International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 5, May 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.5.2025.67

Original Research

Enhancing Medical Education Through Optimized Lecture Delivery: A Comparative Study of Teaching Aids in an Indian Medical College

Dr. Divya Jaiswal[1], Dr. Raveena Singh[2]

[1]Assistant Professor, Department of Physiology, A.S.J.S.A.T.D.S. Medical College, Fatehpur(U.P.), India
[2]Assistant Professor, Department of Anatomy, A.S.J.S.A.T.D.S. Medical College, Fatehpur(U.P.), India

Corresponding Author:
Dr. Divya Jaiswal
Assistant Professor, Department of Physiology, A.S.J.S.A.T.D.S. Medical College, Fatehpur(U.P.), India
Email: dr.divyajaiswal@gmail.com

Received date: 9 March, 2025 Acceptance date: 10 May, 2025 Published: 13 May, 2025

Abstract

Background: The ability to deliver lectures effectively establishes foundations for successful knowledge education within medical programs. Interventional research examines the effectiveness of three teaching methods including chalk and board (C&B), PowerPoint presentations (PPT) and a combination between them at a medical college in Uttar Pradesh India.

Methods: The study divided its 300 students from MBBS and DMLT and OT technician courses into three sections (n=100 each) to access different teaching methods. After the lesson students answered multiple-choice questions which evaluated their academic progress and used a four-scale satisfaction survey. The researchers applied descriptive statistics combined with ANOVA with post-hoc t- tests and Chi-square tests for data analysis. A $p<0.05$ significance threshold was adopted.

Results: The C&B+PPT group achieved significantly higher MCQ scores (8.5 ± 1.3) compared to C&B (7.2 ± 1.1; $p < 0.0001$) and PPT (7.9 ± 1.5; $p = 0.0005$), with ANOVA confirming overall differences ($p = 0.034$). Student satisfaction was highest for the combined method (99%), surpassing C&B (97%) and PPT (95%) ($p = 0.001$). Qualitative feedback highlighted enhanced engagement through real-time C&B interactions and PPT's visual clarity, with 87% of students favouring the integrated approach for its balance of structure and interactivity.

Conclusion: These findings align with prior studies demonstrating the superiority of blended methods in improving knowledge retention and learner satisfaction. The results advocate for integrating traditional and digital tools in medical curricula to accommodate diverse learning preferences and optimize pedagogical outcomes. This study underscores the need for evidence-based, adaptable teaching strategies in medical education to enhance healthcare training quality.

Keywords: Blended learning, medical education, Teaching methods, Chalk and board, PowerPoint presentations

Introduction

Medical education in India faces persistent challenges in balancing traditional and modern pedagogical approaches to optimize student outcomes. While chalk and board (C&B) methods foster real-time interactivity, PowerPoint (PPT) offers structured visual clarity, yet debates persist about their efficacy in diverse learning environments.[1] Recent studies highlight the growing adoption of blended teaching models, which integrate complementary methods to enhance engagement and knowledge retention. For instance, He et al. (2024) demonstrated that blended teaching in clinical skills training significantly improved academic performance compared to traditional methods, emphasizing its potential in medical education.[2] Similarly, Zhang et al. (2024) found that combining team-based and problem-based learning methodologies enhanced critical thinking and practical application among medical students.[3]

Despite global trends, empirical evidence from the Indian context remains limited. Mahanta et al. (2021) reported that Indian medical undergraduates prefer combined teaching aids, citing improved comprehension and engagement.[4] However, discipline-specific variations exist; Elzainy et al. (2022) observed that flipped classrooms boosted cognitive engagement but required careful integration with traditional methods to address diverse learning needs.[5] Additionally, Shrivastava and Shrivastava (2023) emphasized the role of peer-assisted learning in fostering student-centered education, though its synergy with digital tools remains underexplored.[1]

DOI: 10.69605/ijlbpr_14.5.2025.67

This study addresses these gaps by evaluating C&B, PPT, and their combined use in a controlled setting at an Indian medical college. By assessing academic performance and student satisfaction, the research aims to inform evidence-based curriculum design, aligning with India's National Medical Commission guidelines for optimizing pedagogical strategies in healthcare education.

