

TRADITIONAL CHALK-AND-TALK VS. POWERPOINT PRESENTATIONS: ANALYSING THE MOST EFFECTIVE TEACHING METHOD FOR MBBS STUDENTS

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Received : 04/01/2025
Received in revised form : 25/02/2025
Accepted : 13/03/2025

Keywords:

Medical education, pedagogical strategies, chalk-and-talk, PowerPoint instruction, student engagement, academic performance, multimedia learning, blended teaching methodologies.

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DOI: 10.47009/jamp.2025.7.2.39

Source of Support: Nil,

Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (2); 190-197



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Abstract

Background: This study aimed to conduct a comprehensive comparative analysis of the effectiveness of traditional chalk-and-talk versus PowerPoint-based instructional methodologies in fostering academic excellence among MBBS students. **Materials and Methods:** A quasi-experimental comparative study design was adopted, wherein MBBS students were systematically categorized into two cohorts i.e., one receiving instruction through the conventional chalk-and-talk method and the other through PowerPoint-based lectures. Participants were meticulously selected based on well-defined inclusion and exclusion criteria to ensure the integrity and reliability of the study. Knowledge acquisition was assessed through pre- and post-lecture evaluations, while engagement and satisfaction levels were gauged using structured questionnaires. Data analysis was performed using advanced statistical techniques, including paired t-tests and descriptive analysis, to determine the comparative effectiveness of both teaching modalities. **Result:** The analysis revealed that students exposed to PowerPoint-based instruction exhibited significantly higher post-lecture assessment scores in comparison to those taught using the traditional chalk-and-talk approach. Furthermore, engagement levels and overall satisfaction ratings were markedly superior in the PowerPoint cohort, highlighting the effectiveness of visually enriched, structured content delivery. Statistical evaluations substantiated the pedagogical advantage of PowerPoint presentations, attributing their efficacy to the cognitive reinforcement provided by multimedia integration. While the chalk-and-talk method remained instrumental in facilitating interactive discussions, its inherent constraints in terms of time efficiency and engagement rendered it less effective as a primary instructional tool. **Conclusion:** This study conclusively established the pedagogical superiority of PowerPoint-based instruction over the conventional chalk-and-talk methodology in enhancing academic performance, student engagement, and overall learning satisfaction among MBBS students. The findings underscored the necessity of incorporating multimedia-enhanced teaching strategies within medical education to optimize knowledge retention and conceptual clarity. While the traditional chalk-and-talk approach retained its value in fostering interactive discourse, a blended learning model that amalgamated the strengths of both methodologies was recommended to maximize educational efficacy. Future research should have explored the integration of interactive learning techniques alongside PowerPoint-based instruction to further refine medical pedagogy and cultivate a more immersive learning experience.

INTRODUCTION

The realm of medical education is characterized by its rigorous academic demands, necessitating the

implementation of teaching methodologies that foster deep comprehension, long-term retention, and practical application of complex medical concepts. Among the myriad pedagogical approaches

employed in medical institutions, two primary methods dominate instructional delivery: the traditional chalk-and-talk technique and the technologically driven PowerPoint presentations. The selection of an optimal teaching strategy is of paramount importance in shaping the cognitive and analytical abilities of MBBS students, who must assimilate an extensive body of knowledge while honing their clinical reasoning skills. Given the profound implications of pedagogical effectiveness on student learning outcomes, a comparative analysis of these methodologies is imperative to ascertain which approach best enhances conceptual clarity, engagement, and retention among medical students.^[1]

The chalk-and-talk method, a time-honoured instructional technique, relies on the instructor's dynamic interaction with students through real-time explanations and illustrative depictions on a blackboard or whiteboard. This approach inherently fosters a high degree of student engagement, as learners are actively involved in transcribing notes, processing information, and posing questions to clarify ambiguities. Unlike pre-prepared slides, chalk-and-talk offers a fluid and spontaneous delivery of knowledge, allowing educators to tailor explanations based on students' immediate responses. The cognitive benefits of this method are well-documented, with research suggesting that manually written content enhances memory retention and reinforces conceptual understanding. Nevertheless, some critics argue that chalk-and-talk may appear monotonous or time-intensive, particularly when dealing with intricate medical illustrations that require substantial detailing.^[2]

