

Flipped Classroom Model for Undergraduate Teaching Using Mixed-methods Approach: A Pilot Project

Khatoon Fareha¹, Sinha Parul², Ahmed Ayesha³, Singh Amrita⁴, Saxena Shoadashi⁵

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ABSTRACT

Aim and background: Despite the vast heterogeneity of teaching methods, there remains a dilemma on what works best for teaching medical students. Flipped classroom teaching is a learner-oriented active teaching-learning methodology with a focus on inculcating different aspects of knowledge attainment in learners including application, analysis, evaluation, and synthesis of knowledge. This study aimed to assess the acceptability of the flipped classroom model for teaching undergraduate medical students.

Materials and methods: This was a mixed method qualitative analysis conducted over 3 months utilizing anonymized prevalidated questionnaire for learners and focused group discussion (FGD) for facilitators. A total of 50 students were enrolled for the flipped classroom sessions and feedback was taken with a combination of open and closed-ended questions. Focused group discussion was carried out to discuss the merits and constraints of the teaching methodology. Results were compiled as frequency distribution and the qualitative data was analyzed using pre-formed codes to identify recurring themes and opinions.

Results: The majority of students found flipped classrooms to be more interactive and easier to comprehend in comparison with traditional teaching methods. About 72% of students experienced higher confidence levels after the subject was taken up as a flipped classroom.

Conclusion: Flipped classroom teaching is acceptable and finds high satisfaction levels amongst medical students. It involves an investment of extra time and energy by the facilitators, especially initially.

Clinical significance: This pilot project helps to understand the need for innovating and integrating various teaching techniques for better academic outcomes as well as student satisfaction and promotes further research with a higher sample size to fortify these active teaching methods in the world of education.

Keywords: Active learning, Flipped classroom, Focused group discussion, Pilot project.

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INTRODUCTION

The flipped classroom teaching strategy uses a pedagogical approach by providing appropriate resource material to students beforehand for pre-class learning. The class proceeds by building up on the preliminary concept using group discussion. Interactive methodologies such as reciprocal questioning and peer review can be applied during the discussions, enhancing learning through the active participation of students. Psychologists believe that how a student prefers to learn is the single most important factor affecting academic performance.¹

In compliance with the recommendations of the National Medical Council which emphasizes competency-based medical education, educators are experimenting with different teaching-learning strategies. The backbone of a successful competency-based curriculum is strategies that are learner-oriented and provide an opportunity for self-participation, self-direction, higher-order thinking, and the promotion of self-directed learning (SDL).²

Traditionally, didactic lectures have been an important part of medical education in India. We are now innovating the existing techniques in an attempt to discover strategies that work best for medical students. The flipped classroom method is an active teaching strategy that involves providing appropriate resource material beforehand, followed by group discussion involving interactive methodologies such as reciprocal questioning, peer review, etc. This method was first used in the 1980s, however, it was popularized by Harvard Professor Eric Mazur in the 1990s. He

¹Department of Obstetrics and Gynaecology, Apollo Medics, Lucknow, Uttar Pradesh, India

²Department of Obstetrics and Gynaecology, All India Institute of Medical Sciences, Raebareli, Uttar Pradesh, India

³Department of Obstetrics and Gynaecology, Era's Lucknow Medical College and Hospital, Lucknow, Uttar Pradesh, India

⁴Department of Obstetrics and Gynaecology, Indira IVF, Lucknow, Uttar Pradesh, India

⁵Department of Obstetrics and Gynaecology, Baba Raghav Das Medical College and Hospital, Gorakhpur, Uttar Pradesh, India

Corresponding Author: Saxena Shoadashi, Department of Obstetrics and Gynaecology, Baba Raghav Das Medical College and Hospital, Gorakhpur, Uttar Pradesh, India, Phone: +91 9628966727, e-mail: shoadashi@gmail.com

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provided material for students to prepare before class while class time was used for instructor challenge, peer interaction and better understanding also named “just-in-time teaching”.³

Table 1: Score distribution by students on active teaching-learning strategy

Numerical score	Interpretation	Usefulness	Content	Teaching	Overall performance
1–4	Poor	0	0	0	0
5–6	Average	3 (6%)	3 (6%)	4 (8%)	4 (8%)
7–8	Good	18 (36%)	15 (30%)	14 (28%)	12 (24%)
9–10	Excellent	29 (58%)	32 (64%)	32 (64%)	34 (68%)

The present study is a pilot project, conducted to explore the perception and acceptance amongst medical students and educators to flipped classroom teaching methodology.

