



Original Article

Effectiveness of the Flipped Classroom Technique over Traditional Classroom Teaching among Medical Undergraduate Students in Microbiology Subject

Dr. Anandkumar Harwalkar¹, Dr. Bande Nawaz², Dr. Shilpa M Bhimalli³, Dr. Rajeshwari R Surpur⁴

¹Professor, Dept. of Microbiology, Navodaya Medical College, Raichur, Karnataka

²Professor & HOD, Dept. of Forensic Medicine & Toxicology, Navodaya Medical College, Raichur, Karnataka

³Professor, Dept. of Anatomy, JN Medical College, Belagavi, Karnataka

⁴Professor & HOD, Dept. of Microbiology, Navodaya Medical College, Raichur, Karnataka

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Corresponding Author:

Dr. Anandkumar Harwalkar

Professor, Dept. of Microbiology,
Navodaya Medical College, Raichur,
Karnataka

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ABSTRACT

Introduction: Medical education is increasingly shifting from teacher-centered approaches to learner centered strategies. This study evaluated the effectiveness of the flipped classroom (FC) technique compared with traditional classroom (TC) teaching among second-year MBBS students.

Material & Method: A quasi-experimental crossover study was conducted among 140 second-year MBBS students. Students were divided into two groups and exposed to both FC and traditional teaching methods. Pre-tests and post-tests using MCQs were administered, and student perceptions were assessed using a Likert-scale questionnaire.

Result: The FC group achieved significantly higher mean pre-test (8.43 ± 2.64 vs. 5.05 ± 2.64 ; $p < 0.001$) and post-test scores (13.16 ± 1.83 vs. 10.38 ± 2.95 ; $p = 0.026$).

Conclusion: Students perceived FC as more engaging, interactive, and effective. The flipped classroom approach improved academic performance, engagement, and critical thinking skills among undergraduate medical students.

Keywords: Flipped Classroom Technique, Traditional Classroom Teaching, Teaching Learning Method, Medical Education Technique.

INTRODUCTION

Traditional lectures have long been the primary method of teaching medical students, but they often lead to passive learning and limited interaction between students and teachers. Competency-based medical education (CBME) focuses on self-directed learning, critical thinking, problem-solving, and active participation. The flipped classroom (FC) is a newer, student-centered approach in which students learn basic concepts before class through online materials, and class time is used for discussion, clarification, and application of what they have learned^{1,2}.

The FC model encourages students to participate actively, work with peers, and learn together. Earlier studies have shown that FC leads to higher student satisfaction, better knowledge retention, and improved academic results compared to traditional classroom (TC) lectures^{3,4}. Niruba et al. found that undergraduate medical students had better academic outcomes with FC⁵. Nanjundaiah and Anuradha also observed greater student engagement and higher test scores with FC⁶. Sarker et al. reported that FC increased student engagement and satisfaction compared with traditional classroom teaching⁷⁷.

Microbiology needs students to understand concepts, connect ideas, and apply them in clinical settings. Using the FC model in microbiology classes may help second-year medical students learn more effectively.

AIM AND OBJECTIVES

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Aim:

To evaluate the effectiveness of the flipped classroom technique compared with traditional classroom teaching among second-year MBBS students.

Objectives:

1. To compare the effectiveness of the flipped classroom technique over traditional classroom teaching.
2. To assess students' perceptions regarding the flipped classroom technique.

MATERIALS AND METHODS

This study involved 140 second-year MBBS students at Navodaya Medical College, Raichur, over a four-month period. The students were split into two groups of 70. In the first phase, Group A attended flipped classroom sessions, while Group B had traditional lectures. Online learning materials were given out three to four days before the FC sessions. Both groups took pre- and post-tests consisting of MCQs. In the second phase, the groups switched teaching methods. Student feedback was collected using a Likert-scale questionnaire. Data was analysed with SPSS version 25, using Student's t-test, and results were considered significant if $p < 0.05$.

