original article

Medical students' preference of problem-based learning or traditional lectures in King Abdulaziz University, Jeddah, Saudi Arabia

Nahla Khamis Ibrahim,[ab] Shorooq Banjar,[c] Amal Al-Ghamdi,[c] Moroj Al-Darmasi,[c] Abeer Khoja,[c] Jamela Turkistani,[c] Rwan Arif,[c] Awatif Al-Sebyani,[c] Al-anoud Musawa,[c] Wijdan Basfar[c]

From the [a]Department of the Family and Community Medicine, King Abdulaziz University, Jeddah, Saudi Arabia; [b]Department of Epidemiology, High Institute of Public Health, Alexandria University, Alexandria, Egypt; [c]Intern at King Abdulaziz University, Jeddah, Saudi Arabia

Correspondence: Prof. Nahla Khamis Ibrahim · Department of the Family and Community Medicine, King Abdulaziz University, Jeddah 21551, Saudi Arabia · T: +966501632237 F+966226893248 · nahlakhamis@yahoo.com

Ann Saudi Med 2014; 32(4):128-133

DOI: 10.5144/0256-4947.2014.128

BACKGROUND AND OBJECTIVES: Problem-based learning (PBL) is the most important educational innovations in the past 4 decades. The objective of the study was to compare between the preference of medical students for PBL and the preference for traditional lectures regarding learning outcomes (e.g., knowledge, attitude, and skills) gained from both methods.

DESIGN AND SETTINGS: A cross-sectional study was conducted among medical students who studied the hybrid curriculum (PBL and traditional lectures) in King Abdulaziz University, Jeddah, in 2011.

METHODS: Data was collected through a pre-constructed, validated, confidentially anonymous, and self-administered questionnaire. Students' perceptions toward PBL and traditional lectures were assessed through their response to 20 statements inquired about both methods of learning using a five-point Likert scale. Descriptive and analytic statistics were performed using SPSS, version 21 (SPSS Inc, Chicago, Ill., USA).

RESULTS: Learners preferred PBL more to traditional lectures for better linking the knowledge of basic and clinical sciences (*t* test=10.15, *P*<.001). However, no statistical significant difference (*P*>.05) was observed regarding the amount of basic knowledge recalled from both methods. Students preferred PBL more to lectures for better learning attitudes, skills, future outcomes, and learning satisfaction (*P*<.05). PBL motivates students to learn better than lecturing (*P*<.05). From students' opinion, the mean total skill gained from PBL (47.2 [10.6]) was much higher than that of lectures (33.0 [9.9]), and a highly statistical significant difference was observed (*t* test=20.9, *P*<.001).

CONCLUSION: Students preferred PBL more to traditional lectures for improving most of learning outcome domains, especially, learning attitudes and skills. Introducing hybrid–PBL curriculum in all Saudi universities is highly recommended.

Knowledge explosion has been accompanied by decreasing reliance on didactic lecturing because the focus of education has been shifted from teaching to learning. This educational paradigm shift has led to extensive embracement of problem-based learning (PBL).[1] PBL is a professional educational approach that is based on researches done on "how a learner most effectively learns."[2] PBL is a student-centered educational approach[3-5] that stimulates students to explore, inquire, clarify, analyze, debate, discuss, and manage information. This is done through a suitable scenario that triggers students' thinking and curiosity, and consequently improves their learning capacity.[6]

The core idea of PBL is to challenge students and to activate their contextual learning during their professional life.[7,8] PBL provides constructive learning in which learners construct their own meaning, and students are not passive receptacles.[9] Educators have made the correct choice in applying PBL as a pedagogical practice, yet the need to base implementation on constructivism is obligatory if the aim is a better preparation of graduates for practice.[10]

PBL can also promote many skills such as clinical reasoning, problem-solving, and life-long learning.[1] A

study conducted among the second-year undergraduate medical students in China found that students were more satisfied with hybrid–PBL curriculum than with traditional lecturing.[11]

In response to the growing concerns about the conventional methods of medical education, some of the medical schools in Saudi Arabia have reformed to hybrid-PBL curricula.[12] In 2007, the Faculty of Medicine, King Abdulaziz University Hospital (KAUH), Jeddah, launched a hybrid system-based curriculum. It seeks to conform with the prescriptions for curriculum innovation as outlined in Tomorrow's Doctors, as mandated by the UK General Medical Council.[13]

A study was conducted on medical students from the following 2 colleages in Riyadh: (1) King Saud bin Abdulaziz University for Health Sciences (KSAU-HS), which implemented a hybrid- PBL program and (2) King Saud University (KSU) with the traditional lecturing method. Results revealed that students studied hybrid–PBL curriculum in KSAU-HS had higher perceptions in learning and academic self-perception compared to students from KSU.[14]

