Status of problem based learning in postgraduate anesthesia teaching: A cross-sectional survey

Geetanjali Chilkoti,
Rachna Wadhwa,
Ashok Kumar

Department of Anesthesiology and
Critical Care, University College
of Medical Sciences and Guru
Teg Bahadur Hospital, Shahdara,
New Delhi, India

ABSTRACT

Background: Anesthesia is a specialized branch of medicine with a very narrow margin of error. Incorporation of problem-based learning (PBL) in anesthesia post-graduate (PG) teaching enhances the critical thinking and problem-solving skills. It also helps in developing a broader prospective of clinical case scenarios. Case based discussions (CBD) are most widely practiced out of all PBL methods in anesthesia PG teaching. **Materials and Methods:** We conducted an anonymous questionnaire based, cross-sectional survey among 62 anesthesia residents from various medical institutions in a city of Delhi, India. We aimed to assess the current status of PBL by assessing the student satisfaction with CBD in anesthesia PG teaching, educational objectives accomplished with CBD and effectiveness of teaching curriculum in PG teaching with suggested modifications, if any. **Result and Conclusion:** We observed that CBD is lacking in many important key areas of PBL e.g., formulation of objectives, communication on the content and direction of PBL, facilitation skills, supplementation of inadequacies of CBD. However, CBD seems to be a valid method of PBL in terms of the educational objectives accomplished with it but increased motivation for learning is required. Majority of the students felt that PG teaching curriculum should be centralized, with increased emphasis on open interactive sessions regarding its effectiveness.

Key words: Anesthesia, case based discussions, educational objectives, problem based learning

Address for correspondence:
Dr. Geetanjali Chilkoti, A 1404,
Jaipuria Sunrise Greens, Ahimsa
Khand, Indirapuram, Ghaziabad,
Uttar Pradesh, India.
E-mail: geetanjalidr@yahoo.co.in

INTRODUCTION

The teaching curriculum in anesthesia involves topic-based lectures (traditional teaching), problem-based learning (PBL) and simulation. There are limitations and drawbacks to each teaching module; moreover, the learning curve is tedious. The lecture-based traditional approach plays a passive role in knowledge delivery and restricts the development of creativity, critical thinking and reasoning skills.[1] On the other hand, whereas considered the gold standard, simulations is associated with many limitations such as its exorbitant cost, need of infrastructure, trained technicians and faculty. PBL stands desirable as it is easy to implement and readily accepted by the students.[2] PBL is defined as "active learning stimulated by and is focused around a clinical problem encountered in daily practice".[1] The key point is that learning commences as a problem, query or question that the learner seeks to solve.[3] PBL not only enhances and develops problem solving and critical thinking skills but also incorporates the psychosocial, moral, ethical and legal aspects of medicine.[2,4,5] PBL is complex and heterogeneous. A wide variety of educational methods are referred as PBL [Table 1]. In "classical or inquiry -based PBL", following a new patient problem, the students are provided with the resources and then the students are allowed free enquiry in tutor led group. It has been studied to a limited extent and is not widely practiced in anesthesia post-graduate (PG) teaching. Case based discussions (CBD) are most widely and routinely practiced in anesthesia PG teaching. In the case based method, a complete organized case is given to the students for study prior to class discussions, which is facilitated by a tutor.

Hence, the present survey was designed to assess the current status of PBL in anesthesia PG teaching by assessing the student's satisfaction with CBD, educational objectives accomplished with CBD and the effectiveness of teaching curriculum in PG teaching and suggested

Type of PBL	Description	Barrows rating of meeting the educational objectives			
		SCC	CRP	SDL	MOL
Lecture-based case	Information is presented as lectures first and then the cases are used to emphasize significant points Teacher directed learning	1	1	0	1
Case-based lecture	Cases are presented first followed by the lecture Teacher directed learning	2	2	0	2
Case based discussions	A complete case is given to the student for study prior to class discussion, which is facilitated by a tutor Teacher directed and student directed	3	3	3	4
Problem or inquiry-based	Students are presented with a new patient problem and allowed free inquiry in tutor led group Teacher and student directed	4	4	4	5
Closed loop or reiterative	An extension of" inquiry-based", in which students are asked to return to the original problem for re-evaluation of the problem solving activities Both teacher and student directed	5	5	5	5

Table 1: Taxonomy of problem-based learning (adapted from Cisneros *et al*.[1])

Barrow's score 1-5 represents the likelihood (1=least and 5=most) that the educational method will meet the educational objectives. SCC : Structured clinical context, CRP : Clinical reasoning process, SLD: Self-directed learning, MOL: Motivation for learning, PBL: Problem based learning

modifications, if any. In this article, both PBL and CBD terms will be used interchangeably.

