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ORIGINAL ARTICLE

Assessing the Effect of a Problem-Based Learning Tutor-Training Program on Second-Year Tutors and Medical Students at Suez University's Faculty of Medicine: A Mixed-Method Study

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Introduction Problem-based learning (PBL) fosters self-directed learning and critical thinking, but its success depends on effective tutor facilitation. Inconsistent tutor training can hinder student engagement and learning outcomes. This study aimed to enhance PBL quality at the Faculty of Medicine, Suez University, by developing and evaluating a comprehensive training program for PBL tutors.

Methods This study employed a quasi-experimental, mixed-methods design, incorporating both qualitative and quantitative components. Total comprehensive sample included all 10 2nd-year PBL class tutors. A comprehensive training program was developed and implemented for PBL tutors at the Faculty of Medicine, Suez University, covering PBL facilitation techniques, and practical guidance. Program effectiveness was assessed using tutor satisfaction questionnaires. Tutor knowledge and skills were assessed through pre- and post-training questionnaires, while student perceptions of tutor performance were evaluated using Dolmans et al.'s validated questionnaire.

Results The findings showed that 77.8 % of participants rated the suggested strategies for dealing with challenging situations as excellent. The total MCQ test mean score improved from 5.8 pre-intervention to 9.4 post-intervention, indicating a significant increase in tutor knowledge of PBL principles ($p < 0.05$).Concurrently, the mean total score on the student evaluation of tutor performance questionnaire significantly increased from 29.73 (SD = 9.13) pre-intervention to 58.11 (SD = 3.29) post-intervention, indicating a substantial improvement in perceived tutor performance following the tutor-training program.

Conclusions This study provides evidence for the effectiveness of a targeted training program in improving PBL tutoring skills and enhancing the overall PBL learning experience.

Keywords Problem-based learning, Faculty development, Tutor training, Self-directed learning, Feedback.

INTRODUCTION

Problem-based learning (PBL) can be defined as "an instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice and apply knowledge and skills to develop a viable solution to a defined problem."[1]. PBL has been widely used in medical education and is found to be effective in promoting students' critical thinking, problem-solving and teamwork skills[2,3].

PBL is not about problem-solving per se; rather, it uses appropriate problems to increase knowledge and understanding[4, 5]. When clinical material is presented as a learning stimulus, students are better able to appreciate the application of underlying scientific information and concepts in clinical practice[6, 7].

The tutor's role changes, shifting from information provider to facilitator of small group learning. The most important aspect of staff development should be helping PBL tutors improve their facilitation and group dynamics (especially dysfunctional groups) management skills[4]. Tutors or facilitators in PBL are supposed to monitor the depth of learning, take appropriate action when needed and encourage active engagement from all group members[8,9]. The tutor-student relationship can be thought of as a form of cognitive apprenticeship since it pushes students to think more critically and models for them the kinds of questions they should be asking themselves while solving problems[10, 11].

The Faculty of Medicine at Suez Canal University (FOM-SCU) was founded in 1978 to become the region's first problem-based, community-based, student-centered institution[12]. Since then, many medical schools including the Faculty of Medicine at Suez University, have adopted this educational strategy following the steps of FOM-SCU. The success of PBL hinges on effective tutor facilitation. However, inconsistent tutor training can hinder student engagement and learning outcomes. Consequently, adopting a PBL tutor training program at the Faculty of Medicine, Suez University, would help boost tutors' facilitation skills and understanding of the PBL process, in addition to helping to enhance students' learning. This study aims to enhance the PBL experience at the Faculty of Medicine, Suez University, by improving the quality of the PBL tutoring skills of faculty members, thereby ensuring better student engagement and learning outcomes.

Accordingly, this study sought to answer the following two key research questions:

1. How does implementing the PBL tutor-training program improve tutorial skills at the Faculty of Medicine, Suez University?

2. What is the difference between students' evaluation of tutors' performance before and after implementing the PBL tutor-training program?

Subjects and Methods:

Study design:

An interventional quasi-experimental, mixed-methods design was employed to assess the effectiveness of the designed and implemented tutor-training program. This methodology enabled evaluation of tutors' satisfaction and knowledge levels and students' perceptions of tutors' performance both before and after the intervention's implementation.

Study context and target population:

The target population included 2nd-year PBL class tutors and 2nd-year medical students during the academic year 2023-2024, at the Faculty of Medicine, Suez University.

Sample size:

A comprehensive sample included all 213 2nd-year medical students and 10 2nd-year PBL class tutors at the Faculty of Medicine, Suez University, during the academic year 2023 - 2024. Students were distributed across 20 PBL classes, each comprising approximately 10 students. Given the limited number of available faculty, each tutor facilitated two PBL classes on two separate groups and remained with these same classes throughout the academic year.

Inclusion Criteria:

All 2nd-year PBL class tutors in the academic year 2023 - 2024, Faculty of Medicine at Suez University, were enrolled in the study. As well as, all 2nd-year medical students in the academic year 2023 - 2024, Faculty of Medicine, at Suez University, were enrolled in the study.

Exclusion Criteria:

The study excluded second-year Faculty members who were enrolled as PBL class tutors after starting the program. Moreover, it excluded second-year PBL class tutors who attended less than 50 % of the program.

Study Procedure:

The ADDIE model, which includes the five phases of analysis, design, development, implementation and evaluation, was used[13].

Analysis Phase:

1. Problem Identification: A dedicated, formal training program specifically designed to enhance PBL tutoring skills has been identified as a crucial need by both the institution and its faculty members. Implementing a PBL tutor training program at the Faculty of Medicine, Suez University, would enhance tutors' abilities to guide student learning effectively within the PBL framework and deepen their comprehension of the PBL process.

2. Needs Assessment for the Learners Targeted: A needs assessment was conducted using an online form to request 2nd-year PBL tutors to list topics they consider would benefit them the most in the upcoming PBL tutor-training program. An analysis of the needs assessment revealed that most

responses revolved around the process of PBL, group dynamics, the tutor's role and dealing with different challenging situations that face tutors throughout the process in the most ideal manner and providing constructive feedback.

Design Phase:

3. Appropriate Goals and Objectives: The program's main goal was to improve the PBL tutorial experience by providing PBL tutors with formal, clear and effective training that empowers them and improves their understanding and commitment towards PBL. The program aimed to develop tutors' individual competencies in cognitive (knowledge), affective (attitudes) and psychomotor (skills and performance) domains, which is a realistic and quantifiable goal. Faculty development programs designed to meet the needs of tutors enhance their understanding of problem content and their capacity to mentor students' education, particularly for tutors who receive poor reviews from students.

4. Educational Strategies: The authors developed the PBL tutor-training workshop's content through a needs assessment questionnaire, a literature review of crucial tutoring topics[14 - 19] and thematic analysis of students' focus group discussions. Three medical education experts reviewed the program content. They provided feedback, emphasizing the importance of incorporating interactive activities with practical tips and scenarios to aid tutors in various PBL class situations. Face-to-face interactive sessions and group discussions were the adopted instructional methods for the training workshop. Group discussions were focused on challenging PBL scenarios and strategies for effective facilitation.

Development Phase:

5. Development of Training Materials: The one-day in-person workshop included four and a half hours of interactive presentations and collaborative exercises. The workshop was designed to be a face-to-face meeting with 2nd-year PBL tutors. The workshop was scheduled in coordination with the Dean to ensure optimal participation from the ten second-year PBL tutors. An official invitation was disseminated via the faculty's WhatsApp group, outlining the date, time and location of the training. A commendable 90 % attendance rate was achieved, with nine out of ten tutors participating. The workshop was conducted by two instructors, members of the medical education department with three years of experience as a 2nd-year PBL class coordinator. Before the workshop conduction, it was jointly presented in front of four medical education experts at the Faculty of Medicine, Suez Canal University, to ensure effective delivery and interaction.

