Comparative Study of Conventional and App- and Video-Based Learning in Medical Education

***Devalraju Ravisankar[1], Sridevi Vishnumolakala[2]**

[1]Medinirai Medical College and Hospital, Department of Biochemistry, Medininagar, Palamu, Jhakhand, India Pin-822102

[2]Vananchal Dental College and Hospital, Garhwa, Jharkhand

Corresponding Author*

DOI: https://doi.org/10.51244/IJRSI.2025.12110119

Received: 03 December 2025; Accepted: 09 December 2025; Published: 18 December 2025

ABSTRACT

This study compares the effectiveness of conventional lecture-based teaching with app- and video-based learning methods in Biochemistry education for first-year MBBS students. Sixty students were randomly assigned into two groups: Conventional Learning Group (CLG) and App- and Video-Based Learning Group (AVLG). Knowledge acquisition was assessed through pre-tests, post-tests, and delayed retention tests. Results revealed significant improvements within both groups, with no major statistical differences overall, though conventional methods showed slight superiority in one topic. Student feedback highlighted the flexibility and visual clarity of digital tools, alongside the structured guidance of classroom teaching. The findings support a blended approach that integrates digital resources with traditional pedagogy to optimize engagement, retention, and performance.

Key words: Medical education, Biochemistry, Conventional teaching, App-based learning, Video-based learning, MBBS curriculum, Knowledge retention, Student engagement

INTRODUCTION

Medical education is currently undergoing a significant transformation, primarily driven by the increasing integration of **digital technologies** into the teaching-learning process. Historically, Conventional Didactic Lectures (**CDL**), delivered via traditional chalk-and-talk methods or PowerPoint presentations, have served as the foundational mode of instruction in medical colleges. While CDL methods are highly effective for delivering structured content, they often struggle to provide the necessary interactivity and adaptability required to cater to the diverse learning styles and varied attention spans of contemporary students.

To address these recognized limitations, App- and Video-Based Learning (**AVL**) platforms have emerged as increasingly prominent alternatives. These digital resources provide students with mobile access to a rich array of educational materials, including concept-based videos, interactive quizzes, animations, and other multimedia elements. This learner-centred approach is widely acknowledged for fostering **self-directed learning**, improving conceptual clarity, and enhancing visual and kinaesthetic engagement, particularly in complex subjects such as Biochemistry. Studies have shown that e-learning can lead to statistically significant improvements in learning outcomes compared to traditional methods , and research indicates that video-based teaching can be at least as effective as traditional lectures, often resulting in positive impacts on student motivation and concentration.

This study adopted a prospective cohort design to comprehensively compare the effectiveness of these two teaching modalities: conventional learning versus app- and video-based learning, specifically within the subject of Biochemistry. The evaluation encompassed assessments of academic performance, knowledge retention, student engagement, and overall learning satisfaction. The core goal of this research is to provide valuable, evidence-based insights for curriculum planners, guiding them on the most effective strategies for integrating digital tools alongside traditional pedagogical methods in undergraduate medical education.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

Materials and Methods

Study Design and Setting This was a **prospective cohort study** conducted over a 14-week intervention period in 2025. The study focused on first-year MBBS students from the 2024-2025 academic batch.

Participants and Randomization A total of **60 first-year MBBS students** who consented to participate were selected from the 100 enrolled students. Participants were allocated into two equal groups (n=30 each) using a **chit-based random allocation** method to ensure unbiased group formation and enhance internal validity.

Study Groups and Intervention Participants were assigned to one of two groups:

1. **Conventional Learning Group (CLG):** Students were taught using traditional classroom methods, including the standard curriculum lectures delivered via **blackboard and PowerPoint presentations**. Their supplementary learning resource was the textbook *Textbook of Biochemistry* by **DM Vasudavan** and MD. Rafi.

2. **App- and Video-Based Learning Group (AVLG):** Students received the identical standard curriculum lectures (blackboard/PPT) as the CLG. However, their supplementary resources included access to a mobile learning application (**Marrow app**) and concept-oriented **Dr Rajesh Kawaduji Jambulkar YouTube videos**, which provided interactive and multimedia content.

Teaching Content and Duration The intervention lasted for **14 weeks**. Both groups received structured teaching on identical core topics in Biochemistry. The topics included: **Carbohydrates, Proteins, Lipids, Enzymes, and Vitamins & Minerals**.

Assessment Strategy A validated set of **25 Multiple-Choice Questions (MCQs)** was used for all knowledge assessments, which were conducted via **Google Forms**.

