

Introduction of New Teaching-Learning Method for Medical Students Studying Anaesthesiology

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Received: 23-12-2024 / Revised: 21-01-2025 / Accepted: 23-02-2025

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Conflict of interest: Nil

Abstract:

Introduction: The aim is to introduce flipped classroom as teaching learning method and to assess its effectiveness for students in anaesthesia postings.

Methods: The present study was conducted after taking institutional ethical clearance and informed consent of the participants. One hundred fifty students participated and were divided into two Groups A and B. Two topics of anaesthesiology were taught to both groups using either FC-assisted self-directed learning (SDL) sessions or online lecture classes. A cross-over of groups was done to prevent any bias. Pretest and posttest scores of all topics were assessed using multiple-choice questions (MCQs) and feedback was taken. Program evaluation was done.

Results: There was no significant difference in performance in pretest MCQ examinations between the two groups. Students of both Groups A and B performed significantly better in posttest MCQ examinations as compared to pretest MCQ examinations. However, the posttest results of the FC group were better. 46.40% strongly agree that there will be increased interest in subject by FC method. 47.40% agree that enhancement in learning by FC method. 43.30% agree that FC should be preferred teaching learning method. 40.20% feel there is improved understanding and course satisfaction. 42.30% agree that exam performance will improve by FC method.

Conclusion: Faculty and students provided positive views in support of the sessions. Students were highly satisfied with the program. The flipped classroom approach proves to be a superior teaching method, promoting better academic outcomes and greater student engagement and satisfaction. More than 40% students believe that it is a better teaching tool and will improve their performance. Teacher's feedback is the same but they fear that too much effort and resources are required in this FC method.

Keywords: Flipped Classroom; Medical Students; Online Lectures, Small Group Teaching (SGT).

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Introduction

The introduction of Competency Based Medical curriculum in 2019 has brought a revolutionary change in the pattern of teaching in medical colleges in India, which is more learner centric as compared to previous teacher centric approach, previously the didactic lectures used to occupy more time in various teaching-learning methods of the Medical Curriculum. This form of teaching is concerned with lecture delivery by a subject expert to a group of students. The size of the student group may vary according to the intake capacity of different institutions and the available resources will depend on it. The students usually play a passive role in that they usually hear, understand the concepts, or make notes, and have little opportunity to raise questions or interact during the lecture hour, to improve this we thought of introducing a flipped classroom to the first phase MBBS students in our department. It is a form of "blended learning".

A flipped classroom is structured around the idea that lecture or direct instruction is not the best use of class time. Instead, students encounter information before class, freeing class time for activities that involve higher order thinking[1]. In this model, of flipped classroom activities are carried out in many ways, for example, initially students undergo self-study of a given material in the form of lecture notes, animated videos, a portion of textbook, or internet material having valid resources[2]. There are many benefits of flipped classroom like, flipping allows students to learn at their own pace, flipped learning is customized, active, and engaging, flipped lecture videos help students review for exams and master the content also flipped content can be richer through curation and continuous improvement and students in flipped classrooms may show better learning outcomes. The class time is utilized for learning the core content, interactive discussion

among students, or having a problem-solving approach.

There is evidence suggesting that such students taught through this approach have a better understanding of the topic. This understanding allowed more focus in a study to perform optimally in the course. This mode of teaching has been used in non-science courses long before, but the recent availabilities of handy internet facilities have changed the interest in this flipped model in medical science and technology related courses. Biology teachers are specially using this flipped approach using web-based applications, videos, figures, charts, and handout materials to share ideas and easy understanding of this topic; however, there are few published studies demonstrating its effectiveness. World's leading teaching institutions have implemented this model, and the outcome and perception of the flipped classroom model have been studied in several student-centric models.

Our study is almost like previous studies but involves a larger number of students and deals with two topics of physiology which is first of its kind and incorporates students as well as teachers feedback.

Materials and Methods

S.no	Grp A roll no.1--75	Grp B roll no.76-150
1. Topic- Induction agents	Traditional method.	Flipped classroom method
2. Topic – inhalational agents	Flipped classroom method	Traditional method.

During the flipped session, students are encouraged to participate actively. First induction agents were taught to group A by traditional method and grp B by flipped class then inhalational agents was taught to group A by flipped class and to group B by

Study Design: The study design is an Education interventional study.

Sample Size: The sample size 150 (considering the strength of students coming to the 1st MBBS course).