Implementation Phase:

6. Implementation of Training Program: The presentation started with an introduction to PBL and the steps of the PBL process. A discussion with the tutors centered around the theoretical basis of PBL and the roles of students and tutors. A brainstorming question about the common problems of PBL was posed and the presenter received diverse answers from the tutors. Facilitation skills were demonstrated in detail and different questioning techniques like evidence, clarification, explanation, linking, re-voicing and the 3 Ps technique (pause, pose and pounce) were all explained with examples.. Practical tips and tricks to use in PBL class were presented to tutors. Reflection and feedback were discussed. Tutors were asked to pair up and think about challenging situations in PBL class and how they can respond to each situation correctly. The presenter discussed the responses with the groups and the ideal strategies were shown at the end of each situation.

Evaluation Phase:

7. Evaluation of Program Effectiveness: Kirkpatrick's evaluation model was used to evaluate the program's effectiveness[20, 21]. This study evaluated three levels of the model. The first level (reaction), which is tutors' satisfaction, was conducted using a questionnaire adapted from El Naggar *et al.* (2013)[22]. The second level of Kirkpatrick's model (learning) was assessed by a pre-and post-10 MCQ test gauging the knowledge gained at the workshop. For assessing the influence of the training on the tutor's behavior change, the third level of Kirkpatrick's model, Dolmans *et al.'s* (2006)[23] questionnaire, was used. This questionnaire was administered to students for the first time during the first semester before the implementation of the training program. The same questionnaire was then re-administered three months after completing the training program, with the same tutors facilitating the same PBL classes throughout the year.

8- Data collection tools:

Qualitative Tools:

Focus group:

- A pre-program focus group, was held to guide the development of the program's content. The main themes that emerged from the analysis were directly incorporated into the training program's

content. Students' insights on tutor behavior and engagement, evaluation and feedback and discussion and learning facilitation were used to design the training program. This ensured that the training program addressed the specific needs and preferences of the students, enhancing its relevance and effectiveness. The focus group was formed by inviting students from different PBL groups within the 2nd-year to ensure diverse perspectives. The focus group was held in a comfortable seminar room at the medical school. Participants were invited through an online Microsoft Teams invitation, emphasizing the voluntary nature of participation and the importance of their perspectives. Eight students attended the discussion willingly: seven Egyptian students and one foreign student. The lead investigator and the assistant moderator, who also served as the workshop instructors, aimed to understand students' needs from their tutors. They facilitated the focus group discussion, posing the open-ended question: "Based on your experiences with PBL, what advice would you give to PBL tutors to enhance the learning experience?". This open-ended question encouraged students to express their thoughts and experiences freely, leading to rich and nuanced qualitative data on their preferred tutoring approaches and desired characteristics of effective PBL tutors. The discussion was held for an hour and a half. The discussion was audio recorded and transcribed verbatim and the transcripts were then analyzed using thematic analysis. The saturation point was reached when no new themes or insights emerged from the focus group discussions, indicating that the data collected was comprehensive and additional focus groups were unlikely to provide further insights.

Quantitative Tools:

1. Tutors' Satisfaction Questionnaire: The first level of Kirkpatrick's model (reaction) was conducted using a questionnaire adapted from El Naggar *et al*. (2013) with a five-point Likert scale. The questionnaire assessed the tutors' satisfactions with the content presented, the presentation style and small group discussions[21]. A Likert scale, anchored by "excellent" and "bad," served as the response format.

2. A pre- and post-10 (MCQ) test: this test was used to gauge the knowledge gained attending the workshop. Three medical education experts constructed and revised the test to ensure its validity. The questions underwent a rigorous review process and based on their feedback regarding face and content validity, modifications were made to simplify the question format and better align it with the program objectives. The revised questionnaire was then administered to participants. The test consisted of two subthemes. The first subtheme was the basics of PBL (four questions) and the second was dealing with challenging situations (six questions).

3. Pre- and Post-Students' Evaluation of Tutors' Performance Questionnaire: Dolmans *et al.'s* (2006) questionnaire was administered. The questionnaire comprised five main topics: constructive learning, self-directed learning, contextual learning, collaborative learning and interpersonal behavior. There are eleven items in the instrument. On a Likert scale of 1 to 5, students were asked to indicate how much they agreed with each statement. Question number twelve was about giving tutors a global score from 1 to 10. Items of the questionnaire were presented in Arabic and English after being reviewed by medical education experts to make it easier for both Egyptian and foreign students. In the second year, there are approximately 190 Egyptian students and 23 foreign students.

Data analysis:

Quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS version 26). Descriptive statistics were employed to analyze the data, including the calculation of mean, median and mode. The t-test was utilized to compare the means of continuous data. Statistical significance was determined using a *p*-value threshold of less than 0.05.

Qualitative data was analyzed in categories according to the developed themes (thematic analysis was performed)[24]. Official permission was obtained from the Dean of the Faculty of Medicine at Suez University to collect the data from students.

RESULTS

Section One: Results of the Qualitative Data Collected from The Focus Group:

Students' quotes were analyzed. Figure 1 shows three themes: 1) The tutor's behaviour and engagement; 2) evaluation and feedback; 3) discussion and learning facilitation.

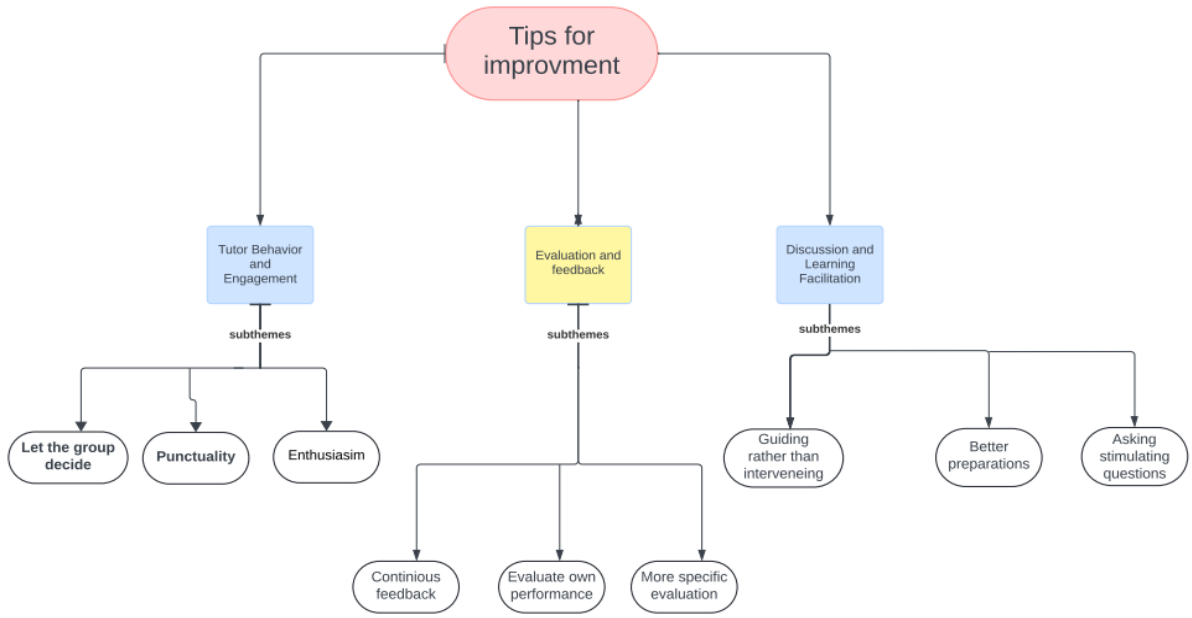

Figure 1: Thematic Analysis of Tips for Tutors' Performance Improvement.

Theme 1: Tutor's behaviour and engagement:

This theme is divided into 3 subthemes: letting the group decide, punctuality and the tutor's enthusiasm.

1. Letting the group decide: Some tips frequently mentioned by students were to let students take the lead in the discussion and give the chair a chance to direct, ask questions and decide how to run the discussion. S1 and S4 said: "The tutor should let the leader ask and manage the discussion without too much interruption" and "I think the tutor should not take on the role of the discussion leader".

