

Original Research Article

INTRODUCTION AND EVALUATION OF FLIPPED CLASSROOM APPROACH AS A TEACHING LEARNING METHOD IN COMMUNITY MEDICINE

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ABSTRACT

Background: The flipped classroom is an instructional strategy that reverses the traditional learning environment by delivering instructional content, typically online, outside of the classroom. The idea is that students can engage with the material at their own pace and convenience, freeing up classroom time for more interactive and application-based activities. The aim is to introduce and evaluate the Flipped classroom as a teaching learning method amongst undergraduate students in Community Medicine

Settings and Design: An educational interventional crossover study with pre-test and post-test assessment was conducted among Phase III MBBS students.

Materials and Methods: Inclusion criteria specified consenting Phase 3 MBBS students, while exclusion criteria focused on those who were absent for sessions. The study utilized a questionnaire as the primary data collection tool, featuring 30 base items aimed at gauging student perception and an additional 20 knowledge-based items specifically focused on Tuberculosis & HIV. Both qualitative and quantitative data variables were incorporated to provide a comprehensive understanding of the students' experiences and knowledge acquisition in the flipped classroom setting.

Results: The mean post test score achieved by flipped group was 13.26 while a score of 9.9 was achieved by non-flipped group in the post-class test of first round of intervention. Significant mean difference was noted in the t-test (t-score: 7.497 p <0.001). In the second round of intervention, 14.54 and 8.938 were the mean scores achieved by flipped and non-flipped group respectively in the post-class test. The difference in the mean score was significant in second round of intervention too (t-score: 8.351, p <0.001) In feedback, students strongly agreed to statements like "Learning foundational content prior to class greatly enhances my understanding of material" and "I like watching the lessons on video", while they leaned towards disagreement regarding statements like "Flipped classroom gives me less class time to practice the concepts of course".

Conclusion: From the study it can be safely concluded that flipped classroom enjoys a positive perception by the students. It aids their understanding and learning, enables them to acquire material at their own pace and encourages them to engage with the instructors in a more effective manner.

Keywords: Flipped classroom, Traditional methods, Active learning, Pedagogy, Online resources.

INTRODUCTION

Flipped classroom approach as a teaching learning method has received much attention in medical education of late. The flipped classroom requires students to obtain background knowledge through homework prior to a face-to face class meeting and reserves precious in class time for applying knowledge to solve real clinical problems through discussion facilitated by faculty.^[1,2]

This is the opposite of the traditional lecture-based classroom, in which students attend didactic lectures where they obtain knowledge passively from the instructor, then study the content and complete assignments after class. Previous studies have shown that the flipped classroom can provide students more flexibility for self-paced learning, help to promote content retention, and promote students' interest in learning.^[3,4]

However, the overall effectiveness of the flipped classroom approach in medical education is still being debated. For example, Willier et al. showed that the flipped classroom did not improve students' performance nor satisfaction in learning neuro anatomy suggesting that the flipped classroom may not be suitable for learning abstract and memorization-heavy concepts. Therefore, it is important to evaluate the effectiveness of the flipped classroom each time that it is applied to a new setting.^[5]

In study by Fen Tanga et al on Comparison between flipped classroom and lecture-based classroom in ophthalmology clerkship. Reported that Flipped classroom stimulates students' learning motivation, improves their performance in the final exam, and may help to enhance clinical thinking and communication skills.^[6]

In study by Ying Lin, Facing the challenges in ophthalmology clerkship teaching: Is flipped classroom the answer? The flipped classroom approach may show greater advantages in helping students to form long-term memory due to students' active learning.^[7]

Flipped classroom approach to clerkship teaching of glaucoma and ocular trauma and showed that the flipped classroom was welcomed by both students and teachers. More importantly, the flipped classroom helped students to develop skills in problem-solving, creative and critical thinking, and teamwork.^[7]

Through the practice of flipped Classroom modern teaching methods, students get enough time to grasp the topic, unlike college where they get only a few minutes to understand the content. If necessary, they can work more on one issue. Students prepare themselves with the content before arriving in college and followed by doubt clearing discussing it in the classroom with the concerned teacher in small group. They can also suggest their ideas related to the content and share it with other classmates.

This topic is chosen as students are not self-motivated to study subject & flipped classroom teaching learning method allows them to develop the highest level of self-motivation for leaning the topics. The aim of the study is to introduce and evaluate the Flipped classroom as a Teaching-Learning Method amongst Undergraduate students in Community Medicine.

