

Awareness, Perceptions and Preferences of Various Teaching and Learning Methodologies Among Medical Imaging Technology Students in Chennai

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Research Article

Keywords: Medical Imaging Technology Students, Teaching–Learning Methodologies, Student Perceptions, Learning Preferences, Medical Education, Educational Strategies, Active Learning Methods, Health Professions Education

Posted Date: March 8th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-8914462/v1>

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Additional Declarations: No competing interests reported.

Abstract

OBJECTIVES:

This study aimed to assess the level of awareness among Medical Imaging Technology students regarding various teaching and learning methodologies; to evaluate their perceptions of the effectiveness, engagement, and applicability of these approaches in enhancing theoretical knowledge and clinical competence; to identify students' preferred teaching methods for improving academic performance, skill development, and practical understanding; and to propose feasible educational strategies that can be implemented by educators and institutions to optimize learning outcomes.

BACKGROUND:

Health professions education increasingly emphasizes student-centered and clinically oriented teaching approaches to improve learning outcomes and professional competence. Understanding students' awareness, perceptions, and preferences toward teaching methodologies is important for aligning instructional strategies with learner needs. This study aimed to evaluate these factors among Medical Imaging Technology (MIT) students in Chennai.

MATERIALS AND METHODS:

A descriptive cross-sectional survey was conducted among undergraduate and postgraduate MIT students in Chennai. Data were collected using a structured, validated online questionnaire assessing demographic details, awareness and perceptions of teaching methodologies, learning style preferences based on the VARK model, and suggested improvements to teaching practices. Descriptive statistics were used for analysis.

RESULT:

A total of 264 MIT students participated. Observational learning demonstrated the highest awareness (54.9%), followed by case-based learning (53.0%), self-regulated learning (50.4%), e-learning (49.6%), and peer-assisted learning (49.2%). Awareness was lowest for simulation-based learning (27.3%), with 23.9% reporting no awareness; 44.3% reported experience with assessment-as-learning.

Perceptions were predominantly positive. High levels of agreement were observed for self-regulated learning (73.5%), observational learning (73.1%), case-based learning (72.7%), and e-learning (71.2%). Simulation-based learning (67.0%) and problem-based learning (68.2%) were also favourably perceived, while neutral responses were relatively higher for flipped classroom and evidence-based medicine.

Reading/writing (43.2%) and visual (25.4%) were the most preferred learning styles, with 19.3% demonstrating multimodal preferences. Case-based and observational learning were the most preferred instructional approaches (64.4% each), followed by e-learning (61.0%) and self-regulated learning (60.2%). Most students reported alignment between teaching methods and their preferred learning

styles (63.3% always/often). Frequently suggested improvements included increased hands-on training, enhanced theory–clinical integration, and expanded case-based and simulation-based learning.

CONCLUSION:

MIT students demonstrated positive attitudes toward active and clinically oriented teaching approaches. Expanding experiential and simulation-based learning opportunities may further improve student engagement, clinical competence, and readiness for professional practice.

INTRODUCTION

Health professions education is continuously evolving to meet the increasing complexity of modern healthcare systems.(1,2) Students in allied health sciences are required not only to acquire theoretical knowledge but also to develop clinical competence, critical thinking ability, and technical skills essential for professional practice.(3,4) The effectiveness of this learning process is strongly influenced by the teaching methodologies adopted within the curriculum.(5)

Constructive alignment between learning objectives, instructional strategies, and assessment methods plays a central role in improving student learning outcomes.(6) Although traditional lecture based instruction remains widely used due to its efficiency in delivering large volumes of information, it has increasingly been criticized for promoting passive learning and limited student engagement.(6,7) Active learning approaches have been shown to improve knowledge retention, student participation, and higher-order cognitive skills across health science disciplines.(7)

Student-centered instructional strategies such as CBL, PBL, SBL, TBL, PAL, flipped classroom models, and e-learning have gained increasing importance in health professions education. These approaches promote collaborative learning, self-directed learning, clinical reasoning, and application of theoretical knowledge in clinical contexts.(8–10) Simulation based education, in particular, has emerged as an important tool for bridging the gap between theoretical instruction and clinical practice while ensuring patient safety.(11) (Table 1)

Individual learning preference is a key factor affecting learning effectiveness, and the VARK model is widely used to describe how learners perceive and process information.(12) Studies among healthcare students have reported multimodal learning preferences, with a notable inclination toward visual and kinesthetic learning modalities in clinically oriented disciplines.(13–16)