2. Punctuality: Another common tip given by many students was punctuality and being on time when it comes to session schedules. S6, S7 and S8 commented, "It's frustrating to wait most of the time for the tutor to start the session.".

3. Enthusiasm:

Becoming enthusiastic and excited to facilitate PBL sessions was another subtheme that emerged among the students' comments. Some students sensed that tutors were not interested in being in PBL classes. S2, S5 and S7 commented, "It would be better if we sensed that the tutor was excited about giving us PBL sessions" and "I wish the tutor would show more energy and interest in the sessions.".

Theme 2: Evaluation and feedback:

Evaluation and feedback were organized into three subthemes: continuous feedback, evaluating his or her own performance and more specific evaluation.

1- Continuous feedback:

Students mentioned they needed regular feedback from their tutors to improve their skills and boost their confidence. S1 student said, " I wish my tutor would not neglect feedback in the session. It's really important for improving my performance in PBL.".

2- Evaluating the tutor's own performance:

Tutors' Self-assessment was a subtheme of evaluation and feedback. Comments like, "To focus on improving their performance and reflect upon their facilitation." and "I think it would be beneficial if the tutor assessed himself on regularly." were mentioned by different students.

3- More specific evaluation:

Some students suggested a more specific evaluation of their performance As the students mentioned, a more serious and explanatory evaluation was needed. S8 said, "The tutor should not evaluate us as a group working sufficiently and neglecting to evaluate each one of us individually.".

Theme 3: Discussion and learning facilitation:

This theme was formed of three subthemes: guiding rather than intervening, better preparations and asking stimulating questions.

1. Guiding rather than intervening:

Some students felt that some tutors were too dominating in the discussion, not giving students a space for brainstorming and generating new ideas. S5 commented, “My tip for the tutor is to step back a little bit and let us debate and generate objectives by ourselves.”.

2- Better preparations

Some students felt that some tutors were not able to direct them through the discussion simply because they did not prepare for the problem in advance and had no clue what the problem was about. S2 said, “The tutor should prepare for the problem to help us navigate the problem and redirect us if we are heading in the wrong direction through the discussions without too much interference." S6 commented, “I wish tutors knew what the problem was before attending the session to help us generate learning objectives, as they are not content experts." These comments indicated a lack of commitment to PBL sessions from some tutors.

3- Asking stimulating questions:

Some tips revolved around asking stimulating questions to help improve the students' performance. Some students thought that some tutors didn’t ask good enough questions to generate ideas. S3 and S5 commented, “I think the tutor should ask more intriguing questions in order to help us think more deeply." Another comment by S4 was, “The tutor should ask us to play a more active role and help us with his/her experience. ".

Section Two: Demographic Data of the Attending Tutors:

Table 1: Distribution of the Academic Ranks of The Attending Tutors (n = 9):

Academic Ranks	Number	Percentage
Demonstrators	4	44.4 %
Lecturers	3	33.3 %
Teaching Assistants	2	22.2 %

Table 1 demonstrated the distribution of the tutors' academic ranks. About 44.4 % of the tutors are demonstrators, while one-third are lecturers and only 22.2 % are teaching assistants.

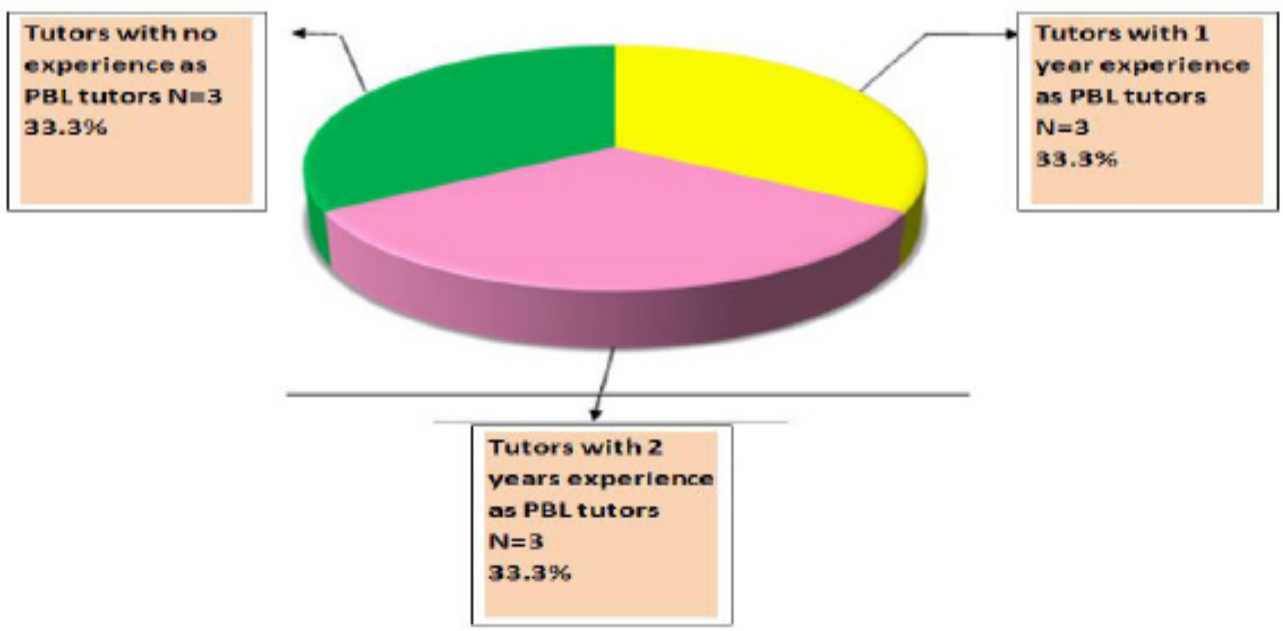

Figure 2: Distribution of Attending Tutors’ PBL Experiences by Year (n = 9).

The distribution of PBL tutoring experience among tutors in figure 2 showed that one third of the tutors had no prior experience in PBL instruction. Another third possessed one year of PBL tutoring experience, while the remaining third had accumulated two years of PBL teaching expertise.

Table 2: Gender Distribution Among the Attending tutors (n = 9):

Gender	Percentage
Males	44.4 %
Females	55.6 %

Table 2 illustrated the gender distribution among the tutors attending the workshop. Out of a total of 9 attendees, females represent 55.6 % and males represent 44.4 %.

Section Three: Evaluation of the Tutor-Training Program:

Table 3: Distribution of Tutors' Satisfaction with The PBL Training Program (n = 9):

		Excellent		Very Good		Good		Needs Improvement		Bad	
		No.	%	No.	%	No.	%	No.	%	No.	%
Content of the workshop											
1	Coverage of useful items	6	66.7	3	33.3	0	0.0	0	0.0	0	0.0
2	Convenience to your interest	5	55.6	4	44.4	0	0.0	0	0.0	0	0.0
3	Organization of the workshop	5	55.6	4	44.4	0	0.0	0	0.0	0	0.0
4	Effectiveness of visual aids and handouts	6	66.7	3	33.3	0	0.0	0	0.0	0	0.0
Presentations											
5	Instructors' knowledge	9	100.0	0	0.0	0	0.0	0	0.0	0	0.0
6	Instructors' presentation style	9	100.0	0	0.0	0	0.0	0	0.0	0	0.0
7	Coverage of the material	7	77.8	2	22.2	0	0.0	0	0.0	0	0.0
8	Response to questions	7	77.8	2	22.2	0	0.0	0	0.0	0	0.0
Small group discussions											
9	Size of the group	4	44.4	5	55.6	0	0.0	0	0.0	0	0.0
10	The selected scenarios represent common difficult tutorial Situations	6	66.7	3	33.3	0	0.0	0	0.0	0	0.0
11	Active participation of every member in the group and sharing experiences	6	66.7	3	33.3	0	0.0	0	0.0	0	0.0
12	Suggested strategies that tutor will use to deal with these situations.	7	77.8	2	22.2	0	0.0	0	0.0	0	0.0

As depicted in Table 3, the overall participant on the program ranged from excellent to very good. Specifically, the program content was deemed highly effective, with 66.7 % of respondents noting excellent coverage of relevant topics, excellent utilization of visual aids and handouts, excellent selection of scenarios that represent common difficult situations and excellent active participation . The instructor's knowledge and presentation style were likewise lauded, garnering excellent ratings (100 %). A significant majority (55.6 %) of participants thought the size of the small groups formed within the workshop to solve difficult tutorial situations was very good. Each group, consisting of three tutors, collaborated to develop effective strategies for managing challenging tutoring scenarios.