Material and Methods

Study Design: This research was performed in Autonomous State Medical College Fatehpur Uttar Pradesh between February and March 2025 to assess the delivery effectiveness of C&B, PPT, and their combined usage across medical and allied health student groups. A total of 300 volunteer students composed three groups of 100 students each who received instruction from three lectures delivered with single teaching aids. Both the Institutional Ethics Committee and participant consents in writing validated the research protocol.

Participants

Students from the MBBS programs of 2021, 2022 and 2023 students from DMLT and OT technician programs formed the cohort. The research groups contained the following number of student participants:

- MBBS students: 60
- DMLT and OT students: 40
- Total: 100

All participants had to be enrolled in their respective programs and participated of their own accord. All students who had experienced the lecture content before or missed any lecture classes were excluded from participation. A computer-generated sequence was used for group assignment to make the distribution balanced.

Intervention

A single instructor gave three 45-minute lectures to every group in order to reduce teaching differences between sessions. Three separate lectures about cardiovascular physiology, microbiology and surgical techniques ran without content bias. The teaching aids were:

1. C&B**:** Traditional blackboard with chalk for real-time explanations and diagrams.
2. PPT: The slides in PPT belong to a presentation format optimized for clarity through structured text manipulation and image integration with animation effects.
3. C&B + PPT: Teaching methodology where instructors switch between writing on the blackboard while showing presentations utilizes the advantages of both practices.

Data Collection

Students took an objective test consisting of 10 multiple-choice questions after the lecture which were specifically developed to measure the material presented in class. Ten points went to those who answered correctly from a total possible score of ten points. The evaluation of knowledge retention and comprehension depended on average scores from each test group. The MCQs received validation from faculty members to guarantee content validity and reliability where Cronbach's alpha reached 0.82.

The survey utilized a four-point Likert scale for measuring student satisfaction which produced four possible response options:

- Not satisfactory (0–25%)
- Just satisfactory (25–50%)
- Satisfactory (50–75%)
- Most satisfactory (75–100%)

The participants shared their opinions about lecture delivery methods through unstructured comment boxes. Research data collection took place right after lecture delivery to reduce participants' memory influence on their reported experiences.

Statistical Analysis

The research utilized mean ± standard deviation (SD) for continuous variables whereas categorical variables showed satisfaction level data as frequencies (percentage). The group mean scores were compared through one-way ANOVA using post-hoc t tests and Chi-square tests for satisfaction proportions analysis. Shapiro-Wilk test employed to evaluate normality of data. The researchers performed their statistical tests using OpenEPI software and considered p-value < 0.05 as significant.

Data Validation

The data quality program involved two independent researchers checking all MCQ responses as well as satisfaction surveys for completion. The analysis excluded responses with unclear interpretations which amounted to three cases (n=3). The researchers transcribed every qualitative response as verbatim before using thematic analysis to extract similar perceptions concerning the teaching aids. The thematic coding Inter-rater reliability achieved an excellent level showing consistent interpretation (Cohen's kappa: 0.87).

Study Procedure

The lecturing period spanned across two months for suitability with academic schedules. Standardized classroom conditions allowed groups to receive lectures inside contained locations which eliminated outside factors affecting the experiment. The teacher received training to maintain equivalent delivery speed together with equivalent information depth throughout all sessions. The prevention of content contamination involved separating student groups during their lectures and issuing instructions that forbade them from exchanging information about the content between education sessions.

DOI: 10.69605/ijlbpr_14.5.2025.67

Results

Baseline Socio-Demographic Characteristics

The research sample included 300 total students who received C&B lectures and PPT lectures and C&B lectures combined with PPT lectures in three distinct groups of equal size. There was no significant difference in age between the participants who were 21.5 ± 1.8 years old on average while ensuring adequate group comparability. The baseline socio-demographic characteristics are presented in Table 1 which includes gender distribution, program type and year of study. Students enrolled in C&B lectures maintained a female majority (59%) among all groups, which included 47% females in PPT and 51% in C&B + PPT. It included an equal number of 60 MBBS students and 40 DMLT/OT students while keeping the number of first- year students balanced with second-year students in each group.