Understanding students' perceptions of both learning methods can be helpful for evaluating their strengths and weaknesses.[14] Research that assesses the impact of PBL on learners' problem-solving and communication skills, self-direction, and motivation is vital.[10] Furthermore, evaluating the effect of learning methods require more efforts for ensuring that students are gaining the highest benefits from their learning.[7] There are many unanswered or partially answered questions regarding the benefits of PBL compared to traditional lectures.[15] Limited numbers of epidemiological studies were conducted for evaluating medical students' preference of PBL or traditional lectures after the introduction of the new hybrid–PBL curriculum in Jeddah, thus emphasizing the need for such studies.

The objective of the study was to compare between the preference of medical students for PBL and the preference for traditional lectures regarding learning outcomes (e.g., knowledge, attitude, and skills) gained from both methods.

METHODS

A cross-sectional study was carried out at the Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia. It was conducted during the elective module of the fourth-year medical students during the year 2011. The target population was all medical students who studied the hybrid–PBL curriculum (third, fourth, and fifth year).

Ethical statement

The study was approved by the Institutional Review Board of the Faculty of Medicine, KAUH, and it conformed to the ethical standards of the Helsinki declaration. During field work, the team followed the ethical consideration of confidentiality and freedom of participation. The objectives of the research were discussed for each participant separately, and upon acceptance, a signed consent was taken from each one. In addition, all administrative approvals were taken.

A multi-stage, stratified, random sample method was set up. Stratification was done on the basis of gender and the educational year. The sample was estimated using the following equation:[16]

n: the minimum sample size, Z=constant (1.96),

p: is the "proportion or prevalence that meets our criteria." As we do not know the previous proportion "p" from previous studies, so it was set at 0.5 (the most conservative estimate that leads to the largest "n").

q=1- p=0.5

The minimum calculated sample size to achieve a precision of ±5% with a 95% confidence interval was 384. For stratification purposes, the sample was exceeded to reach 460 during field work.

Data collection was done through pre-structured, validated, confidentially anonymous, self-administered questionnaire. Estimation of internal reliability was made through calculating Cranach coefficient.

The questionnaire collected:

- Personal and sociodemographic information: age, sex, etc.
- Students' perception toward PBL and traditional lectures: Students' perceptions were assessed through their reponse to 20 statements inquired about both methods of learning using a "five-point Likert scale," a scale of "1" indicating strong disagreement and of "5" indicating strong agreement.

These statements inquired about PBL and traditional lectures regarding:

1. Knowledge gained (4 items): Learning method that helps in recalling basic knowledge, providing large quantity of information within a shorter time, linking knowledge of basic and clinical sciences, etc.
2. Attitude (6 items): Students' feelings toward both methods regarding constructive learning, motivation, learning in a shorter time, etc.
3. Skills gained (8 items): Skills provided from both methods as critical thinking, effective communication, team building, searching skills, lifelong learning skills, etc.

4. Future outcome (1 items): A statement inquired about students' prefernce of either method regarding expectation of their future outcome (through studying by each method).
5. Satisfaction (1 items): A statement inquired about students' prefernce of either method acccording to their learning satisfcation.

Statistical analysis

The data was coded and entered into statistical computer program (SPSS Inc, version 21.0; Chicago, Ill., USA). A total score was calculated for each of knowledge, attitude, academic performance, skills, and satisfaction for both PBL and traditional lectures. Descriptive and analytical statistics were carried; t test was used for comparing 2 means; $P<.05$ was considered statistically significance.

RESULTS

A total of 460 medical students enrolled in the study. Their age ranged from 18-23 with a mean of 21.1 (1.4) years. The majority of students were Saudi (93.7%) and single (96.3%). The male-to-female ratio was almost 1: 1. The sample included 36.7%, 39.3%, and 23.9% students from the third, fourth, and fifth year, respectively. The majority of participants had sufficient and exceeding family income. The fathers (71.3%) and mothers (56.5%) of most of the students had a university degree or above.

Table 1 illustrates the students' perceptions of knowledge gained by PBL and traditional lectures. No statistical significant difference was observed between both methods regarding the amount of recalled knowledge or provision of a large quantity of information within a shorter time ($P>.05$). However, students preferred PBL (mean score = 4.04 [1.13]) to traditional lectures (score=3.29 [1.11]) for a better linkage between knowledge of basic and clinical sciences. A highly statistical significant difference (t test =10.15, $P<.001$) was observed.

