DOI: 10.7860/IJARS/2026/88381.3106

Original Article

Anatomy Section

Perceptions of Gen Z Medical Students on Interactive Teaching Methods in Gross Anatomy: A Cross-sectional Study

SAMINATHAN SUGANYA[1], GOVINDARAJAN AMUDHA[2], MERLIN VERONIKA[3]

ABSTRACT

Introduction: Anatomy remains a cornerstone of medical education, yet its vast volume often leads to poor long-term retention. As the current curriculum moves toward student-centric models, understanding how Gen Z (Generation Z roughly born between 1997-2012) learners perceive various interactive teaching methods beyond traditional didactic lectures is essential for curricular optimisation.

Aim: To compare the perceived efficacy of Interactive Lectures (IL), Self-Directed Learning (SDL), and Peer Discussion (PD) in fostering understanding of concepts and retention of gross Anatomy among medical undergraduates.

Materials and Methods: The present cross-sectional survey was conducted at PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India, from January to May 2025. Data from 309 students were collected via a 5-point Likert scale instrument. The data were analysed using Kruskal-Wallis H tests for inter-method comparison followed by Dunn-Bonferroni post-hoc test analysis (Statistical Package for Social Sciences (SPSS) v.20).

Results: Data were collected from 309 students (Phase I: n=196; Phase II: n=113) comprising 151 males (48.9%) and 158 females (51.1%), with a mean age of 18.9±0.9 years. PD emerged as the superior method for both long-term retention (4.72±0.45) and exam-day recollection (4.68±0.47). In contrast, SDL was rated significantly lower, particularly regarding topic retention (2.72±1.08; p<0.001).

Conclusion: Peer-led environments and IL outperformed unstructured SDL. The marked dissatisfaction with SDL suggests that, without formal training or structured faculty-led facilitation, independent learning may be counterproductive in a high-volume subject like anatomy.

Keywords: Academic performance, Curriculum, Generation Z, Medical school, Questionnaire

INTRODUCTION

Anatomy learning has always been an enigma for every medical student. It is imperative to provide detailed knowledge of the human body and the basic concepts required for diagnostic approaches, clinical practice, and treatment planning [1]. The longevity of basic science knowledge acquired in medical school has long been a concern [2]. Anatomy is one of the most important and challenging subjects for both teachers and students [3]. Traditional one-way teaching methods often fail to sustain student interest, necessitating a change toward interactive and collaborative teaching methods suited to Gen Z learners [4]. Constantly changing learning styles and attitudes of the current generation demand an adaptive academic curriculum with novel teaching methods. But do we really know what these students want?

Recent studies suggest that Gen Z medical students possess a unique cognitive profile characterised by a preference for visual, collaborative, and immediately applicable knowledge [5]. In the context of Anatomy, traditional didactic models are increasingly viewed as insufficient for maintaining engagement [6]. The present study was aimed to compare the perceived efficacy of IL, SDL, and PD in fostering conceptual understanding and retention of gross anatomy among medical undergraduates.

MATERIALS AND METHODS

The current cross-sectional study was conducted in the Department of Anatomy at PSG Institute of Medical Sciences and Research, Tamil Nadu, India, from January to May 2025. The study was conducted after approval from the Institutional Human Ethics Committee (24/055 Dated 7th March 2024).

The study population consisted of 309 MBBS students obtained by universal sampling (Phase I: n=196; Phase II: n=113); {151 males (48.9%) and 158 females (51.1%)}.

Inclusion criteria: All medical undergraduates enrolled in Phase I and Phase II at PSGIMSR who provided informed electronic consent.

Exclusion criteria: Students on leave, those who declined, or those with incomplete survey responses.

Study Procedure

The 424 students were present and eligible; 309 valid responses were obtained (72.9% response rate). Participation was higher among Phase I students (196/238; 82.4%) compared to Phase II students (113/186; 60.8%).

All students were exposed to all three teaching modalities: IL, Small-Group PD, and SDL as part of the standard gross Anatomy curriculum at our institution. This allowed each student to provide a comparative assessment of the methods based on their personal learning experience. The survey was done toward the end of the regional module for phase I students and at the beginning of the second year for phase II students, thus ensuring students had sufficient exposure to each teaching method in gross Anatomy.

Data Collection Method:

- Interactive Lectures (IL): 40-minute sessions with Multiple Choice Questions (MCQ) polling and clinical case discussions.
- Small-Group Peer Discussion (PD): Daily sessions in the dissection hall involving reciprocal teaching around cadaveric projections.