Table 1: Baseline Socio-Demographic Characteristics of Study Participants

Characteristic	C&B (n=100)	PPT (n=100)	C&B + PPT (n=100)
Age	20.8 ± 1.7	21.3 ± 1.9	21.1 ± 1.8
Gender			
Male	41 (41%)	53 (53%)	49 (49%)
Female	59 (59%)	47 (47%)	51 (51%)
Program, n (%)			
MBBS	60 (60%)	60 (60%)	60 (60%)
DMLT/OT	40 (40%)	40 (40%)	40 (40%)
Year of Study, n (%)			
First year	48 (48%)	43 (43%)	39 (39%)
Second year	52 (52%)	57 (57%)	61 (61%)

Academic Performance

Post-lecture MCQ tests evaluated academic performance with maximum scores of 10 per test containing 10 questions. The statistical analysis of Table 2 shows meaningful differences between teaching methods [p = 0.034, ANOVA] by Post-hoc t-tests. Participants in the C&B + PPT group obtained the best MCQ test score of 8.5 points with standard deviation 1.3 points. The combined method of C&B + PPT produced substantially superior results than C&B and PPT in terms of academic performance based on post-lecture MCQ tests ($p < 0.0001$ and $p = 0.0005$). PPT also delivered better scores than C&B ($p = 0.008$). Performance consistency in the C&B + PPT group measured by standard deviation stood at 1.3 while PPT reached 1.5 and C&B recorded 1.1.

Table 2: Mean MCQ Scores by Teaching Aid

Teaching Aid	Mean Score ± SD	P-value	Post-hoc t-test p-value	
			vs. PPT	vs. C&B + PPT
C&B	7.3 ± 1.1	0.034 (sig)	0.008	<0.0001
PPT	7.8 ± 1.5		-	0.0005
C&B + PPT	8.5 ± 1.3		-	-

ANOVA test

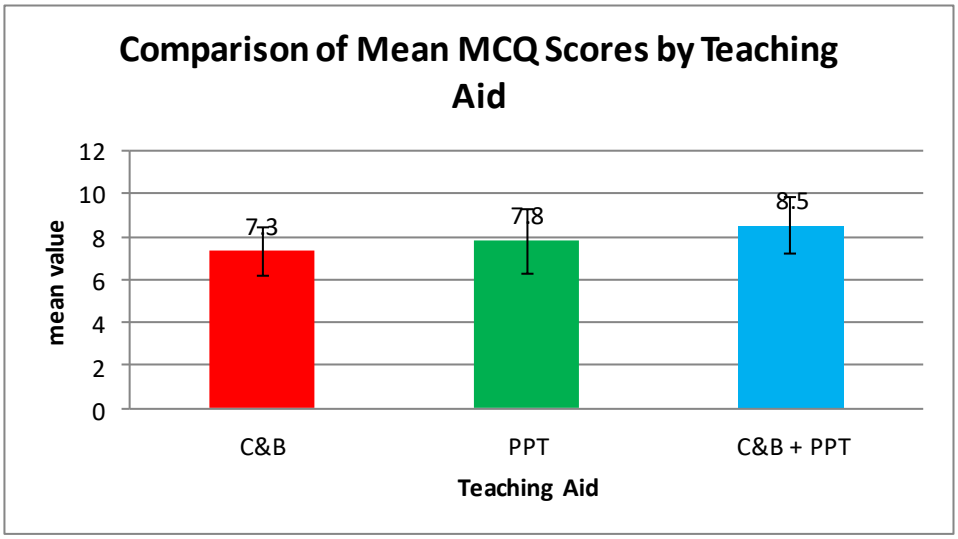

Figure 1: Comparison of Mean MCQ Scores by Teaching Aid

DOI: 10.69605/ijlbpr_14.5.2025.67

Student Satisfaction and Perceptions

Total satisfying responses indicated C&B + PPT obtained the maximum rate at 99.0% while C&B received 97.0% satisfaction followed by PPT with 95.0% as per Table 3. A Chi-square analysis showed statistically significant differences between test groups ($p = 0.001$). The analysis demonstrated that patients rated C&B + PPT as their most satisfactory option at 83% but PPT received 71% satisfaction while C&B achieved 76% satisfaction.