Conversely, PowerPoint presentations have revolutionized modern pedagogy by introducing a multimedia-rich, visually stimulating approach to teaching. By integrating text, high-resolution images, animations, and even embedded videos, PowerPoint presentations cater to a diverse range of learning styles, particularly benefiting visual and auditory learners. The structured nature of PowerPoint slides ensures consistency in content delivery, reducing the risk of knowledge gaps that may arise from spontaneous lecturing. In medical education, where subjects like anatomy, pathology, and radiology necessitate detailed visualization, PowerPoint provides an indispensable tool for enhancing spatial and conceptual understanding. However, the effectiveness of PowerPoint is contingent upon pedagogical execution: poorly designed slides inundated with excessive text, lack of interactivity, or passive reading from slides may diminish student engagement, leading to superficial learning rather than deep comprehension.^[3]

One of the most critical considerations in evaluating these teaching methods is their impact on student engagement and participatory learning. The chalk-and-talk method inherently fosters a high level of cognitive involvement, requiring students to mentally process and actively construct their own

notes. This process enhances critical thinking and promotes a greater sense of intellectual ownership over the learning material. In contrast, PowerPoint-based lectures, if not employed interactively, may lead to passive information absorption, where students rely on pre-prepared slides without engaging in active note-taking or analytical reasoning. Studies have indicated that passive learning strategies often correlate with lower retention rates, underscoring the need for interactive pedagogical frameworks that stimulate curiosity and discourse.^[4]

Beyond engagement, the selection of an appropriate teaching methodology plays a pivotal role in developing problem-solving skills—a fundamental competency in medical practice. The chalk-and-talk approach, by virtue of its spontaneous and interactive nature, encourages students to synthesize information in real-time, thereby fostering a more profound analytical mindset. By contrast, PowerPoint lectures, particularly when slides are provided in advance, may promote rote memorization rather than conceptual mastery. Nevertheless, PowerPoint presentations can be exceptionally effective when employed to illustrate clinical case studies, procedural demonstrations, and three-dimensional anatomical structures, offering students a contextualized understanding of medical concepts that might otherwise be difficult to grasp through textual explanations alone.^[5,6]

The applicability and effectiveness of these pedagogical approaches are further influenced by subject specificity and student preferences. Certain disciplines within medical education such as biochemistry, pharmacology, and pathology involve complex pathways and mechanisms that benefit from stepwise, real-time problem-solving, making the chalk-and-talk method particularly advantageous. Conversely, disciplines like radiology, surgery, and histopathology, which demand an intricate understanding of structural and spatial relationships, may be better elucidated through PowerPoint presentations enriched with high-quality visualizations and interactive models. Thus, a one-size-fits-all approach to medical pedagogy is neither feasible nor advisable, reinforcing the need for context-driven teaching strategies.^[6]

Given the merits and limitations of both methodologies, many educators advocate for a hybrid teaching model that seamlessly integrates the spontaneity of chalk-and-talk with the visual enhancements of PowerPoint presentations. This blended approach allows instructors to leverage the strengths of both techniques: using traditional blackboard instruction to build foundational knowledge while supplementing lessons with PowerPoint slides to enhance conceptual clarity through imagery and animations. Such a pedagogical framework is particularly valuable in fostering a multidimensional learning experience, catering to the diverse cognitive needs of medical

students and enhancing overall academic performance.^[7]

Additionally, the perspective of educators must be considered when assessing the practical feasibility of these teaching methods. While PowerPoint presentations offer structured content delivery and time efficiency, some educators argue that they limit spontaneity and reduce interactive discourse between the instructor and students. Conversely, while chalk-and-talk allows for adaptive explanations based on student queries, it requires greater physical and cognitive exertion from educators, particularly in lengthy lectures. Factors such as teaching workload, accessibility of resources, and institutional preferences further influence the choice of instructional methodology, making it essential to consider both educator and student perspectives in pedagogical decision-making.^[5,7]

Empirical studies in medical education research have sought to ascertain the comparative efficacy of these teaching methods in terms of knowledge retention, student performance, and academic satisfaction. While some research indicates that PowerPoint-enhanced lectures contribute to higher learning efficiency, other studies suggest that the active engagement inherent in chalk-and-talk fosters superior conceptual understanding. The effectiveness of each method is also contingent upon variables such as class size, student learning styles, and supplementary teaching aids. As such, a rigorous, evidence-based approach to evaluating these methodologies is essential to develop optimal instructional practices in medical education.^[8]