Table 2 portrays medical students' perceptions of both learning methods regarding learning attitudes. PBL improves attitude to learning. Students preferred PBL for gaining more motivation to learn, constructive learning, and helping them to discuss information in a professional way. Highly statistical significant differences were present between students' opinion of both methods ($P<.001$).

Table 3 shows that students preferred PBL more to traditional lectures for providing better learning skills, with the presence of highly statistical significant differences ($P<.001$). These skills are critical thinking, team building, effective communication, self-directed learning, self-assessment, ability to cope with changes, etc. The mean total skill gained from PBL (47.2 [10.6]) was much higher than that from traditional lectures (33.0 [9.9]), with the presence of a high statistical significant difference (t test=20.93, $P<.001$).

Table 3 also demonstrates that students were more satisfied with PBL than with traditional lectures

Table 1. Comparison between medical students' perception of knowledge gained from both problem-based learning and traditional lecture.

Students' attitude	Type	Mean score	SD	t-test	P
Method helps in recalling basic knowledge	PBL	3.75	1.14	1.60	.111
	Lectures	3.87	1.04		
Method provides better linkage between knowledge of basic and clinical sciences	PBL	4.04	1.13	10.15	.000[a]
	Lectures	3.29	1.11		
Method provides intact content needed from learning	PBL	3.49	1.11	0.232	.817
	Lectures	3.51	1.16		
Method provides a large quantity of information within a shorter time	PBL	3.45	1.33	0.673	.501
	Lectures	3.51	1.31		

PBL: Problem-based learning.

Table 2. Comparison between medical students' perception of problem-based learning and traditional lectures regarding attitudes toward learning.

Attitude	Type	Mean score	SD	*t* test	*P*
I feel that I am more comfortable in learning with this method	PBL	3.47	1.340	0.704	.482
	Lectures	3.53	1.282		
I feel that I learn in a shorter time	PBL	3.63	1.340	4.589	<.001
	Lectures	3.53	1.282		
I feel that I learn better in this method	PBL	3.72	1.280	4.808	<.001
	Lectures	3.32	1.215		
I feel that this method motivates me to learn	PBL	3.85	1.249	10.859	<.001
	Lectures	2.98	1.179		
I feel that this method is more constructive to me	PBL	3.65	1.89	5.710	<.001
	Lectures	3.22	1.083		
I feel that this method makes me to discuss information in a professional way	PBL	3.99	1.152	14.907	<.001
	Lectures	2.82	1.227		

PBL: Problem-based learning.

(P<.001). A higher mean score was given for PBL compared to traditional lectures for providing better future learning outcome, with a highly statistical significant difference (P<.001).

DISCUSSION

Medical education is currently undergoing innovative evidence-based reform, which includes increased reliance on student-centered approaches as PBL.[17] Walsh stated that PBL is based on the slovenly, complex problems encountered in the real world as a stimulus for learning.[18] Results of the present study showed that there is no statistical significant difference in the amount of knowledge recalled by PBL or traditional lectures. This finding is in line with the results from Netherlands,[19] meta-analysis review,[20] and Indiana University School of Dentistry, USA.[21]

However, students in the present study preferred PBL to traditional lectures, as it improves the information link of basic and clinical sciences. This agrees with the results from the Indiana study.[21]

Regarding attitudes, the current study found a statistically significant difference between the preference of PBL and traditional lectures, with PBL received more positive learning attitudes than lectures. Similar results reported by Cowan, et al[22] from a study conducted in Riyadh. The majority (60%) of their students felt that the student-centered approach enhanced their learning. Meanwhile, Gregson et al[23] assessed the students' perceptions of PBL in studying pharmacology. They found that students had a better understanding and more confidence in the knowledge they gained from PBL. Another study conducted in Nigeria revealed that the interest of medical students in didactic lectures is declining.[17] Furthermore, a randomized clinical trial was done among 40 Iranian nursing students; 20 students enrolled in PBL group, and 20 enrolled in a traditional lecture group. The results showed a statistical significant difference in the level of learning attitude, with a more positive learning attitude among students in the PBL group.[24]

Regarding future learning outcomes, the current study showed that students gave significantly better scores for PBL than for traditional lectures (P<.05). Curtis et al[25] also found that the application of PBL clerkship was associated with higher scores in the National Board of Medical Examiners.

