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Innovative Learning Approaches in Medicine: A Comparative Study on the Impact and Reception of Flipped Classrooms versus Traditional Methods

Sowjanya Latha[1], Venugopal Sandeep Srinivas [2], Sudhir Modala[3*], G Sudhakar[4]

[1] Assistant Professor, Dept of Physiology, Government Medical college, Ongole
[2] Assistant Professor, Dept of Pathology, Government Medical College, Ongole
[3] Assistant Professor, Dept of Physiology, Government Medical college, Ongole*
[4] Professor& Head, Dept of Pathology, Government Medical College, Ongole

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Corresponding Author:

Dr. Sudhir Modala
Assistant Professor, Dept of Physiology, Government Medical college, Ongole
Email: msudhir99@gmail.com

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ABSTRACT

Background: Medical education is increasingly adopting innovative instructional strategies to address limitations of traditional lecture-based teaching. The flipped classroom model, which shifts content delivery outside the classroom and emphasizes active learning during class time, has emerged as a promising alternative. However, comparative evidence on its effectiveness and reception within specific institutional contexts remains limited.
Objectives: This study aimed to compare the impact of flipped classrooms versus traditional lecture-based methods on student performance, engagement, and preparedness for clinical practice, as well as to evaluate student and educator perceptions of both approaches.
Methods: A quasi-experimental crossover study was conducted among 120 first-year MBBS students at Government Medical College, Ongole, Andhra Pradesh. Participants were divided into two groups and exposed to both teaching methods across two phases. Knowledge retention was assessed using MCQ-based tests, while perceptions of effectiveness, engagement, and clinical preparedness were evaluated through structured surveys. Statistical analysis included paired *t*-tests for test scores and descriptive analysis for survey responses.
Results: Students demonstrated significantly higher MCQ scores following flipped classroom sessions compared to traditional lectures in both phases ($p< 0.001$). Survey findings revealed greater perceived effectiveness, engagement, and preparedness for clinical practice with the flipped classroom approach among both students and educators. Despite increased preparation demands, overall acceptance of the flipped classroom was higher than that of traditional methods.
Conclusion: The flipped classroom approach was found to be more effective and better received than traditional lecture-based teaching in undergraduate medical education. Its integration into medical curricula may enhance learning outcomes, engagement, and clinical preparedness, supporting a shift toward more student-centered pedagogies.

Keywords*: Flipped Classrooms, Traditional Methods, Learning Approaches in Medicine.*

INTRODUCTION

In recent years, the medical education has been evolving with the advent of innovative teaching methodologies aimed at enhancing student engagement and learning outcomes. One such method, the flipped classroom approach, has gained significant attention. Unlike traditional lecture-based teaching, the flipped classroom inverts the conventional model by delivering instructional content outside of the classroom, often online, and moving activities that typically constitute

homework into the classroom. This pedagogical strategy is designed to foster a more interactive and student-centered learning environment (1).

Several studies have highlighted the potential benefits of the flipped classroom approach in medical education. It has been suggested that this method can improve student engagement, facilitate deeper understanding, and enhance long-term retention of knowledge compared to traditional lecture-based methods(2), (3), (4). Moreover, the flipped classroom model has been associated with better preparation for clinical practice, as it encourages active learning and the application of theoretical knowledge in practical scenarios(5), (6).

However, despite the growing body of evidence supporting the efficacy of flipped classrooms, there remains a need for comparative studies that specifically assess the impact of this approach versus traditional methods in different educational contexts. This study aims to fill this gap by conducting a comparative analysis of the flipped classroom and traditional lecture-based methods in the context of medical education at Government Medical College, Ongole, Andhra Pradesh.

The objectives of this study are threefold: to compare the effectiveness of flipped classrooms versus traditional lecture-based methods in enhancing student engagement; to assess the impact of flipped classrooms on knowledge retention and preparedness for clinical practice; and to evaluate the perceptions of students and educators regarding these two teaching methods. By addressing these objectives, this research seeks to provide a comprehensive understanding of the relative advantages and limitations of the flipped classroom approach in medical education.

