Medical Student's Feedback towards Problem Based Learning and Interactive Lectures as a Teaching and Learning Method in an Outcome-Based Curriculum

Mohammad Rehan Asad*, Naser Tadvi, Khwaja Mohammad Amir, Kamran Afzal, Abdul Irfan and Sajid Altaf Hussain

Department of Basic Medical Science, College of Medicine, Majmaah University, Al Majmaah, 11952, Kingdom of Saudi Arabia

*Corresponding e-mail: mr.asad@mu.edu.sa

ABSTRACT

Objective: *To explore the medical student's opinion about the effectiveness of problem-based learning and interactive lectures as a teaching and learning method.* ***Method:*** *The cross-sectional study was conducted at the College of Medicine, Majmaah University from April 2016 to June 2016.* ***Results:*** *Total 120 undergraduate medical students were enrolled in this study; out of these 97 students filled the questionnaire form for an interactive lecture and 112 completed the questionnaire form for PBL based learning. The response rate for interactive lectures was 80% and PBL was 93%. The comparison of the responses between the groups was done using independent samples Mann-Whitney U-test. Among the questions of VARK learning styles, the significance was found in PBL as a tool for auditory learning and reading and writing skills over interactive lectures.* ***Conclusion:*** *The study showed a preference of students towards PBL over interactive lectures in a system based hybrid curriculum where both of them used an instructional approach. The merit of the interactive lecture cannot be underrated in the system based integrated as evident from the previously conducted educational research. Based on the findings, there is a need to revisit the process of interactive lecture in our study settings. Exploration is required for the alignment of the assessment tools with the learning outcomes of the PBL.*

Keywords: Medical students, Problem based learning, Interactive lectures, Teaching and learning methods

INTRODUCTION

In the last few decades, medical education has shifted from didactic teacher-centric approaches to interactive student-centered learning [1]. The outcome-based model of education focuses on the specific measurable learning outcomes that students will attain by the end of the program [2]. The learning environment and learning approaches play a significant role in achieving students learning outcomes [3]. The traditional subject-based curricula shifted towards an integrated system based approach that facilitates the construction of knowledge in a more contextual manner by connecting clinical disciplines with basic medical science subjects [4]. Problem-based learning was introduced at McMasters Canada in 1960s; a small group learning method that underpins the socio-constructivist learning theory that came up as one of the commonly applied student-centered learning method [5]. In problem-based learning, the scenario is used as a trigger and problems are used to enhance the knowledge and build the concepts while solving it in a group [6]. Problem-based learning can be used as curriculum design or as an instructional method in a system based integrated modules where the basic medical science objectives were integrated with clinical objectives [7]. Studies showed that working in groups during PBL sessions provide a conducive learning environment by promoting self-directed learning and boosting the motivation of students [8]. In the integrated model of curriculum, the varieties of instructional methods were identified from lectures to PBL for achieving specific learning outcomes [6].

Though the lectures have limitations such as passivity, boredom, large group size but still it forms a substantial part of the instructional method in the early years of the medical program [9]. Usage of illustrations and videos, effective questioning, creating a small activity within the lecture and summarizing at the end are some of the techniques that can engage learners in a more active manner [10]. The College of Medicine, Majmaah University was started in 2010.

An integrated outcome-based curriculum was designed in which phase II of the programme is divided into system based modules. A mix of instructional methods was used in achieving learning outcomes. The lectures rooms were equipped with smart boards, Wi-Fi internet access, and speakers that facilitate tutors to make their lectures interactive. The specific learning outcomes of the topic were provided to students in the form of a module guide at the start of the course. Studies conducted from medical schools of Saudi Arabia showed good satisfaction of the students towards problem based learning as an instructional method [11,12]. A study was also conducted to explore the student's perceptions towards interactive lecture in the same study setting [13]. Majority of the medical schools in Saudi Arabia are following integrated outcome-based curriculum where the interactive lectures and PBL carries significance as one of the main instructional methods [14]. The studies comparing stakeholder perspectives regarding "interactive lectures" versus "problem-based learning" are limited in Saudi Arabia especially in an outcome-based integrated curriculum. Hence this comparative study was planned as students were one of the main stakeholders of the teaching and learning process.