MATERIALS AND METHODS

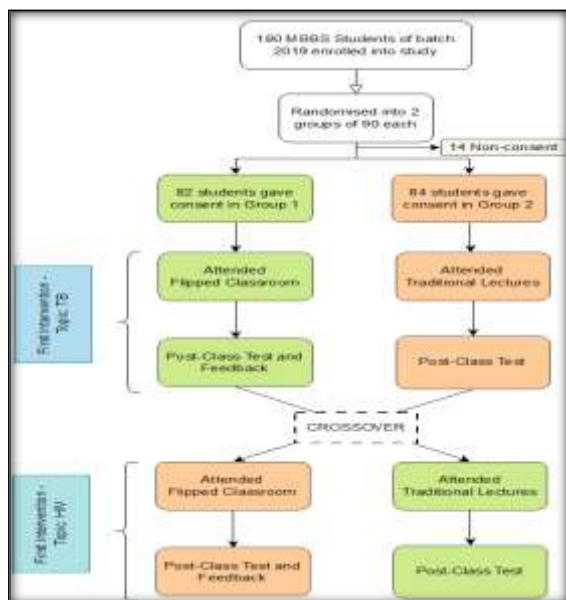
The study was an Educational Interventional study with Crossover trial approved by IEC letter no: GMC/RATLAM/2022/IEC/Approval/07 on 23.02.2022. Sample size was set at 180 (2 groups of approximately 90 students each). The inclusion criteria werethird year MBBS undergraduate students studying in Dr. LNP GMC, Ratlam and who gave their consent. Students who were not present on the day of session were excluded. Written informed consent was taken after explaining to the students the format and other details of the study. A pre-designed questionnaire was used to assess the knowledge and perception of students in flipped classroom.

- A) A questionnaire with 30 base items was used to identify student's perception about flipped classroom method as opposed to traditional lectures.
- B) MCQs with 20 knowledge-based items on epidemiology, diagnosis and treatment of Tuberculosis and HIV was used to assess the knowledge gained by students in flipped classroom.

A pre-test was administered to both groups before the teaching session to assess baseline knowledge. Following completion of the teaching intervention, the same questionnaire was administered as a post-test to evaluate knowledge gain. Pre-test and post-test scores were compared within groups, while post-test scores were also compared between the flipped classroom and traditional lecture groups using appropriate statistical tests.

Statistical analysis

Data were analysed using Epi Info 7.2.2.6. Continuous variables were expressed as mean $\pm$ standard deviation. Paired t-test was used to compare pre-test and post-test scores within each group, while independent Student's t-test was used to compare post-test scores between the flipped classroom and traditional lecture groups. A p-value <0.05 was considered statistically significant.



RESULTS

First Intervention

A test involving 20 questions on epidemiology, diagnosis and treatment of tuberculosis was administered to both flipped and non-flipped group of students. The mean score achieved by flipped group was 13.26 while a score of 9.9 was achieved by non-flipped group. Significant mean difference was noted in the t-test (t-score: 7.497 $p < 0.001$).

Feedback was collected from flipped classroom group involving a questionnaire of 30 questions on Likert scale starting from Strongly Agree (1) to Strongly Disagree (5). Students overwhelmingly agreed with statements like

- Flipped classroom can be a suitable teaching strategy. (Strongly Agree: 42.68%)
- Flipped classroom can improve interest in class. (Strongly Agree: 41.46%)
- I frequently pause or repeat parts of the videos in order to increase my understanding of the material. (Agree: 47.56%)

- Flipped classroom learning has reduced my dependency on the instructor. (Agree: 46.34%)
- I am more motivated to learn the concepts of course via the flipped classroom. (Agree: 45.12%)

Response to statements like “With flipped classroom, we have to do more work out of the classroom” (Strongly Disagree: 41.46%) validates the rest of results.

