Section: Microbiology

Original Research Article

FLIPPED CLASSROOM: AN INTERVENTIONAL STUDY ASSESSING THE NEW APPROACH TO TEACHING- LEARNING IN MEDICAL EDUCATION

Karuna R Ahire[1], Sonal Deshpande[2], Priyanka Patil[3], Bhanupriya Pande[2], Mrudula N Dravid[4], Subhash T Bothikar[3], Deepak K Shejwal[5], Farhan Shah[6]

[1]Associate Professor, Department of Microbiology, JMF'S ACPM Medical college, Dhule, Maharashtra, India.
[2]Associate Professor, Department of Community Medicine, JMF'S ACPM Medical college, Dhule, Maharashtra, India.
[3]Assistant Professor, Department of Microbiology, JMF'S ACPM Medical college, Dhule, Maharashtra, India.
[4]Professor, Department of Microbiology, JMF'S ACPM Medical college, Dhule, Maharashtra, India.
[5]Associate Professor, Department of Pathology, GMC, Jalgaon, Maharashtra, India
[6]Technical officer, Department of Microbiology, JMF'S ACPM Medical college, Dhule, Maharashtra, India.

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Corresponding Author:
Dr. Deepak K Shejwal
Email: kra_18@rediffmail.com

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ABSTRACT

Background: In recent years flipped class has emerged as an innovative educational teaching learning method and one of the approaches of self-directed learning. In the flipped class model, students are exposed to educational content before formal class sessions. Compared to the didactic lecture a flipped class encourages the active participation of the students and may help them understand the topic more clearly, and helps in better retention of learning. **Objective:** 1. To compare the outcome of flipped classroom teaching with didactic lecture on student performance among Phase II MBBS students in Microbiology. 2. To assess the perception of students about flipped classroom teaching. 3. To appraise teachers' perception about the flipped classroom method in teaching Microbiology. **Materials and Methods:** An Interventional study conducted on 100 Students of 2nd phase MBBS in the Department of Microbiology for the period of 6 months. Students were divided into two groups, Groups A and B. In first part both the groups attended the didactic lecture on 2 different topics while in second part, flipped class sessions were conducted by swapping the topics taught in didactic lectures. MCQ tests were conducted before starting and completing the sessions. A feedback questionnaire was prepared for students based on a 5-point Likert scale. In-depth Interviews (IDI) of faculty members were taken to appraise their perception about flipped classroom. **Result:** The mean score in tests was higher for the flipped class for both topics. The majority 60 (68.2%) of the students, agreed that flipped class session is more engaging and interactive than didactic lectures and they got motivated for self-directed learning by the Flipped class session. **Conclusion:** Students are motivated for SDL by flipped class activity, and they find it very helpful in enhancing their communication skills and critical thinking ability. This innovative approach can help students to self-regulate their progress and ultimately build self-confidence.

INTRODUCTION

Edmund Amidon defined teaching as "an interactive process, primarily involving classroom talk which takes place between teacher and pupil and occurs during certain definable activities".[1] The Didactic classroom lecture system remains a prevalent traditional method for teaching undergraduate medical students, even in this modern era. In Didactic lectures, knowledge is imparted passively to the students, and it is a one-way teaching method without active participation or very little interaction with students.[2] The new competency-based medical education (CBME) is designed to make Indian medical graduates (IMG) competent so that IMG can acquire the necessary knowledge, attitude, skill,

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responsiveness, and values.[3,4]Though the self-directed learning (SDL) strategy is included in the new CBME curriculum, students lack necessary skills and training in critical thinking.[5]

Most of the time, didactic lectures are perceived as boring by students due to a lack of interaction.[6] Moreover, students have access to loads of information related to subjects with one click in this technological era. Even online lectures are available on different educational websites and portals. It becomes very difficult and challenging for teachers to attract students' attention in a regular classroom and involve them actively.[7] In recent years flipped class has emerged as an innovative educational teaching learning method and one of the approaches of self-directed learning.