MATERIALS AND METHODS

This survey was undertaken after clearance from the institutional ethical committee. The consenting senior residents and 2nd and 3rd year PGs who have done or are doing their PG from the various medical institutions in the city of Delhi, India was included in this anonymous, questionnaire-based, cross sectional survey. The questionnaire consisted of 24 questions which were specifically designed to obtain the student's opinion on effectiveness of CBD [Annexure 1], educational objectives accomplished with CBD [Annexure 2] and the effectiveness of teaching curriculum and suggested modifications [Annexure 3]. After briefing, the students were distributed the questionnaire and the questionnaire was completed unaided in the form of yes/no. The students were asked to give an only single response to each of the question. The questionnaire was collected anonymously and entered in Microsoft (MS) Excel software and then imported into the SPSS (Statistical package for Social Sciences) Inc., 233 South Wacker Drive, 11th Floor, Chicago, IL) for calculating descriptive statistics such as mean, standard deviation (SD) and percentages.

RESULTS

A total of 74 residents were contacted; eight denied to participate. Four residents did not complete the questionnaire and finally, 60 anesthesia residents were included in the survey. The response rate was therefore 83.8% (62/74). The results of the survey are based on

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ANNEXURE 1
QUESTIONNAIRE
Answer should be given as Yes/No/Unable to judge

- Do you determine the objectives of learning a particular topic ?Y/N
- Is the teaching material/references or/resources are shared amongst the students before the case discussion. Y/N
- Is the "content of PBL" distributed to all students and facilitators prior? Y/N
- Is there prior communication on to the "Direction of PBL" to all students and facilitators? Y/N
- Does it stimulate interest in the topic and motivate learning? Y/N
- Characteristics of facilitator
  - Is the facilitator a content area expert, who is fully familiar with the topic being taught? Y/N
  - Does the facilitator limit the extent to which they provide solution for trainees or Is your teacher a facilitator? Y/N
  - Does the teacher follows the group dynamics e.g., Does he gives adequate time for answering the question or equalizes the participation, use paraphrasing, call for consensus or summarizes at the end? Y/N
- Since the case presentation are based on real patients
  - Are the real patient presented at the time of case presentation? Y/N
  - Are the reports and investigations of the patient is presented during discussion? Y/N
  - If no, do you think it should be practiced? Y/N
- Other learning trait like communication skills of the presenter considered by the teacher? Y/N
- Does the questions and issues that are not answered within the small group, forms the basis for further learning and discussion outside the group. Y/N

ANNEXURE 2

- Does the case discussion in your institutes accomplish following educational objective (Grade it from 1(least) to 5(most))
    1. *Structuring of knowledge for use in clinical context (SCC)* or Do you feel that the knowledge gained was structured to be successfully used in clinical practice?
    2. *Development of effective reasoning process (CRP)* or How much do you feel that the CBD set ups have improved your clinical reasoning skills?
    3. *Development of effective self-directed reasoning skill (SDL)* or How much does the CBD have helped you in identifying your personal learning needs and to locate and use the appropriate information resources?
    4. *Increased motivation for learning (MOL)* or Motivation facilitates extraction and understanding of the information. Grade your motivation gained through your CBD set ups?

ANNEXURE 3

Answer should be given as Yes/No/Unable to judge

- Do you feel that postgraduate teaching is essentially a self-driven learning evolution _____
- There should be a centralized teaching curriculum and not confined to the individual institutes. _____
- Structured curriculum should be given to all the postgraduates and the supervisors. _____
- Should there be a regular feedback about the teaching curriculum from students to teachers and vice versa? _____
- There should be an open interactive discussion on the effectivity of teaching programs and regarding the methods taken for its improvement? _____
- Do you feel that the extent of involvement of faculty members of your department is satisfactory? _____
- Do you feel that research ambience in the department is stimulating and challenging to the post graduates? __
- Do you think that the seminars and other presentations have enough audiovisual content? __
- Do you think lectures are problem based and incorporate case scenarios where required? ____
- Department teaching program can be improved if there is/are (may tick more than one options)
    1. Enhanced departmental funding
    2. Enhanced academic activity time
    3. More experienced faculty members
    4. More departmental space
    5. More advanced equipment
    6. Enhanced determination/willingness/bent of mind

student's opinion and divided into three aspects i.e., assessment of effectiveness of CBD, educational objectives accomplished with CBD and the effectiveness of teaching curriculum with suggested modifications, if any.