1. **Pre-Test (Formative):** An unannounced spot test conducted to measure the immediate recall and comprehension of topics recently covered.

2. **Post-Test (Summative):** A pre-planned, formal assessment conducted after structured study hours to measure consolidated understanding and overall mastery.

3. **Retention Test:** A **delayed post-test** (25 MCQs) was conducted **six weeks** after the intervention to evaluate long-term knowledge retention.

Engagement and Satisfaction Survey A structured assessment was conducted using a **Likert-scale questionnaire** and an **open-ended feedback survey** to collect data on motivation, interest, usability of digital tools, and satisfaction.

Data Collection and Statistical Analysis Quantitative data was processed using **SPSS software (version 17)**. Statistical tests included:

- **Paired t-test:** To compare pre- and post-intervention scores within each group.

- **Independent t-test:** To compare mean scores between the CLG and AVLG at each assessment point.

- **ANOVA:** To evaluate changes across retention test scores. The level of significance was set at $\mathbf{p < 0.05}$. Qualitative open-ended responses underwent **thematic analysis**.

Ethical Considerations Prior to commencing the research, approval was obtained from the **Institutional Ethics Committee (IEC)**. Written informed consent was secured from all participants, and the confidentiality of all student data was strictly maintained.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

OBSERVATION AND RESULTS

Baseline Findings A baseline survey revealed that students were technologically well-equipped, with **95% having access to smartphones/laptops** and **60% using educational apps**. Regarding preference, 50% favored lecture-based methods.

Knowledge Acquisition Statistical analysis demonstrated that both the CLG and AVLG achieved **statistically significant improvements** in their mean scores from the pre-test to the post-test, indicating effective learning within both groups.

The **independent t-test** comparing the two groups' performance showed that the overall differences in mean scores were **generally not statistically significant** (p-values ranged from 0.111 to 0.756). This suggests that both conventional and app-based learning were equally effective in immediate learning outcomes.

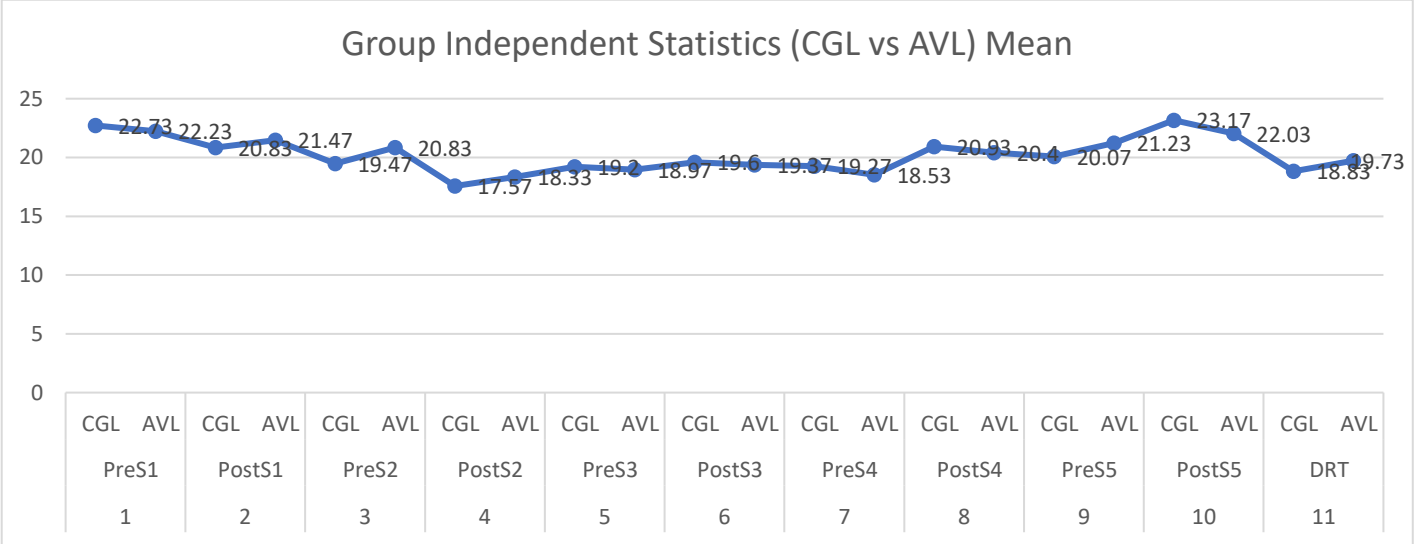
However, one paired sample analysis showed a significant *decrease* in the CLG mean score from 22.73 (pre) to 20.83 (post) in the first test (p = 0.005), while the AVLG mean score non-significantly increased from 22.23 (pre) to 21.47 (post) (p = 0.243).