MATERIALS AND METHODS

The cross-sectional study was conducted at the College of Medicine, Majmaah University from April 2016 to June 2016. The male students from 2nd, 3rd and 4th year participated in the study. By using complete enumeration technique all the students were included in the study. The questionnaire was constructed after a detailed literature review by using the web-based search engines such as Pubmed, and Google Scholar. The keywords "PBL instructional method", "interactive lectures instructional method" and "medical student's feedback towards instructional methods" were used to search the literature.

A 22 items questionnaire was constructed both for PBL and interactive lectures. Broadly the item includes the questions items coverings facilitation of learning modes (visual, auditory, read/write and kinesthetic), professional development (self-confidence, interpersonal and intrapersonal skills etc.), learning behavior, and environment (resources, self-directed learning, deep and superficial learning), and curriculum strategies (achieving curriculum outcome and integration). The content validity of the questionnaire was ensured by a review done by the medical educationists. The student's perspectives for both instructional methods, PBL and IL were assessed on 5-point Likert rating scale (0=strongly disagree; 1=disagree; 2=true sometimes; 3=agree; 4=strongly agree).

The representativeness and clarity of the items were also assessed. Internal consistency and reliability of the questionnaire were checked by Cronbach that was calculated as 0.71. The corrected item/total correlation (TCITC) was repeated for each item with TCITC range of 0.379/0.644. Before commencing the study, ethical approval was taken from Majmaah Institution Ethics Review Committee.

RESULTS

Total 120 undergraduate medical students were enrolled in this study; out of these 97 students filled the questionnaire form for an interactive lecture and 112 completed the questionnaire form for PBL based learning. The response rate for interactive lectures was 80% and PBL was 93%. The feedback of students on Likert 5-point scale for interactive lectures and PBLs are detailed in Tables 1 and 2.

Table 1 Students responses for interactive lectures on Likert 5-point scale n (%)

S. No	Items	Strongly Disagree	Disagree	True Sometimes	Agree	Strongly Agree
1	The Interactive lectures are a reliable tool for facilitating visual/spatial learning	8 (8.2%)	8 (8.2%)	15 (15.5%)	50 (51.5%)	16 (16.5%)
2	The Interactive lectures are a reliable tool for facilitating auditory learning	2 (2.1%)	9 (9.3%)	28 (28.9%)	37 (38.1%)	21 (21.6%)
3	The Interactive lectures are a reliable tool for facilitating kinaesthetic learning	13 (13.4%)	16 (16.5%)	30 (30.9%)	23 (23.7%)	15 (15.5%)
4	The Interactive lectures are a reliable tool for developing reading and writing skills	9 (9.3%)	18 (18.6%)	27 (27.8%)	33 (34.0%)	10 (10.3%)
5	The interactive lectures helped in developing linguistic skills and self-confidence	8 (8.2%)	15 (15.5%)	27 (27.8%)	38 (39.2%)	9 (9.3%)
6	The Interactive lectures facilitate development of interpersonal skills	16 (16.5%)	10 (10.3%)	31 (32.0%)	26 (26.8%)	14 (14.4%)

