



An Overview of Problem-based Learning and Its Perception among Students Taking Basic Science Curriculum in Medical and Health Sciences University

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Authors' contributions

This work was carried out in collaboration between both authors. Author AA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author SAMR managed the analyses of the study, reviewed, edited and helped in literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Problem-based learning (PBL) is tutoring that addresses all curricula types and enables the improvement of key proficiencies such as critical thinking, communication skills, interpersonal relations, and self-assessment. PBL is small group instructive mode based on constructivist beliefs and characterised by the use of a structured problem as the framework for students to acquire clinical, cognitive skills and attain information about the issue. Teaching is structured about judiciously created cases, using a progressive-disclosure layout, that aid as an impetus for small-group learning. In our University, we have integrated problem-based curriculum for health sciences students. Our study aims to analyse the student's perception about problem-based learning at Medical & health Sciences University in UAE and also to analyse student's satisfaction and a process of implementation of problem-based learning methodology in basic science curriculum.

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Material and Methods: It is a cross-sectional survey based study done in a Health Sciences University in UAE. In this prospective study University, students were given self-designed questionnaire which consisted of demographic details & closed-ended questions addressed to report the experience and attitudes of students towards PBL.

Results: 87% students agreed that the PBL sessions are more effective in achieving learning objectives. 43% Students strongly agreed that the PBL allows in-depth understanding of the topics. Only to 65% of the students the time allotted for each PBL session was enough. 41% decided that they could integrate their prior knowledge to solve the problem in problem-based learning sessions. 37% of them strongly agreed that they are motivated when they study the issue getting from real life. 49% of them could integrate the different subjects to solve the problem. 29% Stated that they work harder to prepare for discussion in problem-based learning sessions than others. 87% of them agreed that PBL provided opportunities for to them to contribute ideas. 91% stated that PBL gave them the opportunity to hearing different perspectives and learning from one another. 79% agreed that the resources provided by the library /internet allowed them to satisfy the course requirements. 91% of them stated that their facilitator provided them with a positive learning environment.

Keywords: Problem-based learning; integrated curriculum; student-centered; group learning.

1. BACKGROUND

The transformation of the medical curriculum from teacher centered to student centered problem-based learning (PBL), has been adopted by many medical colleges around the globe. Problem-based learning is implemented either as pure or hybrid models.

In a 'pure-PBL model', PBL is the main instructional method implemented throughout the entire curriculum. However in a 'hybrid PBL model', learning is supported by prior knowledge of students acquired during lectures, tutorial sessions, and laboratories before the PBL session. Problem-based learning is an innovative approach to learning in medical education, which has many advantages, including increasing knowledge retention, a better understanding of basic sciences topics, integration of basic and clinical sciences, and improvement of problem-solving skills. Besides, it contributes to the development of interpersonal and communication skills, presentation skills, promotes self-directed learning, enhances students' enthusiasm, and motivation. The tutors guide the group to achieve their goals by keeping them focused on their task. The PBL sessions involve clear roles for each member of the group, known steps of discussion, and identification of the learning objectives from the discussed problem. Therefore, a trained facilitator plays a crucial role in the success of the PBL session. PBL is a form of education seen as a student-driven activity in which the student sets the pace, and the role of the teacher becomes only to be a facilitator. PBL

in teaching usually employ evaluating a case, the student always comes to a point where more information is needed to continue. This results in the generation of an "objectives." An objective specifies an item of information that must be learned to complete the understanding of the topic. Once objective has been identified, it becomes a learning goal for the next session. Each student then must find an answer to the objectives and be prepared to share it with other students. Thus, PBL employs student initiative as a driving force. The student generates the objectives, provides the answers, and teaches fellow students.

It an abstract model of assisted learning and has been used with terrific results in the education of various health care professions. The teaching in PBL, using real world problems, group learning, student-directed elucidations for problems, and teacher serving as facilitators of learning has much potential solicitations in the curriculum [1]. According to a study [2] PBL incorporate "a encouraged background in which all curriculum essentials are thoroughly allied to help students achieve the learning outcomes". PBL incorporate "active learning with applicability to the learning objectives (as opposed to the outdated rote learning based on teacher-dependent didactic lectures)." Other study [3] have found that "in addition to the formal learning setting, everyday trials are faced with defining solutions to a problem as part of a problem-based curriculum.