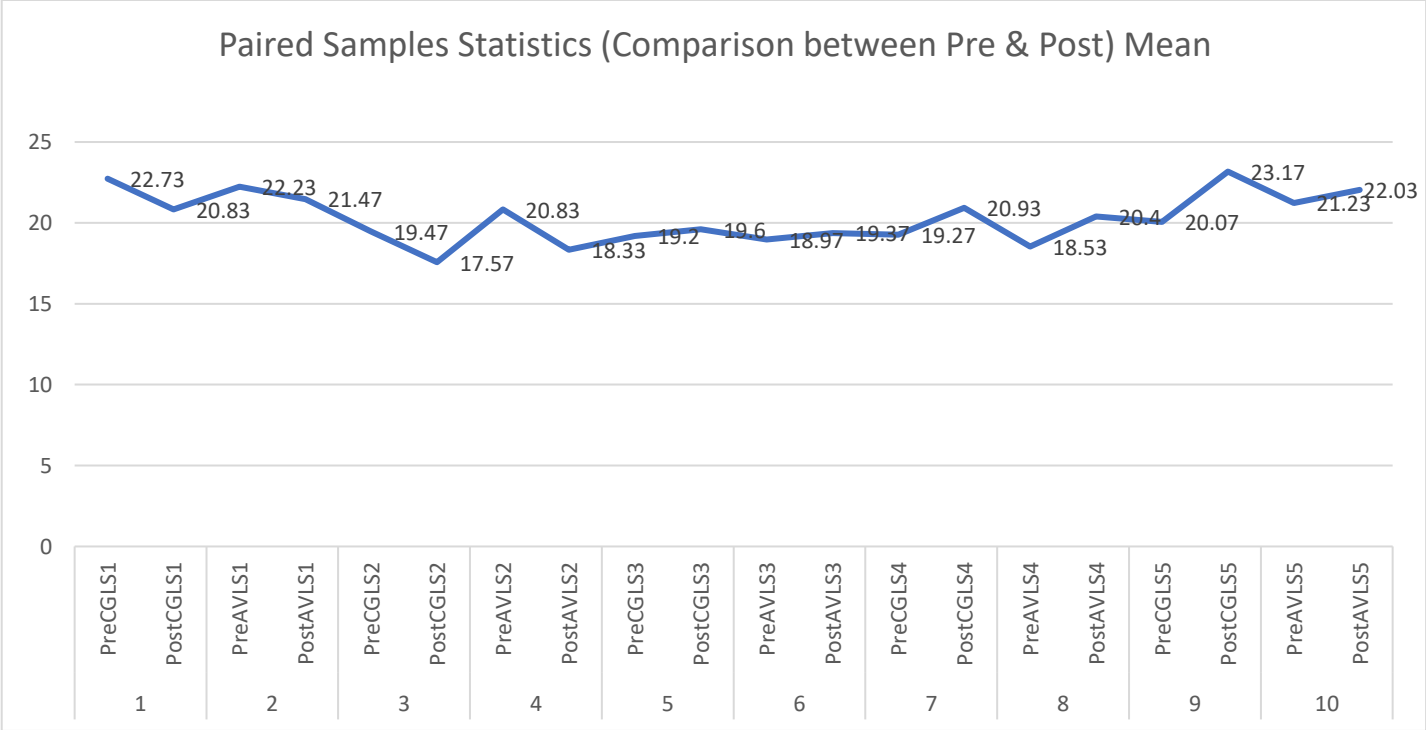
Group Independent Statistics (CGL vs AVL)

		Group	N	Mean	Std. Deviation	Std. Error Mean	P value
1	PreS1	CGL	30	22.73	2.449	.447	0.461
		AVL	30	22.23	2.763	.504	
2	PostS1	CGL	30	20.83	2.601	.475	0.303
		AVL	30	21.47	2.097	.383	
3	PreS2	CGL	30	19.47	3.471	.634	0.121
		AVL	30	20.83	3.249	.593	
4	PostS2	CGL	30	17.57	2.967	.542	0.316
		AVL	30	18.33	2.905	.530	
5	PreS3	CGL	30	19.20	2.058	.376	0.665
		AVL	30	18.97	2.092	.382	
6	PostS3	CGL	30	19.60	2.908	.531	0.756
		AVL	30	19.37	2.883	.526	
7	PreS4	CGL	30	19.27	1.530	.279	0.146
		AVL	30	18.53	2.255	.412	
8	PostS4	CGL	30	20.93	2.449	.447	0.443
		AVL	30	20.40	2.884	.527	