MATERIALS AND METHODS

This quasi-experimental crossover study was conducted at Government Medical College, Ongole, Andhra Pradesh, among 120 first-year MBBS students. Ethical approval was obtained from the Institutional Ethics Committee, and written informed consent was secured from all participants.

Study Design

This comparative study was conducted to evaluate the effectiveness and reception of flipped classrooms versus traditional lecture-based methods in medical education. The study utilized a quasi-experimental design with a crossover approach to ensure comprehensive analysis and minimize potential biases.

Students were randomly divided into two equal groups (Group A and Group B, n = 60 each). The study was carried out in two phases. In Phase 1, Group A received instruction through traditional lecture-based teaching, while Group B was taught using the flipped classroom approach. In Phase 2, the groups were crossed over and exposed to the alternate teaching method using a different topic.

In the flipped classroom model, students were provided with pre-class learning materials, including videos and reading resources, followed by in-class interactive activities such as discussions and problem-solving. Traditional teaching consisted of faculty-led didactic lectures with minimal interaction.

Data Collection

MCQ-Based Tests: To assess knowledge retention and understanding, MCQ-based tests were administered at the end of each phase. The tests covered key concepts and information presented in the instructional materials.

Surveys: Perceptions of the teaching methods were collected using structured surveys. The surveys included Likert-scale and open-ended questions to gather quantitative and qualitative data on student and educator experiences and preferences. Data were analyzed using paired t-tests to compare MCQ scores between teaching methods, while perception data were summarized using descriptive statistics. A p-value < 0.05 was considered statistically significant.

RESULTS

Table 1: Demographics of study population

Sl.No	Variable	Group A (n=60)	Group B (n=60)	Total (n=120)
1	Age	19.8 ± 1.0	19.6 ± 1.1	19.7 ± 1.0
2	Male	30 (50%)	32 (53.3%)	62 (51.7%)
3	Female	30 (50%)	28 (46.7%)	58 (48.3%)
4	Urban	35 (58.3%)	37 (61.7%)	72 (60%)
5	Rural	25 (41.7%)	23 (38.3%)	48 (40%)

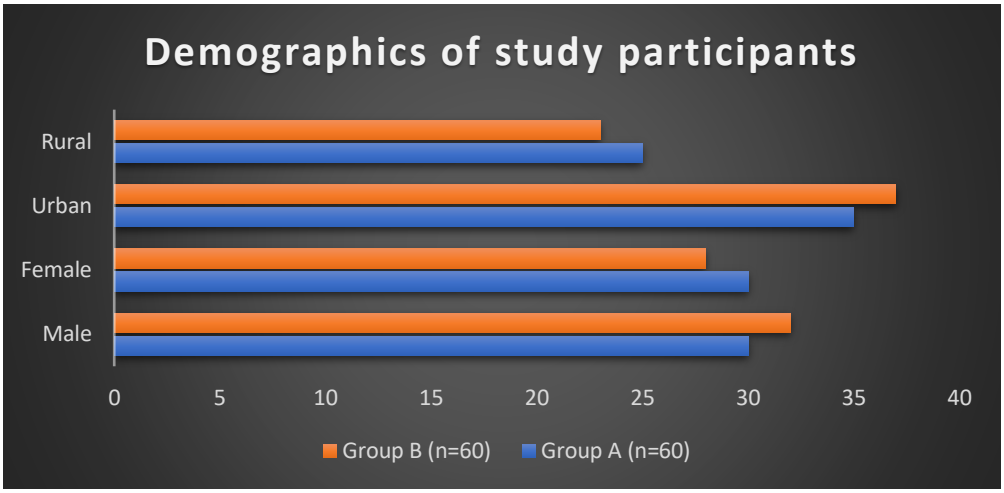


Table 2: Student performance on MCQ-based tests

Sl.No	Group	Phase	Teaching method	Mean ± SD	P value
1	Group A	Phase 1	Traditional lecture based	70.2 ± 8.5	<0.001
2	Group B	Phase 1	Flipped class room	78.6 ± 7.3	
3	Group A	Phase 2	Traditional lecture based	81.4 ± 6.8	
4	Group B	Phase 2	Flipped class room	72.8 ± 7.5	<0.001