Students' awareness of different teaching methodologies, their perceptions of instructional effectiveness, and their preferences for specific learning approaches are important considerations in curriculum design and education quality improvement.(5) Aligning teaching strategies with learner characteristics may enhance engagement and perceived learning effectiveness.(17)

MIT education requires a balance between theoretical instruction and practical training. As diagnostic imaging continues to evolve technologically, it becomes increasingly important to understand how

students perceive and prefer different teaching methodologies within this discipline. Evaluating these factors may provide insights into optimizing instructional strategies in MIT education. Although teaching and learning methodologies in health professions education have been widely studied, evidence specific to MIT education remains limited, particularly in South Indian educational settings.(18)

Therefore, the present study aims to investigate the awareness, perceptions, and preferences related to various teaching and learning methodologies among MIT students in Chennai, and to determine whether existing instructional practices are aligned with students' preferred learning styles.

MATERIALS AND METHODS

Study design

A descriptive cross-sectional, questionnaire-based study was conducted to assess the awareness, perceptions, and preferences regarding various teaching and learning methodologies among MIT students in Chennai, Tamil Nadu, India. The study was carried out between September 2025 and December 2025 using an online survey platform (Google Forms).

Study

Population and recruitment

The study population consisted of undergraduate (B.Sc.) and postgraduate (M.Sc.) MIT students from institutions in Chennai who had completed at least one academic semester. Participants were recruited using a convenience sampling method through electronic distribution of the questionnaire link.

Inclusion criteria: Undergraduate and postgraduate MIT students, Students who had completed at least one academic semester, Students who provided informed consent.

Exclusion criteria: Students from other allied health science programs, Students on academic leave or with irregular attendance, Incomplete questionnaire responses.

Sample size and sampling technique

The sample size was calculated using a prevalence-based formula. Based on findings from a previous study, a prevalence of 77.2% was assumed. With a 95% confidence level and a 10% allowable error, the minimum required sample size was calculated to be 114 participants. A convenience sampling technique was adopted for participant recruitment. Eligible undergraduate (B.Sc.) and postgraduate (M.Sc.) Medical Imaging Technology students in Chennai were invited to participate through an online questionnaire administered via Google Forms.

Data collection tool

Data were collected using a structured, self-administered questionnaire developed after an extensive review of the literature and reference to previously published studies. The questionnaire was designed to address the objectives of the study and underwent expert validation, content validation, and face validation by faculty members in MIT and medical education.

The full English version of the questionnaire is provided as **Supplementary Material 1**.

The final questionnaire consisted of the following sections:

- Sociodemographic details
- Awareness of teaching and learning methodologies
- Perceptions toward teaching methods (Likert scale)
- Learning style preferences based on the VARK model
- Preferred instructional approaches and suggestions

The validated questionnaire was converted into an online format using Google Forms and distributed electronically to eligible participants.

Data analysis

The collected data were entered into Microsoft Excel and analyzed using statistical software. Descriptive statistics were used to summarize the data. Frequencies and percentages were calculated for categorical variables such as awareness, perceptions, and preferences toward teaching and learning methodologies. Measures of central tendency and dispersion, including mean and standard deviation, were used to describe continuous variables such as age. The results were presented using tables and graphical representations where appropriate.

RESULTS

Section A: Demographic Characteristics of the Participants (Table 2)

A total of 264 MIT students participated in the study, with complete responses available for all variables. The mean age of the participants was 20.51 ± 1.94 years.

Among the participants, 158 (59.8%) were male and 106 (40.2%) were female. The majority of respondents were undergraduate students (229, 86.7%), while 35 (13.3%) were enrolled in the postgraduate program.

Regarding institutional distribution, 35 (13.3%) participants were from government institutions and 229 (86.7%) were from private institutions. The mean age of students from government institutions was 20.8

± 1.7 years, whereas students from private institutions had a mean age of 20.6 ± 1.5 years. (Table 2)

Section B: Awareness of Teaching and Learning Methodologies (Graph 1)

Students demonstrated variable levels of awareness and exposure to different instructional strategies. Observational learning had the highest reported awareness and experience (145, 54.9%), followed by CBL (140, 53.0%), SRL (133, 50.4%), e-learning/video lectures (131, 49.6%), and PAL (130, 49.2%).

Lower awareness was observed for SBL, with only 27.3% reporting experience and 23.9% indicating no awareness. AaL was experienced by 44.3% of participants, while 17.4% reported no awareness.