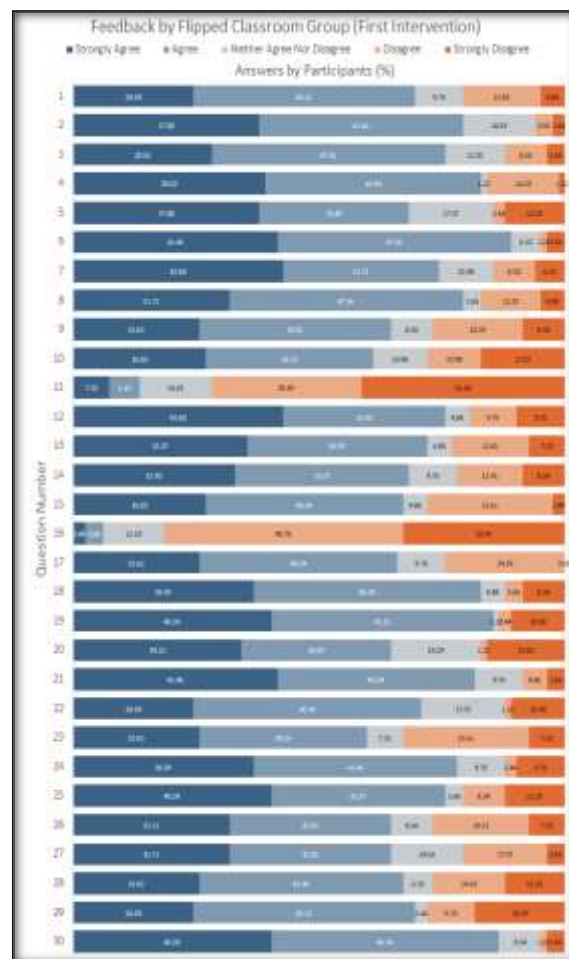


Table 1: Feedback by Flipped Classroom Group (First Intervention)

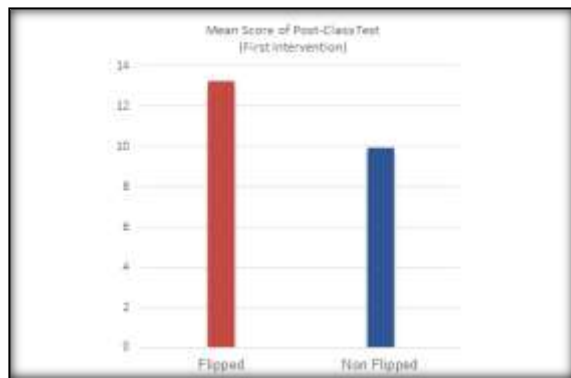
S. No	Question	Mode
1	I feel that watching videos and taking notes contribute efficiently to my learning.	2
2	With flipped classroom model, I feel more prepared for my exam.	2
3	I like watching the lessons on video.	2
4	I try to learn as much as possible while watching the videos.	2
5	I wish more instructors use the flipped or inverted classroom model.	1
6	I frequently pause or repeat parts of the videos in order to increase my understanding of the material.	2
7	Flipped classroom encourages me to practice critical and creative thinking.	1
8	Learning foundational content prior to class greatly enhances my understanding of material.	2
9	Flipped classroom gives me the opportunity to ask more questions inside the classroom.	2
10	Flipped classroom attracts my attention to learning and teaching process.	2
11	With flipped classroom, we have to do more work out of the classroom.	5
12	Flipped classroom can be a suitable teaching strategy.	1
13	Flipped classroom can improve interest in exploring topics.	2
14	I felt prepared to complete course tasks in class after listening to the video content.	2
15	Flipped classroom is more engaging than the traditional classroom.	2
16	Flipped classroom gives me less class time to practice the concepts of course.	4
17	Flipped classroom reduces the effort to understand the basic knowledge of the subject matter.	2
18	Flipped classroom, along with delivery of content outside class and problem solving in class, is an instructional method appropriate for my specialization.	2
19	I am more motivated to learn the concepts of course via the flipped classroom.	2

20	Flipped classroom improved collaborative learning.	1
21	Flipped classroom can improve interest in class.	1
22	I got the ability to self-pace my learning with flipped courses.	2
23	Flipped classroom gives me greater opportunities to communicate with other students.	2
24	I believe that I am able to learn material with flipped classroom instruction better than with traditional lecture-based instruction.	2
25	I would recommend flipped classroom to a friend.	1
26	Flipped classroom matches my learning style.	2
27	I feel that mastering learning through flipped classroom improved my academic achievement.	2
28	Flipped courses did not limit my interaction with instructors.	2
29	I feel that mastering learning through flipped classroom improved my course understanding.	2
30	Flipped classroom learning has reduced my dependency on the instructor.	2

Table 2: Post-class test Score comparison between Flipped and Non-Flipped (First Intervention)