RESULTS

This study examined the effectiveness of the Flipped Classroom (FC) technique compared with Traditional Classroom (TC) teaching for second-year MBBS students in microbiology. Academic performance was measured with pre-test and post-test MCQ scores. The results showed that students who used the FC method did significantly better than those who had traditional lectures.

The FC group had a mean pre-test score of 8.43 ± 2.64 , while the traditional classroom group scored 5.05 ± 2.64 . This difference was statistically significant ($p < 0.001$), showing that FC students were better prepared before class. This may be because they could review videos, presentations, and study materials on their own time, which helped them understand the concepts before coming to class.

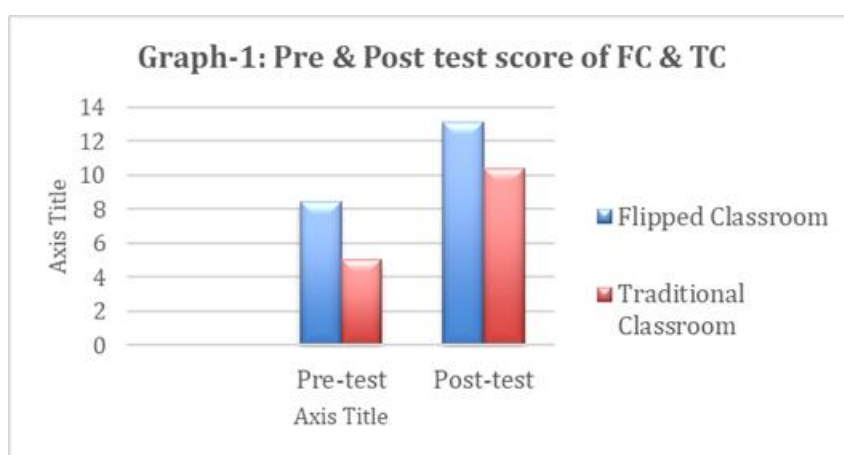
The FC group also had higher post-test scores than the TC group. Students in the FC group scored an average of 13.16 ± 1.83 , while those in the traditional group scored 10.38 ± 2.95 ($p = 0.026$). This suggests that the FC method helped students better understand, remember, and apply microbiology concepts. The lower standard deviation in the FC group also shows that their performance was more consistent.

Student opinions about the FC technique were collected with a Likert-scale questionnaire. Most students agreed or strongly agreed that FC helped them understand the topic better (Q1), improved their memory of the material (Q2), and supported group learning (Q3). Most also said they were well prepared before class (Q4) and felt motivated to finish pre-class online assignments (Q5).

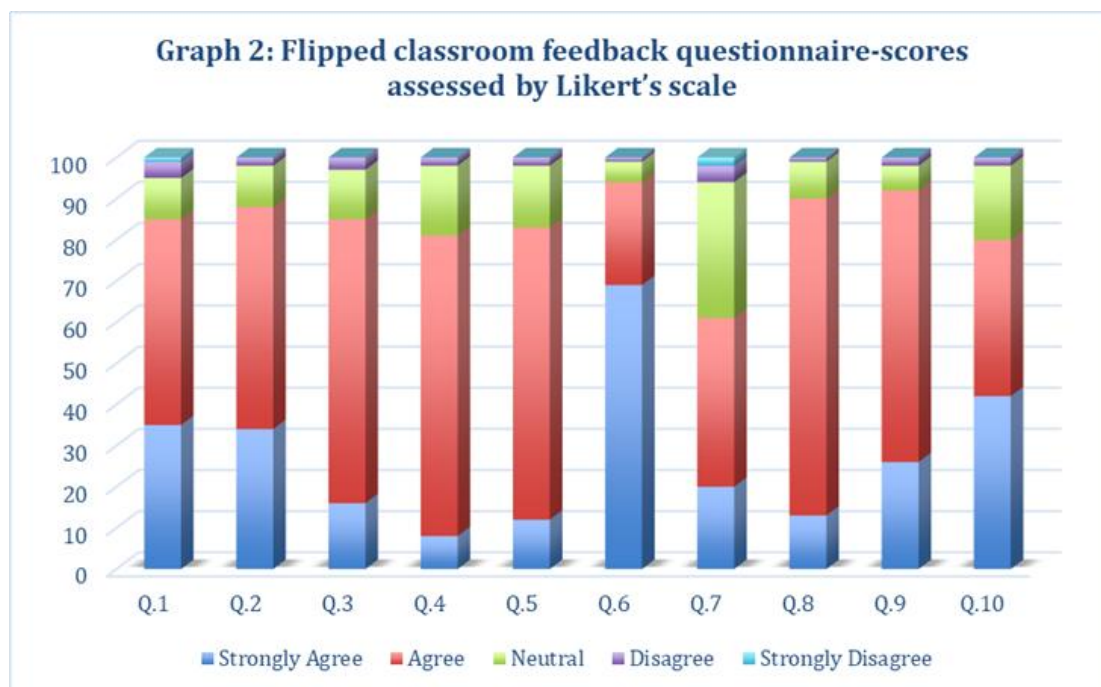
Students said that FC encouraged more interaction with teachers (Q6), active participation in learning (Q8), and better overall communication between students and teachers (Q9). Many also felt that FC improved their analytical thinking and problem-solving skills (Q10). However, some students thought FC sessions took a lot of time (Q7), likely due to the extra preparation and participation required.