Table 4: Distribution of Pre- and Post-program Test Consisting of Multiple-Choice Questions (MCQ) Administered to Determine Tutors' PBL Knowledge (n = 9):

Q		Pre				Post				p
		Incorrect		Correct		Incorrect		Correct		
		No.	%	No.	%	No.	%	No.	%	
Basics of PBL										
1	In PBL, what is the role of the tutor?	6	66.7	3	33.3	1	11.1	8	88.9	0.125
2	What is the first step in the PBL process?	6	66.7	3	33.3	1	11.1	8	88.9	0.063
3	Why is self-directed learning important?	3	33.3	6	66.7	0	0.0	9	100.0	0.250
4	Which of the following statements describes how PBL applies real-world knowledge?	2	22.2	7	77.8	0	0.0	9	100.0	0.500
Dealing with challenging situations										
5	What should you do if a solution is too hard for your group?	5	55.6	4	44.4	1	11.1	8	88.9	0.125
6	If a student supports an idea without proof, which of the following will be your move?	2	22.2	7	77.8	0	0.0	9	100.0	0.500
7	A student isn't improving despite feedback. Which of the following will be the best action?	3	33.3	6	66.7	0	0.0	9	100.0	0.250
8	If one student talks too much, which of the following will you choose?	4	44.4	5	55.6	2	22.2	7	77.8	0.687
9	When a student suggests something against ethics, which of the following will be your immediate action?	3	33.3	6	66.7	0	0.0	9	100.0	0.250
10	If a student fears criticism and doesn't speak up, which of the following will be your response?	3	33.3	6	66.7	0	0.0	9	100.0	0.250

p: *p*-value for comparing between pre and post. *: Statistically significant at $p \leq 0.05$.

Table 4 presents a comparative analysis of PBL knowledge among PBL tutors before and after program participation. Specifically, in the subtheme of PBL basics, pre-test assessments revealed a notable six out of nine incorrect responses to two questions.

Post-test results demonstrated a substantial improvement, with only one incorrect response to the same questions.

Regarding the subtheme of handling difficult situations, pre-test data indicated a 66.7 % correct response rate to questions pertaining to ethical dilemmas and student apprehension. Post-test evaluations revealed a significant enhancement, with all nine participants providing correct answers, indicating a 100 % accuracy rate.

Table 5: Descriptive Analysis of Pre- and Post-Program Tests Consisting of Scores for Multiple-Choice Questions (MCQ) Administered to Tutors (n = 9):

	Pre	Post	P
Overall			
Total score (0 – 10)			
Min. – Max.	1.0 – 8.0	9.0 – 10.0	0.005*
Mean ± SD	5.89 ± 2.37	9.44 ± 0.53	
Median	7.0 (6.0 – 7.0)	9.0 (9.0 – 10.0)	
Average Score (0 –1) (Mean ± SD)	(0.59 ± 0.24)	(0.94 ± 0.05)	

SD: Standard deviation. *p*: *p*-value for comparing between pre and post. *: Statistically significant at $p \leq 0.05$.

As depicted in Table 5, a statistically significant difference ($P < 0.05$) emerged between the pre- and post-test results. The overall mean score increased from 5.89 on the pre-test to 9.44 on the post-test.

Table 6: Distribution of Tutors' Satisfaction with The PBL Training Program (n = 9):

Q	Pre					Post					N	N	N	*P*
	Totally disagree	Disagree	Neutral	Agree	Totally agree	Totally disagree	Disagree	Neutral	Agree	Totally agree				
	%	%	%	%	%	%	%	%	%	%	%			
F1 Constructive/active learning														
1. Summarize what we had learnt in our own words	21.4	32.7	30.4	8.9	6.5	0.0	0.0	3.0	40.5	56.6	< 0.001*			
2. Search for links between topics in the tutorial group	21.4	35.7	27.4	7.7	7.7	0.0	0.0	5.4	44.6	50.0	< 0.001*			
3. Understand underlying mechanisms/theories.	21.4	38.1	26.2	8.9	5.4	0.0	0.0	6.0	39.9	57.1	< 0.001*			
F2 Self-directed learning														
4. Generate clear learning issues by ourselves	32.1	36.3	17.9	7.7	6.0	0.0	0.0	4.2	47.0	48.8	< 0.001*			
5. Search for various resources by ourselves	28.0	36.3	21.4	10.7	3.6	0.0	0.0	4.2	37.5	58.3	< 0.001*			
F3 Contextual learning														
6. Apply knowledge to the problem discussed	29.8	35.7	23.2	9.5	1.8	0.0	0.0	3.0	39.3	57.7	< 0.001*			
7. Apply knowledge to other problems	29.2	41.7	17.3	7.7	4.2	0.0	0.0	6.0	44.6	49.4	< 0.001*			
F4 Collaborative learning														
8. Give constructive feedback on our group work	28.6	33.3	25.6	10.1	2.4	0.0	0.0	4.8	45.2	50.0	< 0.001*			
9. Evaluate group cooperation regularly	26.8	35.1	23.2	11.3	3.6	0.0	0.0	7.7	45.8	46.4	< 0.001*			
F5 Intrapersonal behaviour as tutor														
10. The tutor had a clear picture about his/her	32.1	36.3	19.6	8.9	3.0	0.0	0.0	6.5	43.5	50.0	< 0.001*			
11. The tutor was clearly motivated to fulfill his/her role	39.3	32.1	17.9	8.3	2.4	0.0	0.0	4.8	35.1	60.1	< 0.001*			

p: *p*-value for comparing between pre and post. *: Statistically significant at $p \leq 0.05$.

Table 6 compares students' evaluation of tutors' performance before and after the program. The results of all questions across the five subthemes demonstrated a statistically significant difference ($p = 0.001$). Regarding the constructive learning subtheme, pre-questionnaire data revealed that only 6.5 % of students strongly agreed with the statement summarizing their learned content. Post-questionnaire results, however, indicated a substantial increase, with 56 % of students expressing strong agreement.

In the self-directed learning subtheme, a similar pattern emerged. Pre-intervention, only 6 % of students strongly agreed that tutors allowed them to generate clear learning issues independently. Post-intervention, this percentage rose to 48.8 %.

Expressly, regarding contextual learning, only 1.8 % of students strongly agreed that the tutor applied knowledge to the discussed problem before the intervention. In contrast, a substantial increase was noted post-intervention, with 57.7 % of students expressing strong agreement.

Regarding the provision of feedback, only 2.4 % of students strongly agreed to receive constructive feedback from tutors prior to the program. However, this figure surged to 50 % following the intervention.

Table 7: Distribution of Pre and Post-Students' Evaluations of PBL Tutors' Performance Questionnaires (global score 0-10) (n = 168):

	Pre		Post		P
	No.	%	No.	%	
Q12 (Global score) - Give a grade (1–10) for the overall performance of the tutor (6 being sufficient, 10 being excellent)					
1	6	3.6	0	0.0	
2	3	1.8	0	0.0	
3	23	13.7	0	0.0	
4	35	20.8	0	0.0	
5	44	26.2	0	0.0	
6	29	17.3	0	0.0	< 0.001*
7	14	8.3	8	4.8	
8	9	5.4	54	32.1	
9	5	3.0	67	39.9	
10	0	0.0	39	23.2	

p: *p*-value for comparing between pre and post.
*: Statistically significant at $p \leq 0.05$.