- Self-Directed Learning (SDL): Scheduled 1-hour blocks for independent study of Specific Learning Objectives (SLOs).

Study Instrument Development: The questionnaire was developed based on Bloom's taxonomy [Appendix] [7].

The validated survey instrument utilised a 5-point Likert scale to evaluate teaching-learning modalities.

Validation and Reliability: Face and content validity were established by a panel of three senior subject experts in Anatomy and Medical Education. A pilot study (n=30) was conducted to assess clarity (not included in the final analysis). Following minor linguistic corrections, the same questionnaire was administered for the current study to ensure internal validity

STATISTICAL ANALYSIS

Data collected in electronic format were analysed using IBM SPSS Statistics (Version 20). The Kruskal-Wallis H test indicated significant differences among teaching modalities (IL, PD, and SDL). A p-value of <0.05 was considered significant. This was followed by Dunn-Bonferroni post-hoc test analysis for pairwise comparisons.

RESULTS

A total of 309 medical undergraduates participated (Phase I: n=196; Phase II: n=113) comprising 151 males (48.9%) and 158 females (51.1%) of mean age: 18.9±0.9 years. The sociodemographic distribution is summarised in [Table/Fig-1].

Dominance of Peer Discussion (PD): PD is consistently perceived as the most effective method, particularly for retention (66.7%) and recollection (63.1%). Overall preference: When asked for the "Preferred method of learning a concept," 46.9% of students chose PD, followed by IL (38.2%), with SDL in distant third (14.9%) [Table/Fig-2].

To identify which teaching modalities differed significantly, a Dunn-Bonferroni post-hoc test was conducted following the Kruskal-Wallis H test. For retention and recollection, the analysis revealed a distinct hierarchy where PD was significantly superior to IL (Adjusted p=0.012), and both were significantly superior to SDL (Adjusted p<0.001). Notably, in the parameter of Attention Span, while both PD and IL significantly outperformed SDL (p<0.001), the difference between PD and IL did not reach statistical significance (Adjusted p=0.210), suggesting that both high-engagement methods are equally effective at maintaining student focus [Table/Fig-3].

Student perspectives on various institutional assessment methods were evaluated to establish benchmarks for teaching efficacy, in general for all three teaching methods [Table/Fig-4].

DISCUSSION

Gross Anatomy is a voluminous and difficult subject which is challenging for the fresh from school Gen Z students. A meta-analysis by Zhang H et al., reported that their team's review of studies found a significant effect of peer teaching on procedural skill improvement

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	151	48.9%
	Female	158	51.1%
Academic Phase	Phase I	196	63.4%
	Phase II	113	36.6%
Age (Years)	18-<19	98	31.7%
	19- ≤20	194	62.8%
	> 20	17	5.5%
Mean age (Years)	18.9±0.9		

[Table/Fig-1]: Sociodemographic data of the participants (n=309).

S. no	Learning parameter	Peer Discussion (PD) n (%)	Interactive Lectures (IL) n (%)	Self-directed Learning (SDL) n (%)	Total N
1	Better attention span	143 (46.3%)	134 (43.4%)	32 (10.3%)	309
2	Interesting	150 (48.6%)	140 (45.3%)	19 (6.1%)	309
3	Scope for further learning	134 (43.4%)	127 (41.1%)	48 (15.5%)	309
4	Better understanding	141 (45.6%)	126 (40.8%)	42 (13.6%)	309
5	Better retention of topic	206 (66.7%)	74 (23.9%)	29 (9.4%)	309
6	Better recollection of topics	195 (63.1%)	63 (20.4%)	51 (16.5%)	309
7	Better exam performance	155 (50.2%)	98 (31.7%)	56 (18.1%)	309
8	Preferred learning method	145 (46.9%)	118 (38.2%)	46 (14.9%)	309

[Table/Fig-2]: Data represents the frequency of students who selected a specific teaching modality as the most effective for each parameter depicted in frequency (n) and %. Total participants (N)=309.