7	The Interactive lectures facilitate development of intrapersonal skills	8 (8.2%)	18 (18.6%)	23 (23.7%)	39 (40.2%)	9 (9.3%)
8	The Interactive lectures develop problem solving skills, decision taking ability and practical application of ideas	6 (6.2%)	14 (14.4%)	36 (37.1%)	37 (38.1%)	4 (4.1%)
9	Receiving of the feedback, during the Interactive lectures modify your attitude towards learning	5 (5.2%)	6 (6.2%)	35 (36.1%)	41 (42.3%)	10 (10.3%)
10	Receiving of feedback during the Interactive lectures sessions enhance your motivation and internal drive towards learning	5 (5.2%)	7 (7.2%)	31 (32.0%)	38 (39.2%)	16 (16.5%)
11	The Interactive lectures provide interactive learning environment	9 (9.3%)	22 (22.7%)	22 (22.7%)	28 (28.9%)	16 (16.5%)
12	The Interactive lectures facilitate effective use of learning resources	2 (2.1%)	4 (4.1%)	23 (23.7%)	41 (42.3%)	27 (27.8%)
13	The Interactive lectures enhance retention of knowledge by practice, feedback and evaluation	7 (7.2%)	0 (0.0%)	28 (28.9%)	51 (52.6%)	11 (11.3%)
14	The Interactive lectures stimulate deep learning	6 (6.2%)	3 (3.1%)	28 (28.9%)	43 (44.3%)	17 (17.5%)
15	The Interactive lectures help in developing logical thinking and abstract concepts	5 (5.2%)	16 (16.5%)	30 (30.9%)	37 (38.1%)	9 (9.3%)
16	The Interactive lectures promote self-directed learning	5 (5.2%)	11 (11.3%)	32 (33.0%)	31 (32.0%)	18 (18.6%)
17	The Interactive lectures provide the opportunity of peer teaching and peer feedback	9 (9.3%)	12 (12.4%)	31 (32.0%)	35 (36.1%)	10 (10.3%)
18	The Interactive lectures fulfil horizontal integration i.e., integration between different subjects of basic medical sciences	4 (4.1%)	6 (6.2%)	25 (25.8%)	43 (44.3%)	19 (19.6%)
19	The Interactive lectures fulfil vertical integration i.e., basic medical sciences, efficiently integrated with clinical sciences	6 (6.2%)	5 (5.2%)	39 (40.2%)	28 (28.9%)	19 (19.6%)
20	The Interactive lectures objectives are properly aligned with your assessment	6 (6.2%)	9 (9.3%)	25 (25.8%)	37 (38.1%)	20 (20.6%)
21	The Interactive lecture facilitates constructing of new knowledge based on prior knowledge and experience	8 (8.3%)	0 (0.0%)	18 (18.8%)	50 (52.1%)	20 (20.8%)
22	The Interactive lectures helped in achieving the curriculum outcomes	2 (2.1%)	3 (3.1%)	28 (28.9%)	44 (45.3%)	20 (20.6%)

Table 2 Students responses for problem-based learning (PBLs) on Likert 5-point scale n (%)

S. No	Items	Strongly Disagree	Disagree	True sometimes	Agree	Strongly Agree
1	PBLs are a reliable tool for facilitating visual/spatial learning	1 (0.9%)	14 (12.5%)	35 (31.3%)	41 (36.6%)	21 (18.8%)
2	PBLs are a reliable tool for facilitating auditory learning	1 (0.9%)	1 (0.9%)	21 (18.8%)	60 (53.6%)	29 (25.9%)
3	PBLs are a reliable tool for facilitating kinaesthetic learning	9 (8.0%)	24 (21.4%)	29 (25.9%)	35 (31.3%)	15 (13.4%)
4	PBLs are a reliable tool for developing reading and writing skills	2 (1.8%)	5 (4.5%)	15 (13.4%)	52 (46.4%)	38 (33.9%)
5	PBLs helped in developing linguistic skills and self-confidence	8 (8.2%)	15 (15.5%)	27 (27.8%)	38 (39.2%)	9 (9.3%)
6	PBLs facilitate development of interpersonal skills	0 (0.0%)	0 (0.0%)	13 (11.6%)	38 (33.9%)	61 (54.5%)
7	PBLs facilitate development of intrapersonal skills	0 (0.0%)	3 (2.7%)	11 (9.8%)	46 (41.1%)	52 (46.4%)
8	PBLs develop problem solving skills, decision taking ability and practical application of ideas	0 (0.0%)	4 (3.6%)	26 (23.2%)	42 (37.5%)	40 (35.7%)
9	Receiving of the feedback, during PBLs modify your attitude towards learning	0 (0.0%)	5 (4.5%)	38 (33.9%)	41 (36.6%)	28 (25%)
10	Receiving of feedback during the PBL sessions enhance your motivation and internal drive towards learning	1 (0.9%)	5 (4.5%)	33 (29.5%)	42 (37.5%)	31 (27.7%)