After taking approval from the ethical committee, informed consent will be taken from all the participants and the study will be conducted among undergraduate medical students at Department of Anesthesiology, SHKM GMC, Nalhar Nuh Haryana from August 2024 to January 2025. A total of 150 students involved in the study are divided into two groups according to their roll number, in which Group A having roll number 1–75 and Group B having roll number 76–150. All the students and departmental faculties will be sensitized and explained about the study course.

Inclusion Criteria: MBBS 2024 batch students.

Exclusion Criteria: Any student who remain absent in either of class during flipped activity will be excluded from the study.

After systematic grouping in flipped classroom method, students will be provided study materials 1 week before intervention in the form of animated videos, handout materials, and sharing soft copies for specific topics to a particular group through forming defined social media-

traditional method. the teachers were also exchanged the one who taught by traditional method then in next topic taught by flipped method

Observation Chart

Table 1: Perception of Flipped Learning Experience Questionnaire

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

- I enjoyed the flipped classroom teaching approach more.
- I think the flipped classroom is a more effective and efficient way to learn.
- I participated and engaged myself more in learning in the flipped classroom.
- I thought the time and effort I spent in the flipped classroom was worthwhile
- I prefer the flipped classroom to a lecture-based classroom

Mean Score of the Assessment for the Two Study Groups.

Competency no.	Assessment score	Flipped classroom (n = 150) (mean score ± SD)	Didactic lecture (n = 150) (mean score ± SD)	P-value
AN 20.5	Pre-test score	19 ± 5.64	17.5 ± 4.76	0.16 (NS)
	Post-test score	25.12 ± 4.93	19.83 ± 5.57	<0.001 (S)
AN 18.4	Post-test	18 ± 6.13	16.29 ± 3.89	0.10 (NS)
	Post-test score	25.7 ± 3.95	20.29 ± 4.64	<0.001 (S)

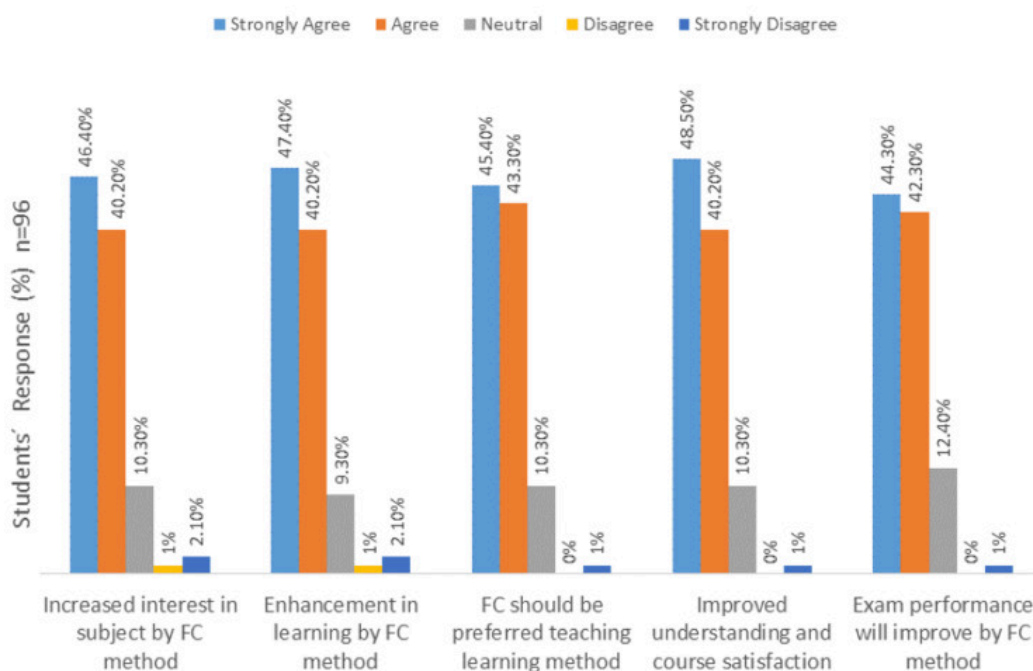
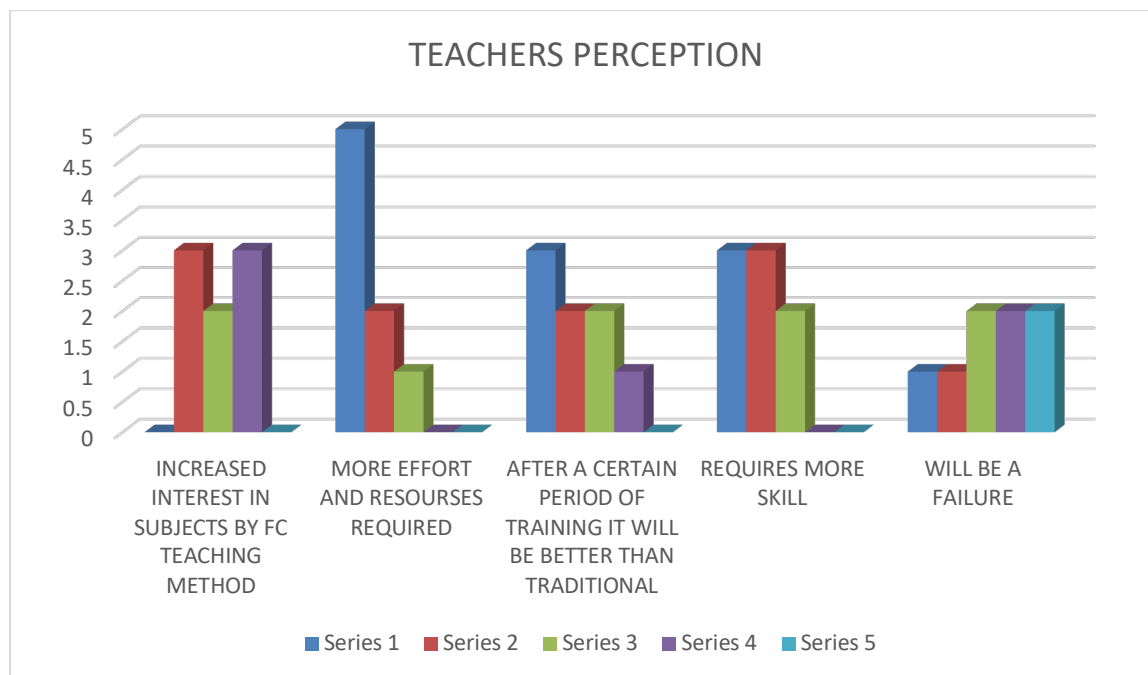