Table 1: Pretest and Post-test scores of FC and TC methods

Test	FC Mean $\pm$ SD	TC Mean $\pm$ SD	p-value
Pre-test	8.43 ± 2.64	5.05 ± 2.64	<0.001
Post-test	13.16 ± 1.83	10.38 ± 2.95	0.026



Graph 2: Flipped classroom feedback questionnaire-scores assessed by Likert's scale



Q1. It helped me understand topic better	Q6. Teacher interaction was seen
Q2. Improves knowledge retention	Q7. Time consuming
Q3. Able to learn effectively through groupactivities	Q8. Actively participated in learning
Q4. Prepared well before class	Q9. Improved communication between students & teachers seen
Q5. Felt encouraged to complete pre-class online assignment	Q10. Enhanced my critical thinking and problem-solving skills

DISCUSSION

This study showed that the flipped classroom approach led to significantly better academic performance among second-year MBBS students than traditional lectures. FC students had higher pre-test and post-test scores than those in the traditional group. These findings are similar to results from other studies in medical education.

Niruba et al. found that students using FC had much higher MCQ scores than those in lecture-based classes. Their study showed that FC encouraged self-directed learning, group discussion, and deeper understanding 5. Nanjundaiah and Anuradha also saw that FC improved student engagement, participation, and academic results for medical students 6. In this study, students also had positive views of FC, especially for understanding concepts, communication, and participation.

Better learning outcomes with FC may be due to students having access to learning materials before class and using class time for discussion and clarification. FC changes the focus from passive listening to active learning and deeper thinking. Mehta et al. say that modern medical education needs new teaching methods that build critical thinking and clinical skills 8. FC supports this by encouraging students to prepare on their own and solve problems in class.

Students in this study preferred FC over traditional lectures, saying it gave them more chances to interact, learn in groups, and work at their own pace. Sarker et al. also found that students were more involved and satisfied with FC than with traditional teaching.

Their study showed that FC improved participation, communication, and motivation to learn.

The findings of this study support the implementation of FC as an effective learning method. This study supports the use of FC as an effective student-centred method in competency-based medical education. Some students did find FC time-consuming because of the need to prepare before class. Success with FC also depends on teachers being ready, having online resources, and students staying motivated. Even with these challenges, FC is a promising way to help students remember and use what they learn in the long term. Teaching in enhancing academic performance, student engagement, and critical thinking skills among second-year MBBS students in microbiology. FC promoted active participation, self-directed learning, and collaborative discussions, establishing it as a valuable learner-centred teaching strategy in competency-based medical education.

Conflict of Interest: Nil

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