	Range	Mean	Std. Deviation	Variance	Skewness	Kurtosis
Flipped	8.00	13.2667	2.06	4.24	0.41	0.38
Non-Flipped	16.00	9.9000	2.92	8.53	0.91	2.97

t-test score: 7.497 p <0.001



Second Intervention

A test involving 20 questions on epidemiology, diagnosis and treatment of HIV was administered to both flipped and non-flipped group of students. The mean post-test score achieved by flipped group was **14.54** while a score of **8.938** was achieved by non-flipped group. Significant mean difference was noted in the t-test (t-score: 8.351, p <0.001). Feedback was collected from flipped classroom group using the same questionnaire used in first

round of intervention, having 30 questions on Likert scale starting from Strongly Agree (1) to Strongly Disagree (5). Students overwhelmingly agreed with statements like

- With flipped classroom model, I feel more prepared for my exam. (Strongly Agree: 52.38%)
- Flipped classroom gives me the opportunity to ask more questions inside the classroom. (Strongly Agree: 41.67%)
- I frequently pause or repeat parts of the videos in order to increase my understanding of the material. (Strongly Agree: 47.56%)
- Flipped classroom gives me greater opportunities to communicate with other students. (Strongly Agree: 42.63%)
- Flipped classroom matches my learning style. (Agree: 36.90%)

Response to statements like “Flipped classroom gives me less class time to practice the concepts of course.” (Disagree: 47.5%) validates the rest of results.

Table 3: Feedback by Flipped Classroom Group (Second Intervention)

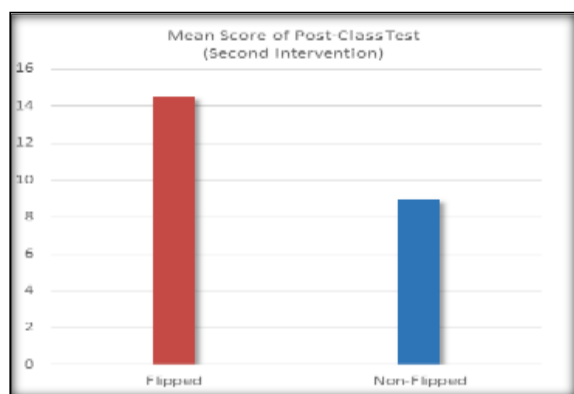
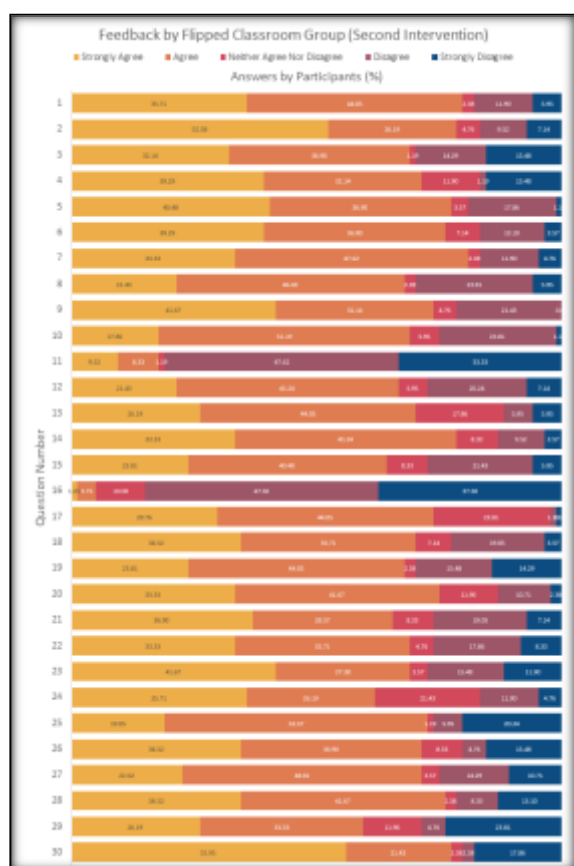
S. No	Question	Mode
1	I feel that watching videos and taking notes contribute efficiently to my learning.	2
2	With flipped classroom model, I feel more prepared for my exam.	1
3	I like watching the lessons on video.	2
4	I try to learn as much as possible while watching the videos.	1
5	I wish more instructors use the flipped or inverted classroom model.	1
6	I frequently pause or repeat parts of the videos in order to increase my understanding of the material.	1
7	Flipped classroom encourages me to practice critical and creative thinking.	2
8	Learning foundational content prior to class greatly enhances my understanding of material.	2
9	Flipped classroom gives me the opportunity to ask more questions inside the classroom.	1
10	Flipped classroom attracts my attention to learning and teaching process.	2
11	With flipped classroom, we have to do more work out of the classroom.	4
12	Flipped classroom can be a suitable teaching strategy.	2
13	Flipped classroom can improve interest in exploring topics.	2
14	I felt prepared to complete course tasks in class after listening to the video content.	2
15	Flipped classroom is more engaging than the traditional classroom.	2
16	Flipped classroom gives me less class time to practice the concepts of course.	4
17	Flipped classroom reduces the effort to understand the basic knowledge of the subject matter.	2
18	Flipped classroom, along with delivery of content outside class and problem solving in class, is an instructional method appropriate for my specialization.	2
19	I am more motivated to learn the concepts of course via the flipped classroom.	2
20	Flipped classroom improved collaborative learning.	2
21	Flipped classroom can improve interest in class.	1