Figure Students' Perceptions Toward the Flipped Classroom Method of Learning.

Students' Response (%)

- 46.40% strongly agree that there will be increased interest in subject by FC method
- 47.40% agree that enhancement in learning by FC method
- 43.30% agree that FC should be preferred teaching learning method
- 40.20% feel there is improved understanding and course satisfaction
- 42.30% agree that exam performance will improve by FC method



Statistical Analysis

Data were coded and entered the Microsoft Excel spreadsheet. The analysis was carried out with the

Statistical Package for the Social Sciences (SPSS) version 20.0 [IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.]. The mean

scores of pre- and post-test for each session were compared and analyzed using paired *t*-test. Besides this, scores obtained by the flipped class batch and conventional small group batch, in the end of module test, were compared using independent *t*-test. $P \leq 0.05$ was considered statistically significant for all statistical tests. The scores of 5-point Likert scale were calculated and expressed as percentages to indicate agreement or disagreement of students about the statements in the questionnaire.

Discussion

The flipped classroom (FC) is a teaching-learning tool that uses learner-centeredness. The primary aim of the introduction of the FC in medical education is to shift from passive learning to accelerated learning to foster learning at cognitively demanding levels such as analysis, synthesis, and evaluation. FCs have been proven to increase student engagement, thereby enhancing their learning outcomes, and improving motivation and attitudes. The availability of more in-class active learning time during synchronous sessions can help to increase students' understanding of the subject in depth.

Marchalot A et al conducted a prospective, multicentre, non-randomised work to study the effect of blended learning on the results of first year anaesthesia and critical care residents in comparison with traditional teaching. The primary outcome was the resident's results as measured with multiple-choice questions between blended learning and control groups after beginning blended learning (post-interventional stage). The secondary outcomes included residents' results between pre and post-interventional stages and homework's time. Moreover, comparison between control and blended learning group before beginning blended learning (pre-interventional stage) was performed. In the two groups, comparison between pre and post-interventional stages showed the increase of mean score, stronger for blended learning group (32% and 28% in blended learning and control group, $P < 0.05$). The average time of homework in the blended learning group was 27 h and 10 h in the control group ($P < 0.05$). This work suggests the positive effect of blended learning (associating internet-based learning and flipped classroom) on the anaesthesia and critical care residents' knowledge by increasing their homework's time.