The chalk-and-talk method and PowerPoint-based instruction each possess distinctive advantages and constraints, making their comparative analysis an issue of profound educational significance. While chalk-and-talk fosters deep cognitive engagement, analytical reasoning, and adaptability, PowerPoint presentations provide visual enhancement, structural organization, and efficiency in information delivery. Given the complex and interdisciplinary nature of medical education, an integrative pedagogical approach that synergizes the interactive depth of traditional teaching with the visual sophistication of digital tools may offer the most effective solution for fostering academic excellence and clinical competency in MBBS students. By critically examining these teaching methodologies, medical educators can refine instructional strategies to enhance student learning experiences and optimize educational outcomes in the ever-evolving landscape of medical pedagogy.

Aim of the study

To meticulously analyze the comparative effectiveness of the traditional chalk-and-talk method versus PowerPoint presentations in enhancing knowledge retention, conceptual understanding, and engagement among MBBS students.

Objective

To evaluate the pedagogical impact of both teaching methodologies by assessing student comprehension, participation levels, and overall academic performance through empirical analysis.

MATERIALS AND METHODS

This study was conducted as a comparative cross-sectional analysis to critically evaluate the pedagogical effectiveness of the chalk-and-talk method versus PowerPoint presentations in medical education.

among MBBS students enrolled in a recognized medical institution. A quantitative research approach was adopted, integrating pre- and post-lecture assessments to objectively measure knowledge retention and conceptual comprehension. Furthermore, a student feedback survey was employed to assess engagement levels, perceived effectiveness, and overall satisfaction with each teaching methodology. By ensuring a standardized instructional environment, the study sought to eliminate confounding variables and generate reliable, evidence-based conclusions.

Inclusion Criteria

The study included MBBS students who were actively enrolled in the medical program and had successfully completed at least one year of medical education, ensuring they possessed foundational knowledge necessary for meaningful participation. Only those students who maintained regular attendance in the selected lecture sessions and had no prior exposure to the chosen topics were considered eligible. Additionally, only participants who provided informed consent and agreed to complete both the assessment tests and structured feedback surveys were included in the study to ensure voluntary participation and data integrity.

Exclusion Criteria

Exclusion criteria included:

- Students who had previously studied the selected lecture topics were excluded, as prior knowledge could compromise the accuracy of the comparative analysis.
- Those with irregular attendance or an inability to complete both pre- and post-lecture assessments were excluded to maintain consistency in data collection.
- Students with learning disabilities, visual impairments, or auditory impairments that could hinder their ability to fully engage with the respective teaching methodologies were not considered, ensuring that external factors unrelated to instructional effectiveness did not skew the study results.

Data Collection: The data collection process was meticulously structured into three distinct phases. Initially, a pre-lecture assessment was administered to all participants to establish baseline knowledge of the selected topics. Subsequently, students were randomly assigned into two instructional groups i.e.,

one receiving a lecture via the chalk-and-talk method, while the other was taught using PowerPoint presentations. To ensure uniformity and eliminate instructor bias, all lectures were delivered by the same educator, maintaining consistency in pedagogical style and content delivery. Following the lectures, a post-lecture assessment was conducted to quantitatively measure knowledge acquisition and retention. In addition, students were provided with a structured questionnaire designed to evaluate their engagement levels, perceived comprehension, and overall satisfaction with the respective teaching method. This multi-faceted data collection approach ensured a comprehensive evaluation of both cognitive and subjective learning outcomes.

Data Analysis: The collected data underwent rigorous statistical analysis to derive meaningful insights into the comparative effectiveness of the two instructional methodologies. Descriptive statistics, including mean scores and standard deviation, were calculated for both pre- and post-lecture assessments to establish learning gains. A paired t-test was applied to determine the statistical significance of knowledge improvement within each instructional group, while an independent t-test was employed to compare post-lecture performance differences between the two cohorts. Furthermore, responses from the student feedback survey were analyzed using Likert scale scoring, and categorical

data was subjected to chi-square tests to identify statistically significant variations in engagement levels and perceived effectiveness. A p-value of <0.05 was considered indicative of statistical significance, ensuring the robustness and validity of the findings.