The PBL facilitator emphasizes on five areas: Esteem, Communication Skills, Accountability,

Self-Evaluation, and Knowledge attainment. PBL facilitator focus on key aspects of the formal, informal, and hidden curricula and provide useful information for increasing professional competence. By monitoring the development associated with this, faculty can mark their interpolations to help students become more self-reflective in their learning.

2. AIM AND OBJECTIVES

1. To analyze the student's perception about problem based learning at Medical & health Sciences University in UAE.
2. To analyze student's satisfaction and process of implementation of problem based learning methodology in basic science curriculum.

AN OVERVIEW OF PROBLEM BASED LEARNING IN MEDICAL COLLEGE & HEALTH SCIENCES UNIVERSITY

Conduction of PBL at Medical & health Sciences University for basic science students is done as follows-Case scenario are made based on the learning objectives included in the curriculum. PBL is conducted in 2 sessions. In first session students use prior knowledge to analyze what is known and not known, specify learning objectives and potential resources, share new information in the group and map key concepts, test their hypotheses, design a plan to solve the problem, and evaluate all aspects of the learning experience. In the 2nd session students do presentations based on the learning objectives identified by them. Students conduct facilitator evaluations using a 5-point, Likert-type scale ranging from 1 (poor) to 5 (outstanding). Facilitators use the same tool for student assessment. Students and facilitator complete the evaluation after each case, supplementing the informal, oral feedback routinely provided during the last session of each case.

The process of problem based learning and its assessment at Medical College & Health Sciences University are as follows. Facilitators and students are provided with guide.

The contents of the Facilitator guide are as follows:

COURSE NUMBER:
MODULE / SYSTEM:
SERIAL NUMBER:

FACILITATOR'S BOOKLET

1. Title page.....
2. Guidelines for facilitators
3. Problem statement (sample)
4. Learning objectives (sample).....
5. Hypothesis worksheet (sample)
6. Resources (sample)
7. Student assessment form (sample).....

STUDENT'S BOOKLET

1. Title page.....
2. Guidelines for students.....
3. Flow chart for Problem based learning.....
4. Problem statement sample
5. Hypothesis worksheet (sample).....
6. Objectives worksheet (sample)
7. Student's self/peer assessment form
8. Student's assessment of facilitator form.....
9. PBL assessment feedback form

GUIDELINES FOR AUTHORS

The problems created for Problem based Learning (PBL) are intended to provide system wise learning for 2nd year MBBS students. These problems deal with the content and learning objectives of each system.

1. Each problem is a common clinical scenario or a statement with clinical relevance.
2. The problem format allows sequential and interdependent analysis of understanding the problem.
3. The problem provokes interest, query and discussion that emphasizes aspects of basic sciences (pathology, microbiology & pathology).
4. Each problem is addressed over a week's time.
5. Accordingly, additional information on history or physical findings is provided as a *second sheet*.
6. Associated visual materials (Photographs, Lab reports and Radiological Imaging are provided as and when necessary.
7. Second sheet is made available for the small group for discussion, after the group has identified the learning objectives.
8. The tutor/facilitator is not expected to be a content expert.
9. The facilitator is oriented towards student centered learning.
10. Tutor guidelines are provided to make them familiar with different topics that are

addressed during discussions. This helps the tutor to guide the students.

CHECKLIST FOR ANALYZING THE PROBLEM

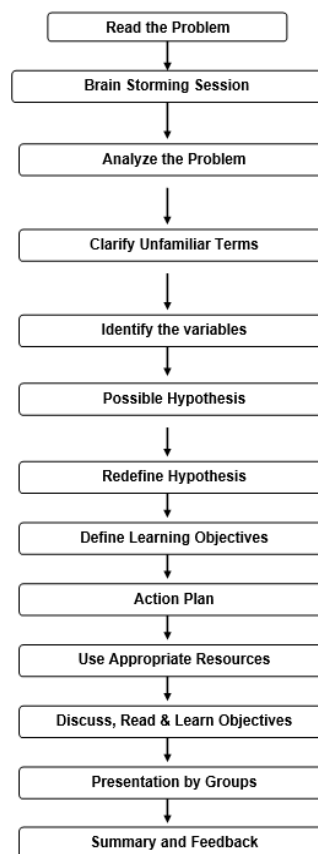
1. Is the problem informative and does it provoke curiosity?
2. Has the specific topic to be discussed given importance?
3. Are there any controversies in the statement of problem?
4. Are the stages of the problem developed logically and clearly?
5. Does the problem allows identification of related topics ?
6. Is the problem well written and proof read?
7. Are the visuals clear and informative?
8. Are the learning objectives clear, specific and appropriate for 2nd year MBBS students?
9. Are the resources specific and authentic and easily accessible to students?
10. What is the pedagogical value of the problem?