Chen YL et al studied flipped classroom teaching model with video instruction improves skills in local anesthesia training. This study investigated whether a flipped classroom (FC) teaching model with instructional videos improves students' skills in administering LA. The FC group showed statistically significantly higher final grades than the traditional teaching group ($P < 0.05$). Most FC students agreed that the videos improved clarity and

learning objectives. Videos can be a beneficial supplement in pre-clinical dental training.

Zhang D et al studied effects of flipped classroom teaching in anaesthesiology residents: a protocol for systematic review and meta-analysis. Emerging studies have evaluated the effects of the flipped classroom teaching model on anaesthesiology residents. Randomised controlled trials that compared the effects of flipped classrooms versus traditional teaching methods in anaesthesiology residents were included. The primary outcome was the theoretical knowledge score. The secondary outcomes included skill scores and the proportion of anaesthesiology residents who preferred the flipped classroom model.

Kurup V et al did a pilot study on the feasibility of incorporating a flipped classroom model in an anesthesia residency curriculum. Educators need to ensure that meaningful education occurs within limited interaction time between teachers and trainees. The Flipped Classroom (FC) model combines the use of both online and face-to-face interaction. Post-session surveys were administered to both learners and teachers. A total of 153 resident responses and 8 faculty responses were submitted voluntarily. Most residents indicated they preferred the FC format. They also indicated they enjoyed working in groups. All the participating faculty felt that student interaction and student learning were higher in these sessions. Residency programs need to adopt evidence-based solutions to problems arising in medical education. Initial assessment shows that it is feasible to introduce the FC model into an existing curriculum in an anesthesia residency program and both residents and faculty felt that the format enhanced learning and interaction in class.

Phillips J et al felt that many medical educators, out of necessity imposed by the COVID-19 pandemic, had to flip their classrooms. However, instead of adapting to this new teaching style, many have proceeded in the manner that they have always used to create content, opening a slide deck and inserting content until they are satisfied with the result. The next best option is video education, although there are other forms of prework that can be utilized to flip medical classrooms, including short readings and exercises.

Newer teaching-learning methods and assessment modules in anaesthesia education was discussed in detail by Kundra P et al. This means that the existing teaching-learning (TL) methods need a major face-lift. E-learning and blended learning including learning management systems, virtual classrooms, app-based learning, flipped classroom, podcasts, webinars, web-based collaborative education, reflective feedback, problem-based discussions and mentorship are some newer TL methods that can be

adopted. Simulation can help teach technical and non-technical skills such as leadership, teamwork and communication. Objective structured clinical examination, simulation-based assessment and E-assessment are other useful evaluation methods.

Flipped classroom and a new hybrid “Teach the Airway Teacher” course: an innovative development in airway teaching Trends in Anaesthesia & Critical Care was started by Cortese G et al. The importance of face-to-face teaching goes without saying but e-learning and nowadays hybrid learning, which means combining all these modalities, has been established as a meaningful approach to enhance theoretical and clinical teaching and learning, overall, in particular circumstances. The “Teach-the-Airway-Teacher” (TAT) course, designed and supported by the European Airway Management Society (EAMS), aims to prepare future airway teachers and to support established teaching clinicians.

Chan E et al studied flipped classroom, same-level peer-assisted learning approach to clinical skill teaching for medical students. It aimed to determine the influence of pre-class demonstration video watching and in-class student-student interactions on clinical skill acquisition. The participants watched a demonstration video before class, and then underwent self-directed practice as triads. Afterwards, each participant video-recorded their skill performance and completed post-class questionnaires. The questionnaire results showed that most participants preferred the new approach of clinical skill teaching and perceived it to be useful for skill acquisition. The flipped classroom, same-level peer-assisted learning model is potentially an effective way to address the current challenges and improve the efficiency of clinical procedural skill teaching in medical schools.

The key to the success of this approach is that students take responsibility for their own learning. Advantages of this approach include that there is an increase in opportunities for interaction between students and facilitators with a shift in the responsibility for learning onto the students, the opportunity to revise the material and as many times as required, the freedom to prepare for the class at a time that suits them, and the ability to readily archive learning resources. There was an increase in student engagement which led to shift from passive to active learning.