Table 7 presents the difference in grading the overall performance of tutors pre- and post-intervention. Prior to program implementation, the most frequent score awarded to tutors was 5, with 26.2 % of students selecting this rating. Conversely, following the program's implementation, the highest proportion of students' responses (39.9 %) assigned tutors an average score of 9. A statistically significant difference ($p < 0.05$) was observed between these two distributions.

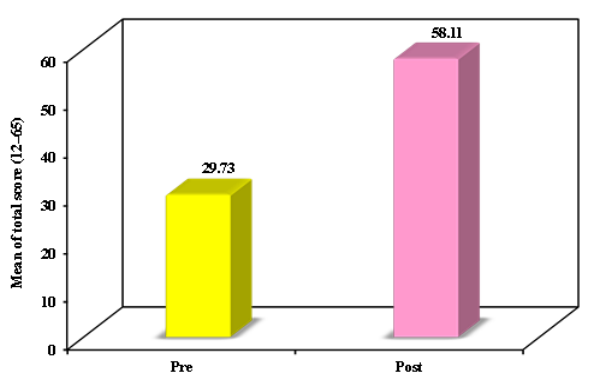

Figure 3: Descriptive Analysis of Pre and Post-Intervention Student Evaluations of PBL Tutor Performance Total Score Mean.

Figure 3 presents a comparative analysis of pre- and post-intervention student evaluations of PBL tutor performance (n = 168). The mean total score on the student questionnaire significantly increased from 29.73 (SD = 9.13) pre-intervention to 58.11 (SD = 3.29) post-intervention, indicating a substantial improvement in perceived tutor performance following the tutor-training program.

DISCUSSION

The PBL process revolves around facilitation and it has been observed that students see the competence and abilities of facilitators as essential to their success in terms of social and academic results[25]. This should be taken into account while providing master classes to expert facilitators to help them hone their art and throughout the induction process for new facilitators to help them grow their skills[26].

The training program underwent several phases: analysis of needs assessment, design of program objectives, development of content and instructional methods, implementation of the one-day training program and evaluation of the program's effectiveness using three levels of Kirkpatrick's evaluation model. The program covered the basics of PBL , facilitation skills, how to give and receive feedback within the group and how to handle challenging characters and situations. Small groups were formed and participants collaborated to identify the best approaches to facilitation challenges in PBL.

Analysis of tutors' post-program satisfaction: Tutors' reactions to the PBL tutor-training program ranged from excellent to very good, indicating high levels of satisfaction with various aspects of the training. One of the standout aspects of the training was the presentation of scenarios depicting common, difficult situations. Most responses rated this component as excellent, indicating that the scenarios were highly relevant and useful for the tutors. Additionally, the suggested strategies for handling these situations were also rated as excellent, reflecting the practical value of the training content. This high satisfaction can be attributed to the relevance of the program content which was tailored to address the specific needs identified during the needs assessment phase. The findings of this study align closely with those of El Naggar *et al*.,[22], who also reported high levels of tutor satisfaction following a PBL training workshop. high levels of satisfaction across underscore the importance of well-structured PBL tutor-training programs in enhancing tutors' competencies and overall effectiveness.

Results of the current study regarding tutors' satisfaction go in line with the results of Piryani *et al.,*[27] assessing the effectiveness of the workshops. Participants shared that the training workshops fostered a better understanding of PBL and improved their skills in PBL facilitation.

Evaluation of Pre- and Post-Program Knowledge Change: The knowledge level of the tutors was assessed using a paper-and-pencil test administered at the beginning and end of the workshop. The pre- and post-tests were scored out of 10. The results indicated a statistically significant difference between the pre- and post-test scores ($p < 0.05$). The mean score for the pre-test 5.89 ± 2.37, while the mean score for the post-test was 9.44 ± 0.53. The significant improvement observed in the can be attributed to the structured and tailored approach of the training program, the interactive and practical delivery methods, expert feedback and focused content. These factors combined to create an effective learning environment that enhanced tutors' knowledge and skills, leading to better performance in the MCQ tests. A study by John *et al.,*[28] involved eighty-eight faculty volunteers who completed a 20-item multiple-choice questionnaire before and after the workshops. The post-test results showed significant improvement in tutors' knowledge and skills related to the tutor role.

Another study by Baral *et al.,*[29] showed that participants gained significant knowledge of PBL concepts. Both this study and the B.P. Koirala Institute of Health Sciences (BPKIHS) study by Baral demonstrate significant improvements in participants' PBL knowledge post-workshop. The importance of foundational concepts like PBL basics and the role of the tutor were discussed in both studies.

Students' Evaluation of Tutors' Performance Before and After Implementing the Program: Regarding Level 3 of Kirkpatrick's model, behavior outcomes focus on the degree to which the knowledge and skills acquired during training are utilized in the workplace or lead to outstanding job performance[21]. Students' evaluations provide valuable insights into how tutors' behaviours have changed over time, reflecting the program's impact on teaching quality. Students evaluated tutors' performance prior to the intervention after attending approximately six PBL classes during the first semester of the 2023-2024 academic year. This allowed students to interact with tutors and form an opinion about their performance. The post-intervention questionnaire was administered at the end of the second semester, three months after the workshop. During this period, students attended approximately eight PBL classes. The results indicated statistically significant improvements in students' evaluations of tutors' performance across all five subthemes of the students' questionnaire after the implementation of the training program. The initial low ratings can be attributed to the controlling and authoritative tendencies exhibited by many tutors before the program. Tutors were accustomed to being the primary information providers, often employing a one-way communication style and lacking feedback within the class. These factors likely contributed to the pre-intervention ratings. The subsequent increase in ratings indicates a positive transformation in tutor behavior. Improvements in facilitation skills, enhanced communication with students, continuous feedback and a shift from dominating to facilitating discussions are all factors that could explain the significant improvement in tutors' behavior. These findings suggest that the intervention positively influenced students' perceptions of tutors' effectiveness and that the program may have led to observable changes in tutor behavior.

These findings are consistent with those of Baroffio *et al.*[30], who reported that students rated tutors lower on several skills before the workshop, with notable improvements observed after the training. In the current study, students rated tutors' performance three months after the program, allowing sufficient time for tutors to incorporate and absorb the new facilitation strategies into their practice. Barnawi *et al.*[31] investigated a faculty development program on PBL at King Abdulaziz University and found that students agreed tutors promoted constructive, self-directed, contextual and collaborative learning. These findings support the current study indicating that effective tutors enhance student learning outcomes.

The results of this study also showed that students had a stronger tendency to give their tutors higher performance rankings the more engaged they were. These findings support the suggestion made by Vogt *et al.*[32] that tutors should interact with students, offer feedback and be willing to reflect on their own teaching in order to improve their instruction.

Limitations of the Study: The study's focus on a single medical faculty restricts the generalization of findings to other educational contexts. Moreover, the study's focus on knowledge acquisition and behavioural changes may not fully capture the long-term impact of the training program on institutional-level changes. Finally, the relatively small sample size of tutors might limit the statistical power of the study and affect the generalization of the findings.

Recommendation: To enhance the effectiveness of our tutoring program, it is strongly recommended that all tutors undergo comprehensive PBL training program before the start of the academic year. This training should be mandatory for anyone wishing to join as a tutor.