11	The PBLs provide interactive learning environment	1 (9.3%)	0 (0.0%)	22 (19.6%)	44 (39.3%)	45 (40.2%)
12	The PBLs facilitate effective use of learning resources	1 (0.9%)	2 (1.8%)	17 (15.2%)	53 (47.3%)	39 (34.8%)
13	The PBLs enhance retention of knowledge by practice, feedback and evaluation	0 (0.0%)	2 (1.8%)	14 (12.5%)	52 (46.4%)	44 (39.3%)
14	The PBLs lectures stimulate deep learning	1 (0.9%)	6 (5.4%)	17 (15.2%)	40 (35.7%)	48 (42.9%)
15	The PBLs help in developing logical thinking and abstract concepts	0 (0.0%)	4 (3.6%)	15 (13.4%)	54 (48.2%)	39 (34.8%)
16	The PBLs promote self-directed learning	1 (0.9%)	4 (3.6%)	15 (13.4%)	46 (41.1%)	46 (41.1%)
17	The PBLs provide the opportunity of peer teaching and peer feedback	0 (0.0%)	2 (1.8%)	15 (13.4%)	54 (48.2%)	41 (36.6%)
18	The PBLs fulfil horizontal integration i.e., integration between different subjects of basic medical sciences	0 (0.0%)	2 (1.8%)	26 (23.2%)	48 (42.9%)	36 (32.1%)
19	The PBLs fulfil vertical integration i.e., basic medical sciences, efficiently integrated with clinical sciences	0 (0.0%)	3 (2.7%)	41 (36.6%)	43 (38.4%)	25 (22.3%)
20	The PBLs objectives are properly aligned with your assessment	7 (6.3%)	8 (7.1%)	41 (36.6%)	35 (31.3%)	21 (18.8%)
21	The PBLs facilitates constructing of new knowledge based on prior knowledge and experience	1 (0.9%)	5 (4.5%)	13 (11.6%)	51 (45.5%)	42 (37.5%)
22	The PBLs helped in achieving the curriculum outcomes	1 (0.9%)	7 (6.3%)	31 (27.7%)	44 (39.3%)	29 (25.9%)

The mean scores of the student responses are shown in Table 3. The comparison of the responses between the groups was done using independent samples Mann-Whitney U-test. Among the questions of VARK learning styles, the significance was found in PBL as a tool for auditory learning and reading and writing skills over interactive lectures.

Table 3 Comparison of student's response to interactive lectures versus problem-based learning (PBLs)