Mengesha AK et al assessed the effectiveness of flipped classroom teaching-learning method. Data were collected using pre- and post-intervention tests to measure academic performance, the Student Engagement Scale to gauge engagement, and a validated questionnaire to assess student satisfaction. Data were analyzed using Statistical Package for the Social Sciences version 25, with

descriptive statistics, paired t-tests, independent t-tests, and Chi-square tests employed to interpret the findings. This study adds to the growing body of evidence advocating for the implementation of flipped classrooms in medical education Both studies observed high satisfaction score regarding teaching and learning through flipped class on a five point Likert scale. Around 98% of students with SI of 93.61 agreed that flipped classroom session improved their understanding of the key concepts. All faculty strongly agreed that flipped class is a more interesting teaching learning methodology compared to the traditional method. There was better faculty- student interaction and that it helped promote higher order thinking in the students. Positive responses were seen in the open ended questions regarding this methodology. The present study concludes that flipped classroom is an effective and motivating method to engage students[13].

Jha S et al did comparative study of the flipped classroom and traditional lecture methods in anatomy teaching. The study was conducted on 96 phase-one medical learners after obtaining approval from the Institutional Ethics Committee. Students' perceptions were recorded by a pre-validated questionnaire quantified on a Likert scale. The difference in posttest scores for the topics taught between the two groups was found to be statistically significant. Perception regarding various aspects of the FC method was affirmative. The results of this study indicated that FC is advantageous for students[14]

Prabhavathi K et al studied Flipped classroom as an effective educational tool in teaching physiology for first-year undergraduate medical students. A well-planned classroom discussion with a formative assessment was conducted at the end. The test scores were compared between the two groups by using an independent t-test. A feedback report was obtained from both groups' students to analyze the teaching-learning methods' accomplishment. FC proves to be an effective, interesting, and motivating teaching-learning module. It enhances communication skills, clinical thinking, interaction, and active student participation.

Joy P et al studied flipped classroom from a student perspective of an innovative teaching method during the times of pandemic. Flipping the lectures outside the classroom and using the classroom for active interaction and projects has been the need of the hour. It is an innovative way of learning anatomy. The students were assessed by a group of subject experts who assessed the student's anatomical knowledge, innovation with which they prepared the model, presentation, correctness of presentation and clinical application. Flipped classroom enhanced student learning through knowledge applications. Flipped classroom helped teachers to review and

understand how much their students have read, retained, and applied the knowledge which was catered to them. There was largely a positive response for flipped classroom though flipped classroom cannot replace a regular classroom. Flipped classroom can be cumbersome as it involves extensive planning and coordination. It can be used to promote interest in the subject. Flipped classroom enhanced peer assisted learning.

Flipping the traditional classroom is both a feasible and necessary move to educate students to reinvent their classrooms in a way that empowers students to develop higher order cognitive skills and to engage in meaningful learning that will ultimately improve the delivery of health care. Medical teaching with flipped classroom approach improved the student performance and learning experience effectively as compared to conventional small group teaching (SGT). The flipped classroom approach improved the students' performance and perceptions of the learning experience. Student response to the flipped classroom structure was largely positive, indicating it to be an approach worth pursuing in future years for advancement in medical education technologies.

Conclusion/Take Home Message

The FC provides opportunities and time for face-to-face engagement. These experiences collectively help to build the confidence of the learner and provide opportunities to support the development of self-efficacy. It also encourages critical thinking and problem-solving attitudes among participants and creates an environment of inquiry and open questioning.

Declarations:

Funding: None

Availability of data and material: Department of Anesthesiology, SHKM GMC, Nalhar Nuh Haryana

Code availability: Not applicable

Consent to participate: Consent taken

Ethical Consideration: There are no ethical conflicts related to this study.

Consent for publication: Consent taken

Future Scope

It improves learner engagement and performance, and interaction with teachers. Effective execution of this method requires detailed planning, constant motivation, and consistent efforts. It is an approach worth pursuing in future years for advancement in medical education technologies.

Limitations of the study

There are certain shortcomings of flipped class which include the need to invest time and resources to develop such courses and the possible need for

technological investment and time for both teachers and students to acquire and adapt to the new skills required for this more active and self-directed approach to learning.

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