Section C: Perceptions Toward Teaching and Learning Methodologies (Graph 2)

Students' perceptions toward different teaching methodologies were demonstrated predominantly positive perceptions. High levels of agreement (agree + strongly agree) were observed for SRL (n = 194, 73.5%), observational learning (n = 193, 73.1%), CBL (n = 192, 72.7%), and e-learning/video lectures (n = 188, 71.2%).

SBL (n = 177, 67.0%) and PBL (n = 180, 68.2%) also received favourable perceptions, with the majority of students expressing agreement regarding their usefulness. Neutral responses were relatively higher for flipped classroom and EBM, suggesting possible uncertainty or limited exposure among participants.

Strong disagreement across all teaching methods was minimal, indicating an overall positive attitude toward diverse instructional approaches.

Section D: Learning Style Preferences (Graph 3)

Based on the adapted VARK questionnaire, the most preferred single learning style was Reading/Writing (n = 114, 43.2%), followed by Visual learning (n = 67, 25.4%). A notable proportion of students (n = 51, 19.3%) demonstrated a multimodal learning preference, indicating flexibility in learning approaches.

Auditory (n = 17, 6.4%) and Kinesthetic (n = 15, 5.7%) learning styles were least preferred when considered independently.

Preference for Teaching Methodologies (Graph 4)

When students were asked to rate their instructional preferences, CBL and observational learning emerged as the most preferred methods (each 64.4%). E-learning/video lectures (61.0%) and SRL (60.2%) were also strongly preferred.

Flipped classroom and PAL showed comparatively lower preference ratings, with a higher proportion of students selecting neutral or least-preferred responses. However, no single method was universally rejected, reflecting the diversity of learning preferences within the cohort.

Alignment Between Teaching Methods and Learning Preferences (Graph 5)

Most students reported that their current teaching methods supported their preferred learning styles, with 95 (36.0%) indicating “always” and 72 (27.3%) reporting “often”. In contrast, only 11 participants (4.1%) indicated rare or no alignment between teaching methods and their learning preferences.

Section E: Student-Suggested Improvements to Teaching Methods

Participants were asked to suggest changes that could improve teaching methods in the MIT curriculum. Multiple responses were permitted. The most frequently suggested improvements included increased hands-on training, better integration of theory with clinical practice, and greater use of case based or clinical examples. Students also recommended more engaging lectures incorporating visual aids and videos, increased use of interactive teaching strategies such as group discussions and PBL, and expanded simulation-based or laboratory sessions.

Overall, 165 participants (62.5%) selected four or fewer improvement options, whereas 99 participants (37.5%) selected more than four options, indicating substantial student interest in enhancing teaching practices through multiple instructional approaches.

DISCUSSION

The present study assessed the awareness, perceptions, and preferences of various teaching and learning methodologies among Medical Imaging Technology students in Chennai. The findings indicate that students are generally aware of several instructional approaches and demonstrate positive perceptions toward student-centered and clinically oriented teaching methods.

Participants showed greater awareness of observational learning, CBL, SRL, and e-learning/video lectures. These methods are commonly integrated into health science curricula because they support clinical understanding and independent learning(19). In contrast, relatively lower awareness of SBL and AaL suggests that these strategies may not yet be widely implemented in MIT education within the study setting. SBL has been shown to improve technical competence, confidence, and clinical decision-making in healthcare training(11), indicating an opportunity for curricular enhancement.

Perceptions toward teaching methodologies were predominantly positive. SRL, observational learning, CBL, and e-learning received the highest levels of agreement, suggesting that students value active participation, autonomy in learning, and clinically relevant instruction. Similar findings have been reported in studies of allied health and medical students, where active learning approaches were associated with improved engagement and perceived learning effectiveness.(7)

Although SBL and PBL were viewed positively, the relatively higher proportion of neutral responses may indicate limited exposure to these methods rather than negative perceptions. Increased and structured implementation of such strategies may improve student acceptance and engagement.

Analysis of learning style preferences using the VARK framework showed that the reading/writing learning style was the most preferred, followed by visual learning, while a considerable proportion of

students demonstrated multimodal preferences. The prominence of visual learning is consistent with the nature of MIT education, which relies heavily on image interpretation and visual analysis. The preference for reading/writing may reflect the theoretical components of imaging education, including physics, anatomy, and imaging protocols.

CBL and observational learning emerged as the most preferred teaching methodologies, reinforcing the importance of clinically contextual instruction in MIT training. These approaches facilitate the integration of theoretical knowledge with clinical imaging practice and support the development of diagnostic reasoning skills. E-learning and SRL were also strongly preferred, highlighting the importance of flexible learning opportunities in modern health professions education.

