

Traditional and Digital visualizer assisted (DVAT) Teaching Anatomy for BSC NURSING Phase-I Students: A Comparative Study

© Copyright 2026 corresponding author. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

AUTHORS:

Dr. Yogesh Yadav¹, Dr. Charu Gupta², Dr. Rahul Srivastava³

Corresponding author: Dr. Yogesh Yadav Email ID yogeshyadav@msn.com

AFFILIATIONS:

1. Professor & head Anatomy Department Radha Govind Institute of Medical Sciences Meerut U.P
2. Assistant Professor Anatomy Department Radha Govind Institute of Medical Sciences Meerut U.P
3. Assistant Professor Anatomy Department Radha Govind Institute of Medical Sciences Meerut U.P

Received: 01 Jul 2026

Received in revised form: 29 Jul 2026

Accepted: 07 Aug 2026

ABSTRACT

Background: With rising medical college enrolments and faculty shortages in India, innovative teaching methods are required in anatomy education. This study compared the effectiveness of Digital visualizer assisted teaching (DVAT) with traditional faculty-led demonstrations for teaching cervical and lumbar vertebrae to first-year BSc Nursing students. **Methods:** A randomised crossover comparative study was conducted in the Department of Anatomy at Radha Govind Institute of Medical Sciences (RGIMS), Meerut, from September to December 2024. A total of 250 first-year BSc Nursing students were randomly allocated into two groups (n=125 each). Group A received traditional teaching for cervical vertebrae followed by Digital visualizer assisted teaching (DVAT) for lumbar vertebrae, while Group B received the reverse sequence. Traditional sessions were faculty-led, whereas PLL sessions were conducted by trained peer leaders in small groups emphasizing active learning. Both methods covered identical content and were delivered in 2-hour sessions. Academic performance was assessed using a validated 10-mark MCQ test, and student perceptions were evaluated using a 5-point Likert scale questionnaire. Data were analysed using SPSS version 26, expressed as mean $\pm$ SD, and compared using paired t-test. A p-value <0.05 was considered statistically significant. Ethical approval was obtained, and informed consent was taken from all participants. **Results:** Digital visualizer assisted teaching (DVAT) groups demonstrated significantly higher mean multiple-choice question (MCQ) scores than traditional groups for both topics: cervical vertebrae (7.19 ± 1.76 vs. 5.16 ± 1.73 , $p < 0.001$) and lumbar vertebrae (5.57 ± 1.81 vs. 3.66 ± 1.66 , $p < 0.001$). Over 70% of students (SA + A) rated PLL favourably for clarity of objectives, understanding, retention, participation, interaction and comfort in asking questions. More than 80% reported superior active learning and retention compared with traditional lectures and supported wider incorporation of PLL in the BSC NURSING curriculum. All peer leaders reported increased confidence and satisfaction. **Conclusion:** Peer-led learning is a highly effective, acceptable and scalable alternative (or complement) to traditional faculty-led teaching in anatomy. It improves knowledge acquisition, engagement and soft skills while addressing faculty shortages in resource-constrained Indian medical colleges. Hybrid models combining PLL with structured traditional input merit further exploration.

Keywords: Peer-led learning, anatomy teaching, traditional teaching, active learning,

INTRODUCTION

Anatomy remains the foundation of medical education, requiring mastery of complex three-dimensional structures and clinical correlations. Traditional faculty-led lectures and demonstrations, while effective for content coverage, often result in passive learning and limited student engagement.⁽¹⁾ Rapid expansion of medical colleges in India has intensified faculty shortages, further restricting interactive teaching opportunities.

Peer-led learning (PLL), where trained senior or high-performing students facilitate small-group sessions, has emerged as a promising student-centred approach.(2) It promotes active participation, deeper understanding and the development of communication and teamwork skills.(3) International studies have shown improved academic performance and engagement with PLL (4,5,6,7,8), yet direct comparisons with traditional methods in Indian anatomy curricula—particularly for cadaveric topics—are limited. This study addresses that gap by comparing PLL and traditional demonstrations in teaching cervical and lumbar vertebrae to Phase-I BSC NURSING students.