We assessed the student satisfaction with CBD by framing questions in such a manner and hence that it involved the key areas of PBL [Annexure 1]. Formulation of learning objectives is an important aspect of any PBL session. In our survey, only 53% of students agreed that they practice this as routine; whereas, 47% accepted that they never formulate the learning objectives before the case discussions [Figure 1a]. Majority of the students (98%) agreed that the teaching materials/references or/resources are never shared among the students before the case discussion. PBL are known to be based on real patients and all participants accepted the fact that in their CBD set ups neither the real patient nor their reports and investigations are incorporated [Figure 1a]. This is further authenticated by the suggestion that real patient along with their original reports and investigations must be presented at the time of discussion. Communication on the content and direction of PBL is an important aspect as it not only helps in the structuring of knowledge but also facilitates extraction and understanding of information from various resources; thus, enhancing the learning process as well as clinical performance. Communication on content and direction of PBL was assessed by finding if the direction and content of PBL are given routinely prior to the case discussions. Only 26% of the students agreed that content of the CBD are distributed but it never contained the direction of PBL [Figure 1b]. The remaining large majority of the students responded that the communication in regard to the content and direction of PBL has never been attempted.

To assess facilitation skills, we assessed if the PBL teacher is actually a facilitator or knowledge imparter or if the teacher is a content area expert and efficient in managing group dynamics. Majority (74%) of the students thought that their teacher is more of the knowledge imparter than the moderator or facilitator and only 58% agreed that their teacher is a content area expert [Figure 1c]. Questions are specially designed to assess if the facilitator can effectively manage the "Group dynamics" and 52% of the students agreed that their facilitators can effectively manage "Group dynamics".

Another important key area of PBL is that any inadequacy of the small group CBD must be supplemented further. In our survey, majority (73%) of the students admitted the fact that there is no provision of supplementation of deficiencies or queries of a CBD [Figure 1d]. Other learning traits like communication skills and empathy improves with PBL. In our survey, 75% of the students agreed that communicative skills of the residents are never considered.

To study educational objectives achieved with CBD, we used Barrow's rating of meeting the educational objectives. The four educational objectives assessed
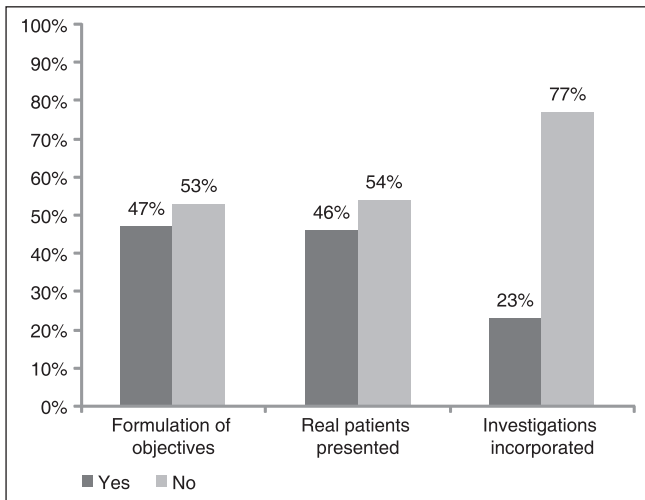
Figure 1a: Student's opinion on formulation of objectives and presence of real patients and incorporation of real investigation reports in case based discussions
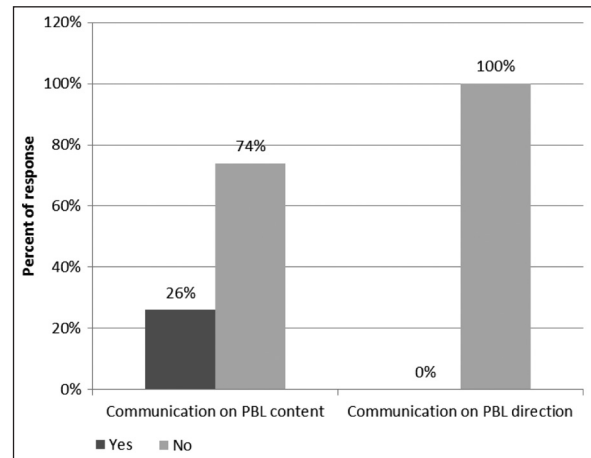