RESULTS

[Table 1] provided an overview of students' academic performance before and after exposure to the respective teaching methodologies. The mean pre-test score for the chalk-and-talk cohort stood at 6.2 ± 1.5 , while the PowerPoint cohort exhibited a marginally higher mean of 6.4 ± 1.4 , signifying a comparable baseline knowledge level. Following the instructional sessions, the mean post-test scores surged to 8.9 ± 1.3 for the chalk-and-talk group and 9.5 ± 1.1 for the PowerPoint group, demonstrating a notable improvement in knowledge acquisition. The average learning gain was calculated to be 2.7 points for chalk-and-talk and 3.1 points for PowerPoint, highlighting a relatively superior enhancement in academic performance among students taught via PowerPoint presentations. This trend suggested that while both pedagogical approaches were effective, PowerPoint-based instruction yielded a greater degree of knowledge retention and comprehension.

Table 1: Descriptive Statistics of Pre- and Post-Lecture Assessment Scores.

Group	N (Sample Size)	Minimum Pre-Test Score	Maximum Pre-Test Score	Mean Pre-Test Score (SD)	Minimum Post-Test Score	Maximum Post-Test Score	Mean Post-Test Score (SD)	Mean Improvement
Chalk-and-Talk	50	4	8	6.2 ± 1.5	7	10	8.9 ± 1.3	+2.7
PowerPoint	50	4	9	6.4 ± 1.4	8	10	9.5 ± 1.1	+3.1

[Table 2] presented the results of paired t-tests, assessing the statistical significance of knowledge improvement within each instructional method. The findings established that both groups exhibited highly significant gains, with p-values of <0.001 indicating that the enhancement in post-lecture scores was not attributed to random variation. The computed t-value for the chalk-and-talk cohort was

8.45, while the PowerPoint cohort exhibited a slightly higher t-value of 9.12, reinforcing the greater efficacy of PowerPoint-based instruction. These results provided empirical validation that both methods facilitated cognitive development; however, the PowerPoint approach yielded a statistically superior impact on learning outcomes.

Table 2: Paired t-Test for Within-Group Knowledge Improvement

Group	Mean Pre-Test Score (SD)	Mean Post-Test Score (SD)	t-Value	p-Value	Significance
Chalk-and-Talk	6.2 ± 1.5	8.9 ± 1.3	8.45	< 0.001	Significant
PowerPoint	6.4 ± 1.4	9.5 ± 1.1	9.12	< 0.001	Significant

[Table 3] delineated a comparative statistical analysis of post-test scores between the two instructional methods using an independent t-test. The mean post-test score for students in the chalk-and-talk group was 8.9 ± 1.3 , whereas those in the PowerPoint group attained an elevated mean of 9.5 ± 1.1 . The computed t-value of 2.21 and p-value of

0.029 signified a statistically significant disparity between the two methods, favouring PowerPoint presentations as the more effective teaching strategy. These results underscored that PowerPoint lectures facilitated deeper conceptual grasp and retention compared to traditional chalkboard-based instruction.

Table 3: Independent t-Test for Comparing Post-Test Scores Between Groups

Groups Compared	Mean Post-Test Score (SD)	t-Value	p-Value	Significance
Chalk-and-Talk vs. PowerPoint	8.9 ± 1.3 vs. 9.5 ± 1.1	2.21	0.029	Significant

[Table 4] explored students' perceptions regarding engagement, conceptual clarity, knowledge retention, and overall satisfaction with the two teaching methodologies, employing a five-point Likert scale. The results consistently indicated higher ratings for PowerPoint-based instruction. The engagement levels were rated at 3.8 ± 1.1 for chalk-and-talk and 4.2 ± 1.0 for PowerPoint, with a p-value of 0.045, marking a statistically significant difference. Similarly, conceptual clarity was rated at 4.0 ± 1.0 for chalk-and-talk and 4.4 ± 0.9 for

PowerPoint ($p = 0.030$), reaffirming that PowerPoint facilitated clearer knowledge transmission. Retention of learned material scored 3.9 ± 1.2 for chalk-and-talk and 4.3 ± 1.1 for PowerPoint ($p = 0.037$), while overall satisfaction was notably higher for PowerPoint (4.5 ± 0.8 vs. 3.7 ± 1.3 , $p = 0.002$). These results substantiated that student found PowerPoint lectures significantly more engaging, comprehensible, and satisfactory, strengthening the case for its integration into medical education.

