

Introduction and implementation of problem based learning in preclinical years: a survey on students' perspective

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INTRODUCTION

Basic medical science is an integral aspect of medical education. Over the years, the quest to advance medical education, particularly basic sciences has been on the rise. Various teaching methods have been explored to improve basic understanding, critical thinking and enhance the transition from basic science to clinical science (1). One such example is problem-based learning (PBL), which is designed to apply basic knowledge to real-life problems, reversing the traditional approach. These effective learning and teaching modules should be introduced and implemented early in pre-clinical years to benefit students (2, 3). PBL has been used to help develop self-directed learning skills through active participation and self-study (4). The information processing approach to learning stimulates the learners to restructure the understanding, gain new knowledge and elaborate on the information. It has been shown to develop communication skills, team working capabilities, clinical judgement and reasoning abilities.

The traditional class room only teaching embraces teacher-focused cognitive and psychomotor process without fully exploring student-oriented active learning. These new developments are attributed to the shortcomings of traditional classroom teaching practices, mostly inability of the educators to achieve holistic student development (5). PBL, on the other hand, focuses on collaborative learning by

involving group interaction between students while they analyze a clinical scenario presented as a case. Students identify the problems, set learning goals and present their findings during plenary discussion. They complete their assignments using study resources and prepare reports to the group. This is followed by sharing the knowledge during the next plenary discussion, summarizing their findings and writing an examination given by the preceptor. Students have to actively construct the knowledge themselves and share ideas amongst one another through the group and learning assignments to achieve maximum learning. (6, 7, 8, 9)

PBL in Avalon University School of Medicine (AUSOM), a Caribbean medical university in Curacao, Netherland Antilles was introduced in the fall of 2013. AUSOM is running a four-year comprehensive doctor of medicine (MD) program with discipline based curriculum since its inception in 2003. The change process was initiated when the university decided to move from the discipline-based curriculum to integrated curriculum after the internal self evaluation and review from the Caribbean Accreditation Authority for Education in Medicine and other Health Professions (CAAM-HP). The continuous quality improvement (CQI) committee placed the curriculum committee in charge to oversee this change process and co-ordinate with all the departments for effective and smooth transitions. This new curriculum employed PBL along with tra-

ditional lectures, presentations, group discussions, standardized patients program and clinical skills classes, hands-on learning, and simulation. The aim of its implementation was to inculcate good study habits and evolve exceptional critical thinking ability. It involves students tackling clinical vignettes so that they may learn to diagnose, treat and manage clinical cases. After discussing the problems, students are required to give a presentation to their peers the following week, along with a handwritten solution to be submitted to the instructor and a formal assessment in the form of a quiz. Proper coordination and monitoring, without interfering with the PBL process, is needed to ensure active learning. The leader of a PBL classroom commonly acts as a facilitator rather than a teacher, using their expertise to encourage and guide the students as they tackle the clinical case. The objective of this study is to review student perspectives on the implementation and effectiveness of PBL at AUSOM.

MATERIAL AND METHODS

A cross-sectional questionnaire survey was conducted among 1st to 4th Semester (MD1 to MD4) basic science students of AUSOM in the fall 2017. All students currently admitted in the university and attending PBL as a mandatory course curriculum were voluntary enrolled to assess their cognisance and attitudes towards PBL at AUSOM. The students with class attendance less than 90% were excluded from the study.

Approval for this study was received from the university ethical review committee, and the anonymity of participants was preserved. The study was consolidated with an online quantitative and qualitative questionnaire. Qualitative questionnaires were designed to assess students' perceptions on the objectives of PBL. Similarly, the quantitative questionnaires were graded on a five point scale to evaluate the students' opinion on its practice, and to get feedback on its effectiveness. All the questionnaires were validated by the faculty senate undertaking PBL course curriculum. Survey collected and data were analyzed using Stata-15 (©StataCorp LLC) in the form of proportion, mean, median, mode, and standard deviation.

PBL course objectives

The objectives of PBL in AUSOM is to inculcate the self directed study habits, introduce integrated clinical cases in basic medical sciences to enhance and develop understanding, critical reasoning and in depth learning skills in the students, promote group participation, presentation and communication skills between the peers, consolidate professional behaviour, and establish peer and self assessment to promote reflective learning.

PBL course delivery

PBL in AUSOM is conducted as per the classical seven stages PBL approach (10). A standard set of a clinical vignettes based on the course objectives and validated by the curriculum committee are used in PBL session. Students are divided into small random groups (8-10 students/group). Each group selects a chair and a scribe amongst them. Instructor acts as a facilitator without providing any knowledge based information. All the students are provided with the standard study resources including the clinical handbook and online database for every PBL sessions. The PBL session begins with the display of the clinical vignette to all the groups simultaneously. Students are required to discuss among groups to identify the key words and the associated clinical case. They create objectives thereafter in accordance to the case, which are to be approved by the facilitators. This is followed by a week of self directed study to address the objectives. Each PBL session last for two hours divided into a session of an hour for two weeks. Finally, students meet again after a week to present the objectives, discuss and critically analyze the case, and address its various determinants.

PBL assessment strategies

Students are assessed with a multiple choice questions (MCQ) based summative assessment and rubrics based peer assessment after each PBL case. MCQ based summative assessment is conducted by the individual facilitator in the classroom setting through online MCQ's, normally including in and

around 10 questions for each PBL case. Questions are based on the specific objectives created by the individual groups. Similarly, peer assessment is based on the standard rubrics validated and presented to the students by the facilitator to address the course objectives. Rubrics are divided into three major groups to assess knowledge, skills and attitude. Facilitators make sure that students strictly adhere to the rubrics system while undergoing the peer assessment. As such, the final grades of the students represent the composite scores of both the assessments in a 100 point scale. Feedback is provided after completion of each PBL case based on the Pendleton's formula, and the rationale is provided for each MCQ by the facilitator.