Most participants reported that current teaching methods supported their preferred learning styles, indicating reasonable alignment between instructional practices and learner needs. However, student feedback emphasized the importance of increasing hands-on training, improving theory clinical integration, incorporating more case-based examples, and expanding SBL opportunities. These suggestions underscore the importance of experiential learning in MIT education.

This study adds to the limited literature on teaching and learning methodologies in Medical Imaging Technology education in India, particularly in the Chennai region. The findings suggest that students are receptive to diverse instructional approaches, especially those that promote clinical application and active learning. Expanding experiential and simulation-based learning opportunities may further enhance student engagement and competency development.

STRENGTHS

A key strength of this study is its focused on MIT students, a population that has received relatively limited attention in health professions education research. The use of a structured and validated questionnaire, along with an adequate sample size, enhances the reliability and credibility of the findings.

LIMITATIONS

Some limitations should be considered when interpreting the results. As the study employed a cross-sectional design, responses reflect student perceptions at a single point in time. Data were collected through self-reported questionnaires, which may be influenced by individual interpretation. Additionally, the study was conducted among institutions within Chennai; therefore, findings may reflect the educational context of the study setting. Future multi-center studies could provide broader generalization.

CONCLUSION

This study demonstrates that MIT students in Chennai possess positive awareness and favourable perceptions of teaching and learning methodologies that emphasize clinical application, active engagement, and self-directed learning. Among these, observational learning, CBL, SRL, and e-learning

were particularly well-recognized and preferred. Aligning instructional strategies with student preferences may enhance engagement, learning outcomes, and professional competence. Greater integration of theory with clinical practice, enhanced hands-on training, and expanded SBL opportunities can further strengthen the curriculum. These findings offer valuable insights for educators and curriculum developers aiming to implement student-centered and experiential teaching approaches in MIT education.

Abbreviations

MIT: Medical Imaging Technology

CBL: Case Based Learning

EBM: Evidence Based Medicine

PBL: Problem Based Learning

SBL: Simulation Based Learning

PAL: Peer-Assisted Learning

TBL: Team-Based Learning

SRL: Self-Regulated Learning

AaL: Assessment as Learning

Declarations

Declaration of Generative AI and AI-Assisted Technologies in the Manuscript Preparation Process

During the preparation of this manuscript, the author used ChatGPT (OpenAI) to assist with language editing, improving grammar, refining sentence structure. After using this tool, the author carefully reviewed and edited the content as needed and take full responsibility for the final version of the manuscript.

Availability of data and materials: The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate: Ethical approval for the study was obtained from the Institutional Ethics Committee of SRM Medical College Hospital and Research Centre (IEC No: SRMIEC-ST0825-2782; dated 17 September 2025). The study was conducted in accordance with institutional ethical guidelines and the principles of the Declaration of Helsinki. Participant confidentiality and anonymity were strictly maintained throughout the study.

Consent and voluntary participation: Participation in the study was voluntary. An electronic informed consent form was included at the beginning of the questionnaire, and only participants who agreed to participate were allowed to proceed with the survey.

Consent for publication: Not applicable.

Funding:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Competing interests:

The authors declare that they have no competing interests.

Author contributions:

Swetha Hari: conceived and designed the study, developed the questionnaire, collected data, performed analysis, and drafted the manuscript.

Karan Sekar: contributed to study design, coordinated data collection, assisted in interpretation of results, served as corresponding author, and reviewed the manuscript.

Victor Rakesh Lazar: contributed to methodological guidance, academic input in imaging education, and manuscript review.

Akash Nixon: assisted with data analysis, technical support, and manuscript editing.

Sibyl Siluvai: provided expert guidance on questionnaire validation, including content validation and methodological refinement.

Evangelin Vijaya Kumar: assisted in data collection, literature review, and manuscript review.

Senthil Kumar Aiyappan: supervised the study.