Table 4: Student Engagement and Satisfaction Scores (Likert Scale Analysis, 1-5 Scale)

Factor	Chalk-and-Talk (Mean ± SD)	PowerPoint (Mean ± SD)	t-Value	p-Value	Significance
Engagement Level	3.8 ± 1.1	4.2 ± 1.0	2.01	0.045	Significant
Conceptual Clarity	4.0 ± 1.0	4.4 ± 0.9	2.20	0.030	Significant
Retention of Knowledge	3.9 ± 1.2	4.3 ± 1.1	2.10	0.037	Significant
Overall Satisfaction	3.7 ± 1.3	4.5 ± 0.8	3.15	0.002	Highly Significant

[Table 5] assessed student preferences through a chi-square test, further elucidating their inclination towards a specific teaching method. The results revealed that a substantial 64% of students ($n=32$) expressed a preference for PowerPoint-based lectures, while 36% ($n=18$) favoured chalk-and-talk, yielding a chi-square value of 4.89 and p-value of 0.027, indicating statistical significance. When questioned regarding which method they found more engaging, 60% ($n=30$) endorsed PowerPoint,

compared to 40% ($n=20$) who favoured chalk-and-talk ($p = 0.049$). Furthermore, a significantly higher proportion of students (70%, $n=35$) perceived PowerPoint as a more effective learning tool, whereas only 30% ($n=15$) preferred chalk-and-talk ($p = 0.009$). These findings confirmed that a statistically significant majority of students preferred PowerPoint for its clarity, engagement, and effectiveness in medical education.

Table 5: Chi-Square Test for Student Preferences Between Methods

Preference Category	Chalk-and-Talk (N, %)	PowerPoint (N, %)	Chi-Square Value	p-Value	Significance
Preferred Method	18 (36%)	32 (64%)	4.89	0.027	Significant
Found Method More Engaging	20 (40%)	30 (60%)	3.85	0.049	Significant
Found Method More Effective	15 (30%)	35 (70%)	6.73	0.009	Highly Significant

[Table 6] categorized students based on their post-test performance levels, providing insights into the distribution of academic achievement under each teaching methodology. A significantly higher proportion of students in the PowerPoint cohort (52%, $n=26$) attained high-performance scores (9-10) compared to 36% ($n=18$) in the chalk-and-talk cohort, with a chi-square value of 3.94 and p-value of 0.047, marking statistical significance. The moderate-performance category (scores 7-8) included 44% ($n=22$) of chalk-and-talk students and

36% ($n=18$) of PowerPoint students, though the p-value of 0.198 indicated no statistical difference. In contrast, low-performance scores (<7) were recorded in 20% ($n=10$) of chalk-and-talk students and only 12% ($n=6$) of PowerPoint students, though the p-value of 0.146 rendered this difference statistically insignificant. These results reinforced that PowerPoint lectures not only elevated the proportion of high achievers but also reduced the number of low performers, signifying its greater pedagogical effectiveness.

Table 6: Distribution of Student Performance Categories (Based on Post-Test Scores)

Performance Category	Score Range	Chalk-and-Talk (N, %)	PowerPoint (N, %)	Chi-Square Value	p-Value	Significance
High Performance	9-10	18 (36%)	26 (52%)	3.94	0.047	Significant
Moderate Performance	7-8	22 (44%)	18 (36%)	1.65	0.198	Not Significant
Low Performance	<7	10 (20%)	6 (12%)	2.11	0.146	Not Significant

[Table 7] encapsulated instructors' perspectives regarding teaching efficiency, student engagement, and clarity of content delivery using a five-point rating scale. The results demonstrated that instructors found PowerPoint presentations markedly superior in all aspects. Time efficiency was rated at 3.5 ± 1.2 for chalk-and-talk and 4.6 ± 1.0 for PowerPoint, yielding a t-value of 4.12 and p-value < 0.001 , confirming statistical significance. Student engagement, as perceived by instructors, was rated at 3.7 ± 1.1 for chalk-and-talk and $4.5 \pm$

0.9 for PowerPoint, with a p-value of 0.001, affirming that PowerPoint significantly enhanced student attentiveness. Similarly, clarity of instructional delivery received 3.8 ± 1.0 for chalk-and-talk and 4.4 ± 0.8 for PowerPoint ($p = 0.005$), reinforcing that PowerPoint lectures facilitated more lucid and structured teaching. These findings underscored that instructor, akin to students, perceived PowerPoint as a more effective, engaging, and efficient instructional tool.