Students in the current study preferred skills gained

Table 3. Comparison between medical students' perception of skills, satisfaction, and outcome gained from problem-based learning and traditional lecture

Skills	Type	Mean score	SD	t test	P
Critical thinking	PBL	4.13	1.42	14.68	<.001
	Lectures	2.86	1.19		
Team building	PBL	4.04	1.17	21.89	<.001
	Lectures	2.38	1.13		
Effective communication	PBL	4.12	1.10	23.07	<.001
	Lectures	2.41	1.13		
Self-directed learning	PBL	4.10	1.11	17.97	<.001
	Lectures	2.68	1.27		
Self-assessment	PBL	3.82	1.18	14.66	<.001
	Lectures	2.67	1.18		
Problem solving	PBL	4.03	1.10	19.60	<.001
	Lectures	2.57	1.17		
Coping with change	PBL	3.84	1.11	14.78	<.001
	Lectures	2.75	1.12		
Life-long learning	PBL	3.81	1.20	9.38	<.001
	Lectures	3.05	1.25		
Total skills score	PBL	47.22	10.65	20.93	<.001
	Lectures	33.0	9.94		
Satisfaction with PBL	PBL	3.70	1.25	4.94	<.001
	Lectures	3.30	1.24		
Provides better learning outcome for my future	PBL	3.77	1.23	5.24	<.001
	Lecture	3.33	1.27		

PBL: Problem-based learning.

from PBL to traditional lectures. From their opinion, PBL provides them with better critical thinking, reasoning, team building, communication, self-directed learning, and summarization skills than do traditional lectures. Highly statistical significant differences ($P<.001$) were present. These results agree with the results of Schmidt et al[26] who reported that the Dutch students graduated from schools implemented PBL curriculum rated themselves as having much better interpersonal competencies and skills than other graduates. They rated themselves as having better problem-solving, self-directed learning, information-gathering, and task-supporting skills compared to other graduates.[26,27] These results also agree with the results of another study performed in Hong Kong.[28] However, results from the Iranian study,[24] which used dimensions of California Critical Thinking Disposition Inventory, revealed a diverse and often contradictory result about critical thinking dispositions of nursing students in Asian and non-Asian countries.

Finally, the present study showed that students are more satisfied with PBL than with traditional lectures. This result is consistent with the results of another Saudi study performed for comparing PBL curriculum at the Al-Qaseem campus with traditional teaching curriculum at the Riyadh campus. Results showed that

75% of students from the PBL campus were satisfied with their curriculum compared to 20% of students from the traditional-based campus.[29] Chang et al[30] conducted another study on medical students using hybrid curriculum for studying anesthesia, and they found that most of the students preferred PBL to the lecture-based traditional teaching.

In conclusion, PBL as an approach to instruction has attracted more medical students in the current study. Students preferred PBL to lectures for better linking knowledge of basic and clinical sciences. However, no significant difference ($P>.05$) was observed between knowledge gained by both methods, according to the opinion of students.

Medical students preferred PBL to traditional lectures for improving most of the learning outcome domains. From the medical students' opinion, PBL provides them with better attitude to learning, better learning skills, more satisfaction, and better future outcome as future physicians. The faculty of medicine needs to provide more integration between PBL and traditional lectures, with an increase amount of PBL for improving different learning domains, especially attitude, skills, and learning outcome. The study recommended introduction of PBL in all faculties and schools of Jeddah and Saudi Arabia for better skills and learning outcome. Conduction of more researches is required among medical graduates who studied the hybrid PBL curriculum to evaluate the skills and outcomes gained and to determine how well they prepared for practice after graduation.

There is no competing interest.

Acknowledgment

The authors would like to thank all administrators who facilitated conduction of the study. Special thanks to all students who participated and helped in completing the study.