Table 3: Student Satisfaction by Teaching Aid

Teaching Aid	Not Satisfactory (%)	Just Satisfactory (%)	Satisfactory (%)	Most Satisfactory (%)	Total Satisfactory (%)
C&B	1.0	2.0	21.0	76.0	97.0
PPT	2.0	3.0	24.0	71.0	95.0
C&B + PPT	0.0	1.0	16.0	83.0	99.0

Note: Total satisfactory includes "satisfactory" and "most satisfactory" responses. $\chi^2 = 13.8$, $p = 0.001$.

Student feedback about lecture delivery reaction during various instructional materials exists in deep detail in Table 4. Student responses showed strong preference for the C&B + PPT method which achieved positive results in the majority of questions starting with clarity of content/diagrams (71.0%) through clarity of structural relations (73.0%) up to student-teacher interaction (77.0%). Student-teacher interaction and note-taking and diagram copying functions received the highest praise (70.0% and 75.0% respectively) for the C&B teaching aid because of its interactive design characteristics. Students appreciated the organized format of PPT because it allowed clear visibility of content and maintained understandable structural relations at 68.0% and 67.0% respectively. The findings showed that PPT received lower marks for its ability to keep students interested (43.0%) and support note-taking (35.0%).

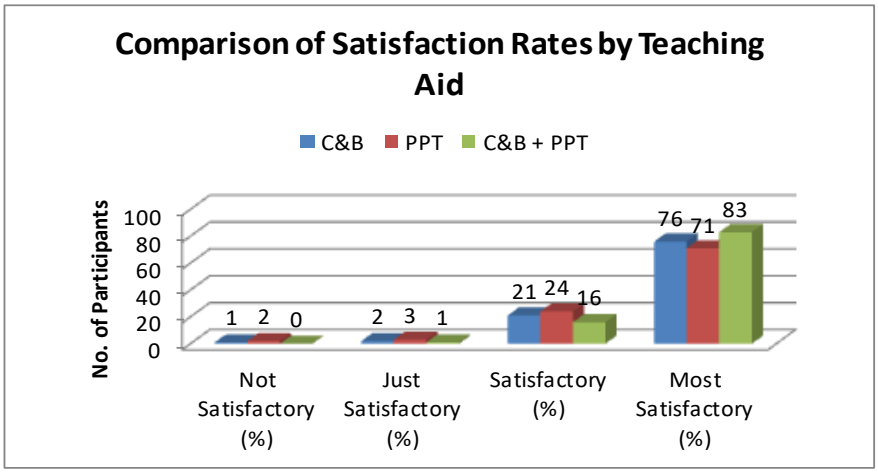

Figure 2: Comparison of Satisfaction Rates by Teaching Aid

Table 4: Comparison of Student Responses to Chalkboard, PowerPoint, and Combined Methods

Questions	Chalkboard (Favourable, n, %)	PowerPoint (Favourable, n, %)	C&B + PPT (Favourable, n, %)
Lectures were well organized and structured?	56 (56.0%)	53 (53.0%)	69 (69.0%)
Clarity of the contents/diagrams?	50 (50.0%)	62 (62.0%)	71 (71.0%)
Clarity of relations of structures?	45 (45.0%)	67 (67.0%)	73 (73.0%)
Visibility of lecture contents?	42 (42.0%)	68 (68.0%)	70 (70.0%)
Reproducibility of text and diagrams?	57 (57.0%)	50 (50.0%)	65 (65.0%)
Stimulates interest in subject?	63 (63.0%)	43 (43.0%)	68 (68.0%)
Integration of text with figures?	50 (50.0%)	59 (59.0%)	66 (66.0%)
Able to take notes and copy diagrams?	70 (70.0%)	35 (35.0%)	73 (73.0%)
Better understanding of topic?	64 (64.0%)	41 (41.0%)	70 (70.0%)
Overall satisfaction and effectiveness?	69 (69.0%)	43 (43.0%)	72 (72.0%)
Demonstration of applied aspects	48 (48.0%)	63 (63.0%)	69 (69.0%)
Student-teacher interaction	75 (75.0%)	39 (39.0%)	77 (77.0%)

Note: Favourable responses indicate agreement with the statement (satisfactory or most satisfactory).