In the flipped class model, students are exposed to educational content before formal class sessions. This content may be in the form of reading material, videos, PPTs, other electronic-source-based exercises or evidence-based website links. This enables students to gather knowledge and then implement it for solving challenging problems in collaboration with their colleagues in the classroom.[8] Flipped-class teaching empowers and encourages students to study in their own space and outside the classroom so that the classroom time can be utilized to apply their knowledge in the discussion of problems and understand the advanced concepts. Thus, students get opportunities to enhance higher cognition features of Bloom's revised taxonomy like analysis and synthesis.[9]

In flipped class teaching, the teacher plays the role of a facilitator and a mentor by identifying and resolving the misconceptions and doubts and encouraging teamwork, which enhances their learning skills. Students get feedback as well as appropriate guidance from their teachers.

As a part of self-directed learning, a flipped class encourages the active participation of the students, may help them understand the topic more clearly, and helps in better retention of learning. Flipped-class, thus, may have a positive impact on improving their academic performance and ultimately help them in improving practical as well as clinical skills in real-life situations.

Objectives

- To compare the outcome of flipped classroom teaching with didactic lecture on student performance among Phase II MBBS students in Microbiology.
- To assess the perception of students about flipped classroom teaching.
- To appraise teachers' perception about the flipped classroom method in teaching Microbiology.

MATERIALSANDMETHODS

Study design- Interventional study

Sample size - 100 Students of 2nd phase MBBS

Study site- Department of Microbiology, JMF'S ACPM MC, Dhule.

Study Duration-Six months

Inclusion Criteria

Second-year MBBS students who were willing to give consent for the study.

Exclusion criteria

Students who were absent from any session of the study.

Approval from the Institutional Ethics Committee was sought (vide letter no 113 IEC/ACPMMC/Dhule). Informed consent of the students was taken before the commencement of the study.

Students were divided into two groups (50 students each), Groups A and B, with the help of a computer-generated random number table according to their college roll numbers. In the first part of the study, both the groups attended the didactic lecture on two different topics (one topic for each group) in two different classrooms. In the second part, the topics taught to them in didactic lectures were swapped. [Figure1]

For the flipped class, the study material was provided one week before the session in the form of prepared notes and PPTs. Students were also asked to study the topic from textbooks and other online authentic sources suggested by the teachers.

One test was conducted just before starting each session and another as a surprise post-test in MCQ format for both didactic as well as flipped classroom. A surprise post-test was conducted after one month to check retention of knowledge, critical thinking, and problem-solving skills on the topic. To avoid bias, the teacher remained the same for a particular topic.

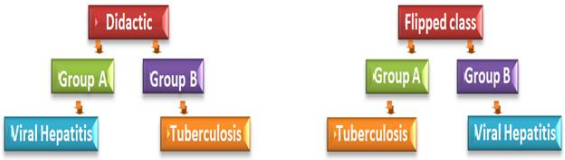

Figure 1: Flowchart showing method of intervention

A feedback questionnaire was prepared for students. The responses to the questions were based on a 5-point Likert scale. In-depth Interviews (IDI) of faculty members involved in the implementation of intervention (n=4) were taken to appraise their perception about flipped classroom.

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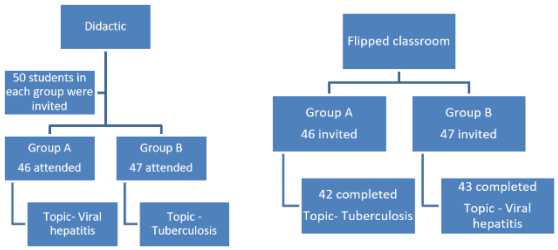
RESULTS



Out of a total batch of 100 students, 93 students attended the didactic lecture (46 in group A and 47 in group B). These 93 students were invited to the flipped classroom but only 88 students among them attended the flipped classroom session. Among those who attended the flipped classroom, three students did not complete the post-test.

[Table 1] Describes the difference in the mean scores of the class test conducted before starting the FC session for the didactic lecture and flipped class. The mean score was higher for the flipped class for both topics. This difference was statistically significant. (P <0.05).