GUIDELINES FOR STUDENTS

1. Select a "leader" to lead the discussion and a "scribe" to record the discussion.
2. Go through the problem individually.
3. Clarify any words or terms by group discussions or with the aid of facilitators.
4. Identify the important issues in the problem – **VARIABLES**.
5. Consider the **basic mechanisms** that might explain each important aspect of the problem. Assess current understanding of the basic structural and/or functional mechanisms that may contribute to the presentation of the problem – **HYPOTHESIS**.
6. Use the collective skills and experiences of group members or facilitator to explore or explain these phenomena.
7. Identify current gaps in knowledge or understanding – **LEARNING OBJECTIVES**.
8. Group members are encouraged to provide information that will allow the group to progress.
9. Group members are encouraged to share their knowledge, expertise, or ability to analyze and synthesize information.
10. The primary task of each problem is to provide a springboard to learning, not to make a quick decision.
11. All members of the group are expected to take an active role.

12. Group members are encouraged to ask questions. Questioning can serve to keep the group focused and can also help other group members present information and concepts more precisely.
13. Pay attention to the group process and work at becoming an effective learning group. Conflicts and differences of opinion are an inevitable and necessary consequence of a comprehensive group process.
14. Avoid giving a "mini-lecture" on what you learned since the previous session.
15. It is extremely valuable for students to create their own summaries of what they learn during the session. This also makes study and review easier.
16. Group members must remember that the tutor, in a role as small group facilitator, will assist in the process of identification and discussion. He or she will monitor group progress and interaction, intervening where necessary to help maintain the direction of the group.

FLOW CHART FOR PROBLEM BASED LEARNING



PROBLEM STATEMENT (Sample)

A 3 year old male child was brought to the Pediatrician by his mother. Her primary concern was bowing of legs and frontal bossing. After detailed clinical examination the doctor ordered for a lab investigation which revealed an elevated serum alkaline phosphatase. The Radiological picture of the lower limb was also taken and shown below.



LEARNING OBJECTIVES (Sample)

1. Histology & anatomy of bone
2. Ossification of the bone.
3. Classification of bone diseases
4. Metabolic bone diseases
5. Vitamin D and Calcium metabolism in relation to bone diseases
6. Role of Vitamin D & serum alkaline phosphatase in relation to bone diseases.
7. Histopathological findings in Metabolic bone diseases

Treatment & management of Metabolic bone disease

GUIDELINES FOR FACILITATORS

Facilitator should

1. Understand the problem based approach as an effective method of learning.
2. Understand the small group discussions as a way of integration, to solve problems in right direction and to give appropriate feedback.
3. Understand the overall objective of the problem.
4. Have a good knowledge of the steps necessary to promote the problem based learning, problem solving and critical thinking in students.
5. Understand the basic principles of PBL and method of evaluation
6. Have attended the orientation/training on PBL workshops.
7. Schedule and be prepared with the program which will make them available for individual meetings with students if necessary.
8. Have skills in being a facilitator, ask thought provoking questions, provide additional information about appropriate resources.
9. Avoid lecturing in the group and promote effective student participation, and proper group dynamics.
10. Coordinate with authors to ensure that the student evaluation is completed along with the feedback.

HYPOTHESIS WORKSHEET (Sample)

VARIABLE 1	
HYPOTHESIS 1 A	
HYPOTHESIS 1 B	
HYPOTHESIS 1 C	

VARIABLE 2	
HYPOTHESIS 2 A	
HYPOTHESIS 2 B	
HYPOTHESIS 2 C	

VARIABLE 3	
HYPOTHESIS 3 A	
HYPOTHESIS 3 B	
HYPOTHESIS 3 C	

RESOURCES (Sample)

BOOKS FOR REFERENCE

- Clinical Oriented Anatomy by Keith L Moore, Dalley Arthur F, 2006
- Physiology by Linda Costazo, 3rd edition, 2006
- Harper's Illustrated Biochemistry by Murray, Robert K, Granner, Daryl K, Rodwell, Victor W, 27th edition 2006.
- Basic pathology by Robbins.