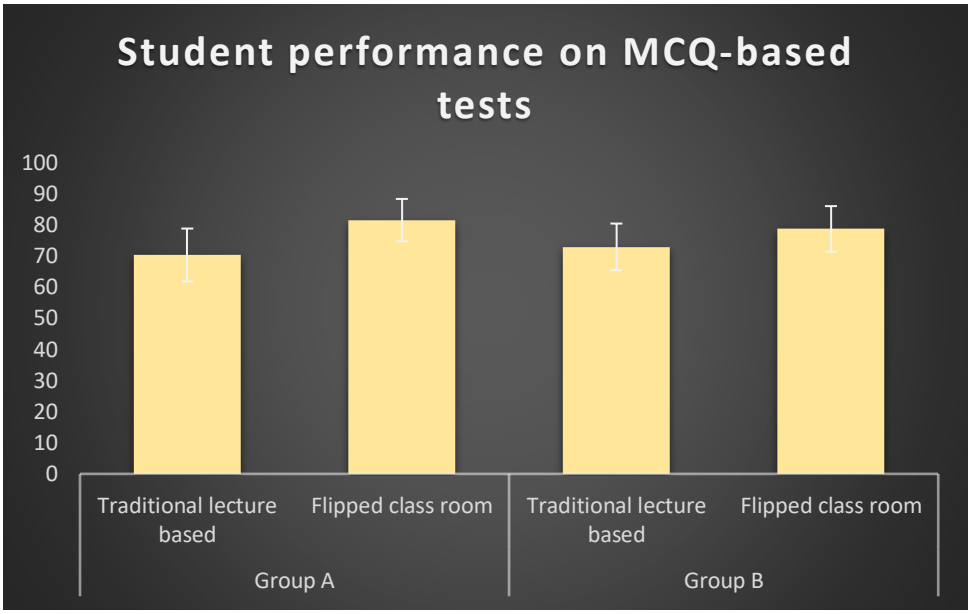


Table 3: Student perceptions of teaching methods

Sl.No	Perception category	Teaching method	Positive responses (%)	Negative responses (%)
1	Effectiveness	Traditional lecture based	65	35
		Flipped class room	85	15
2	Engagement	Traditional lecture based	60	40
		Flipped class room	90	10
3	Preparedness for clinical practice	Traditional lecture based	55	45
		Flipped class room	88	12