MATERIALS AND METHODS

This was a questionnaire-based mixed-methods study conducted at Era's Lucknow Medical College and Hospital, India over 3 months. Institutional ethical clearance was obtained before recruitment and duly written; informed consent was taken. Study participants were medical undergraduate students in their second semester attending classes in Obstetrics and Gynaecology and facilitators involved in conducting the flipped classroom. The students were asked to fill in a prevalidated questionnaire regarding aspects of the session. Feedback from facilitators was taken by conducting a focused group discussion (FGD) regarding the session focussing on its merits and demerits and a comparative analysis vis-a-vis traditional methods of teaching.

Technique

Every week, 6–7 students were randomly selected for active teaching-learning by flipped classroom technique instead of traditional demonstration classes conducted in the department. A total of 50 students (from a class of 150) completed these sessions. They were assigned the topic and given reference materials one week prior to the 2-hour session, for pre-class learning. In the 'flipped classroom' teaching, the initial 60 minutes were allocated to discussion of the topic amongst students. The next 60 minutes were utilized by the facilitator for small-group discussion. The session included reciprocal questioning and ended with one-minute reflections. At the end of the two-hour session, feedback was taken from the students using a prevalidated proforma containing both open- and closed-ended questions on the usefulness of the session, content, overall performance, and self-assessment of confidence level on the topic. The questionnaire was anonymized to minimize bias. Grading of the session was done using a Likert scale. Students were asked to assign a score on a scale of 1–10, with 1–4 being poor performance, 5–6 as average, 7–8 as good, and 9–10 being excellent performance based on a four-level rubric grading system. They were requested to write down the positives and negatives regarding the session and the method of teaching. Suggestions were sought on areas which could be improved.

Analysis

The data was entered into a Microsoft Excel sheet and analyzed based on frequency distribution. The qualitative questions were assessed using pre-formed codes to identify recurring themes and opinions.

RESULTS

Fifty students (31 girls; 62% and 19 boys; 38%) were enrolled for the sessions. Table 1 shows the scoring of the active teaching-learning

Table 2: Perception of confidence levels among students after the session

Confidence in the subject	N = 50	Percentage (%)
Yes	36	72
No	4	8
Unsure	10	20

strategy as given by our students. Overall, 68% of students found teaching by flipped classroom method as excellent– 58% (usefulness), 64% (content), and 64% (teaching). No student found the method bad for learning and retaining.

Table 2 shows the perception of confidence levels as scored by the students. About 72% of students felt an increase in confidence levels; 20% were unsure of whether they had benefitted and 8% did not find any increase in confidence levels. The majority of students (76%) found these classes more interactive and easier to comprehend. There were many suggestions for more frequent sessions of a similar nature. Focused group discussion was conducted for 5 teachers who were involved in carrying out the flipped classroom sessions.

DISCUSSION

Though it had been previously used, 'Flipped classroom teaching' is an active teaching-learning technique that was first documented for teaching in 2012 by Bergmann and Sams, two high school chemistry teachers from Colorado, USA.⁴ As part of the methodology, the learners are expected to switch the in-class with at-home activities by initially performing self-directed pre-class studying and progressing to in-class, face-to-face discussions in small groups. A successful model is purported to provide deeper insight into the subject, increasing active learner participation and engagement in discussion, thus making the process learner-centric. It is theorized that this approach cuts down on unnecessary wastage of time and energy for both learners and facilitators by preparing a preliminary background.