FORM FOR STUDENT EVALUATION BY FACILITATORS

Module / System : e.g. Musculoskeletal System
Serial Number : _____
Student name : _____
Facilitator name : _____ **Date:** _____

Please rate each group member by circling your choice on the following characteristics
 Please rate each criteria from 1- 5, based on the following key.

Excellent-5 Very Good-4 Good-3 Satisfactory-2 Not-Satisfactory-1

A. KNOWLEDGE

EXCELLENT	RATING	REQUIRES REVISION
Consistently well-prepared for sessions: E.g., uses a variety of references; supports statements with appropriate references; makes concise summaries.	Preparation 5 4 3 2 1	Consistently seems unprepared for sessions: E.g., inadequate reading or researching of learning issues; contributes little to group knowledge; does not summarize material.
Highly skilled in critical thinking: E.g., consistently demonstrates skill in performing key tasks such as generating hypotheses, applying knowledge of PBL cases, critically appraising information, making sound deductions, explaining reasoning process.	Critical Thinking 5 4 3 2 1	Deficient in critical thinking: E.g., consistent difficulties in performing key tasks such as generating hypotheses, applying knowledge of PBL cases, critically appraising information, making sound deductions, explaining reasoning process.
Effective teaching skills: Presents learning issue report at appropriate level, related to the case and in an organized fashion. Uses handouts or summaries to help others remember the material	Teaching 5 4 3 2 1	Ineffective teaching skills: Presents learning issue report at inappropriate level, fails to relate material to the case and presents in a disorganized fashion. Fails to use handouts or summaries to help others remember the material

B. SKILLS

EXCELLENT	RATING	REQUIRES REVISION
Active participation in group learning: E.g., actively participates in discussions; willingly takes on assignments.	Participation 5 4 3 2 1	Passive participation in group learning: E.g., No active participation in discussions; reluctantly takes assignments.
Demonstrates effective group skills/awareness E.g., takes the lead or intervenes appropriately; shows respect and sensitivity for others, helps to resolve misunderstandings and conflicts.	Group Skills 5 4 3 2 1	Demonstrates poor group skills/awareness: E.g. intervenes inappropriately; shows poor judgment by interrupting, withdrawing, ignoring others, dominating or impatience.
Skillful in communicating with peers : E.g., listens actively; sensitive to non-verbal and emotional messages.	Communication 5 4 3 2 1	Difficulties communicating with peers: E.g., poor listening skills; unable to attend to non-verbal or emotional messages.

C. ATTITUDE

EXCELLENT	RATING	REQUIRES REVISION
Accepts responsibility for own learning: E.g., directs own learning agenda; actively tries to improve; critiques resources.	Responsibility 5 4 3 2 1	Does not accept responsibility for own learning: E.g., depends upon others for learning agenda; covers up mistakes; rarely critiques resources.
Highly developed professional behavior: E.g., excellent attendance; reliable; willingly accepts feedback and learns from it.	Professionalism 5 4 3 2 1	Deficiencies in professional behavior: E.g., absent without an excuse; untrustworthy; difficulty in accepting feedback.
Skillful in communicating with peers : E.g., listens actively; sensitive to non-verbal and emotional messages.	Communication 5 4 3 2 1	Difficulties communicating with peers: E.g., poor listening skills; unable or unwilling to attend to non-verbal or emotional messages.

COMMENTS (if any) :

STUDENT'S PBL ASSESSMENT FEEDBACK FORM

Course Title : _____

Course Number : _____

Student ID No. : _____

Faculty Name : _____

Semester & Year : _____

Section No. : _____

The purpose of the PBL evaluation is to ensure quality and satisfaction of the PBL sessions. Results will be used for continuous improvement.

Please complete this questionnaire by ticking (☑) the appropriate box of the five point rating scale.