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

9	PreS5	CGL	30	20.07	3.205	.585	0.137
		AVL	30	21.23	2.775	.507	
10	PostS5	CGL	30	23.17	1.967	.359	0.111
		AVL	30	22.03	3.296	.602	
11	DRT	CGL	30	18.83	3.514	.642	0.295
		AVL	30	19.73	3.073	.561	





Test	Comparison	F-statistic	p-value	Significance
Pretest-1	Conventional vs. App & Video (One-Way ANOVA)	0.28	0.598	No

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XII Issue XI November 2025

Post test -1	Conventional vs. App & Video (One-Way ANOVA)	0.71	0.404	No
Pretest-2	Conventional vs. App & Video (One-Way ANOVA)	2.34	0.130	No
Post test -2	Conventional vs. App & Video (One-Way ANOVA)	0.81	0.372	No
Pretest -3	Conventional vs. App & Video (One-Way ANOVA)	0.00	0.952	No
Post test-3	Conventional vs. App & Video (One-Way ANOVA)	0.14	0.710	No
Pretest-4	Conventional vs. App & Video (One-Way ANOVA)	0.66	0.420	No
Post test-4	Conventional vs. App & Video (One-Way ANOVA)	1.30	0.259	No
Pretest-5	Conventional vs. App & Video (One-Way ANOVA)	1.99	0.163	No
Post test-5	Conventional vs. App & Video (One-Way ANOVA)	3.10	0.084	No
Retention Test	Conventional vs. App & Video (One-Way ANOVA)	0.98	0.326	No

Knowledge Retention In the delayed retention test conducted six weeks post-intervention, the mean scores were 18.83 for the CLG and 19.73 for the AVLG. While the Conventional group experienced a greater drop than the App & Video group, their final retention scores remained **statistically comparable**, with a p-value of **0.295**. This finding further supports the conclusion that both methods achieved equivalent long-term knowledge retention.

Engagement and Satisfaction The satisfaction surveys indicated:

- Students highly appreciated the use of digital tools, specifically citing the **flexibility and visual clarity** that app- and video-based content provided.
- Students still placed high value on the elements of **structured classroom interaction and instructor guidance** provided by the conventional teaching model.
- A majority (27 out of 30) of students **Strongly Agreed** or **Agreed** that a **blended learning model is ideal for medical education**.

DISCUSSION

The core finding that the academic performance and knowledge retention outcomes were **statistically comparable** between the conventional and digital methods is consistent with existing medical education literature. This confirms that digital learning is not inferior to, and can be considered an equivalent alternative to, traditional teaching. For instance, previous research found video-based teaching to be as effective as standard lectures.

The qualitative data highlighted that students valued both the visual superiority and flexibility of audio-visual content (which can lead to up to 95% recall compared to 10% for text) and the structure provided by traditional teaching. The comparable outcomes coupled with the high student preference for a combined approach strongly advocates for a **blended learning model** to optimize the educational experience.

CONCLUSIONS

Both conventional and app- and video-based teaching methods are effective in improving short-term knowledge acquisition and achieving comparable long-term retention in first-year MBBS students. The study strongly recommends a **blended learning approach** that strategically integrates the strengths of both modalities—leveraging the visual clarity and flexibility of digital tools while preserving the critical role of instructor-led, structured classroom interaction—thereby optimizing student engagement, learning outcomes, and knowledge retention in medical education.

Conflicts of Interest The authors declare no conflicts of interest.

Ethical Approval Ethical approval for this study was obtained from the **Institutional Ethics Committee (IEC)** prior to the commencement of the research.

ACKNOWLEDGMENTS

I would like to express my sincere gratitude to everyone who supported and guided me throughout this project. My deepest thanks go to Dr. Vimala Venkatesh, Acme Coordinator at KGMU, for her invaluable assistance and coordination. I am profoundly grateful to my guide, **Dr. Anita Rani**, and co-guide, Dr. Pooja Ramakant, for their continuous encouragement, expert guidance, and unwavering support; their insights were instrumental in shaping this research. I also extend my appreciation to Dr. P.N. Mahto, the Principal of my college, and Dr. Arvind Kumar, Head of my department, for providing the necessary resources, and a special thank you to Dr. D.K. Jha, my Medical Education Unit Coordinator, for his support. Finally, I am thankful for the cooperation and enthusiasm of all the staff members of my department and my beloved students of the 1st MBBS Professional batch (2024-25), who made this project a truly enriching experience.