REFERENCES

1. Epstein RJ. Learning from the problems of problem-based learning. BMC Med Educ 2004 Jan;4: 1.
2. Azer SA. Problem-based learning. A critical review of its educational objectives and the rationale for its use. Saudi Med J 2001 Apr;22(4): 299-305.
3. Allareddy V, Havens AM, Howell TH, Karimbux NY. Evaluation of a new assessment tool in problem-based learning tutorials in dental education. J Dent Educ. United States; 2011. p. 665-71.
4. Samarakoon L, Fernando T, Rodrigo C. Learning styles and approaches to learning among medical undergraduates and postgraduates. BMC Med Educ 2013;13: 42.
5. Luh SP, Yu MN, Lin YR, Chou MJ, Chou MC, Chen JY. A study on the personal traits and knowledge base of Taiwanese medical students following problem-based learning instructions. Ann Acad Med Singapore 2007 Sep;36(9): 743-50.
6. Groves M, Rego P, O'Rourke P. Tutoring in problem-based learning medical curricula: the influence of tutor background and style on effectiveness. BMC Med Educ 2005;5(1): 20.
7. Shamsan B, Syed AT. Evaluation of problem based learning course at college of medicine, qassim university, saudi arabia. Int J Health Sci (Qassim) 2009 Jul;3(2): 249-58.
8. Gurpinar E, Musal B, Aksakoglu G, Ucku R. Comparison of knowledge scores of medical students in problem-based learning and traditional curriculum on public health topics. BMC Med Educ. England; 2005. p. 7.
9. Cooperstein SE, Kocevar-Weidinger E. Beyond active learning: a constructivist approach to learning. Reference Services Review 2004;32(2): 141-8.
10. Kantar L. Incorporation of constructivist assumptions into problem-based instruction: A literature review. Nurse Educ Pract 2013; S1471-5953(13).
11. Lian J, He F. Improved performance of students instructed in a hybrid PBL format. Biochem Mol Biol Educ 2013 2013 Jan-Feb;41(1): 5-10.
12. Khalid BA. The current status of medical education in the Gulf Cooperation Council countries. Ann Saudi Med 2008 Mar-Apr;28(2): 83-8.
13. Al Shawwa LA. The establishment and roles of the Medical Education Department in the faculty of Medicine, King Abdul Aziz University, Jeddah Saudi Arabia. Oman Med J 2012 Jan;27(1): 4-9.
14. Zawawi AH, Elzubeir M. Using DREEM to compare graduating students' perceptions of learning environments at medical schools adopting contrasting educational strategies. Med Teach 2012;34 Suppl 1: S25-31.
15. Neville AJ. Problem-based learning and medical education forty years on. A review of its effects on knowledge and clinical performance. Med Princ Pract 2009;18(1): 1-9.
16. Wang J. Clinical Epidemiology. Second ed; 2001.
17. Anyaehie US, Nwobodo E, Oze G, et al. Medical students' evaluation of physiology learning environments in two Nigerian medical schools. Adv Physiol Educ 2011 Jun;35(2): 146-8.
18. Walsh K. Learning styles: do they really exist? Med Educ. England; 2007: 618-20.
19. Prince KJ, van Mameren H, Hylkema N, Drukker J, Scherpbier AJ, van der Vleuten CP. Does problem-based learning lead to deficiencies in basic science knowledge? An empirical case on anatomy. Med Educ 2003 Jan;37(1): 15-21.
20. Albanese MA, Mitchell S. Problem-based learning: a review of literature on its outcomes and implementation issues. Acad Med 1993 Jan;68(1): 52-81.
21. Callis AN, McCann AL, Schneiderman ED, Babler WJ, Lacy ES, Hale DS. Application of basic science to clinical problems: traditional vs. hybrid problem-based learning. J Dent Educ. United States; 2010. p. 1113-24.
22. Cowan M, Arain NN, Assale TS, Assi AH, Albar RA, Ganguly PK. Student-centered integrated anatomy resource sessions at Alfaisal University. Anat Sci Educ 2010 Sep-Oct;3(5): 272-5.
23. Gregson K, Romito LM, Garetto LP. Students' attitudes toward integrating problem-based learning into a D.D.S. pharmacology curriculum. J Dent Educ 2010 May;74(5): 489-98.
24. Dehkordi AH, Heydarnejad MS. The impact of problem-based learning and lecturing on the behavior and attitudes of Iranian nursing students. A randomised controlled trial. Dan Med Bull 2008 Nov;55(4): 224-6.
25. Curtis JA, Indyk D, Taylor B. Successful use of problem-based learning in a third-year pediatric clerkship. Ambul Pediatr 2001 May-Jun;1(3): 132-5.
26. Schmidt HG, Vermeulen L, van der Molen HT. Longterm effects of problem-based learning: a comparison of competencies acquired by graduates of a problem-based and a conventional medical school. Med Educ 2006 Jun;40(6): 562-7.
27. Azer SA. Medical education at the crossroads: which way forward? Ann Saudi Med 2007 2007 May-Jun;27(3): 153-7.
28. Wun YT, Tse EY, Lam TP, Lam CL. PBL curriculum improves medical students' participation in small-group tutorials. Med Teach 2007 Sep;29(6): e198-203.
29. Al-Damegh SA, Baig LA. Comparison of an integrated problem-based learning curriculum with the traditional discipline-based curriculum in KSA. J Coll Physicians Surg Pak 2005 Oct;15(10): 605-8.
30. Chang CH, Yang CY, See LC, Lui PW. High satisfaction with problem-based learning for anesthesia. Chang Gung Med J. China Republic: 1949-; 2004. p. 654-62.