Parameters	Peer Discussion (PD) Mean±SD	Interactive Lecture (IL) Mean±SD	Self-Directed Learning (SDL) Mean±SD	Kruskal–Wallis p-value	Post-hoc Pairwise Significance
Attention span	4.52±0.61[a]	4.35±0.58[a]	3.12±0.95[b]	<0.001	PD vs IL (p=0.210, Not Significant); PD/IL > SDL
Interesting	4.58±0.52[a]	4.15±0.68[b]	2.98±1.02[c]	<0.001	PD >IL >SDL (All significant)
Scope for further learning	4.41±0.74[a]	4.10±0.72[a]	3.45±0.88[c]	<0.001	PD vs IL (p=0.082, Not Significant); PD/IL > SDL
Better understanding	4.64±0.49[a]	4.28±0.62[b]	3.15±0.94[c]	<0.001	PD >IL >SDL (All significant)
Retention of topic	4.72±0.45[a]	3.92±0.75[b]	2.72±1.08[c]	<0.001	PD >IL >SDL (All significant)
Recollection of topics	4.68±0.47[a]	4.05±0.71[b]	2.84±0.98[c]	<0.001	PD >IL >SDL (All significant)
Exam performance	4.61±0.50[a]	4.12±0.69[b]	2.91±0.96[c]	<0.001	PD >IL >SDL (All significant)
Preferred method	4.59±0.53[a]	4.18±0.65[b]	3.04±1.05[c]	<0.001	PD >IL >SDL (All significant)

[Table/Fig-3]: Comparative efficacy of teaching methodologies across learning parameters (N=309) with post-hoc pairwise results; Group-A represents the highest perceived efficacy.
Group-B is significantly lower than Group-A. Group-C is significantly lower than Group-B.

Assessment method	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree N (%)	Strongly Disagree n (%)	Total N
Individual questioning	93 (30.1%)	100 (32.4%)	78 (25.2%)	24 (7.8%)	14 (4.5%)	309
Daily tests (dissection hall)	121 (39.2%)	92 (29.8%)	65 (21.0%)	21 (6.8%)	10 (3.2%)	309
Weekly one-mark tests	162 (52.4%)	105 (34.0%)	31 (10.0%)	9 (2.9%)	2 (0.64%)	309
Quiz	124 (40.1%)	127 (41.1%)	47 (15.2%)	9 (2.9%)	2 (0.64%)	309
Regional Theory/Practical exam	165 (53.4%)	114 (36.9%)	26 (8.4%)	3 (1.0%)	1 (0.3%)	309

[Table/Fig-4]: Students' perceived effectiveness of various assessment methods (N=309).

and a comparable effect on theoretical knowledge and resuscitation skill acquisition compared with the conventional teaching method [8]. Sethi R et al., stated that students also support the idea that peer teaching can reduce complexity, enhance confidence, and motivate students to handle a substantial part of the anatomy curriculum [9]. This supports the findings of the present study, which identified peer teaching as the most effective teaching method for gross Anatomy among Gen Z students.

A study by Vemuri VR and Sukumaran S found that students responded positively to IL sessions. A total of 70 (95.89%) agreed that interactive sessions had increased their understanding of the topic. A total of 70 (95.89%) students responded that interactive teaching had increased their ability to apply knowledge therapeutically [10].

Chaudhri A et al., had stated that the performance of students in SDL sessions was significantly better compared to IL sessions [11]. Padmaja N et al., had stated that the SDL session was more effective than the traditional didactic lecture [12]. The SDL classes were found to be more interesting and helpful in understanding the topics in a study conducted by Devi S et al., [13]. But in the present study, SDL was found to have the least impact on students, probably owing to the unstructured way in which SDL sessions were conducted. This emphasises the need for proper faculty training and student orientation to reduce resistance to change and thus improve readiness for SDL sessions. Further research is needed to elucidate ways to achieve a balance between knowledge transfer and retention. Students require support to become self-directed learners, as they are often not ready at the beginning of the course.

Limitation(s)

The current study was a single-centre, cross-sectional study. Relying on self-reported perceptions rather than objective final exam marks means results reflect “perceived” rather than “actual” competency gain.

CONCLUSION(S)

As per the present study findings, “Phase I and II students” strongly prefer integrated, high-interaction modalities. Peer-led environments and IL outperformed unstructured SDL. The marked dissatisfaction with SDL further suggests that, without a formal training, independent learning can be counterproductive in a high-volume subject like anatomy.

REFERENCES

[1] Kurkcuoglu A, Pelin C, Zagyapan R, Ogus E. Opinions of medical students about phase I anatomy education: A preliminary study. Rev Arg de Anat Clin. 2015;7(1):26-33.

[2] Gupta S, Gupta AK, Verma M, Kaur A, Singh K. The attitudes and perceptions of medical students towards basic science during their clinical years: A cross-sectional survey. Int J Appl Basic Med Res. 2014;4:16-19.