S. No	Item/Questionnaire	Interactive lecture Mean ± SEM	PBLs Mean ± SEM	p-value
1	Reliable tool for facilitating visual/spatial learning	2.60 ± 0.11	2.60 ± 0.09	0.5000
2	Reliable tool for facilitating auditory learning	2.68 ± 0.10	3.03 ± 0.07*	0.0090
3	Reliable tool for facilitating kinaesthetic learning	2.11 ± 0.12	2.21 ± 0.11	0.6100
4	Reliable tool for developing reading and writing skills	2.59 ± 0.31	3.06 ± 0.08*	0.0001
5	Helped in developing linguistic skills and self-confidence	2.88 ± 0.46	3.48 ± 0.06*	0.0001
6	Facilitate development of interpersonal skills	2.74 ± 0.46	3.43 ± 0.06*	0.0001
7	Facilitate development of intrapersonal skills	2.24 ± 0.11	3.31 ± 0.07*	0.0001
8	Develop problem-solving skills, decision-making ability and practical application of ideas	2.20 ± 0.09	3.05 ± 0.08*	0.0001
9	Receiving of the feedback during it modify your attitude towards learning	2.46 ± 0.95	2.82 ± 0.08*	0.0160
10	Receiving feedback during it enhance your motivation and internal drive towards learning	2.55 ± 0.10	2.87 ± 0.08*	0.0330
11	Provide interactive learning environment	2.21 ± 0.09	3.18 ± 0.07*	0.0001
12	Facilitate effective use of learning resources	2.90 ± 0.09	3.13 ± 0.07	0.0640
13	Enhance retention of knowledge by practice, feedback, and evaluation	2.61 ± 09	3.23 ± 0.06*	0.0001
14	Stimulate deep learning	2.64 ± 0.10	3.14 ± 0.08*	0.0001
15	Help in developing logical thinking and abstract concepts	2.30 ± 0.10	3.14 ± 0.07*	0.0001
16	Promote self-directed learning	2.47 ± 0.11	3.18 ± 0.08*	0.0001
17	Provide the opportunity of peer teaching and peer feedback	2.26 ± 0.11	3.20 ± 0.06*	0.0001
18	Fulfil horizontal integration i.e., integration between different subjects of basic medical sciences	2.69 ± 0.10	3.05 ± 0.07*	0.0120
19	Fulfil vertical integration i.e., basic medical sciences, efficiently integrated with clinical sciences	2.51 ± 0.10	2.80 ± 0.07	0.0580
20	Objectives of sessions are properly aligned with your assessment	2.58 ± 0.11	2.49 ± 0.10	0.4370
21	Facilitates constructing of new knowledge based on prior knowledge and experience	2.83 ± 0.10	3.14 ± 0.08*	0.0120
22	Helped in achieving the curriculum outcomes	2.79 ± 0.08	2.83 ± 0.08	0.7600

*p<0.05 by independent samples Mann-Whitney U test

DISCUSSION

From the 4 domains of the VARK (visual, auditory, read/write and kinesthetic), the results showed the significance of auditory learning and reading and writing skills over the interactive lectures. There was a study which showed the learners in PBL have the highest preference for reading and writing [15]. In small groups, the PBL evokes a verbal discussion among the students so it justified the auditory learning over the interactive lectures. During the session, and also between 2 sessions of the PBL the student has to prepare a lot for attaining learning outcomes that lead to the facilitation of read/write learning mode. No significant difference was found between PBL vs IL in visual and kinesthetic learning modes. Effective use of learning resources such as smart boards, flipcharts, and diagrams in the small group sessions and interactive lectures can enhance visual learning [13]. Visual learning in PBL sessions can also be increased by the inclusion of visual cues in the case scenario like charts, figures, diagrams, etc., or utilizing concept maps for achieving learning outcomes. Studies showed that PBL sessions address kinesthetic learning by demonstration and role play utilizing models for basic medical science subjects [15,16]. Similarly, interactive lectures can also promote all learning styles and can be made effective by certain interventions like including videos, flipping classroom, peer teaching, etc. [17].

Statistical significance was found in the student's perceptions that PBL as a learning tool has a better contribution to the development of personality and soft skills as compared to IL. The difference is significantly higher for PBL regarding the development of self-confidence, linguistic skills, interpersonal skills, intrapersonal skills, and decision making. These findings are in alignment with the comparative study that showed the enhancement of the above mentioned soft skills in PBL session in comparison with interactive lectures [18,19]. For the item pertaining to feedback, and interactive learning environment, the statistical significance was found in the PBL session over interactive lectures. As a student-centered approach, the studies showed PBL as facilitates interactive learning environment and provision of peer and tutor feedback if conducted by trained tutors [20,21]. The PBL as a learning tool facilitates the development of interpersonal communication by encouraging group discussion during the sessions [22].

The results of this study showed the significance of PBL over IL for stimulating deep learning, facilitating self-directed learning, developing concepts and also for providing an opportunity for peer teaching and peer feedback. Our findings are in alignment with the previous studies conducted at College of Medicine, King Saud University and Qasim University where students perceive that PBL fosters self-directed learning, and problem-solving skills by facilitating effective feedback from peers and tutors during the session [23].