		Strongly agree	Agree	Neutral	Disagree	Strongly Disagree
PBL helps me to:						
1	Link subject material to the lecture topics.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Take responsibility for my own learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Learn how to obtain information from a variety of sources.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Apply the general principles I learnt to from other academic problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Improve my ability to find, read, analyze and interpret information.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Group work enables me to be:						
6	Comfortable asking for help from others in my group.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Attentive when others are presenting information.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Respectful of my group members and their learning styles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Comfortable sharing information with others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Fair in evaluating the individual efforts of myself and my group members for the benefit of the group.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The Instructor/Facilitator helps me by:						
11	Developing my reasoning processes through questioning, challenging and critiquing information presented.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Guiding and intervening when necessary to keep the group on track.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Promoting integration and synthesis of information.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	Encouraging the use of a variety of resources.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Listening and responding well to student concerns and problems.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Using good judgment to provide information when necessary.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall:						
17	PBL sessions are helping me to develop problem solving skills.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	The whole class discussion session after each problem gives me a comprehensive overview of the situation/problem.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	The grading scheme in this class fairly reflects the objectives of the course.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please answer the following questions:

1. Which aspects of this course contributed most to your learning?
2. Which aspects of this course should be changed to make the course better for you?
3. How many hours per week would you estimate that you spent on this course outside of class?

3. MATERIALS AND METHODS

3.1 Study Subjects

In this prospective survey based cross-sectional study student participation within the Medical, Dental, Nursing and Pharmacy colleges in a RAK Medical and Health Sciences University in UAE was completely voluntary and confidentiality was maintained at all times. Total 200 hundred students participated in the study. There were 50 students each from Medical, Dental and Nursing college included to participate in the survey. A pre-validated self-designed modified questionnaire based on the literature search was administered. A pilot study was also carried out. The questionnaire consisted of demographic details & closed-ended questions addressed to report the experience and attitudes of University students towards PBL. We conducted this cross-section study based on an anonymous and self-administered questionnaire. The data was collected from the students. However, uncompleted questionnaires were excluded.

The questionnaire was made available in English and was designed in a way that it took on average only five to ten minutes to complete.

Sample size-200

Study population-Students of University in UAE

Sample selection-Random selection

Inclusion criteria: Regular students enrolled with the University

Exclusion criteria-Part time students; Students with no PBL in their course

Ethical clearance was taken from the University ethical committee and descriptive statistics was used for the analysis of the results.

3.2 Data Collection Methods

The questionnaire was developed, based on an extensive literature search using the web based search engines Medline, PubMed, and Google scholar. We used key words 'problem based learning', 'PBL and increase of knowledge', 'PBL and skill development', 'PBL in hybrid curriculum', 'PBL and self-directed learning', . It was further reviewed by the PBL experts educationists and piloted on 20 students for validation. The questionnaire was divided into three parts. The first part consisted of items, which tested the students' perception toward the benefits of PBL sessions. The second part tested the students' perception toward the PBL processes (PBL sessions). The third part tested of items, which measured the students' perception toward the preparation of the facilitators to facilitate the sessions, and their fairness on students' evaluation. These items were answered on a 5-point's Likert scale as strongly agree (5), agree (4), neutral (3), disagree (2), and strongly disagree (1). The internal consistency of all items was measured by Cronbach's alpha reliability test and showed 0.88 ($\chi^2=1783.7, p=0.001$).

3.3 Data Analysis

Data were coded and entered into Microsoft Excel software and analyzed using SPSS version 19.0 statistical software. The average score for each student was calculated on a 5-point's Likert scale. The 5-point Likert scale responses were combined into three categorical variables 'agree' (strongly agree plus agree), 'neutral', and 'disagree' (strongly disagree plus disagree). Chi-Square test was used to measure the associations between the different categorical variables (agree, neutral, and disagree) among the male and female or first and second year students. A $p<0.05$ was considered statistically significant.