CONCLUSION

The comprehensive training program for PBL tutors at the Faculty of Medicine, Suez University, significantly enhanced tutor knowledge and facilitation skills. The program's effectiveness was evidenced by substantial improvements in both tutor knowledge and student perceptions of tutors' performance. This study emphasize the value of structured training for PBL tutors in improving the learning experience. Future research should consider collaborative efforts between medical schools to create standardized training programs

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ETHICAL APPROVAL

Ethical approval was obtained from the Research and Ethics Committee (REF No. 5460#) at the Faculty of Medicine at Suez Canal University and Research and Ethics Committee (REF No. 15#) at the Faculty of Medicine at Suez University. Informed written consent was obtained from faculty members and second-year students after explaining the aim of the study. Faculty members and students were assured that the confidentiality of data and results would be maintained, including anonymizing responses and securely storing all collected information.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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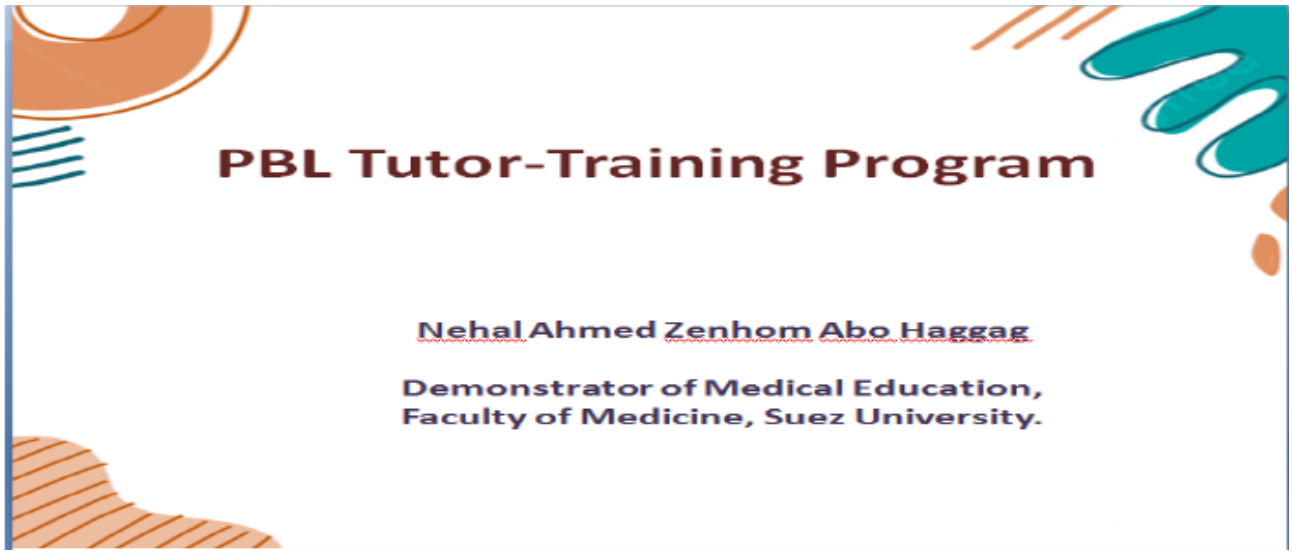
ANNEX (1)

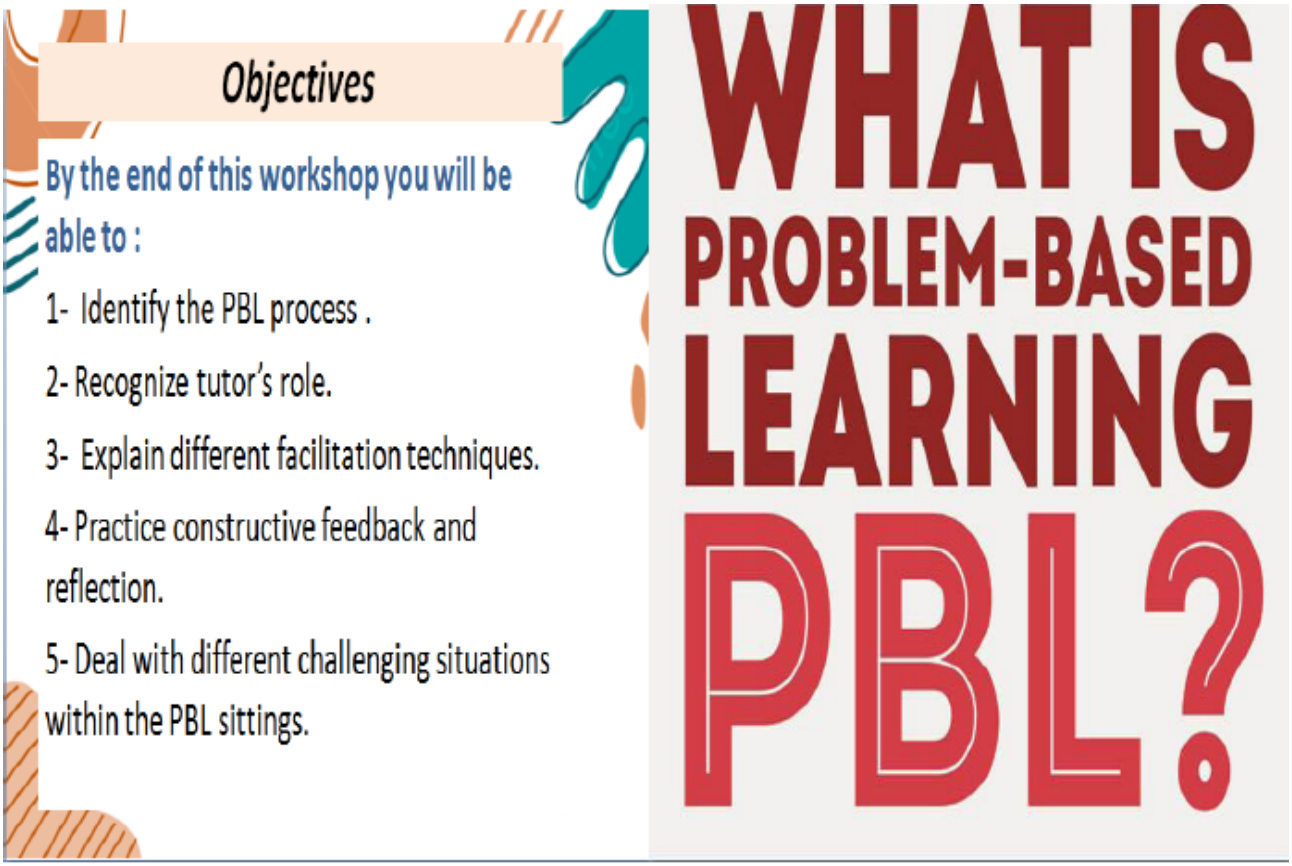
PROGRAM OUTLINE

Topic	ILOS	The instructional method	Year	Assessment
PBL Tutor- Training program	• Identify the PBL process. • Recognize tutor's role. • Explain different facilitation techniques. • Practice constructive feedback and reflection. • Deal with different challenging situations within the PBL sittings.	• Didactic and interactive training session.	2nd year PBL tutors	• Post-training satisfaction questionnaire. • Pre- and post-training evaluation questionnaires of knowledge. • Students' evaluation of tutors' performance questionnaire before and after the program.

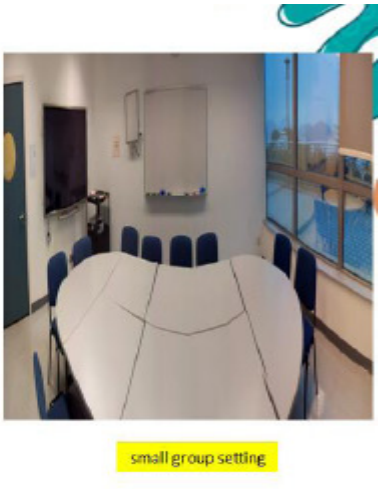
ANNEX (2)