The findings showed the significance of PBL in integrating the basic medical sciences disciplines such as anatomy, physiology, pathology, and biochemistry. PBL as instructional methods proved to be effective in breaking the barriers between the subjects of basic medical sciences [24]. However, the integration of basic medical sciences with clinical disciplines is more than interactive lectures but the findings are not significant.

Integration (horizontal and vertical) is identified as one of the advantages of the problem-based learning [25,26].

Students found that PBL session leads to the more effective utilization of learning resources and help them in achieving curricular outcomes. The study conducted at the College of Medicine, Qasim University suggested reviewing the process of PBL for attaining curricular outcomes. They also found that students at early level preferred tutors both as content and process expert for achieving the learning outcomes. In our study settings, the mostly non-content experts facilitate the PBL session [20,23].

For the alignment of assessment with learning objectives, the students preferred interactive lectures over PBL. In IL, the objectives were delivered to the students in module guides and directly delivered by the content experts. In PBL, the students came up with their learning issues and tutor as a facilitator ensured the alignment of learning issues with learning objectives. This might be the reason for the student's preference for interactive lectures of PBL. Though for the majority of the items, the preference was found for the PBL over IL. However, a comparative study conducted at Swiss medical students showed that integrated lecture based integrated curriculum also proved to be efficient as PBL in stimulating deep approaches of learning among students [19]. A similar study also proved the integrated curriculum as more efficient over the traditional curriculum in all the dimensions of educational context (student's perception towards deep learning approaches, academic environment, and teachers) [19].

CONCLUSION

The study showed a preference of students towards PBL over interactive lectures in a system based hybrid curriculum where both of them used an instructional approach. The merit of the interactive lecture cannot be underrated in the system based integrated as evident from the previously conducted educational research. Based on the findings, there is a need to revisit the process of interactive lecture in our study settings. Exploration is required for the alignment of the assessment tools with the learning outcomes of the PBL.

Limitations

The study has a limitation of the sample size, and inclusion of only male students from phase II i.e., based on the system modules implemented in the time of two and a half consisted of basic medical science subjects integrated with pathology, microbiology, biochemistry with a small chunk of clinical subjects. Inclusion of female and phase III (clinical) students supplemented with some qualitative approaches (interviews, observations and open questions) will facilitate further exploration in future on this context.

DECLARATIONS

Acknowledgment

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

REFERENCES

[1] Ling, Y. U., et al. "Retention of basic science information by senior medical students." *Academic Medicine,* Vol. 83, No. 10, 2008, pp. 82-85.

[2] Ramani, Subha, and Sharon K. Krackov. "Twelve tips for giving feedback effectively in the clinical environment." *Medical Teacher,* Vol. 34, No. 10, 2012, pp. 787-91.

[3] Biggs, John B. "From theory to practice: A cognitive systems approach." *Higher Education Research and Development,* Vol. 12, No. 1, 1993, pp. 73-85.

[4] Atwa, Hani S., and Enas M. Gouda. "Curriculum integration in medical education: A theoretical review." *Intellectual Property Rights: Open Access,* 2014.

[5] Norman, G. T., and Henk G. Schmidt. "The psychological basis of problem-based learning: A review of the evidence." *Academic Medicine,* Vol. 67, No. 9, 1992, pp.557-65.

[6] Wood, Diana F. "Problem-based learning." *BMJ,* Vol. 326, No. 7384, 2003, pp. 328-30.

[7] AlHaqwi, Ali Ibrahim, et al. "Problem-based learning in undergraduate medical education in Saudi Arabia: Time has come to reflect on the experience." *Medical Teacher,* Vol. 37, 2015, pp. 61-66.

[8] Kaufman, David M., and Karen V. Mann. "Comparing students' attitudes in problem-based and conventional curricula." *Academic medicine: journal of the Association of American Medical Colleges,* Vol. 71, No. 10, 1996, pp. 1096-99.

[9] Brown, George, and Michael Manogue. "AMEE Medical Education Guide No. 22: Refreshing lecturing: A guide for lecturers." *Medical Teacher,* Vol. 23, No. 3, 2001, pp. 231-44.