4. RESULTS

Demographic details

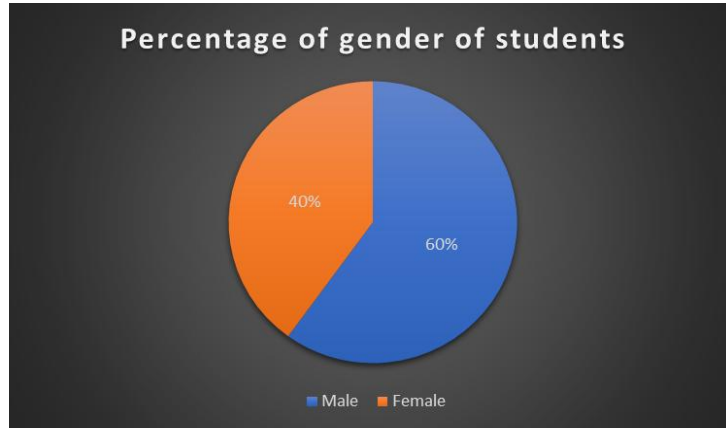


Fig. 1. Percentage of male and female students

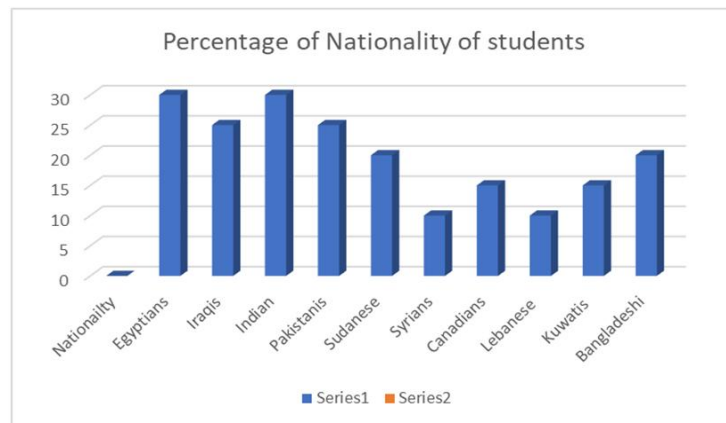


Fig. 2. Details of percentage of nationality of students

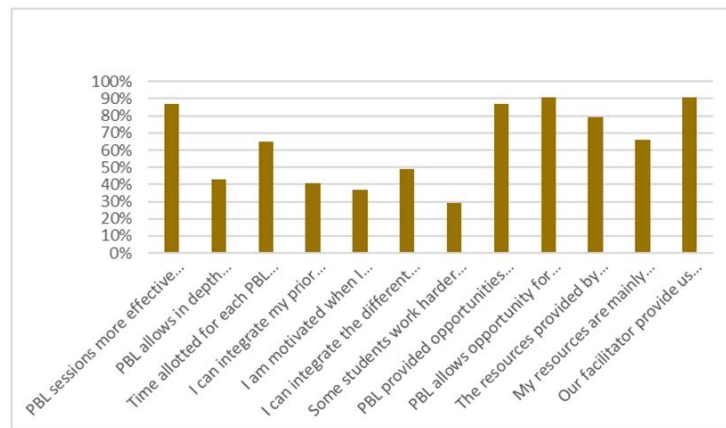


Fig. 3. Perception, attitude and practices of students about problem based learning

4.1 Results based on the questionnaire survey

Perception of students on problem solving and self-directed learning	Strongly agree
1. PBL sessions more effective in achieving learning objectives	87%
2. PBL allows in depth understanding of the topics	43%
3. Time allotted for each PBL session is enough	65%
4. I can integrate my prior knowledge to solve the problem	41%
5. I am motivated when I study the problem getting from real life	37%
6. When searching the resources, I try to evaluate the relevancy of different books with the subjects to be studied	25%
7. I can integrate the different subjects to solve the problem	49%
Perception on cooperative learning	
8. All members in my PBL group participate in discussion	
9. Some students work harder to prepare them than others to participate in PBL discussion	29%
10. PBL promotes better student participation in the learning process	42%
11. PBL provided opportunities for me to contribute ideas	87%
12. I usually participate actively during PBL session	36%
13. PBL promotes students team work and interpersonal skills	38%
14. PBL allows opportunity for hearing different perspectives and learning from one another	91%
Perception of students on learning resources for PBL	
15. Enough learning resources are available for PBL sessions	65%
16. The resources provided by the library /internet allowed me to satisfy the course requirements	79%
17. My learning resources are mainly from my lecture notes and text books	72%
18. My resources are mainly from the senior students' work	66%
Perception of students on role of facilitator in PBL	
19. The facilitator effectively facilitated the PBL sessions	78%
20. Our facilitator helps us to find resources that are related to the topic	65%
21. Our facilitator provide us with a positive learning environment	91%
22. We can identify the learning goals for the trigger without depending on the facilitators	77%
23. It is the facilitator's job to select the leader and scribe, not our group members	82%

87% students agreed that the PBL sessions are more effective in achieving learning objectives. 43% students strongly agreed that the PBL allows in depth understanding of the topics. Only, to 65% of the students the time allotted for each PBL session was enough. 41% agreed that they can integrate their prior knowledge to solve the problem in problem based learning sessions. 37% of them strongly agreed that they are motivated when they study the problem getting from real life. 49% of them could integrate the different subjects to solve the problem.