AIM & OBJECTIVES

* Aim: To compare the effectiveness of traditional faculty-led and peer-led learning methods in teaching anatomy and evaluate their impact on knowledge retention, engagement and learning outcomes.

* Objectives:

- * To evaluate knowledge retention using immediate post-session assessments.
- * To assess student engagement and participation in both approaches.
- * To compare effectiveness in improving understanding of anatomical concepts.
- * To analyse student perceptions and satisfaction with each method.

MATERIAL & METHODS

The Study was designed as a randomized crossover comparative study and was conducted in the Department of Anatomy at Radha Govind Institute of Medical Sciences (RGIMS), Meerut, Uttar Pradesh, India, over a period of four months from September to December 2025. A total of 50 first-year BSc Nursing students (Batch 2025–26) were included in the study after obtaining written informed consent. Students who were absent during any teaching session or did not consent to participate were excluded from the study.

The participants were randomly allocated into two equal groups (Group A and Group B, n=25 each) using a computer-generated randomization method. A crossover design was employed to minimize inter-individual variability. Group A received traditional faculty-led teaching for the topic of cervical vertebrae followed by Digital visualizer assisted teaching (DVAT) for lumbar vertebrae, whereas Group B received PLL for cervical vertebrae followed by traditional teaching for lumbar vertebrae.

Traditional teaching sessions were conducted by faculty members (residents under supervision) and included structured demonstrations using lectures, cadaveric specimens, and standard teaching aids. Peer-led learning sessions were facilitated by 12 trained peer leaders selected from senior BSC NURSING students based on academic performance and communication skills. These peer leaders underwent structured training sessions that included faculty demonstrations, instructional videos, teaching modules, and supervised practice sessions prior to the study. The PLL sessions were conducted in small groups and emphasized active learning through discussion, cadaveric interaction, and collaborative problem-solving.

Both teaching methods covered identical content related to cervical and lumbar vertebrae, including anatomical structures, relations, functions, and clinical correlations. Each session was conducted for a duration of two hours to maintain uniformity in teaching exposure.

Academic performance was assessed using a validated 10-mark multiple-choice questionnaire (MCQ) administered immediately after each teaching session. The MCQs were designed to test knowledge of anatomical concepts, clinical applications, and spatial understanding, ensuring similar difficulty levels across both topics. Student perceptions were evaluated using a pre-validated five-point Likert scale questionnaire (ranging from strongly agree to strongly disagree), which assessed various domains such as clarity of concepts, retention, participation, interaction, and comfort in asking questions. Feedback from peer leaders regarding confidence, communication skills, and teaching experience was also collected using a structured questionnaire.

All data were entered into Microsoft Excel and analysed using Statistical Package for the Social Sciences (SPSS) version 26. Quantitative data were expressed as mean and standard deviation (mean $\pm$ SD). Since a crossover design was used, comparisons between peer-led learning and traditional teaching methods were performed using the paired t-test. A p-value of less than 0.05 was considered statistically significant.

Ethical approval for the study was obtained from the Institutional Ethics Committee of RGIMS, Meerut. All participants provided informed consent, and confidentiality and anonymity of the data were strictly maintained throughout the study.

Flow Chart of Study Design:

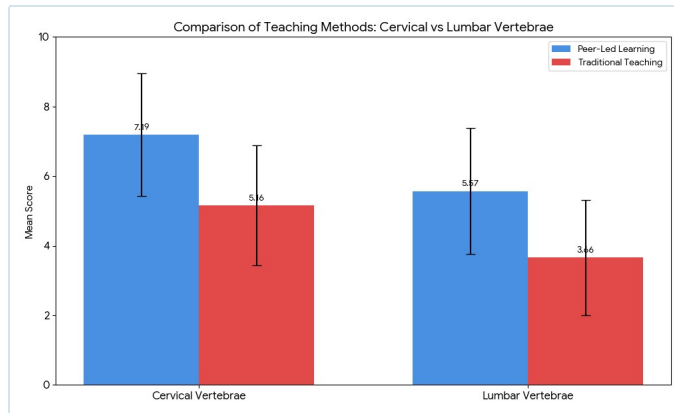
250 BSC NURSING Phase-I students were randomly allocated into Group A and Group B. They completed a cervical module (traditional or PLL) followed by a post-test MCQ. They then completed a lumbar module (PLL or traditional) followed by another post-test MCQ. Data analysis and feedback were conducted.