Figure 1b: Student's opinion regarding the communication on problem based learning content and direction
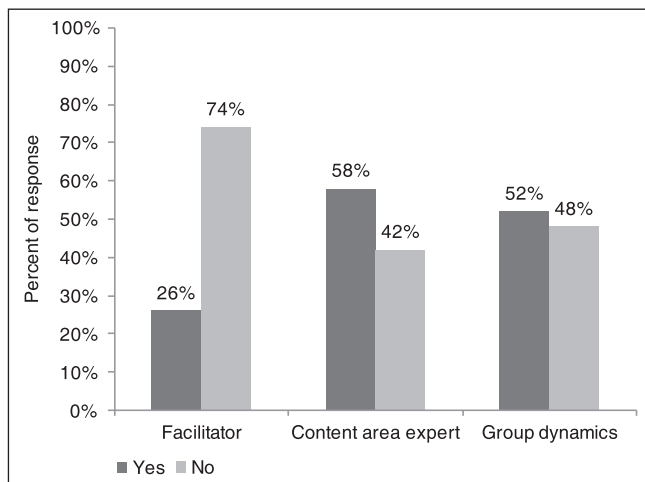

Figure 1c: Student's opinion on facilitation skills e.g., If the tutor is facilitator/knowledge imparter, expertise in content area, group dynamics skills
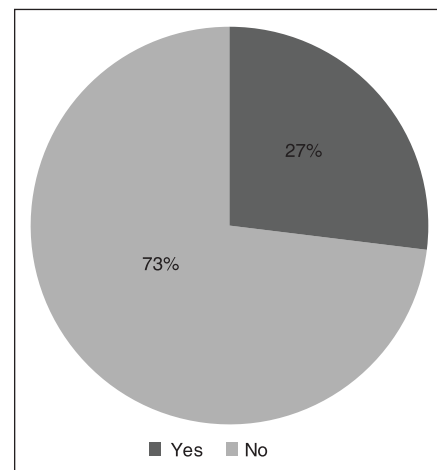

Figure 1d: Is the inadequacy of case based discussions supplemented?

are structuring of knowledge for use in clinical context (SCC), effective clinical reasoning process (CRP), effective self-directed learning (SDL) skill and increased motivation for learning (MOL). In our survey, the degrees to which each of the four educational objectives addressed by the CBD are estimated by a score of 0-5 each. The Barrow's ratings for CBD are 3, 3, 3 and 4 for SCC, clinical reasoning process (CRP), SDL and MOL, respectively [Table 1]. The mean ± SD of educational objectives were found to be 3.5 ± 0.92 for SCC, 3.06 ± 1.05 for CRP, 3.05 ± 1.01 for SDL and 3.29 ± 1.25 for MOL. The calculated mean of each educational objective was compared to the Barrow's rating of meeting the educational objectives with CBD. It was observed that SCC and MOL were statistically different; whereas, CRP and SDL were found to be

comparable to the Barrow's rating for CBD [Figure 2]. The inference derived was that although, SCC is better but increased MOL is required in our CBD set-up.

The third aspect of the survey was to assess the effectiveness of teaching curriculum in student's opinion [Annexure 3] and the results of the analysis are shown in [Table 2]. The students were asked to choose from the list of factors which they feel might improve the departmental teaching. Majority of the students were in favor of increased academic activity time including weekly academic half day and availability of advanced equipments [Figure 3].