29% stated that they work harder to prepare for discussion in problem based learning sessions than others . 87% of them agreed that PBL provided opportunities for to them to contribute ideas .91% stated that PBL gave them the opportunity for hearing different perspectives and learning from one another .79% agreed that the

resources provided by the library /internet allowed them to satisfy the course requirements .66% of them strongly agreed that their resources were not mainly from the senior students' work. 91% of them stated that their facilitator provided them with a positive learning environment.

5. DISCUSSION

PBL from simply a teaching method associated with a set of principles and is supported by links to a number of theoretical frameworks [4]. including adult learning [5-7] and empirical learning [8-10]. The philosophical principles of PBL that are consistent with these theories include: - Student-centeredness of the learning environment, Student-authorization in the learning process, the advance of enduring learning skills and the upliftment of self-

dependent, keen and self-directed learning. It is an instructive format that is centered around the discussion and learning that originates from a clinically-based problem. In our study the students mentioned that enjoyed the discussion during the PBL sessions a lot compared to didactic lectures. It is a teaching and learning method that emboldens self-regulating learning and gives students practice in handling baffling situations and stating their own spaces in understanding in the viewpoint of appropriate clinical problems, hopefully that they will be able to recall the material later in the clinical years. It is also a way of learning which emboldens a deeper understanding of the material rather than superficial coverage. The same was confirmed by the feedback from our students based on the integrated PBL based program adopted by many Health Sciences University. This teaching and learning method has been assimilated as a curriculum component in a number of health sciences university around the globe and there is ample evidence that students learn well using a problem-based learning format in their curriculum. Our University also has recently changed the curriculum from lecture and discipline based teaching to integrated and PBL based teaching.

The small group setting used in PBL emboldens an intrusive look at all issues, concepts and principles contained within the problem. The time spent outside of the group setting facilitates the development of skills such as literature retrieval, critical evaluation of accessible information and the pursuing of views of peers and faculty. In our study also, majority of the students had same opinion about their experience for PBL It inspires students to become more involved in, and responsible for, their own learning, and most students and faculty report that this is a highly satisfying way to teach. Majority of the students again in our study admitted that it inspired them and is of a great help to be life -long learners. Debatably the, PBL as a standpoint which goes very much further than just "a method of forming a curriculum" [11].

Faculty in many University are resistant to design learner-centered background that gives openings for students to learn the topic and capitalize on the knowledge, skills, and values that they bring to the learning setting. The collaborating environment of the curriculum exposes students to leadership and group work, peer reviewing and self-evaluation. In our University students stated that the use of a structured problem as the

milieu for students to learn clinical reasoning skills and it has helped them to acquire knowledge about the problem. Tutoring in our PBL sessions were structured around useful problem based cases, based on their learning outcome, that served as stimuli for small-group learning.

A recent study [12] has shown that PBL extensively magnifies knowledge and learning skills in a system-based hybrid curriculum as was seen in our study also. We agree with the importance of PBL as a teaching-learning tool. Like other teaching methods, it has its strengths and weaknesses. [13]. It can cause changes in issues, such as self-assessed learning, encouragement, and in the gaining of knowledge about basic essentials. Differing from our findings, some previous studies also reported that PBL did not support learners' self-directed learning aptitude, and did not show positive effects on precarious thinking. Discrepancy regarding the values of PBL might be partly explained by differences timing of inclusion of PBL into courses (such as, before or after lectures), and PBL contents. [14]. Therefore, to overcome the weakness of PBL, systematic good facilitator and student training are essential to implement the PBL properly in the curriculum so that the students are benefited and it can enhance active, self-directed learning. [15].