DOI: 10.69605/ijlbpr_14.5.2025.67

Qualitative Feedback

Open-ended comment analysis discovered the main themes which consisted of interactivity and clarity together with engagement. Students who used C&B technology found the interactive features most beneficial due to its capability to enable immediate diagram drawing while promoting active understanding. The pace moved at a slower rate during complex subject matter according to 22% of those surveyed who reported this as an issue for understanding complicated concepts. The respondents rated PPT for its clear organization at 72% but 28% experienced diminished engagement through passive listening. The combination of the C&B + PPT approach received 87% support from students because it united clarity with interactive elements which enhanced focus and understanding. Students complimented the presentation approach because it combined organized teaching methods with active participation. Thematic coding reliability between analysts reached an impressive level shown by Cohen's kappa value at 0.89 to guarantee strong results in qualitative assessment.

Discussion

The findings of this study demonstrate that a combined teaching approach using both chalk and board (C&B) and PowerPoint presentations (PPT) produces superior outcomes in medical education compared to either method alone. The significantly higher academic performance observed in the C&B+PPT group (mean MCQ score 8.5±1.3) suggests that integrating traditional and digital teaching modalities optimizes knowledge acquisition and retention. Meo et al. found similar results, concluding that an integrated method was more suitable for medical teaching than PowerPoint or chalkboard alone.[6]The higher student satisfaction with the combined approach (99.0%) indicates that learners appreciate a balanced teaching methodology that leverages both the interactive nature of C&B and the visual clarity of PPT. This aligns with Mahanta et al.'s research, which highlighted that Indian medical undergraduates prefer combined teaching methods that incorporate both traditional and digital approaches.[4] The ability to address diverse learning preferences through a multi-modal approach appears to enhance engagement and comprehension in medical education settings.

Our findings both corroborate and extend existing research on teaching methodologies in medical education. Parolia et al. reported that Indian dental students preferred lectures using both PowerPoint and chalkboard,[7] which supports our results. However, Seth et al. observed a divergence in preferences between medical and dental students, with medical students favoring PPT and dental students preferring chalkboard teaching.[8] This highlights the importance of considering discipline-specific needs when designing instructional approaches.The superior performance of students exposed to the combined method aligns with Bath-Hextall et al.'s research on multimedia learning objects, which demonstrated that supplementing lectures with visual aids improved students' understanding of complex concepts.[9] Furthermore, Naqvi et al. found that students preferred blackboard plus animations over other combinations,[10] suggesting that the visual benefits of PPT combined with the interactive nature of C&B create an optimal learning environment.Recent work by He et al. on blended teaching approaches in medical practice courses revealed that combining online and offline teaching methods leads to improved outcomes compared to traditional teaching alone.[2] This supports our observation that integrating complementary teaching modalities enhances educational effectiveness.

Strengths

One of the greatest merits of this study is the strong experimental design in which the 3 different groups were all exposed to the standardized lectures and taught by the same lecturer, thereby reducing the likelihood of other confounding factors. The large sample size (n=300) guaranteed statistically meaningful comparisons of teaching methods. By including both an objective assessment (MCQ result) and a subjective satisfaction test, an extensive analysis of teaching performance can be achieved. Swanberg et al. stressed the value of using a variety of measures to evaluate educational interventions,[11] something our study includes. The heterogeneous subject pool of students from multiple programs (MBBS, DMLT and OT technician), may lend to an external generalizability of the findings to multiple healthcare educational contexts, in contrast to the limitation of prior studies which were confined to a single discipline.

Limitations

Many strengths notwithstanding some limitations merit discussion. One: the research investigated the immediate impact of learning and not long-term memory retention or transfer of knowledge to clinical settings. Ilic et al. emphasised that both close and long effects needed to be considered when evaluating teaching strategies.[12]

Secondly, generalizability to other cultural and educational contexts may be constrained due to the one institution setting in India. Educational preference and efficiency might be different in various areas, as reflected by the inconsistent results of international studies.[13,8,4]

Third, the specificity of the topics of cardiovascular physiology, microbiology and surgical technique studied. Zhang et al. found that the efficacy of instructional methods could depend on the content domain and whether methods are focused on theoretical concepts or practical applications.[3]

DOI: 10.69605/ijlbpr_14.5.2025.67

Future Directions

Long-term retention of knowledge and clinical application should be evaluated in further study via follow-up testing. Furthermore, the study of the effect of combined teaching approaches in a wider range of medical specialties and cultural settings would elucidate it overall generalizability. Research is warranted to investigate how newer teaching technologies will complement traditional instruction as it is increasingly incorporated into medical education. Elzainy et al. showed the positive effect of technology-based active learning in the flipped classrooms, as well as other technology interventions.[5] A comparison of the impact of various teaching methods on students with various learning styles also seems justified. Ankad et al. found no difference in the effectiveness of PowerPoint presentations for students with the various learning style preferences.[14] Additional investigation is needed on how multimodal teaching modalities interact with the learning of the individual.