RESULTS

Academic Performance:

TABLE 1: Comparison of Academic Performance Between Teaching Methods

Topic	Digital visualizer assisted (DVAT) (Mean $\pm$ SD)	Traditional Teaching (Mean $\pm$ SD)	Mean Difference	t-value	p-value	Significance
Cervical Vertebrae	7.19 $\pm$ 1.76	5.16 $\pm$ 1.73	+2.03	High	<0.001	Highly Significant
Lumbar Vertebrae	5.57 $\pm$ 1.81	3.66 $\pm$ 1.66	+1.91	High	<0.001	Highly Significant



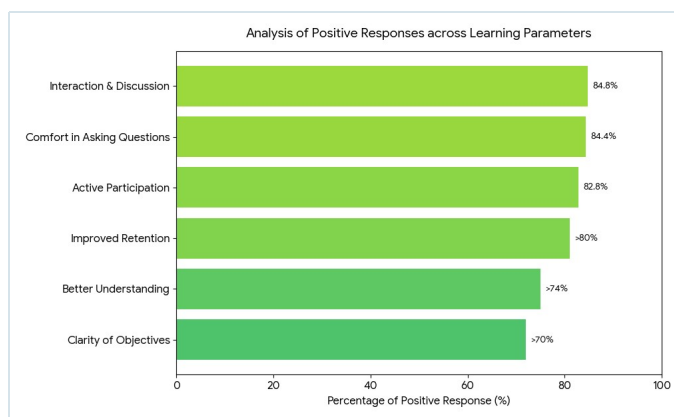
Bar graph 1 Comparison of Academic Performance Between Teaching Methods

Interpretation

Digital visualizer assisted teaching (DVAT) demonstrated significantly higher mean MCQ scores compared to traditional teaching for both cervical and lumbar vertebrae. The mean improvement of ~2 marks in both topics indicates a clinically and academically meaningful gain in knowledge acquisition. The p-value <0.001 confirms that this difference is highly statistically significant, suggesting that PLL is superior in enhancing immediate learning outcomes.

TABLE 2: Student Perception Towards Digital visualizer assisted (DVAT) (n = 50)

Parameter	Positive Response (SA + A)	Percentage (%)
Clarity of Objectives	36+	>70%
Better Understanding	37+	>74%
Improved Retention	40+	>80%
Active Participation	41	82.8%
Interaction & Discussion	42	84.8%



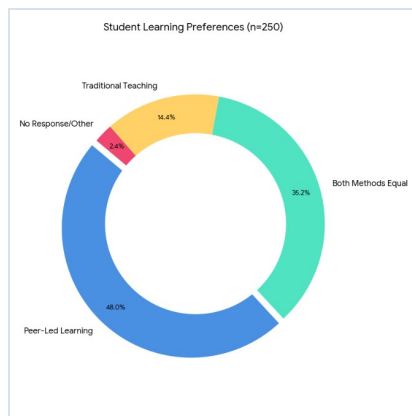
Bar graph 2 Student Perception Towards Digital visualizer assisted (DVAT)

Interpretation

A large majority of students (>70–85%) expressed positive perceptions towards PLL across multiple domains. The highest responses were seen in interaction, participation, and comfort, indicating that PLL fosters a student-friendly, non-threatening learning environment. These findings strongly support the role of PLL in improving affective and communication domains of learning.

TABLE 3: Preferred Learning Method Among Students

Learning Preference	Number (n)	Percentage (%)
Digital visualizer assisted (DVAT)	24	48%
Both Methods Equal	18	36%
Traditional Teaching	7	14%
No Response/Other	1	2%