The present study found that the majority of students (94%) graded the sessions as good or excellent. Similarly, high likability rates have been observed by other investigators. McLaughlin et al., in their research on pharmacy students, found that 95.6% of students preferred flipped classrooms, citing better understanding and ability to apply key concepts in clinical situations.⁵ Davies et al. also showed the superiority of flipped classroom methodology to other instructional strategies.⁶ Nouri observed that 75% of students expressed a positive attitude toward flipped classrooms after completion of the course.⁷ Similarly, Veeramani et al. found flipped classroom teaching to enhance the performance of students in exams.⁸ A meta-analysis of 225 studies concluded that using active teaching-learning methods in undergraduate science courses resulted in a 6% improvement in student performance in exams. Additionally, students being taught with the traditional methods

Table 3: Qualitative themes

Positive aspects	No. of students (%)	Theme	
		Negative aspects	Percentage (%)
Increased time for discussion	38 (76%)	Learning difficulty: Difficult to understand the topic by myself	13 (26%)
Increased sense of participation in the subject	23 (46%)	Facilitator issues: Some facilitators conduct better sessions	16 (32%)
Prior studying makes it easier to understand class	20 (40%)	Learner motivation: Don't want to study before the class	3 (6%)

Table 4: Focused group discussion (FGD) of facilitators

Positive aspects	Negative aspects
Increased learner-facilitator interaction	Time-consuming
Learners take onus of their education	Some learners are not motivated and despite provision of course material, they do not come prepared
Lesser time needs to be devoted to basic concepts	The positive impact of flipped classroom teaching over traditional methodology is yet to be proved by improvement in grades of learners
	Not yet been incorporated in the undergraduate medical curriculum, so constraints with planning and usage

were 50% more likely to fail the examination, reinforcing that flipping increases class time for more engaging instruction, increased student engagement, and focused classroom discussion.^{9,10}

While this was outside the scope of the present study, we found that 72% of the students perceived an elevation in confidence levels after the sessions. However, other authors have argued that the likability of sessions does not translate into improving knowledge retention. Since learner motivation is an essential component of any self-directed learning (SDL) technology, it could be argued that students who are motivated perform equally irrespective of traditional lectures or flipped classroom teaching.

In our qualitative assessment using initial codes (Table 3), the maximum scores were given to having sufficient time for learner-facilitator interaction. However, that does involve considerable effort on the part of the facilitator. McLaughlin et al. recommend an additional 127%-time investment by the facilitator to course development and 57% extra time to maintain the standards of the course in comparison to the traditional lecture. The FGD with facilitators explored this aspect in detail (Table 4). All agreed that the initial effort was indeed massive and daunting especially because the curriculum was still not in sync with active teaching-learning methodologies. The learners were also experiencing it for the first time, so more time was required for sensitization. It was accepted, however, that with time the sessions became easier. Student enthusiasm was an additional encouraging factor. All agreed that the same pre-class material could be used on successive cohorts of students, easing the classroom time so that more focus could be given to discussions.

Strengths

The selection of the participants was randomized, and the outcome assessment was on a rubric grading system excluding the selection and subjective interpretation bias. Combining FGD with facilitators helps us understand the merits and demerits across the board.

Limitations

The main limitations of our study remained a small sample size and no comparison with a proper control group. However, since

it was a pilot project, further research will be performed using a higher sample size to enable us to generalize the findings. The limited duration of the study precluded the observation of whether flipped classroom translates into better knowledge. Therefore, the difference between learner output and the type of teaching methodology could not be ascertained in the present study.

CONCLUSION

- Flipped classroom teaching is acceptable and finds high satisfaction levels among medical students.
- It involves the investment of extra time and energy by facilitators, especially initially.

Clinical Significance

This pilot project helps to understand the need for innovating and integrating various teaching techniques for better academic outcomes as well as student satisfaction and promotes further research with a higher sample size to fortify these active teaching methods in the world of education.

ORCID

Saxena Shoadashi  <https://orcid.org/0000-0002-1102-3289>

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