Table 1: Mean scores of class test conducted before the session: Didactic and Flipped class

Sr no	Topic	Didactic			Flipped class			t test	
		Number of students	Mean score	SD	Number of students	Mean score	SD	F value	P value
1.	Viral hepatitis	46	5.19	2.24	42	9.1	3.19	2.02	0.02(S)
2.	Tuberculosis	47	5.23	1.85	43	8.04	3.32	3.22	0.001(S)

[Table 2] Describes the differences in the mean test scores of post-tests. Here, the Flipped class had a higher score as compared to the didactic lecture for both the topics (viral hepatitis and tuberculosis), but the difference was statistically significant only for Tuberculosis (P=0.001)

Table 2: Mean scores of Post-tests: Didactic and Flipped class.

Sr no	Topic	Didactic			Flipped class			t test	
		Number of students	Mean score	SD	Number of students	Mean score	SD	F value	P value
1.	Viral hepatitis	46	8.52	3.16	42	10.09	4.22	1.78	0.06(NS)
2.	Tuberculosis	47	8.82	2.22	43	10.25	3.66	2.71	0.001(S)

[Table 3] Shows the feedback taken from 88 students. It showed that 68.2 % of the students got motivated for self directed learning and found flipped class session more engaging and interactive than didactic lecture and 71.6 % of the students felt that flipped class can help them in better application of knowledge.

More students (78.4 %) were of opinion that flipped class can improve their critical thinking ability and can enhance their communication skill. Around half (46.6 %) students agreed that flipped class session was more satisfactory than didactic lectures for learning. 19.3 % of students said that flipped class activity gave too much burden and 14.8 % felt isolated and disconnected during flipped class session.

Table3: Students' feedback about flipped class (n=88)

Sr. No.	Questions	Strongly agreen (%)	Agreen (%)	Neither agree nor disagreen (%)	Disagreen (%)	Strongly disagreen (%)
1	Flipped class session is more engaging and interactive than didactic lecture.	14(15.9)	46(52.3)	16(18.2)	8(9.1)	4(4.5)
2	I got motivated for self-directed learning by the Flipped class session.	13(14.8)	47(53.4)	17(19.3)	9(10.2)	2(2.3)
3	The flipped class activity was too much of a burden and pressure.	4(4.5)	13(14.8)	34(38.6)	34(38.6)	3(3.4)
4	Flipped class activity occupied too much of my spare time	5(5.7)	20(22.7)	27(30.7)	31(35.2)	5(5.7)
5	I was feeling isolated and disconnected during Flipped class session.	3(3.4)	10(11.4)	16(18.2)	52(59.1)	7(8)
6	Flipped class can help me in better application of knowledge.	9(10.2)	54(61.4)	18(20.5)	5(5.7)	2(2.3)
7	Flipped class can improve my critical thinking ability.	10(11.4)	59(67)	12(13.6)	5(5.7)	2(2.3)
8	Flipped class can enhance my communication skills.	16(18.2)	53(60.2)	14(15.9)	3(3.4)	2(2.3)
9	Flipped class session is more satisfactory than didactic lectures for learning.	5(5.7)	36(40.9)	34(38.6)	10(11.4)	3(3.4)
10	I would prefer a flipped class over a didactic lecture.	7(8)	32(36.4)	32(36.4)	13(14.8)	4(4.5)

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Results of In-depth Interviews (IDI)

Four faculty members who were actively involved in implementing the flipped classroom were interviewed by the author, who is trained in In-depth Interviews. A guide for interviews was prepared beforehand, involving factual questions at the start and open-ended questions about their opinion regarding flipped classrooms. Out of four faculty members, three were females. Mean years of teaching experience was 15 yrs.

Teachers involved in implementing flipped class sessions opined that they are more engaging and interactive than traditional didactic lectures. While an overview of the topic can be provided in a didactic lecture that covers the must-know areas, a flipped class offers opportunities for additional knowledge, covering desirable-to-know and nice-to-know subtopics. As students come prepared to the class beforehand, depth of the knowledge can be attained.

One of the teachers said, "I was very happy to teach the class as most of the students were answering and responding to the narration as opposed to didactic lecture where I tend to see blank faces."

One teacher suggested that a Flipped class session is better than a didactic lecture to cover a vast topic. Priming to the topic can be given in the previous class, and various sub-topics can be covered.

Instead of spending time on the "knows" level from Miller's pyramid, the time can be utilized for higher levels.