Acknowledgements:

The authors thank the Department of Radio-Diagnosis, SRM Medical College Hospital and Research Centre, for their support during the study

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Tables

Table 1: Overview of teaching and learning methodologies assessed in the study

Teaching Method	Description	Educational purpose
Case-Based Learning (CBL)	Applying knowledge to real or simulated clinical cases through guided discussion.(20)	Application of theory to clinical practice.
Evidence-Based Medicine (EBM)	Using best available research evidence to guide clinical decision-making.(21)	Research and analytical skills.
Problem-Based Learning (PBL)	Learning initiated by problems that promote self-directed and collaborative learning.(22)	Critical thinking and self-directed learning.
Simulation-Based Learning (SBL)	Developing clinical skills using simulated environments, models, or virtual tools.(23)	Practical and technical skill development.
E-Learning	Learning delivered through digital technologies independent of time and location.(24)	Flexible and self-paced learning.
Peer-Assisted Learning (PAL)	Students learning collaboratively by teaching and supporting each other.(25)	Collaborative learning.
Observational Learning	Learning by observing and imitating behaviours or skills demonstrated by others.(26)	Visual understanding of procedures.
Flipped Classroom	A student-centered model where content is learned before class digitally, and classroom time is used for active learning.(27)	Active classroom engagement.
Team-Based Learning (TBL)	Small-group collaboration, readiness assurance, and application activities to enhance engagement, teamwork, and problem-solving.(28)	Communication and teamwork.
Self-Regulated Learning (SRL)	Students independently set goals, apply strategies, monitor progress, and evaluate their learning outcomes.(29)	Metacognitive development.
Assessment as Learning (AaL)	Learning through self-assessment, peer feedback, and reflective evaluation.(30)	Reflective learning.

Table 2: Section A: Demographic characteristics of study participants (N = 265)

Variable	Government institutions (n = 35)	Private institutions (n = 229)	Total (N = 264)
Mean Age (years)	20.8 ± 1.7	20.6 ± 1.5	20.51 ± 1.94
Gender, n (%)			
Male	17 (48.6%)	141 (61.6%)	158 (59.8%)
Female	18 (51.4%)	88 (38.4%)	106 (40.2%)
Academic Level			
Undergraduate	32 (91.4%)	197 (86.0%)	229 (86.7%)
Postgraduate	3 (8.6%)	32 (14.0%)	35 (13.3%)