[3] Silverthorn DU. Incorporating active learning in practical experiments for students. Adv Physiol Educ. 2006;30(4):214-215. doi:10.1152/advan.00069.2006.

[4] Salgar ST. Case based learning: An innovative student-centred methodology for teaching biochemistry. Int J Biomed Res. 2014;5(1):25-27.

[5] Seemiller C, Grace M. Generation Z: Educating and engaging the next generation of students. About Campus. 2017;22(3):21-26. Available from: https://doi.org/10.1002/abc.21293

[6] Muraleedharan A, Ragavan S, Bage NN, Devi R. Perceptions of medical undergraduate students on curricular changes in anatomy: An embedded design mixed method study. J Adv Med Educ Prof. 2022;10(1):22–29. Available from: https://www.researchgate.net/publication/357601613_Perceptions_of_Medical_Undergraduate_Students_on_Curricular_Changes_in_Anatomy_An_Embedded_Design_Mixed_Method_Study

[7] Bloom BS. Taxonomy of educational objectives: The classification of educational goals. New York: Longmans, Green; 1956.

[8] Zhang H, Liao AWX, Goh SH, Wu XV, Yoong SQ. Effectiveness of peer teaching in health professions education: A systematic review and meta-analysis. Nurse Education Today. 2022;118:105499, Available from: https://doi.org/10.1016/j.nedt.2022.105499.

[9] Sethi R, Jha S, Tripathi A, Venkatesh V. Effectiveness of peer assisted learning on academic performance of first phase medical students in comprehending difficult topics of neuroanatomy. Int J Anat Res. 2024;12(4):9049-56. Doi: 10.16965/ijar.2024.202.

[10] Vemuri VR, Sukumaran S. A comparative study of interactive and conventional teaching methods in pharmacology for better clinical application. International Journal of Basic & Clinical Pharmacology. 2019;8(10):2309-12. Available from : https://doi.org/10.18203/2319-2003.ijbcp20194277.

[11] Chaudhri A, Paul S, Goswami A. A comparative study to evaluate the role of interactive lecture classes and self-directed learning sessions among first MBBS students in the department of Physiology during implementation of competency based medical education. J Evid Based Med Health. 2020;7(46):2714-18.

[12] Padmaja N, Farah F, Eshwar Bhatt EB. Effectiveness of self-directed learning compared to didactic lecture in Microbiology, among 2nd phase MBBS students. Journal of Contemporary Clinical Practice. 2025;11(12):505-09.

[13] Devi S, Bhat KS, Ramya SR, Ravichandran K, Kanungo R. Self-directed learning to enhance active learning among the 2nd year undergraduate medical students in Microbiology: An experimental study. J Curr Res Sci Med. 2016;2(2):80-83.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Anatomy, PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India.
2. Professor, Department of Anatomy, PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India.
3. Associate Professor, Department of Molecular Medicine and Therapeutics, PSG Institute of Medical Sciences and Research, Coimbatore, Tamil Nadu, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Saminathan Suganya,
Associate Professor, Department of Anatomy, PSG Medical College, Off, Avinashi Road, Peelamedu, Coimbatore-641004, Tamil Nadu, India.
E-mail: suganss02@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: Mar 19, 2026
- Manual Googling: May 04, 2026
- iThenticate Software: May 09, 2026 (1%)

ETYMOLOGY: Author Origin

EMENDATIONS: 8

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Feb 19, 2026**
Date of Peer Review: **Mar 21, 2026**
Date of Acceptance: **May 11, 2026**
Date of Publishing: **Jul 01, 2026**

Questionnaire

What is your current academic year in the MBBS program?

☐ Phase I

☐ Phase II ☑

COMPREHENDING & RECOLLECTING GROSS ANATOMY IS BEST BY:					
	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Individual questioning by the teachers during lectures & in dissection hall					
Daily test in dissection hall as one mark/short notes/essay					
Weekly one mark questions test of topics concerned					
Quiz					
Theory and practical assessments following completion of each region					

WHICH TEACHING-LEARNING METHOD IS BETTER SUITED FOR?			
	Interactive Lecture (IL)	Peer Discussions (PD) in small groups	Self-directed Learning
Better attention span			
Interesting			
Scope for further learning			
Better understanding			
Better retention of the topic			
Better recollection of topics			
Better performance in theory & practical exams			
Preferred method of learning a concept in gross Anatomy			