As each coin has two sides, the Flipped class session does have some limitations. It requires more planning and preparation, and hence, it is more time-consuming for teachers. One of the teachers felt that didactic lectures are like comfort zones for teachers and students as well. Some of the teachers have been delivering the lectures on the same topic for years, and students do not need to do any homework. Another limitation is that a flipped class session cannot be executed for all topics. It will not only be overwhelming, but also some of the topics are better demonstrated or 'taught' by traditional methods.

Flipped class is not suitable for all students. For example, we at our institute divide students based on their performance as slow learners and Advanced learners. Though, logically, the Flipped class will be more beneficial for slow learners, it becomes ineffective due to their non-involvement. Thus, the Flipped class is not suitable for all students. All the teachers said that the Flipped class session is more satisfactory than didactic lectures for teaching and, given a chance, they would prefer a flipped class over a didactic lecture.

DISCUSSION

Even though the concept of flipped classrooms has been in exercise for many years, its implications for undergraduate medical students are quite new.

In this study, a statistically significant difference was seen in the mean scores of tests conducted prior to class sessions for both viral hepatitis as well as tuberculosis. Learning material was provided to the students before the flipped class session, so students came with preparation, resulting in higher test scores for the Flipped class. Similar results were found in the study conducted by Patkar KU et al.[5] Zhao Y et al in their study found no significant difference in students' performance after flipped classroom teaching.[10] We conducted the post-test after one month as a surprise test to check the retention of knowledge. For both topics, the mean score of the test was higher for the flipped class as compared to didactic lecture, though it was not statistically significant in viral hepatitis. This suggests that understanding of the topic and retention of knowledge was better in the flipped class group as compared to didactic lecture, but more such sessions need to be conducted to arrive at such a conclusion. In similar studies, students have admitted that the flipped classroom sessions improved their understanding and retention of course material in comparison with traditional teaching.[11-13]

When asked about students' and teachers' perceptions about flipped class, they found it more engaging, interactive, and motivating as compared to didactic lecture. Studies conducted to understand students' perception towards flipped class are concordant with the present study.[2-4] As classroom time was fully utilized and sessions were interactive, students liked these sessions, and teachers were also satisfied with this method of teaching. Similar findings have been noted by other studies.[14-16]

The results suggested that pre-class learning as well as discussion during class can help to clear their doubt, resolve misconceptions, and improve their communication and learning skills. Compared to traditional teaching, the flipped classroom method had a positive influence on learning outcomes, achievement, and learning experience.

There was improvement in the grades on the final examination and students also recommended continually using this teaching strategy during the course in the study conducted by Porcaro PA et al,[17] whereas Sajid et al. revealed no difference in the students' grades but found that students were strongly satisfied with the teaching strategy.[11]The few studies have also shown very high student satisfaction, and they accepted flipped class as an effective teaching learning tool.[18-20] In the present study, though the students admitted that they would prefer the flipped class over didactic lectures, due to time constraints, we were not able to take more such sessions and assess the outcome in the final examination.

In the present study, all the teachers believed that flipped class sessions cannot be executed for all students and all topics. This was even reflected in feedback from the students. As only two sessions were conducted and more time is needed to get

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adapted to any new method of teaching learning, more sessions need to be conducted for better generalizability of results. All the teachers said that flipped class can not be executed for all topics, as the diagnostic part in microbiology, which has the practical application, is difficult to understand by students on their own and needs demonstration during practical activity.

CONCLUSION

Test scores before starting class sessions as well as post-test scores of flipped class session are higher as compared to traditional didactic lectures. Students are motivated for SDL by flipped class activity, and they find it very helpful in enhancing their communication skills and critical thinking ability. Most students and teachers are satisfied with the flipped-class teaching- learning method. All the teachers believe that flipped class sessions cannot be executed for all students and all topics. This innovative approach can help students to self-regulate their progress and ultimately build self-confidence.

Limitation of the study: As this was a short-term project, students as well as teachers did not get sufficient time to adapt to this newer method. Also, the assessment was done just by MCQs, so more such sessions, along with other assessment methods, need to be applied for the validation of various outcomes.

Ethics approval and consent to participate: Approval from the Institutional Ethics Committee was sought (vide letter no 113 IEC/ACPMMC/Dhule). Informed consent of the students was taken before the commencement of the study.

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