PROGRAM CONTENT



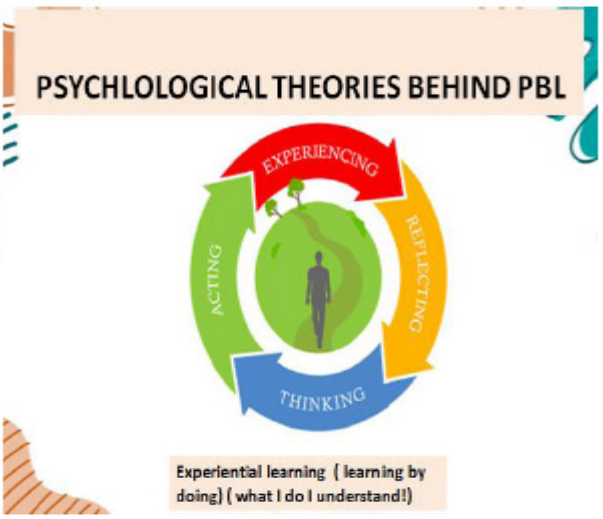



Case scenario

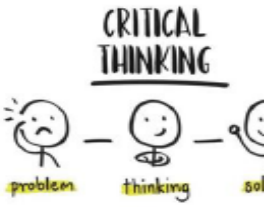

small group setting

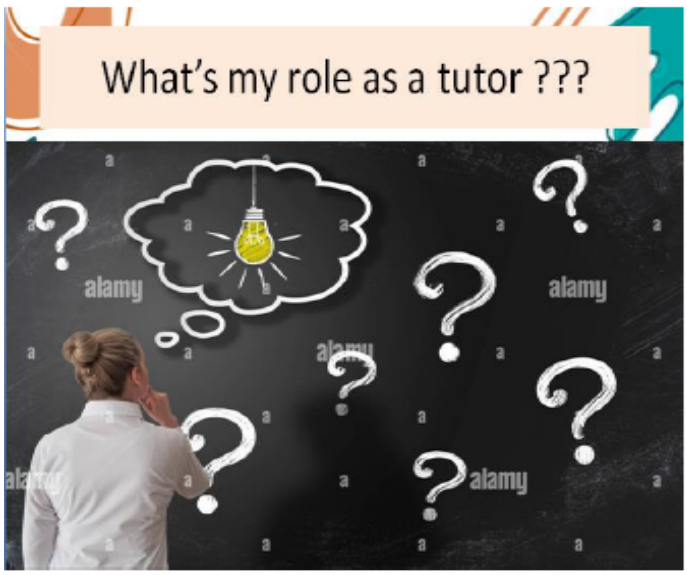
STUDENT ROLES & RESPONSIBILITIES

Research information & share with others



Experiential learning (learning by doing) (what I do I understand!)





1-Facilitating the session and ensuring it runs on time

2- Encouraging students to ask questions throughout the session

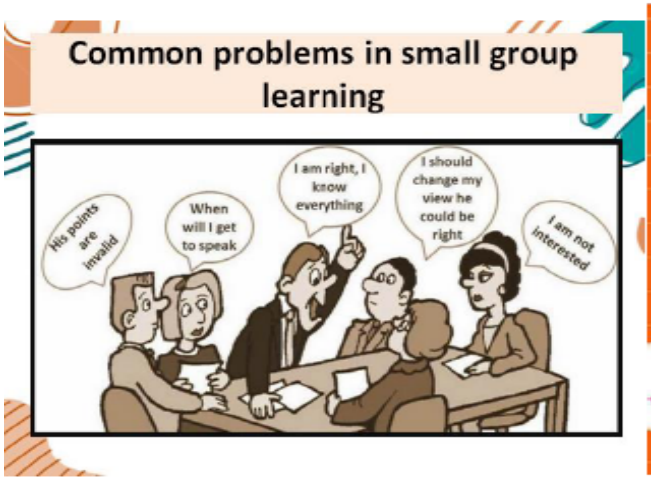
3- Clarifying areas that may cause misunderstanding or confusion for students

4- Providing effective feedback

5- Managing the group dynamics, including resolving conflict and unprofessional behavior

7- Critical reflection at the debriefing session

Burgess, Annette, et al. "Facilitating small group learning in the health professions." BMC Medical Education 20.2 (2020): 1-6.



Facilitating skills:-

- Questioning, probing during discussion.

Types of questioning:

1- Yes / No questions.

2- Open ended questions.

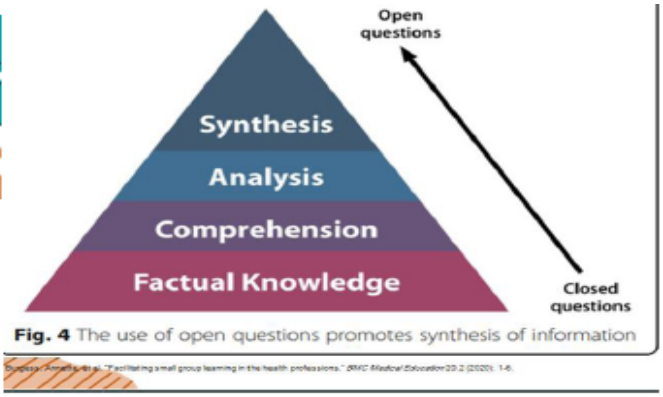


Fig. 4 The use of open questions promotes synthesis of information

Some examples of questioning strategies include:

- **Evidence**: 'What evidence is there to support that?'
- **Clarification**: 'Can you explain what that means?'
- **Explanation**: 'Why do you think that would be the case?'
- **Linking**: 'How does this idea support what we mentioned earlier on?'

Burgess, Annette, et al. "Facilitating small group learning in the health professions." *BMC Medical Education* 20.2 (2020): 1-6.

Tips and tricks in facilitation

Tip 1

Ask your group to identify their ground rules in the first tutorial

Tip 2

Discuss with your group the different roles they may play

Tip 3

Build trust and encourage bonding of group members

- **Tip 4**

Do not dominate group discussion but rather facilitate the process.

- **Tip 5**

Be a role model for your group and monitor your teaching skills.

- **Tip 6**

Encourage understanding.

- **Tip 7**

Prepare the problem and put yourself in students' shoes.

- **Tip 8**

Ask open-ended questions & probe students for answers

- **Tip 9**

Promote and evaluate group dynamics.

- **Tip 10**

Solve problems in the group with a win-win Approach.

- **Tip 11**

Allow reflection.

Why do we reflect?

We do not learn from experience... we learn from reflecting on experience.

- John Dewey

Some of the reflective questions include:-

1-What went well during the lesson?

2-What can be improved?

3-Did the lesson cover the learning objectives I set at the start of the lesson?

4-Was my questioning technique effective?

5-How well did I engage learners?

6-Where can I improve next time?

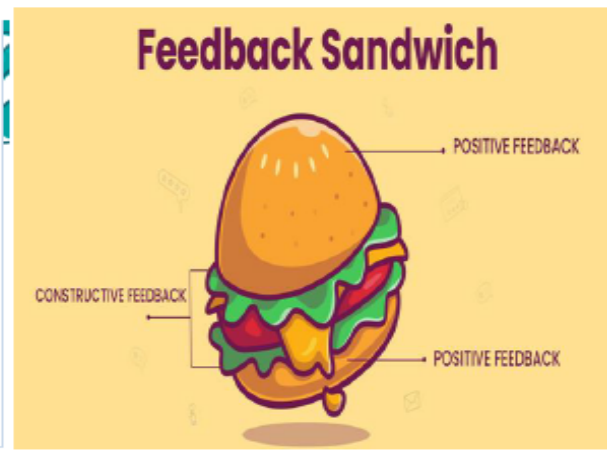
- **Tip 12**

Provide feedback.

- Be specific and be timely.
- Concentrate on the content NOT the person.
- Make it regular. (it's feedback time!!)
- Location is important. (DO NOT RUSH IT).
- Simple trick... write your name and rotate!!
- This can be done verbally, by asking "what were the key messages" from the session?

or what areas were "confusing" or "least well understood"?

How much did you learn from this PBL discussion?



Dealing with difficult situations what would you do?

1-You notice that a student **tries to force his own views upon the group**, regardless of the opinions of other students. You know that what he is arguing is not scientifically correct. Another student has different views. She tries to explain the other students' views, but fails to persuade him to agree with the group. It was difficult for the scribe to find anything to write.

If the group already has ground rules, remind them that 'we should appreciate each other's views and should listen to one another.

Bring the discussion to the whiteboard.

Suggest that the student research that issue for the group and bring the outcomes to the next tutorial.

If the student continues his disputative attitude in the next tutorials, you will need to talk to him privately.

2-Today is tutorial two. One of the students has researched a learning topic, but has not been able to provide adequate information about the learning issues. Another student tries to help him and explain some points, **but soon they start talking amongst themselves**, excluding the rest of the group.