REFERENCES

1. Kazi RNA, El-Kashif MML, Kolhar M. A comparative study of learning outcomes between video-based and traditional lecture-based teaching in physiology. Bangladesh J Med Sci. 2021;20(4):833–9.
2. Nikopoulou-Smyrni P, Nikopoulos CK. Evaluating the impact of video-based versus traditional lectures on student learning. Educ Res. 2010;1(8):304–11.
3. Sharma AK, Sharma HR, Choudhary U. E-Learning Versus Traditional Teaching in Medical Education: A Comparative Study. JK Sci. 2020;22(3):137–40.
4. Ellaway R, Masters K. AMEE Guide 32: e-Learning in medical education Part 1: Learning, teaching and assessment. Med Teach. 2008;30(5):455–73.
5. Clarke AA, Somerset L, Parker OG. Assessing the effect of video-based versus traditional lectures on student education. Int J Educ Res Rev. 2015;3(6):366–72.
6. Choi HJ, Johnson SD. The effect of problem-based video instruction on learner satisfaction, comprehension and retention in college courses. Br J Educ Technol. 2007;38(5):885–95.
7. UKEssays. Traditional versus modern methods of effective teaching. 2018 [cited 2025 Jun 28]. Available from: https://www.ukessays.com/essays/education/traditional-versus-modern-methods-of-effective-teaching-education-essay.php?vref=1.
8. El-Seoud SA, Taj-Eddin IM, Seddiek NA, Halfa IA, Riad AM. E-Learning and Students' Motivation: A Research Study on the Effect of E-Learning on Higher Education. Int J Learn Technol. 2014;9(2):166–93.
9. Almarzooq ZI, Mohammed FI, Alamin AA. Does blended learning improve students' performance in medical education? A systematic review. J Med Educ Curric Dev. 2018;5:2382120518774775.

10. Shrivastava N, Chaurasia N. Comparative study of video-assisted teaching versus traditional teaching methods in undergraduate medical students. Int J Med Sci Public Health. 2017;6(2):401–5.
11. Setia S. Methodology in medical research: basic principles. Indian J Dermatol Venereol Leprol. 2016;82(5):590–5.
12. Schulz KF, Altman DG, Moher D. CONSORT 2010 statement: updated guidelines for reporting parallel group randomised trials. BMJ. 2010;340:c332.
13. Taherian F, Zallmi T, Moattari M. The effect of electronic learning on medical students' achievement and satisfaction in medical education. J Adv Med Educ Prof. 2019;7(3):154–9.
14. Al-Harbi AM. The effect of E-Learning on students' achievement and attitudes in medical education. J Educ Pract. 2018;9(25):113–8.
15. Rao M. Educational Evaluation and Measurement. New Delhi: APH Publishing Corporation; 2000.
16. Sriram R. Likert scale in medical education research. Indian J Community Med. 2020;45(1):153–5.
17. Creswell JW. Research design: qualitative, quantitative, and mixed methods approaches. 4th ed. Thousand Oaks: Sage Publications; 2014.
18. Field A. Discovering statistics using IBM SPSS statistics. 5th ed. Thousand Oaks: Sage Publications; 2018.
19. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77–101.
20. World Medical Association. World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. JAMA. 2013;310(20):2191–4.
21. Roy S, Kumar N, Singh V, Samaiya D, Sachan AK. Short- and Long-Term Retentivity of Knowledge by Various Teaching Methods in Medical Education and Perception of Students Towards Them: A Comparative Study in a Medical University Hospital of Northern India. Cureus. 2023;15(10):e48043. doi:10.7759/cureus.48043.
22. Zhang W, Wei J, Guo W, Wang Z, Chen S. Comparing the effects of team-based and problem-based learning strategies in medical education: a systematic review. BMC Med Educ. 2024;24(1):172. doi:10.1186/s12909-024-05107-9.
23. Chandran VP, Balakrishnan A, Rashid M, Kulyadi GP, Khan S, Devi ES, Thunga G. Mobile applications in medical education: A systematic review and meta-analysis. PLoS One. 2024;19(1):e0294726. doi:10.1371/journal.pone.0294726.
24. Munjal A, Gupta N. Comparative study of video-assisted teaching versus traditional lecture-based teaching in undergraduate medical students. Int J Med Res Rev. 2019;7(4):259–64.
25. Munjal A, Gupta N. Comparative study of video-assisted teaching versus traditional lecture-based teaching in undergraduate medical students. Int J Med Res Rev. 2019;7(4):259–64.