DISCUSSION

The main findings of our survey were that: CBD seems to be a valid PBL method in anesthesia PG teaching in terms of the educational objectives accomplished with it and CBD in our set-up lacks many important aspects of PBL such as formulation of objectives, facilitation
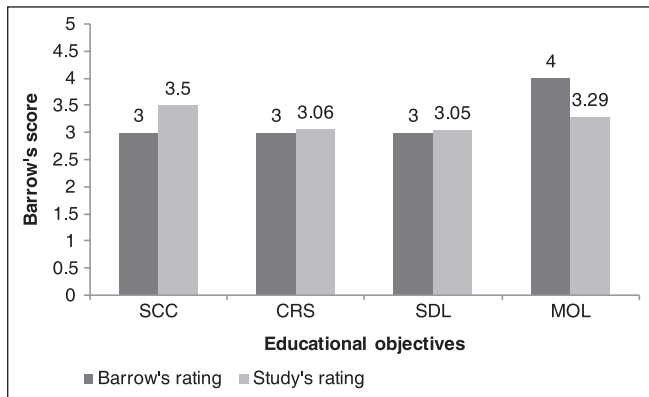
Figure 2: Comparison of Barrow's rating of meeting the educational objectives with the means of the educational objectives of the present survey
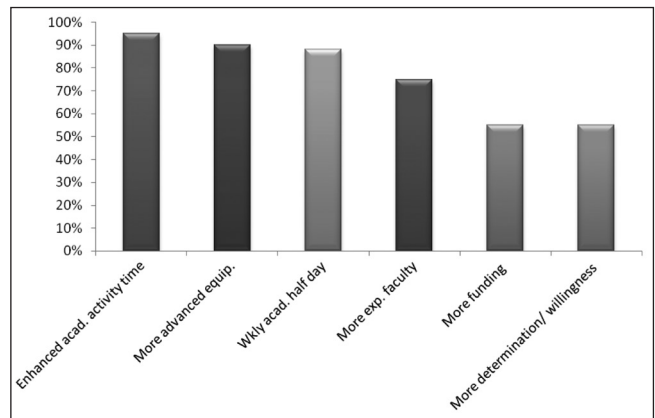

Figure 3: Student opinion of the factors that may enhance the departmental teaching

Table 2: Students' opinion on the effectiveness of the teaching curriculum (results of the Annexure-3)

Questions	Yes %	No %	Unable to judge %
Is PG teaching a self-driven learning evolution?	69	25	4
Should the teaching curriculum be centralized/institutional?	75	19	6
Should the structured curriculum be given to all the PGs and the supervisors?	97	3	—
Regular feedback about the teaching curriculum from students to teachers and vice versa?	97	3	—
Satisfactory involvement of faculty members	63	35	2
Research ambience in the department is stimulating and challenging to the post graduates	60	35	5
Do you think seminars are sufficient in audiovisual content?	63	37	—
Do you think that seminars are problem based and incorporate case scenarios where required?	53	47	—

PG: Post graduate

skills, communication on content and direction of PBL, supplementation of inadequacies and emphasis on other learning traits. In the present survey, the educational objectives such as SCC, effective clinical reasoning process (CRP) and effective SDL were found to be comparable to Barrow's rating of meeting the educational objectives for CBD;[6] however, MOL was found to be significantly reduced in our CBD set-up.

PBL is considered as genus with many species and subspecies.[6] In anesthesia PG teaching, the most commonly used PBL design is CBD. Case studies or CBDs are easy to implement and readily accepted by the students. As the case material is already organized, the clinical reasoning skill achieved is ought to be limited.

"Classical or inquiry-based PBL" is considered to be best in terms of the educational objectives achieved [Table 1] but is not followed uniformly and has been studied to a very limited extent in anesthesia teaching. Few randomized studies have compared lecture-based approaches with inquiry-based PBL and only in a limited range of educational topics, such as pre-anesthetic checkups,[7] ethical reasoning skills,[8] airway management,[9] and cardio-pulmonary cerebral resuscitation (CPCR).[10] In all these studies, sample sizes were small and there was significant variation in PBL designs and the assessment methods. Furthermore, only one review has documented the pedagogy of learning with case based methods in anesthesia teaching.[11] Institutional variation may be observed when the CBD set ups of various institutions are compared in terms of their adherence to the key aspects of PBL like formulation of learning objectives, active or SDL, facilitation, improvement of affective learning domains etc. To the best of our knowledge, no survey has been conducted in this regard. So we herein, aimed to assess if CBD set-ups in our region (city of Delhi, India) incorporates the key elements of PBL and the educational objectives accomplished with it.

