

Transforming Paramedical Education: A Comparative Study of Traditional and Digital Learning Methods

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ABSTRACT

Abstract

This study compares the effectiveness of Chalk-and-Board (CB) teaching and PowerPoint Presentations (PPT) in paramedical education. Seventy-eight students were divided into two groups, each taught two topics using CB and PPT methods. Pre- and post-test assessments revealed significant learning improvements in both groups ($p < 0.05$). The CB group showed greater improvement (Pre-Test: 48.60 ± 2.22 ; Post-Test: 58.60 ± 2.22) compared to the PPT group (Pre-Test: 47.80 ± 1.93 ; Post-Test: 54.70 ± 2.06). CB was preferred for interactive, step-by-step learning, while PPT excelled in visually complex topics. A blended teaching approach is recommended for optimal learning outcomes.

Keywords: Whiteboard teaching, PowerPoint presentations, paramedical education, teaching methods, blended approach.

INTRODUCTION

Learning and teaching are ongoing, dynamic activities. Teaching is the skill of helping learners develop their learning character. Lectures were delivered using the White board prior to the invention of technology. However, the PowerPoint approach has recently become more popular than the conventional White board teaching style in the current computer era. [1,9]

The education system has undergone a significant transformation over the last few decades, particularly in teaching methodologies. Traditional blackboard teaching, often referred to as the “chalk-and-talk” method, has gradually been supplemented or even replaced by modern technologies such as PowerPoint presentations (PPT). [2] In paramedical education, where complex concepts, diagrams, and processes are taught, choosing the right teaching method is crucial to ensure effective learning outcomes. Throughout undergraduate education, one-hour lectures are frequently used to teach students. [3]

White board teaching has long been the cornerstone of education. It involves instructors using chalk and a board to explain concepts step by step. White board teaching allows instructors to explain topics in a sequential and organized manner. Writing on the board encourages active participation, as students often follow along by taking notes. White board teaching requires minimal resources, making it accessible in resource-limited settings.[4]

Our study aimed to explore paramedical students' perspectives on White board and Microsoft PPT teaching methods in education. In order to accomplish this, we created a questionnaire to find out how the students felt about our institution's

usage of two teaching modalities. In order to track learning differences, we also administered tests to students using two distinct audio-visual aids (PPT or CB) before and after the lectures.

White Board vs. PPT Teaching: Strengths and Challenges [5,6,7,8]

Aspect	White board Teaching	PPT Teaching
STRENGTHS		
Active Engagement	Encourages real-time interaction and note-taking, fostering better focus.	Allows integration of quizzes, polls, and multimedia for interactive sessions.
Step-by-Step Learning	Ideal for explaining calculations, diagrams, and pathways with sequential clarity.	Visual elements like videos, animations, and graphs enhance understanding of complex topics.
Flexibility	Allows instructors to adapt the pace and revisit topics during lectures.	Pre-designed slides provide structure, ensuring consistent content delivery across classes.
Accessibility	Requires minimal technology; ideal for resource-limited settings.	Slides can be shared for revision, benefiting students who missed class or need extra preparation.
Memory Retention	Concepts developed in real-time aid long-term retention.	Efficiently covers large amounts of content in a structured format.
CHALLENGES		
Time Consumption	Writing and drawing on the board takes time, limiting content coverage.	Overloaded slides can cause cognitive fatigue and overwhelm students.
Visual Limitations	Cannot display high-resolution images or animations, critical for topics like radiology.	Highly dependent on technology; issues like equipment failure can disrupt lectures.
Physical Strain	Teachers may experience fatigue due to prolonged standing and writing.	Fast-paced slide progression makes it difficult for students to take notes and follow along.
Classroom Suitability	Struggles with visibility and engagement in large classrooms.	Perceived as less interactive, with students passively absorbing content rather than engaging actively.
Adaptability	Requires teachers to create content in real-time, which can lead to skipped points or uneven delivery.	Lacks flexibility for real-time adjustments to meet student needs mid-lecture.

MATERIAL & METHODS

Study Design

The study employed a quasi-experimental, pre-test and post-test comparative design to evaluate the efficacy of traditional chalk-and-board (CB) teaching versus Power point presentation-based (PPT) instruction. Both qualitative and quantitative approaches were used to assess learning outcomes and student perceptions.

Participants

The participants included 78 paramedical students enrolled in specific course/program, e.g., B.Sc. MLT, B.Sc. OTT, M.Sc. MLT at School of Allied Health Sciences, Datta Meghe Medical College. Students were included based on the following criteria:

- Enrolment in specific course name and year, e.g., B.Sc. MLT 1st Semester Students.
- Willingness to participate, confirmed through signed informed consent.
- Regular attendance ($\geq 75\%$ of the total sessions).

Exclusion criteria were:

- Students with prior knowledge of the selected topics (verified through the pre-test).
- Students whose attendance was not meeting the inclusion criteria

Participants were divided into two groups: the CB group and the PPT group, using simple randomization.

Intervention

The study focused on two core topics from the curriculum:

1. **Topic A:** [Serological test for Diagnosis of HIV & Syphilis]
2. **Topic B:** [Culture methods]

Each topic was taught to both groups using their respective teaching methods:

- **Chalk-and-Board (CB) Method:** The instructor delivered content by writing and illustrating key concepts, diagrams, and explanations on a chalkboard. The sessions emphasized direct interaction, stepwise explanations, and student engagement through questions.
- **Power Point Presentation (PPT) Method:** The instructor used pre-designed PowerPoint slides that included multimedia elements such as animations, images, and videos to enhance understanding. A laser pointer was used to emphasize key points during the session.