Conclusion

The present study indicates that the combination of chalk and board with PowerPoint is more effective than chalk and board to enhance the impact of the medical education, in the form of improvement in the student's academic performance and their satisfaction. Combined applications exploit the interaction of traditional forms and the visual transparency of digital forms, which encourages pedagogic diversity. Educators need to embrace evidence-based, flexible approaches that combine traditional and new methodologies to best equip healthcare professionals.

Authors Contribution

All authors contributed equally.

Ethical Considerations

Ethical approval was taken from the institutional ethics committee vide letter no. ……. Study participants received information about the research goals while being protected through unidentified coding methods. No monetary or non-monetary incentives were offered to the participants as a way to prevent coercive influences.

Financial Support and Sponsorship

Nil

Conflicts of Interest

There are no conflicts of interest.

Acknowledgment

We gratefully acknowledge faculty and administration of Autonomous State Medical College, Fatehpur for cooperation & support. Special thanks go to all students who participated in the research, for their enthusiastic participation and precious feedback that allowed the execution of the study. We thank the team of data validation and analysis for their hard work.

References

1. Shrivastava SRBL, Shrivastava PS. Assessing the merits of peer teaching in medical education. Adv Med EducPract. 2023;14:721-7.
2. He Z, Zhou X, Zhang Z, et al. Blended teaching in clinical skills training. BMC Med Educ. 2024;24(1):287.
3. Zhang W, Li C, Yuan Z, et al. Comparing team-based and problem-based learning in medical education. BMC Med Educ. 2024;24(1):131.
4. Mahanta P, Barman S, Bhattacharyya N. Indian medical undergraduates' perceptions of lecture methods. J Educ Health Promot. 2021;10:382.
5. Elzainy A, El Sadik A, Al Abdulmonem W. Impact of flipped classrooms on medical students. Ann Anat. 2022;241:151952.
6. Meo SA, Shahabuddin S, Al Masri AA, et al. Comparison of the impact of powerpoint and chalkboard in undergraduate medical teaching. J Coll Physicians Surg Pak. 2013;23(1):47-50..
7. Parolia A, Mohan M, Kundabala M, et al. Indian dental students' preferences regarding lecture courses. J Dent Educ. 2012;76(3):366-371.
8. Seth V, Upadhyaya P, Ahmad M, et al. PowerPoint or chalk and talk: perceptions of medical students versus dental students in a medical college in India. Adv Med EducPract. 2010;1:11-16.
9. Bath-Hextall F, Wharrad H, Leonardi-Bee J. Teaching tools in evidence based practice: evaluation of reusable learning objects (RLOs) for learning about meta-analysis. BMC Med Educ. 2011;11:18.
10. Naqvi SH, Mobasher F, Afzal MA, et al. Effectiveness of teaching methods in a medical institute: perceptions of medical students to teaching aids. J Pak Med Assoc. 2013;63(7):859-864.
11. Swanberg SM, Dennison CC, Farrell A, et al. Instructional methods used by health sciences librarians to teach evidence-based practice: a systematic review. J Med Libr Assoc. 2016;104(3):197-208.
12. Ilic D, Maloney S. Methods of teaching medical trainees evidence-based medicine: a systematic review. Med Educ. 2014;48(2):124-135.
13. Meyur R, Mitra B, Adhikari A, et al. Attitude of medical students about different teaching aids used in lectures in Anatomy. Nepal Med Coll J. 2011;13(3):157-159.
14. Ankad RB, Shashikala GV, Herur A, et al. PowerPoint presentation in learning physiology by undergraduates with different learning styles. AdvPhysiol Educ. 2015;39(4):367-371.