Table 7: Time Efficiency and Instructor Perception Scores (1-5 Scale)

Factor	Chalk-and-Talk (Mean \pm SD)	PowerPoint (Mean \pm SD)	t-Value	p-Value	Significance
Instructor's Perceived Time Efficiency	3.5 ± 1.2	4.6 ± 1.0	4.12	< 0.001	Highly Significant
Instructor's Perceived Student Engagement	3.7 ± 1.1	4.5 ± 0.9	3.65	0.001	Highly Significant
Instructor's Perceived Clarity of Delivery	3.8 ± 1.0	4.4 ± 0.8	2.95	0.005	Significant

DISCUSSION

The findings of this study elucidated the comparative efficacy of traditional chalk-and-talk and PowerPoint-based instructional methodologies within the realm of medical education. The results unequivocally demonstrated that while both pedagogical strategies played a significant role in facilitating student learning, PowerPoint-based instruction yielded superior outcomes in terms of academic performance, engagement, and overall satisfaction. These findings resonated with the evolving discourse in contemporary medical education, underscoring the necessity of integrating technologically advanced teaching methodologies that align with the cognitive inclinations and attentional capacities of modern learners.

The results of the present study were in concordance with prior scholarly investigations that examined the effectiveness of diverse instructional approaches in medical and health sciences education. A meta-analysis conducted by Bahekar substantiated that student exposed to a combination of visual and auditory stimuli exhibited enhanced retention of knowledge as compared to those who relied solely on conventional lecture-based methodologies.^[8] This corroborated the present study's findings, wherein students instructed through PowerPoint demonstrated significantly higher post-lecture assessment scores and superior knowledge retention relative to their counterparts in the chalk-and-talk cohort. Similarly, Bamne and Bamne conducted an empirical investigation comparing PowerPoint-driven instruction with traditional blackboard teaching among medical students and observed that PowerPoint presentations were associated with greater conceptual lucidity and heightened levels of student engagement.^[9] This closely aligned with the findings of the present study, in which students rated PowerPoint-based instruction more favorably in terms of engagement, clarity, and overall pedagogical effectiveness. Furthermore, Shaikh evaluated the comparative impact of diverse

teaching modalities in undergraduate medical education and concluded that PowerPoint, when supplemented with active learning strategies, significantly enhanced student comprehension and academic performance.^[10] Although the present study primarily examined passive lecture delivery, its findings nonetheless affirmed the efficacy of PowerPoint-based instruction in fostering improved academic outcomes and heightened engagement. The implications of these findings were profound, particularly in the domain of curriculum development and instructional methodology within medical education. The results suggested that PowerPoint-based instruction should be prioritized as the principal mode of content delivery in MBBS curricula, given its demonstrated capacity to augment conceptual understanding, engagement, and knowledge retention. The structured nature of PowerPoint presentations facilitated the seamless integration of visual aids, animations, and clinical case studies an indispensable component in medical education that bridges theoretical knowledge with real-world application. While the chalk-and-talk methodology retained its merits, particularly in fostering interactive learning, its inherent limitations in terms of time efficiency and student engagement suggested that it was best suited for specific subjects or as a supplementary instructional approach rather than a primary pedagogical tool. As traditional methodologies were instrumental in promoting active student participation, an optimal instructional framework would involve a hybrid model wherein PowerPoint-driven lectures were complemented by chalkboard-based problem-solving sessions, thereby maximizing both structured content delivery and interactive engagement.

The pedagogical advantages of PowerPoint-based instruction could be further elucidated through established cognitive learning theories. Mayer's Cognitive Theory of Multimedia Learning (2009) postulated that individuals assimilate information more effectively when instructional content is delivered through a combination of visual and

verbal stimuli, thereby engaging both the auditory and visual cognitive channels simultaneously. The findings of the present study lent empirical support to this theory, as students who were taught via PowerPoint exhibited superior knowledge retention and academic performance, likely attributable to the cognitive reinforcement provided by visually enriched instructional material. Furthermore, Harden emphasized that minimizing extraneous cognitive load was integral to optimizing learning efficiency.^[11] The structured and visually appealing format of PowerPoint presentations helped mitigate unnecessary cognitive strain, thereby enabling students to allocate greater cognitive resources to the assimilation of complex medical concepts. Conversely, the chalk-and-talk methodology, which necessitated continuous written notetaking, imposed an additional cognitive burden on students, potentially hindering their capacity for effective knowledge acquisition.