The use of the whiteboard and a scribe will allow all the group members to contribute.

If a highly productive discussion arises straight away, *allow it to be continued at this point for limited issues and for a limited time only. It is necessary to clarify this for the members.*

Use the Parking lot.

4-Your group knows that you specialize in the topic under discussion. They seem to be unable to discuss the case with the depth needed. They constantly turn to you for answers as you are an expert.

What would you do?

You are a guide NOT a hero!

Be comfortable with silence. Use the think, pair, share.

Probe (don't explain) You may ask questions like: *Why ....? Why not ...? What next? etc..*

Parking lot (don't do their work).

5-Students are discussing three problems in a case: (1) upper abdominal pain; (2) vomiting; and (3) dark urine. They include the following causes for the first problem:

- . Peptic ulcer
- . Food poisoning
- . Angina

They are unable to find more causes. The tutor and asks 'What else could cause upper abdominal pain. They are unable to progress and one of them says, **'We do not know.**

What would you do?

Effective facilitation of such a situation may necessitate asking two key questions:

1.What are the structures in the upper abdomen that can be a source of pain?

2. What could possibly go wrong in each of these structures/organs and produce pain?

6-It is the second week of the semester. One of the male students **made a serious impolite comment to the scribe.** She looks very embarrassed and the whole group is silent for a moment. Then one of the girls tries to resume the discussion. You look at him and you find him laughing and talking to the person next to him.

What would you do ?

This is an important incident that should be managed immediately.

The student who made the comment, as well as the group, should realize that there is no place for such offensive comments in the group.

Ask members to reflect on their concerns and what will be the best options to avoid such instances in the future.

7- you notice that a particular student is a **trouble maker** that asks questions that are irrelevant to the problem and constantly interrupts other students.

What would you do?

DON'T IGNORE A TROUBLEMAKER.

Instead, give them tasks.

Ask them probing questions.

Involve other members.

Finally, if the behavior continues, talks to them in private and REALLY LISTEN to them.

8- You notice Low participation by the entire group.

What would you do?

The 3 Ps technique.

Think, pair, share.

Ideas-listing can also work very well when participation is low.

9- You notice that one or two silent members in a group of active Participants.

What would you do?

You could say, **"I'd like to get opinions from those who haven't talked for a while."**

THINK, PAIR, SHARE.

Show them affirmation & encouragement.

Give them a task like chairperson or a scribe next time.

Make sure that learners are at the heart of small group activities, with active engagement.

- Keep an eye on group dynamics to guarantee task completion and productive group work.
- Open-ended questions can be promote clinical reasoning.
- Consider your teaching experience and get participant feedback.

ANNEX (3)

TUTORS' SATISFACTION QUESTIONNAIRE

Questions		Excellent	Very good	Good	Needs improvement	Bad
Content of the Workshop	Coverage of useful items					
	Convenience to your interest					
	Organization of the workshop					
	Effectiveness of visual aids and handouts					
Presentations	Instructors' knowledge					
	Instructors' presentation style					
	Coverage of the material					
	Response to questions					
Small group discussions	Size of the group					
	The selected scenarios representing common difficult tutorial Situations					
	Active participation of every member in the group and sharing experiences					
	Suggested strategies that tutor will use to deal with these situations					

ANNEX (4)

TUTORS' MCQ (PRE-AND POST-TEST)

EVALUATION OF PBL TUTORS' KNOWLEDGE

1:4 Basics of PBL

1-In PBL, what is the role of the tutor?

a) to record points shared by the group

b) to facilitate the learning process

c) to lecture the group

d) to evaluate without intervention

2- What is the first step in PBL process?

a) Clarifying unfamiliar terms

b) Researching the problem

c) Brainstorming solutions

d) Formulating learning objectives

3- Why is self-directed learning important?

a) Limits learning to certain topics

b) Helps learners lead their own learning

c) Depends only on teachers for guidance

d) Stops individuals from exploring on their own

4-Which of the following statements describes how PBL applies real-world knowledge?

a) Studying alone

b) Ignoring practical applications

c) Presenting real-life problems

d) Focusing only on theories

5:10 dealing with challenging situations

5-What should you do if a solution is too hard for your group?

a) Make it easier

b) Forget about it

c) Get help

d) Tell them they can't do it

6- If a student supports an idea without proof, which of the following will be your move?

a) Say it's great

b) Ask for evidence

c) Don't discuss it more

d) Tell them they're wrong

7-A student isn't improving despite feedback. Which of the following will be the best action?

a) Avoid talking about it

b) Criticize in public

c) Talk privately about how to do better

d) Ignore it and move on

8-If one student talks too much, which of the following will you choose?

a) Let them lead everything

b) Get others to join

c) Just praise their talking

d) Don't mind the over talker

9-When a student suggests something against ethics, which of the following will be your immediate action?

a) Explain why it's not okay

b) Say they're creative

c) Ask for more similar ideas

d) Don't think about ethics, focus on the idea

10-If a student fears criticism and doesn't speak up, which of the following will be your response?

a) Criticize them to help

b) Keep them out of discussions

c) Don't bother, focus on others

d) Create a safe space for all ideas **ANNEX (4)**

ANNEX (4)

Students' evaluation of PBL tutors' performance questionnaire
تقييم الطلاب لأداء معلمي التعلم القائم على حل المشكلات

Number tutorial group: **رقم المجموعة التعليمية**

This instrument is aimed at evaluating the performance of the teacher. The statements can be answered by encircling a number: 1 = totally disagree 2 = disagree 3 = neutral 4 = agree 5 = totally agree.
تهدف هذه الأداة إلى تقييم أداء المعلم. يمكن الإجابة على العبارات بوضع دائرة حول رقم: 1 = غير موافق تمامًا 2 = غير موافق 3 = محايد 4 = موافق 5 = موافق تمامًا

	Totally disagree				Totally agree					
F1 Constructive/active learning:										
The tutor stimulated us . . . لقد حفزنا المعلم . . .										
1.to summarize what we had learnt in our own words **لتلخيص ما تعلمناه بأسلوبنا الخاص**	1		2		3		4		5	
2. to search for links between topics in the tutorial group للبحث عن الروابط بين الموضوعات التي تمت مناقشتها في المجموعة	1		2		3		4		5	
2.to understand underlying mechanisms/theories. **لفهم الآليات/النظريات الأساسية**	1		2		3		4		5	
F2 Self-directed learning **The tutor stimulated us.. لقد حفزنا المعلم . . .**										
4.to generate clear learning issues by ourselves. **لإنشاء اهداف تعليمية واضحة بأنفسنا**	1		2		3		4		5	
5.to search for various resources by ourselves. **للبحث عن المصادر المختلفة بأنفسنا**	1		2		3		4		5	
F3 Contextual learning **The tutor stimulated us...**										
6.to apply knowledge to the problem discussed **لتطبيق المعرفة على المشكلة التي تمت مناقشتها**	1		2		3		4		5	
7.to apply knowledge to other problems **لتطبيق المعرفة على مشاكل أخرى**	1		2		3		4		5	
F4 Collaborative learning **The tutor stimulated us...**										
8.to give constructive feedback on our group work **لتقديم تعليقات بناءة على عمل مجموعتنا**	1		2		3		4		5	
9.to evaluate group cooperation regularly **لتقييم التعاون بين المجموعة بانتظام**	1		2		3		4		5	
F5 Intrapersonal behaviour as tutor										
10.The tutor had a clear picture about his/her strengths/weaknesses لدى المعلم صورة واضحة عن نقاط القوة والضعف لديه كميسر للنشاط التعليمي	1		2		3		4		5	
11.The tutor was clearly motivated to fulfill his/her role **الواضح أن المعلم متحمس للقيام بدوره**	1		2		3		4		5	
Global score										
12- Give a grade (1–10) for the overall performance of the tutor (6 being sufficient, 10 being excellent) (إعطاء درجة (1-10) للأداء العام للمدرس (6 كافية - 10 ممتازة	1	2	3	4	5	6	7	8	9	10