22	I got the ability to self-pace my learning with flipped courses.	2
23	Flipped classroom gives me greater opportunities to communicate with other students.	1
24	I believe that I am able to learn material with flipped classroom instruction better than with traditional lecture-based instruction.	1
25	I would recommend flipped classroom to a friend.	2
26	Flipped classroom matches my learning style.	2
27	I feel that mastering learning through flipped classroom improved my academic achievement.	2
28	Flipped courses did not limit my interaction with instructors.	2
29	I feel that mastering learning through flipped classroom improved my course understanding.	2
30	Flipped classroom learning has reduced my dependency on the instructor.	1

Table 4: Post-class test Score comparison between Flipped and Non-Flipped (Second Intervention)

	Range	Mean	Std. Deviation	Variance	Skewness	Kurtosis
Flipped	6.00	14.54	2.14	4.57	0.35	0.59
Non-Flipped	15.00	8.938	2.86	8.17	0.89	1.27

t-test score: 8.351 p <0.001



DISCUSSION

The study showed that students had generally positive perceptions towards flipped classroom. They agreed with the notion that “Learning foundational content prior to class greatly enhances my understanding of material.”

Fei Chen et al,^[2] also reported that there were generally positive perceptions of the FC approach. In contrast, the effects of FCs on changes in knowledge and skills were less conclusive as the effect sizes ranged from $d = -0.27$ to 1.21 , with a median of 0.08 . The varying direction and magnitude of the effect sizes, together with their 95% confidence interval, which contained zero, suggested the lack of strong evidence for the effectiveness of FCs in promoting knowledge acquisition above and beyond the traditional learning methods.

Study showed that students overwhelmingly agreed with the statement “I try to learn as much as possible while watching the videos.” Similarly, DeGrazia et al,^[8] notes that students supplied with optional video lectures came to class much better prepared than when they had been given textbook readings. This observation is encouraging because although learning gains are high for information presented textually, Sappington et al,^[9] shows that college students don’t generally complete reading assignments.

Students in both interventions has voted in favour of the statement “I believe that I am able to learn material with flipped classroom instruction better than with traditional lecture-based instruction.” Similar findings were noted by Fen Tang et al,^[6] as “More students in the Flipped Group agreed that the classroom helped to promote their learning motivation, improve their understanding of the course materials, and enhance their communication skill and clinical thinking. However, students in the Flipped Group did not show a preference for this method of teaching, and reported more burden & pressure than those from the Traditional Group”

We found that there was significant difference in the mean score of post-class test between flipped group and non-flipped group which throws light on the effectiveness of flipped classroom method. In

contrast, there were no significant differences between the 2 cohorts in final grades ($p = .259$), self-rated knowledge ($p = 0.182$), or overall satisfaction with the course ($p = 0.892$) in study conducted by Whillier et al.^[5] Also, flipped classroom approach did not increase the scores of students in the final exam in the study conducted by Lin et al.^[7]

CONCLUSION

From the study it can be safely concluded that flipped classroom enjoys a positive perception by the students. It aids their understanding and learning, enables them to acquire material at their own pace and encourages them to engage with the instructors in a more effective manner. These findings can be interpreted that students prefer to learn through multimedia and new innovations. Therefore, we can conclude that elements of multimedia such as PowerPoint presentation, videos, animation, and pictures have a great effect on student learning compared to traditional learning methods.

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