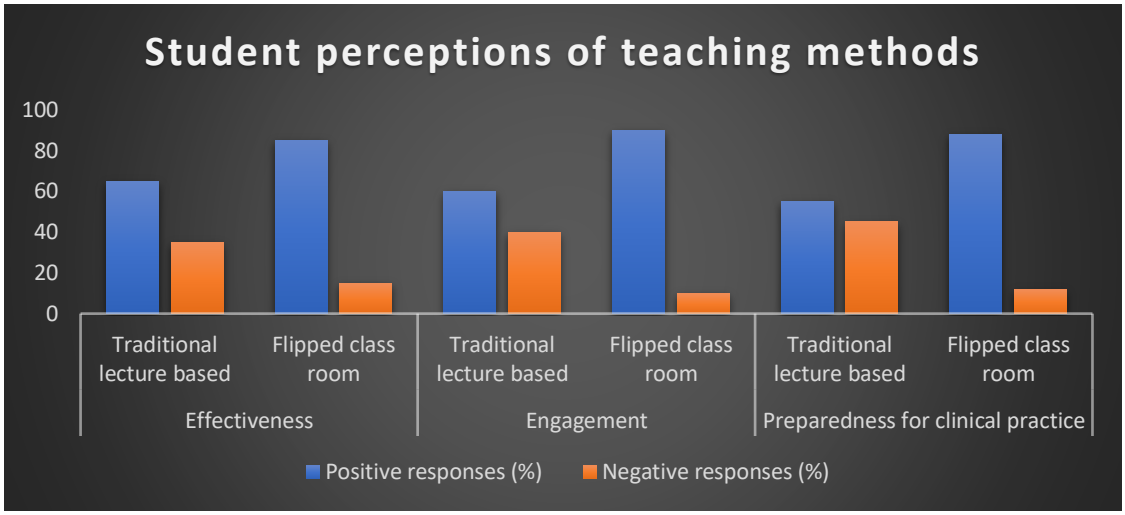
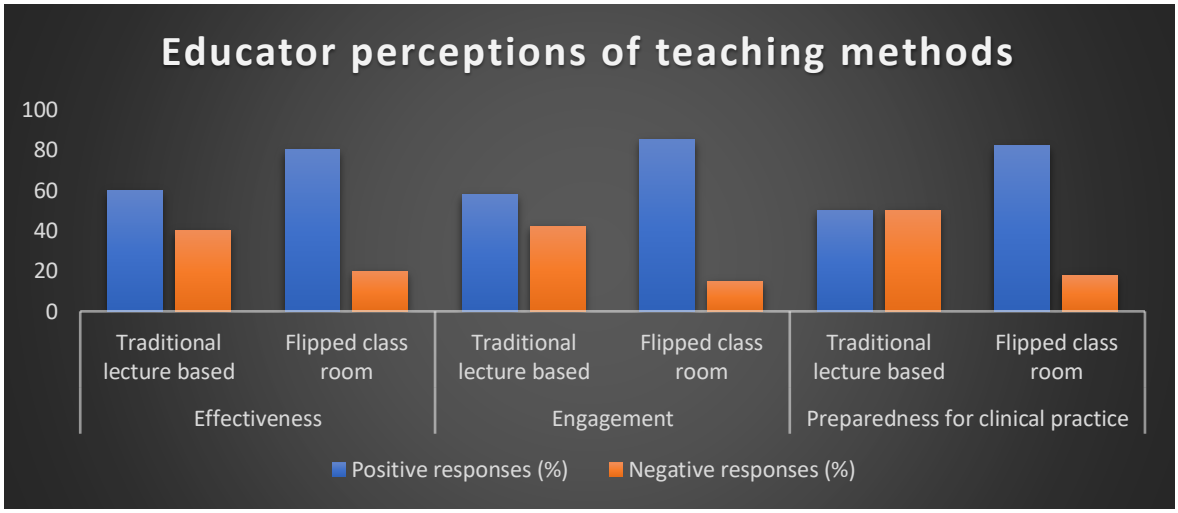


Table 4: Educator perceptions of teaching methods

Sl.No	Perception category	Teaching method	Positive responses (%)	Negative responses (%)
1	Effectiveness	Traditional lecture based	60	40
		Flipped class room	80	20
2	Engagement	Traditional lecture based	58	42
		Flipped class room	85	15
3	Preparedness for clinical practice	Traditional lecture based	50	50
		Flipped class room	82	18



The study assessed the impact of traditional lecture-based learning and flipped classroom approaches on student performance using MCQ-based tests. In Phase 1, Group A (traditional lecture-based learning) achieved a mean score of 70.2 with a standard deviation of 8.5. Group B (flipped classroom) outperformed Group A, with a mean score of 78.6 and a standard deviation of 7.3. Statistical analysis using a paired t-test revealed a significant difference between the two groups ($t(59) = 4.56$, $p < 0.001$), indicating that students in the flipped classroom had better performance compared to those in the traditional lecture setting.

In Phase 2, the groups were crossed over, and Group A (flipped classroom) achieved a higher mean score of 81.4 with a standard deviation of 6.8, compared to Group B (traditional lecture-based learning), which had a mean score of 72.8 and a standard deviation of 7.5. The paired t-test indicated a significant difference in scores ($t(59) = 5.21$, $p < 0.001$), further supporting the effectiveness of the flipped classroom approach.