The ASA recommended key elements of PBL (as designed by Liu and Liu) include small group, learner centered, active learning and case based/problem oriented.[12] The small group discussions have been made an integral component of PBL discussions in order to achieve the desired learning outcome. In order to achieve maximal development of communication skills and knowledge, it is proposed to have a group size of 5-10 members.[13,14] The CBD in most of the institutions are done in small groups as only 3rd year PGs participate in the discussions. It is more learner-centered and less teacher-centered. Since the case material is organized, the active/SDL and clinical reasoning skills are bound to be limited. The discussions are based on real patients but in our survey, we observed that in majority of

times, neither the real patients nor the actual reports and investigations are presented at the time of discussions. Other common elements of PBL are learning objectives formulation, communication on the direction and content of PBL, supplementation of inadequacies of small group discussions and facilitation skills.[15] In the present survey, we observed a significant lack of all these elements.

The success of PBL is mainly determined by the facilitation skill of the tutor.[13,16] PBL is learner centered and the role of a teacher/tutor is that of a facilitator/moderator. The facilitator plays a key role as he not only monitors but also stimulates and directs the PBL process. The best facilitator is the one who is content area expert and has been trained in facilitation and management of "Group dynamics".[16] "Group dynamics" refers to the interactions between people in a group setting. A facilitator must be an expert in utilizing various techniques to manage the group dynamics. Different situations may require different techniques of managing group dynamics such as equalizing participation, listing, stacking, pacing, checking the process, silence, taking a break, call for consensus, summarizing, censoring, expulsion etc.[12,16] In our survey, majority of the students considered their teacher to be more of a knowledge imparter than a facilitator. Approximately half the students agreed that their facilitators are content area expert and also efficient in managing group dynamics. In the current set-up available in all the medical institutions in the city of Delhi, very few faculty members are trained in PBL facilitation. Hence, emphasis must be laid upon implementation of various faculty development programs in the medical institutions.

Educational objectives addressed by the PBL programs are SCC, the development of effective CRP, the development of effective (SDL) skills and increased MOL.[6,17] Table 1 shows details about the PBL taxonomy and the Barrow's rating of meeting the educational objectives. The "inquiry-based PBL" is given almost the maximum scoring for each of the four objectives. In CBD, since the case material is already organized, the SCC, SDL and CRP are limited, whereas MOL is better. In our survey, we found that in our CBD set-up although the SCC, CRP and SDL were comparable to Barrow's educational objectives but increased MOL is required. Motivation of learning stimulates an internal drive and enhances the understanding of information from the various learning resources. Emphasis needs to be laid on various resources like instruction, peers, library and inter-net in order to motivate learning.

Evaluation of teaching curriculum by students is firmly recommended as a part of the teaching learning process.[18,19] Most of the student evaluation of teaching curriculum is done in anesthesia under-graduate teaching.[20,21] However, no studies have previously evaluated this in PG anesthesia teaching. In the present survey, majority of students desired to have more clinical oriented lectures with audio-visual aid and problem based wherever deemed essential. An overwhelming majority of the students were in favor of open interactive sessions and regular feedback to assess the effectiveness of teaching curriculum. According to the survey results, research ambience and faculty involvement needs further encouragement. A huge majority of the students felt that enhanced academic activity time, weekly academic half day and advanced equipments may possibly improve the departmental teaching.

FUTURE PERSPECTIVE

Upper case PBL methods like "Inquiry-based PBL" and "Closed loop PBL" which addresses to maximum degree of educational objectives needs to be incorporated in anesthesia PG curriculum. Moreover, there is limited existing research of "Inquiry-based PBL" in anesthesia teaching; therefore, an appropriate methodology with standardized assessment tool needs to be developed and be tested in larger number of students.

CBD, a sequence of PBL is popular and has been an effective mean of learning in anesthesia PG teaching. Institutional variation may be observed when the CBD set-ups of various institutions are compared in terms of their adherence to the key aspects of PBL. This is definitely a future potential area for performance measurement and improvement.

CONCLUSION

A broader, strict and organized implementation of PBL incorporating the key elements of PBL needs emphasis in PG teaching curriculum. CBD, a widely practiced PBL method seems to be valid for meeting the educational objectives with increased emphasis on MOL. Facilitation skill development programs needs motivation and encouragement from the perspective of the academic administrators. PG teaching curriculum could be centralized, with increased emphasis on open interactive sessions regarding its effectiveness.

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