculum Design. JAOA. 107(10):443-9.
11. Alben JO, Krueger WA, Berezniak R, et al. Problem Based Learning: A Mould for Excellence in Medical Education. LECAM / Bradenton.
12. Haim Eshach, Haim Bitterman. From Case-based Reasoning to Problem-based Learning. Academic Medicine. 2003;78(5),491-6.
13. Butler R, Inman D, Lobb D. Problem-based learning and the medical school: another case of the emperor's new clothes?
14. Chapagain M. Introducing problem based learning into an organ system programme. Medical Teacher. 1998;20(6):587-9.

15. Ghosh S, Dawka V. Combination of didactic lecture with problem-based learning sessions in physiology teaching in a developing college in Nepal. Advan Physiol Edu. 2000;24:8-12.
16. Jane in Nepal: Contrasting PBL Tutor Training at PAHS (Nepal) and at the IMP (Canada). Blog.
17. Clark LC, Eddy WS, Stone SM, et al. Tutor less PBL groups in a medical school. Academic Exchange Quarterly. Winter 2006.
18. Zaman. Problem Based Learning in the 3rd World Context. JPMA. 2001Aug.
19. Ravi Shankar P, Malhotra V. Small group facilitation skills in problem-based learning. South East Asian J Med Edu. 4(2):18-22.