Study have shown where the students found that the PBL sessions were helpful for understanding basic science concepts. However, there are some basic concerns with this finding. The PBL are ideal if learners can identify and resolve problems in clinical situations, and understand the basic concepts of the topic involved. [16]. Recently, studies reported that PBL performance is related to factors, such as grading system, and learning style, which facilitator need to understand prior to PBL sessions. [13-14]. In our study also, students identified some problems and pointed out that during PBL sessions many times the facilitator were not aware of ways the PBL has to be conducted and also in our study the students disagreed that PBL is a substitute for the lectures.

In our study the students felt that It is appropriate for learners to be involved in assessment in their learning during PBL sessions but at times the overall assessment was not satisfactory. Studies have shown that carefully designed tools used for assessment should include self-assessment, peer assessment and reflection and competency-

based assessment [17-18]. The assessment of students learning and outcomes is necessarily subjective but the difficulties of subjective assessment can be overcome by using qualified and facilitators [19-21].

Auto didacticism, which is usual in advanced learning, is the idea that the teacher does not need to program learners' time. Students are expected to be able to plan their studies and learning in a approach which prepares them for their chosen profession [22]. Studies have suggested that these schemes are built through self-directed and with active interaction specially in a new situation, or problem [23-24]. The problem is also encountered when the facilitators do not have the same ability to interpret the learning outcomes given in the curriculum and also the differences between student groups can lead to differences in learning [25]. Similar problem was stated by our students in this study.

Study also states that when "assessing PBL, assessment seems as a more appropriate as it assess deep fact-based learning compared to traditional assessments that assesses recall of factual content knowledge" [26]. Other studies have also addressed the findings similar to ours regarding the problem of inexperienced tutors. For PBL to be an effective approach the group controlling is a critical part of the tutor's job [27-28]. Study states that to be able to handle this issue in a satisfactory way, in regards to student development, it "requires sophisticated tutoring and group management skills". Also, in other studies it had been noted that the ultimate goal of PBL is for students to be self-motivated, independent learners. By using peer review and self-assessment from group interaction students can build independence and problem-solving skills on their own.

Advantages of PBL over the traditional methods of teaching.

1. PBL is student centered active form of learning.
2. PBL helps to eliminate much of the irrelevant and obsolete muddling of undergraduate's basic training program.
3. It contributes to the acquisition of skills such as problem solving, communication and team working, essential for all graduates.
4. It is an important educational policy for integrating the curriculum.

5. It encourages a deep approach to learning as the students interact with the learning material more than the theoretical approach.
6. PBL facilitates a constructivist approach to learning. When generating learning objectives, students make a use of prior knowledge to ascertain what they still need to learn.
7. The scenarios in PBL may in many instances be considered by students as exemplar cases.
8. Most faculty who have taught in both conventional and PBL curricula favor the latter, largely because it seems a more natural format for learning. For example, no PBL student would make a practice of coming to tutorial sessions unprepared. Also, that the students become skilled at self-directed learning.
9. The PBL curriculum is perceived by the student as more open than the conventional curriculum and seems to promote better student-faculty relationships.

Drawbacks of the PBL curriculum

Reported disadvantages of the PBL curriculum include high faculty workload, variable tutor quality, and the need for facilitators training.

Future of the PBL curriculum

PBL creates a stimulating and supportive environment to teach and learn. Adoption of a PBL curriculum necessitates a radical change in faculty and administrative attitudes. The future of PBL is influential and we feel that there will be even greater use of PBL at all levels of education in coming days.

6. CONCLUSIONS

The classifying of PBL approaches is essential for understanding and adopting appropriate and effective models to meet educational objectives. Educators adopt PBL techniques as a tool to reconceptualise their programs as student-centered and learner-inspiring environments see PBL as a paradigm shift needing necessary changes in curriculum, delivery and assessment design.

Our study has highlighted the perception and practices of students of PBL in a health sciences university. Also, the overview of PBL mentioned

can help to understand the readers for whom the PBL is a new educational strategy. By participating in this study, students and faculty awareness were also increased regarding the importance of the process of problem analysis, hypothesis generation, and the generation of learning objectives. Majority of the students in our study admitted that felt that each problem was proposed to incite dire inquest, encourage free access to a variety of learning resources, and generate small group discussion.

CONSENT

As per international standard or university standard, patient's consent has been collected and preserved by the authors.

ETHICAL APPROVAL

As per international standard or university standard, written approval of Ethics committee has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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