Figures

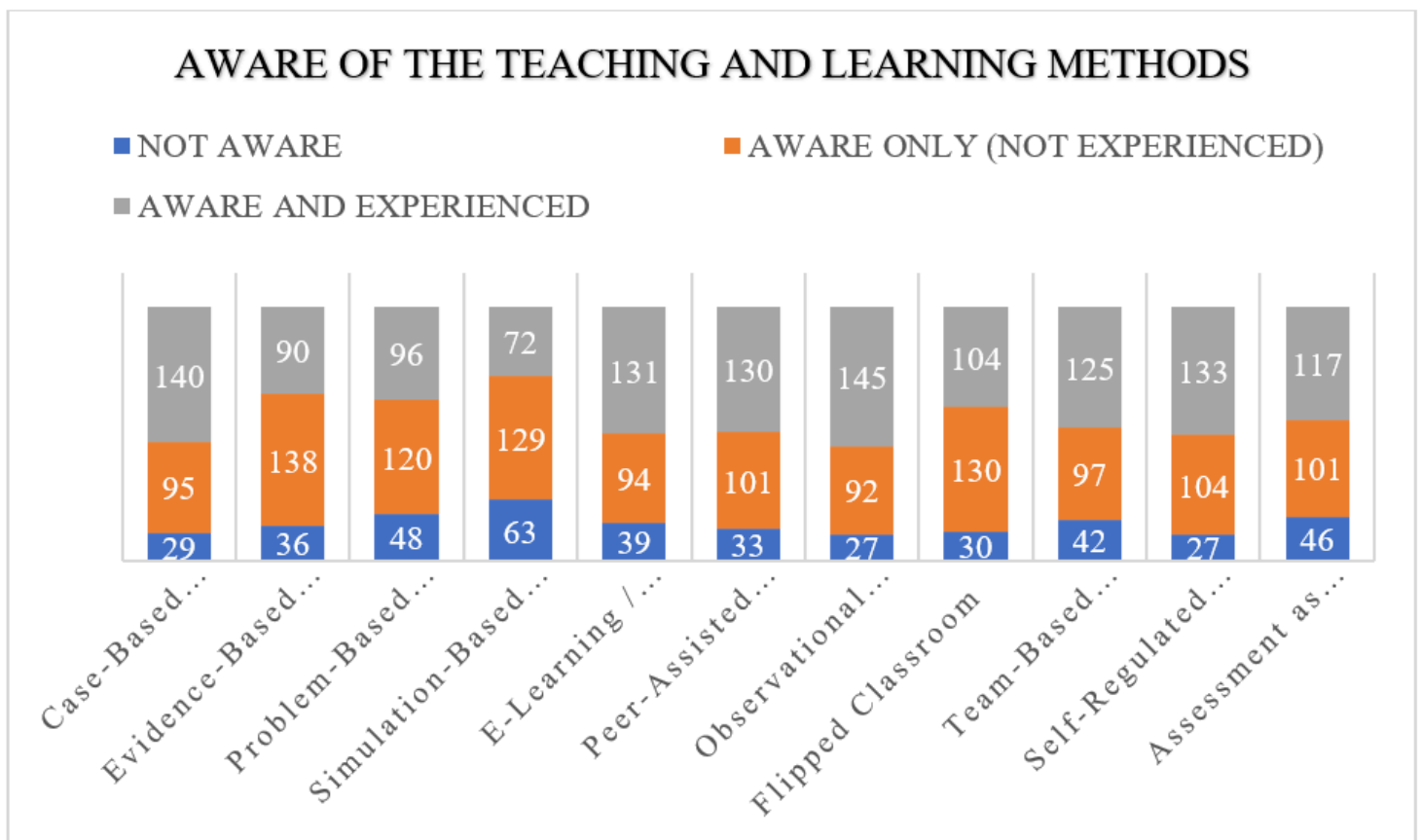


Figure 1

Graph 1 Aware of teaching and learning methods

PERCEPTIONS

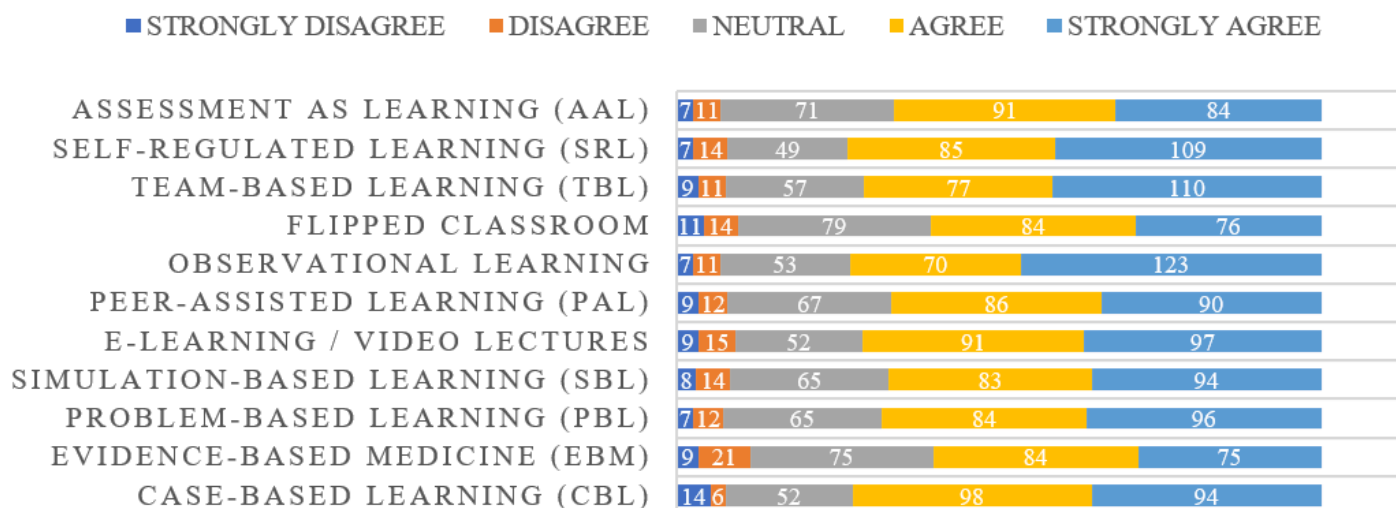


Figure 2

Graph 2 Perceptions towards teaching methods

LEARNING STYLE PREFERENCES (ADAPTED FROM VARK)