RESULTS

101 {Males: 58.42%, (n=59), Female: 41.58% (n=42)}, among 110 total students participated in the study. The students gave an overwhelming response to the introduction and implementation of PBL in the curriculum. Most of the students responded that they had a positive impact in learning and understanding with PBL. 82.18% (n=83) of students agreed that they benefited with PBL, 4.95% (n=5) of students were in disagreement and 12.87% (n=13) gave an ambivalent response.

PBL objectives

Students were asked to choose and grade the most important PBL objective as a learning tool, followed by how well each of those objectives was achieved (Table 1). The top three most chosen objectives were: to improve the presentation skills (37.63%, n=37), to enhance in the learning depth (15.84%, n=16), and to develop the critical thinking ability (13.86%, n=14).

Instructor involvement

The mean score for faculty satisfaction was 3.7 ± 1.3 (5-point scale). 91.09 % (n=92) of the students agreed that PBL provided a positive learning environment to enhance their understanding. Students perspectives regarding the involvement

	Mean±SD	Median	Mode	Range
Inoculates self-study habits	3.59±1.27	4	5	1-5
Develops team working ability	3.62±1.17	4	4	1-5
Improve presentation skills	3.96±1.20	4	5	1-5
Develop research capabilities	3.65±1.25	4	5	1-5
Enhance understanding and learning depth	3.75±1.16	4	4	1-5
Develop critical thinking ability	3.79±1.16	4	5	1-5
Establish professional Attitude	3.71±1.30	4	5	1-5
Reflect on self-improvement	3.80±1.21	4	5	1-5

Table 1. Scoring and assessment of the student's perspectives in relation to the fulfilment of PBL objectives and related factors (Objectives were ranked on a 5-point scale, with a score of 1 meaning the objective was not effectively achieved and a score of 5 meaning that the objective was effectively achieved.)

of faculty in effective delivery of PBL had varied response with 34.65% (n=35) responding that the instructor should be fully involved in explaining all of the concepts in depth, while 30.70% (n=31) wanted the limited role of the instructor as a facilitator only, and 34.65% (n=35) were divided in opinion on whether the faculty should have a moderate involvement or no involvement as such.

Evaluation criteria

54.5% (n=55) of the students responded that they were aware of the evaluation process and grading rubrics used in PBL. Students overall final evaluation yielded an average score of 77.54% (range: 60% to 90%).

Feedback and class time

60.4% (n=61) of the students responded that adequate feedback was given after each PBL session, with 73.3% (n=74) believing that sufficient class time had been provided to teach and implement PBL.

DISCUSSION

PBL requires that students develop a systematic and critical attitude towards the presented problems and integrate their current knowledge while reflecting on areas for learning and self-improvement (11). Students recognized enhanced presentation skills, understanding and critical thinking as being the primary objectives of PBL. Students' ability to convey the information is crucial in ensuring that concepts are understood correctly by their classmates. Communication skills are the appropriate tool to improve collaborative learning to allow for a more systematic approach to the basic medical sciences. This helps the students to incorporate clinical skills and rudiments of basic science. PBL engages communication capacity while developing a flexible knowledge of the core subject, improving efficient problem-solving abilities, enhancing self-directed learning and effective intrinsic motivation.

The instructor of a PBL classroom acts as a facilitator rather than a teacher, allowing students to better develop their reasoning skills and become independent learners (8). To preserve this role, CQI and curriculum committee in AUSOM conducts a regular faculty workshop concerning the seven steps of PBL course delivery, and to align the basic science course objectives to the PBL case selection. This workshop is also able to address the concerns regarding the case selection, validation and level of involvement of the facilitator. Similarly, a detail framework is presented to the individual facilitator's at the beginning of the semesters regarding their involvement and smooth delivery of the course objectives. However, it is necessary to understand that the productivity of PBL groups depends on faculty co-ordination, individual cognitive skills, self-reflective ability and interpersonal functioning of the student groups. Observations' in the

past have shown students predominantly opt for a meticulously guided approach to learning, where there is a crucial role for the facilitator to organize the discussions (12). As such, the necessary level of receptor/facilitator involvement has not been fully understood despite the fact that the most important aims of any teaching method is to boost study habits engaging students in an active and collaborative learning practice. Further assessment of different levels of instructor involvement and the impact on learning outcomes on professional development, would be obviously beneficial in order to optimize the PBL application and integration in course curriculum.

The evaluation criteria in AUSOM chiefly focus on the active participation, team work and professionalism. Understanding the evaluation criteria helps the students to enhance goal-oriented learning. Better self-assessment and motivation could be achieved through the use of all-inclusive, yet simplified rubrics. Majority of students reported they received adequate feedback on their performance in PBL. A timely feedback motivates students, giving them an insight into their performance and weaknesses, as well as ways to hone their skills. This adequate feedback should be maintained in the use of PBL in order to remain aligned with goals and enhance the student-teacher relationship. It is worth noting that since the time of the survey, PBL at AUSOM has inculcated the use of educational videos. It would be of interest to see if this has helped the students to further consolidate their knowledge.

CONCLUSION

PBL allows students to actively engage in the learning process. The majority of medical students at AUSOM benefitted from the use of PBL with favourable responses. Students believed that the introduction and implementation of PBL in their curriculum enhanced presentation skills, understanding, and critical thinking. It is imperative that PBL should be effectively implemented early in the pre-clinical years to strengthen learning and bridge the void during this process.

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