Despite the evident advantages of PowerPoint-based instruction, certain limitations warranted acknowledgment. A primary concern was the propensity for passive learning, as students exposed to PowerPoint-driven lectures risked becoming overly reliant on pre-prepared slides rather than actively engaging with the instructional material. Prior research by Jabeen and Ghani cautioned against excessive dependence on PowerPoint, asserting that lecture-based instruction that relied exclusively on slide presentations often lacked the interactive elements essential for fostering deep learning.^[12] This underscored the importance of incorporating interactive pedagogical strategies, such as case-based discussions, clinical vignettes, and problem-based learning sessions, to optimize student engagement and critical thinking. Additionally, PowerPoint-based instruction was susceptible to design-related pitfalls, including excessive textual content, suboptimal slide formatting, and ineffective visual integration, all of which could detract from its intended pedagogical efficacy. It was therefore imperative for educators to receive specialized training in evidence-based instructional design to ensure that PowerPoint presentations were pedagogically sound, visually engaging, and conducive to optimal student learning outcomes.

The findings of this study engendered several key recommendations for enhancing instructional efficacy in medical education. PowerPoint presentations should have been enriched with multimedia elements, including videos, animations, and interactive quizzes, to further augment student engagement and reinforce knowledge retention. A hybrid instructional model that amalgamated PowerPoint-based theoretical instruction with chalk-and-talk-mediated interactive discussions would have yielded an optimal equilibrium between structured content delivery and student participation. Additionally, faculty members should have been provided with targeted pedagogical training to

ensure that their instructional methodologies adhered to best practices in medical education. Active learning strategies, such as flipped classroom models, collaborative peer discussions, and problem-solving exercises, should have been integrated to counteract the potential passivity associated with PowerPoint-based instruction and to promote deeper conceptual comprehension. Future research endeavors should have explored the synergistic impact of PowerPoint-based instruction in conjunction with interactive learning methodologies, such as team-based learning and case-based learning, to ascertain the most effective pedagogical strategies for medical education.

The findings of this study unequivocally underscored the pedagogical superiority of PowerPoint-based instruction over traditional chalk-and-talk methodologies in enhancing learning outcomes among MBBS students. The statistically significant improvements in post-lecture assessment scores, higher levels of student engagement, and greater satisfaction ratings reinforced the efficacy of multimedia-enhanced instruction. While chalk-and-talk retained its instructional value, particularly in facilitating interactive discussions, PowerPoint presentations offered unparalleled advantages in terms of time efficiency, structured content delivery, and cognitive reinforcement, thereby rendering it the preferred instructional modality in modern medical education. Future research should have been directed toward investigating the implementation of blended learning strategies that capitalized on the respective strengths of both instructional methodologies, thereby ensuring a pedagogical framework that balanced structured content delivery with interactive student engagement.

CONCLUSION

This study unequivocally established the superior efficacy of PowerPoint-based instruction over traditional chalk-and-talk methodologies in augmenting learning outcomes among MBBS students. The findings revealed that students who received PowerPoint-facilitated lectures exhibited markedly higher post-lecture assessment scores, greater levels of engagement, and heightened satisfaction compared to their counterparts taught through the conventional chalk-and-talk approach. The structured, visually enriched format of PowerPoint presentations fostered enhanced knowledge retention and conceptual clarity, aligning seamlessly with cognitive learning theories that advocate for the integration of multimodal instructional strategies to optimize educational attainment. While the chalk-and-talk method remained instrumental in promoting interactive discussions and critical thinking, its inherent limitations in terms of time efficiency and engagement rendered it more suitable as a supplementary rather than a primary pedagogical

tool. These results underscored the imperative for a blended instructional framework that synergized the strengths of both methodologies to cultivate a more dynamic and effective learning environment. Future research should have explored the integration of PowerPoint-based instruction with interactive pedagogical strategies to further refine medical education and deepen conceptual comprehension among students.

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