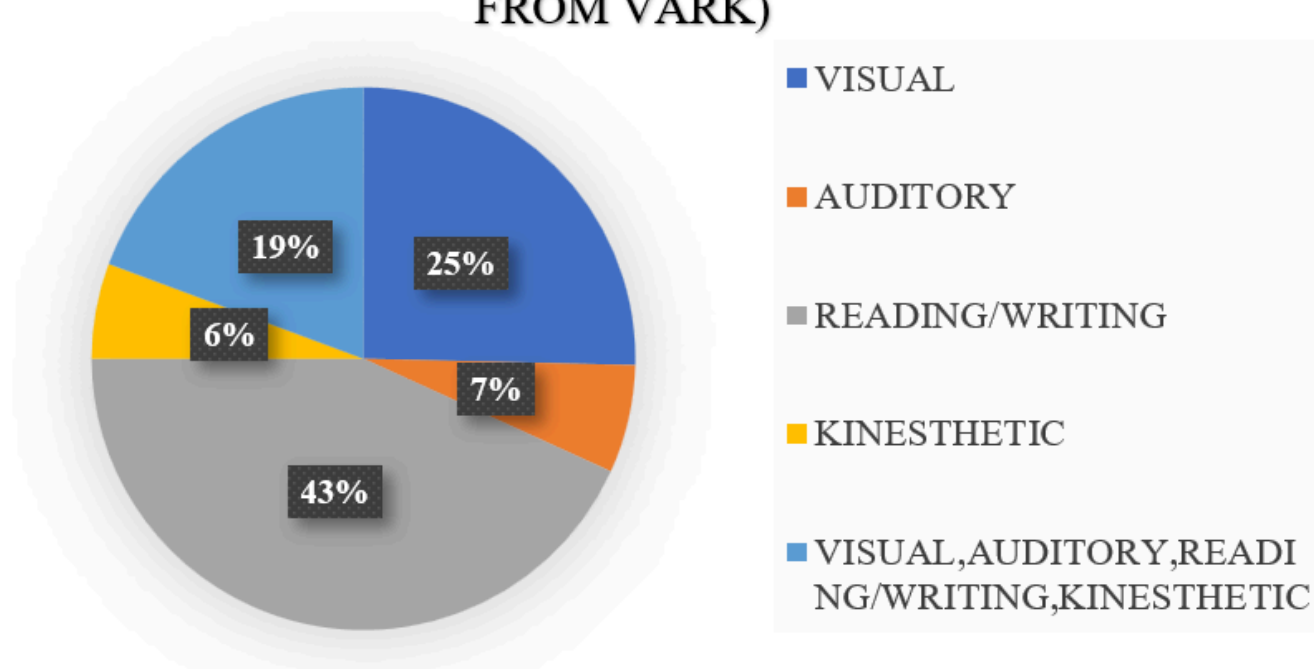


Figure 3

Graph 3 Learning style preferences

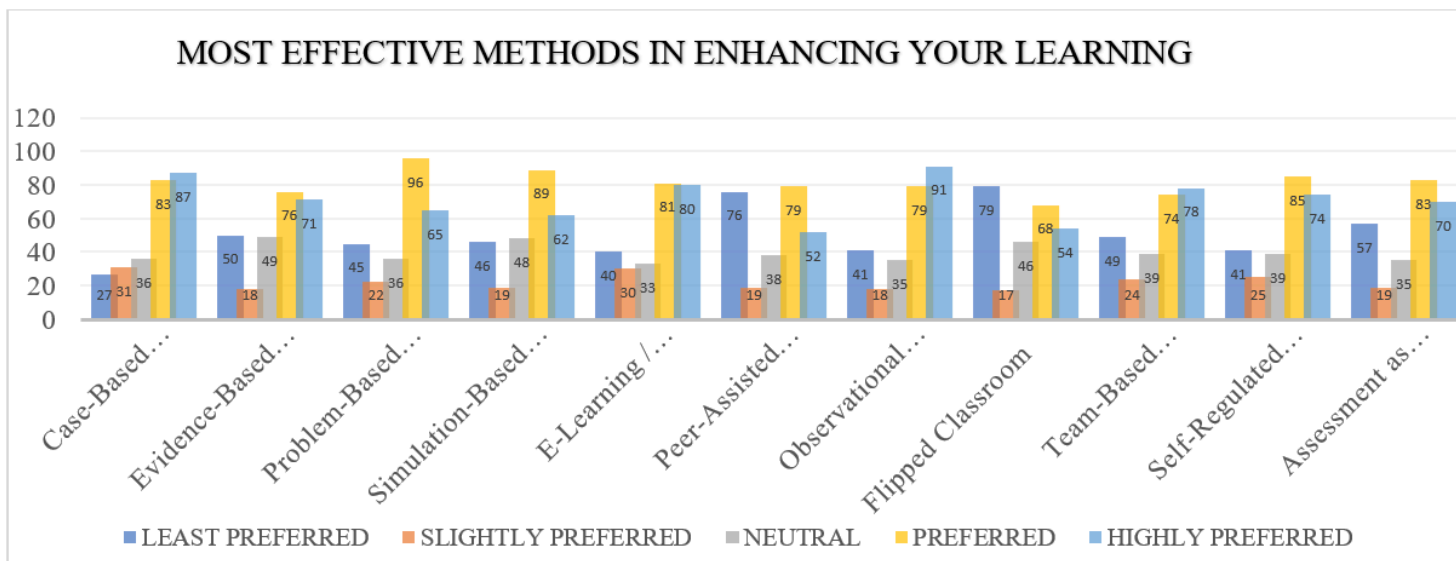


Figure 4

Graph 4 Most effective methods in enhancing your learning

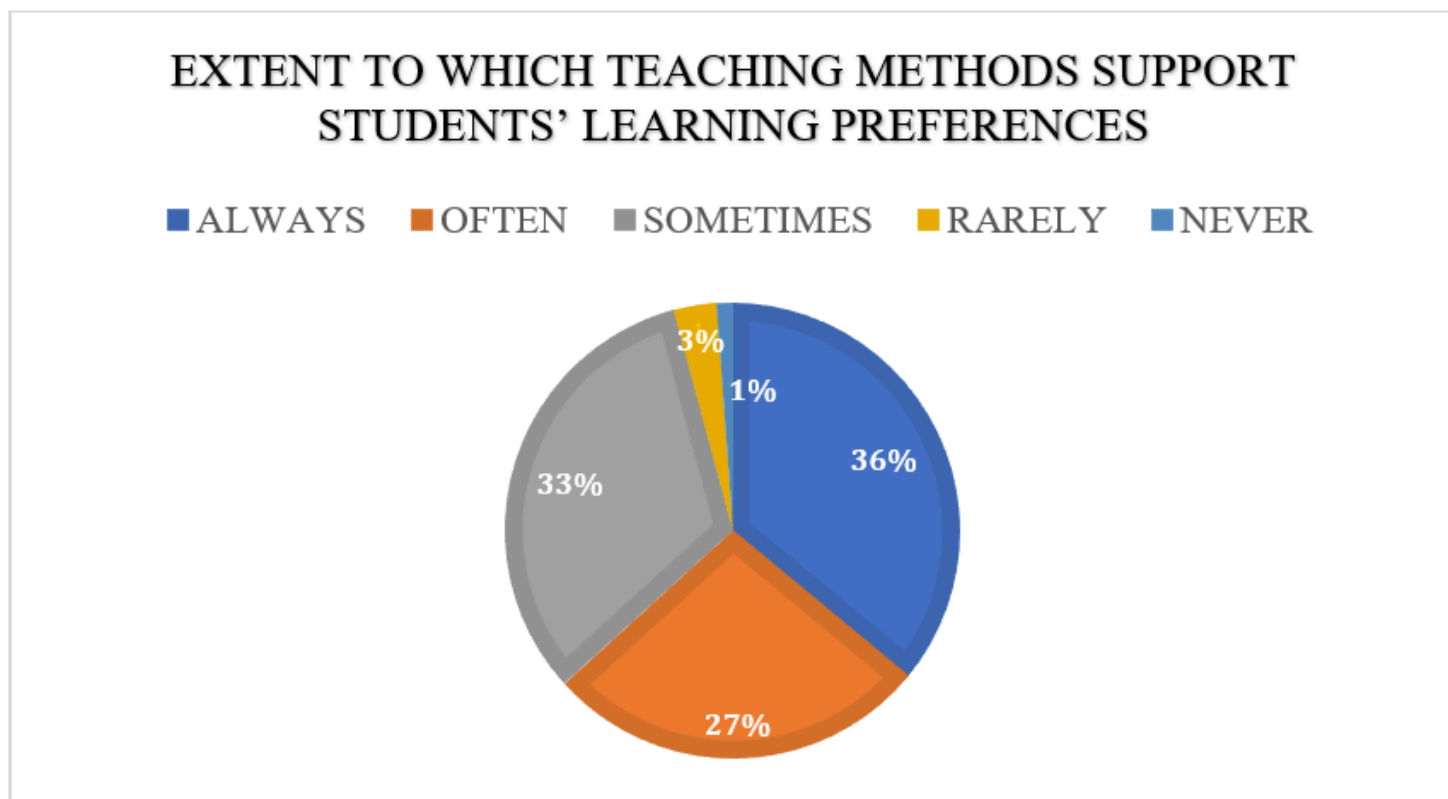


Figure 5

Graph 5 Extent to Which Teaching Methods Support Students' Learning Preferences

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [SupplementaryFileTeachingLearningMethodsQuestionnaire.docx](#)