Both groups were taught by the same instructor to control for variability in teaching style and depth of content delivery. Each session was conducted for 60 minutes, with an equal allocation of time for both methods. To minimize biases, the order of the topics was randomized, and classroom environments were standardized for seating arrangements, lighting, and audiovisual equipment.

Instruments and Materials

1. Pre- and Post-Test Assessments:

A custom-designed test was used to measure cognitive learning outcomes. The test included: MCQs: To evaluate factual knowledge and understanding.

• Student Perception Questionnaire:

A structured questionnaire was developed to assess students' preferences, engagement levels, and perceived effectiveness of each teaching method.

Quantitative data (test scores) were analyzed using paired t-tests to compare pre- and post-test scores within each group.

Qualitative data (open-ended responses) were analyzed using thematic content analysis to identify common themes and insights related to teaching preferences and engagement.

Statistical analysis was performed using SPSS Version. A p-value of <0.05 was considered statistically significant.

Limitations and Controls

To minimize confounding variables:

- The same instructor delivered content to both groups.
- The classroom settings (temperature, lighting, seating arrangements) were kept consistent.
- Pre-validated assessment tools were used for data collection.

RESULTS

Table: White board vs. PowerPoint Teaching for Paramedical Students

Aspect	White board Teaching	PowerPoint Presentations (PPT)
Student Engagement	72% of students found it more engaging due to interaction and step-by-step explanations.	28% of students favored its multimedia appeal and structured delivery.
Learning Outcomes (Test Scores)	15% improvement in post-test scores, especially for sequential and diagram-heavy topics.	12% improvement in post-test scores, better for visual-heavy and theoretical topics.
Strengths	- Promotes active learning and note-taking.	- Visual appeal with animations, images, and videos.
	- Encourages flexibility and adaptability based on student understanding.	- Covers large amounts of content efficiently.
	- Effective for step-by-step demonstrations (e.g., pathways, calculations).	- Structured format aids quick delivery and organization.
Challenges	- Time-consuming, limiting the amount of content covered.	- Can feel less interactive or passive.
	- Lacks visual appeal for high-resolution diagrams or videos.	- Overloaded slides can cause cognitive fatigue.
	- Visibility issues in large classrooms.	- Dependent on technology, with potential for disruptions.
Preferred Topics	- Ideal for calculations, anatomical diagrams, and problem-solving.	- Best for visual-heavy and multimedia-driven topics like radiology/pathology.
Overall Student Feedback	Valued for clarity and interactivity but noted inefficiency for large syllabi.	Appreciated for its multimedia approach but criticized for fast-paced delivery.

Recommendation	Best for interactive and foundational topics.	Best for theory-oriented and visually complex topics.
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Comparison of Pre-Test and Post-Test Results

The study evaluated the effectiveness of Chalk-and-Board (CB) and PowerPoint Presentation (PPT) teaching methods by analysing the improvement in pre-test and post-test scores among paramedical students. A paired t-test was applied to assess the significance of learning outcomes.

Group	Pre-Test Mean \pm SD	Post-Test Mean \pm SD	p-value (Paired t-test)
CB (Chalk-and-Board)	48.60 \pm 2.22	58.60 \pm 2.22	0.0000
PPT (PowerPoint)	47.80 \pm 1.93	54.70 \pm 2.06	0.0000

Key Findings

- Significant Improvement in Test Scores:**
 - Both CB and PPT groups showed statistically significant improvements ($p < 0.05$) in post-test scores, highlighting the effectiveness of both teaching methods in enhancing student learning.
- Greater Learning Gains in CB Group:**
 - The CB group demonstrated a larger improvement in test scores (mean difference of 10.00) compared to the PPT group (mean difference of 6.90). This indicates that White board teaching may be more beneficial for interactive, step-by-step topics requiring deep conceptual understanding.
- Strengths of Each Method:**
 - CB was particularly effective for subjects involving problem-solving and diagram-based learning, fostering better student engagement.
 - PPT was highly effective for topics requiring multimedia support, such as high-resolution images, videos, and structured theoretical explanations.

Interpretation

The independent t-test shows a statistically significant difference ($p < 0.05$) between the post-test scores of the CB and PPT groups. The CB group outperformed the PPT group, indicating that Chalk-and-Board teaching was more effective for enhancing post-test performance in this study.

Recommendation

A blended teaching approach combining White board and PowerPoint methods is recommended for paramedical education. For instance:

- Begin with White board teaching to build foundational concepts interactively.
- Supplement with PowerPoint slides for visual reinforcement and detailed illustrations.

This approach can cater to diverse learning preferences, maximize engagement, and improve overall learning outcomes.

CONCLUSION

The findings underscore the importance of selecting teaching methods tailored to specific topics in paramedical education. While Chalk-and-Board (CB) teaching proves more effective for interactive and sequential learning, PowerPoint presentations excel in visually complex and theory-heavy subjects. A blended teaching approach combining both methods is recommended to maximize learning outcomes for diverse student needs.

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