[10] Snell, Yvonne Steinert, Linda S. "Interactive lecturing: Strategies for increasing participation in large group presentations." *Medical Teacher,* Vol. 21, No. 1, 1999, pp. 37-42.

[11] Shamsan, Bader, and A. T. Syed. "Evaluation of problem-based learning the course at college of medicine, Qassim University, Saudi Arabia." *International Journal of Health Sciences,* Vol. 3, No. 2, 2009, p. 249.

[12] Asad Mohammad Rehan, et al. "Medical undergraduate's feedback towards problem-based learning (PBL)." *Majmaah Journal of Health Sciences*, Vol. 5, No. 2, 2017, pp. 87-98.

[13] Asad, Mohammad Rehan, et al. "Perception of medical undergraduate students about interactive lectures in an outcome-based integrated curriculum: A cross-sectional study." *Journal of Education and Health Promotion,* Vol. 6, 2017.

[14] Abdulrahman, Khalid A. Bin, and Farid Saleh. "Steps towards establishing a new medical college in the Kingdom of Saudi Arabia: an insight into medical education in the Kingdom." *BMC Medical Education,* Vol. 15, No.1, 2015, p. 85.

[15] Alkhasawneh, Israa M., et al. "Problem-based learning (PBL): Assessing students' learning preferences using VARK." *Nurse Education Today,* Vol. 28, No. 5, 2008, pp. 572-79.

[16] Asad, M. R., et al. "Perceptions of medical undergraduates towards Problem Based Learning (PBL) in an integrated outcome-based curriculum at College of Medicine, Majmaah University, Saudi Arabia." *South-East Asian Journal of Medical Education,* Vol. 12, No.1, 2018.

[17] Malik, Alam Sher, and Rukhsana Hussain Malik. "Twelve tips for effective lecturing in a PBL curriculum." *Medical Teacher, Vol.* 34, No. 3, 2012, pp. 198-204.

[18] Downing, Kevin, Flora Ning, and Kristina Shin. "Impact of problem-based learning on student experience and metacognitive development." *Multicultural Education and Technology Journal,* Vol. 5, No. 1, 2011, pp. 55-69.

[19] Gustin, Marie-Paule, et al. "Integrated problem-based learning versus lectures: a path analysis modeling of the relationships between educational context and learning approaches." *Medical Education Online,* Vol. 23, No. 1, 2018.

[20] Al-Drees, Abdulmajeed A., et al. "Students' perception towards the problem-based learning tutorial session in a system-based hybrid curriculum." *Saudi Medical Journal,* Vol. 36, No. 3, 2015, p. 341.

[21] Wijnen, Marit, et al. "Comparing problem-based learning students to students in a lecture-based curriculum: learning strategies and the relation with self-study time." *European Journal of Psychology of Education,* Vol. 32, No. 3, 2017, pp. 431-47.

[22] Yew, Elaine HJ, and Henk G. Schmidt. "Evidence for constructive, self-regulatory, and collaborative processes in problem-based learning." *Advances in Health Sciences Education,* Vol. 14, No. 2, 2009, pp. 251-73.

[23] AlHaqwi, Ali I. "Learning outcomes and tutoring in problem-based-learning: how do undergraduate medical students perceive them?" *International Journal of Health Sciences,* Vol. 8, No. 2, 2014, p. 125.

[24] Hassan, Shahid. "Concepts of vertical and horizontal integration as an approach to an integrated curriculum." *Education in Medicine Journal,* Vol. 5, No. 4, 2013.

[25] Hmelo-Silver, Cindy E. "Problem-based learning: What and how do students learn?" *Educational Psychology Review,* Vol. 16, No. 3, 2004, pp. 235-66.

[26] Yaqinuddin, Ahmed. "Problem-based learning as an instructional method." *Journal of College of Physicians and Surgeons Pakistan,* Vol. 23, No. 1, 2013, pp. 83-85.