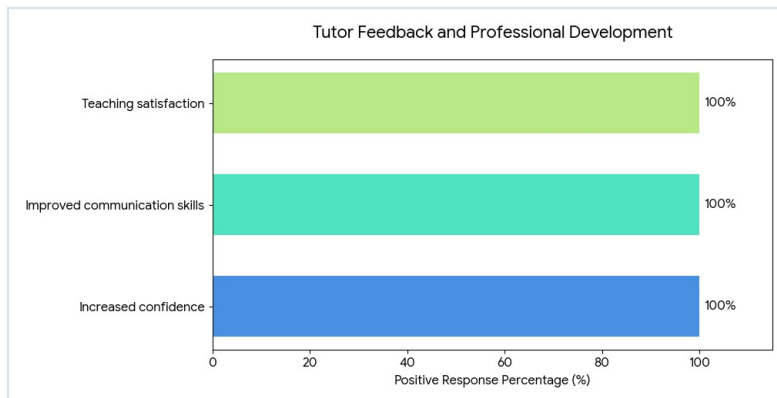
Pie chart 1 Preferred Learning Method Among Students

Interpretation

Nearly half of the students (48%) preferred PLL, while 35.2% favoured a hybrid approach, indicating that combining both methods may yield optimal outcomes. Only a small proportion (14.4%) preferred traditional teaching alone, highlighting a shift towards active learning strategies in modern medical education.

TABLE 4: Peer-Leader Feedback

Parameter	Response
Confidence Improvement	100%
Communication Skills	100%
Teaching Satisfaction	100%



Bar graph 3 Peer-Leader Feedback

Interpretation

All peer leaders reported enhanced confidence and teaching satisfaction, suggesting that PLL not only benefits learners but also contributes to faculty development and leadership skills among students.

DISCUSSION

This study demonstrates that peer-led learning significantly outperforms traditional faculty-led demonstrations in both cognitive and affective domains. The statistically significant improvement in immediate knowledge acquisition (higher multiple-choice scores) aligns with earlier international findings and is attributable to active engagement, verbalisation of concepts and collaborative problem-solving inherent in PLL.

The crossover design minimised inter-individual variability and strengthened causal inference. In the Indian context of large class sizes and faculty shortages, PLL proved scalable and resource-efficient. Student feedback highlighted a less intimidating environment, higher participation and improved comfort—factors known to enhance learning. Peer leaders also benefited through gains in teaching and leadership skills, supporting the “near-peer” teaching model.(9)

Limitations include the single-institution setting, a focus on immediate rather than long-term retention and potential carry-over effects from the crossover design. Variability in peer-leader expertise may have influenced outcomes.

CONCLUSION

Digital visualizer assisted (DVAT) is a highly effective and well-accepted teaching modality for anatomy among Indian BS Nursing undergraduates. It improves academic performance student engagement and satisfaction while addressing faculty constraints. Integration of peer-led learning—ideally in hybrid formats with traditional methods—into the BSc Nursing anatomy curriculum is strongly recommended.

REFERENCES

1. Drake RL, McBride JM, Lachman N, Pawlina W. Medical education in the anatomical sciences: the winds of change continue to blow. *Anat Sci Educ*. 2009;2(6):253-259.
2. Topping KJ. The effectiveness of peer tutoring in further and higher education: A typology and review of the literature. *Higher Education*. 1996;32(3):321-345.
3. Lockspeiser TM, O'Sullivan P, Teherani A, Muller J. Understanding the experience of being taught by peers: the value of social and cognitive congruence. *Adv Health Sci Educ Theory Pract*. 2008;13(3):361-372.
4. Yu TC, Wilson NC, Singh PP, Lemanu DP, Hawken SJ, Hill AG. Medical students-as-teachers: a systematic review of peer-assisted teaching during medical school. *Adv Med Educ Pract*. 2011;2:157-172.
5. Secomb J. A systematic review of peer teaching and learning in clinical education. *J Clin Nurs*. 2008;17(6):703-716.
6. Burgess A, McGregor D, Mellis C. Medical students as peer tutors: a systematic review. *BMC Med Educ*. 2014;14:115.
7. Ten Cate O, Durning S. Peer teaching in medical education: twelve reasons to move from theory to practice. *Med Teach*. 2007;29(6):591-599.
8. Tai JH, Molloy EK, Haines TP, Canny BJ. Same-level peer-assisted learning in medical clinical placements: a narrative systematic review. *Med Educ*. 2016;50(4):469-484.
9. Furmedge DS, Iwata K, Gill D. Peer-assisted learning—beyond teaching: how can medical students contribute to the undergraduate curriculum? *Med Teach*. 2014;36(9):812-817.