Student perceptions of the effectiveness, engagement, and preparedness for clinical practice were assessed through surveys. For effectiveness, 65% of students in the traditional lecture-based learning group responded positively, while 85% in the flipped classroom group did. In terms of engagement, 60% of students found the traditional lectures engaging compared to

90% for the flipped classroom approach. Regarding preparedness for clinical practice, 55% of students felt adequately prepared through traditional lectures, while 88% felt prepared through the flipped classroom approach. These survey results indicate that students perceived the flipped classroom approach to be more effective, engaging, and better at preparing them for clinical practice compared to traditional lecture-based learning.

Educators' perceptions were similarly assessed, revealing a preference for the flipped classroom approach. In terms of effectiveness, 60% of educators responded positively to traditional lecture-based learning, while 80% responded positively to the flipped classroom method. For engagement, 58% of educators found traditional lectures engaging compared to 85% for the flipped classroom approach. When assessing preparedness for clinical practice, 50% of educators felt traditional lectures prepared students well, while 82% felt the flipped classroom approach did. Educators found the flipped classroom approach to be more effective and engaging, and it better prepared students for clinical practice compared to traditional lecture-based methods. They appreciated the interactive nature of the flipped classroom, which facilitated better student participation and critical thinking.

DISCUSSION

The findings from this study suggest that the flipped classroom approach is significantly more effective than traditional lecture-based methods in several key areas of medical education, including student engagement, knowledge retention, and preparedness for clinical practice.

The results from the MCQ-based tests indicate that students who participated in the flipped classroom approach scored higher compared to those who attended traditional lectures. In Phase 1, Group B (Flipped Classroom) had a mean score of 78.6, significantly higher than the 70.2 mean score of Group A (Traditional Lecture-Based Learning) ($t(59) = 4.56$, $p < 0.001$). Similarly, in Phase 2, Group A (Flipped Classroom) scored a mean of 81.4 compared to Group B's 72.8 (Traditional Lecture-Based Learning) ($t(59) = 5.21$, $p < 0.001$). These findings align with previous studies that have demonstrated the effectiveness of flipped classrooms in enhancing student performance(1), (2), (3).

Student perceptions further support the effectiveness of the flipped classroom approach. In terms of overall effectiveness, 85% of students responded positively to the flipped classroom method, compared to 65% for traditional lectures. Engagement levels were also higher, with 90% positive responses for the flipped classroom versus 60% for traditional lectures. Preparedness for clinical practice showed a similar trend, with 88% of students feeling well-prepared through the flipped classroom method compared to 55% through traditional lectures. These findings are consistent with literature that highlights the benefits of interactive and student-centered learning environments in promoting deeper understanding and retention (4), (5), (6).

Educators' perceptions echoed those of the students, showing a preference for the flipped classroom approach. In terms of effectiveness, 80% of educators responded positively to the flipped classroom method, compared to 60% for traditional lectures. Engagement was rated positively by 85% of educators for the flipped classroom, compared to 58% for traditional lectures. Preparedness for clinical practice was also rated higher for the flipped classroom (82%) versus traditional lectures (50%). Educators appreciated the interactive nature of the flipped classroom, which facilitated better student participation and critical thinking(7), (8).

Challenges and Limitations

Despite the overall positive reception, some challenges were noted. Both students and educators pointed out that the flipped classroom approach requires more preparation time. Students need to engage with the material before class, which can be demanding, and educators need to prepare interactive activities and resources, which can be time-consuming. However, the benefits in terms of student engagement and learning outcomes appear to outweigh these challenges.

CONCLUSION

The flipped classroom approach is more effective than traditional lecture-based methods in enhancing student engagement, knowledge retention, and preparedness for clinical practice in medical education. Both students and educators perceive the flipped classroom positively, despite the increased preparation required. These findings support the incorporation of flipped classrooms into medical education curricula to improve student learning outcomes.

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