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Rethinking flipped classroom in forensic medicine: a content-sensitive approach to self-directed learning in CBME

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Abstract: **Introduction:** Competency-Based Medical Education (CBME) emphasises the development of the Indian Medical Graduate as a lifelong learner too which can be achieved by Self-directed learning (SDL) explicitly allocated dedicated curricular time. However, SDL is often misinterpreted as unguided self-study, with limited clarity regarding its structured implementation. If SDL is intended to foster lifelong learning, the role of the teacher, assessment strategies, and topic selection become critical. Evidence remains limited on when, how, and for which types of content SDL approaches are most effective. Flipped classroom is one of the ways to achieve the goal of conducting SDL in undergraduate medical education. **Objective:** To compare the learning outcomes, to assess the knowledge retention between flipped classroom and conventional lecture methods, and to explore undergraduate students' perceptions of flipped classroom as an approach to facilitate self-directed learning in Forensic Medicine. **Methods:** A comparative teaching intervention was conducted among undergraduate medical students, with the same instructor delivering selected topics using conventional lectures and flipped classroom methods. The flipped model utilised curated learning resources provided prior to class. During the dedicated SDL hours for flipped classroom batches the pre-learned contents were discussed and clarified. Learning outcomes were assessed using recall-based MCQs and learner perceptions were collected at the end of each session. **Results:** The flipped classroom approach demonstrated improved knowledge retention and was positively perceived by students compared to conventional lectures like other studies have showed. However, its effectiveness appeared to be content-dependent in this study. While flipped classroom was advantageous for standalone and conceptually accessible topics, conventional lectures performed better for recall-intensive and medico-legal content. In addition, conducting SDL through the flipped model requires substantial faculty preparation and may be less suitable for some topics. These findings support a selective and context-sensitive integration of SDL though flipped classroom within CBME rather than its uniform application. **Conclusion:** SDL should not be equated with independent learning in isolation; rather, dedicated SDL time implies structured guidance, accountability, and assessment. The effectiveness of SDL through flipped classroom appears to be content-dependent. These findings highlight that lifelong learning must be actively cultivated through appropriate instructional design and integration aligning more closely with CBME goals rather than assumed.

Keywords: Flipped classroom, Self-directed Learning, Lifelong learner, Medical Education, Indian Medical Graduate, Forensic Medicine.

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INTRODUCTION

Students start their academic careers as dependent learners, greatly depending on their teachers for direction and guidance. However, the goal of the education system is to facilitate these learners into self-directed learners in the end and make them the ideal medical graduates who actively participate in their own education.

Flipped classroom can be conceptualized as a structured form of self-directed learning within the competency-based curriculum. However, equating SDL with independent, unguided learning is a reductionist interpretation. Within the IMG framework, the role of the lifelong learner necessitates not the absence of a teacher, but the presence of an appropriately calibrated facilitator. The CBME curriculum explicitly allocates dedicated hours for self-directed learning, indicating that SDL is intended as a structured and accountable

educational activity rather than unguided self-study. The presence of scheduled SDL hours in CBME curriculum implies guided autonomy, progressive release of responsibility, and sustained mentorship. In this context, the flipped classroom represents teacher-facilitated SDL rather than learner isolation.

The flipped Classroom, also known as the inverted classroom, acts by flipping the usual learning environment. With the technology enabled flipped classroom approach, students receive their homework before class rather than after, giving them the opportunity to familiarize themselves with new material on their own [14]. Having access to lecture material outside of scheduled class times helps with at-home preparation. Often, learning resources in all the forms can be used to convey the content. Before class, students should go through the material to understand the basics. Group discussions, cooperative coursework, assessments, and one-on-one interactions are some of the in-class activities that will allow the teacher to concentrate on deeper learning activities.

The flipped classroom concept, which has garnered [14] a lot of attention recently aims to empower students [6]. In a traditional classroom, students are expected to passively absorb and repeat information from their teacher, who is frequently regarded as the major source of knowledge. Students usually do not have the chance to work through problems or engage in critical thought during a standard lecture. This teacher-centred method has drawn criticism for being disconnected from students and giving them little chance to actively create their own understanding. The advantages of flipped classrooms are it being interactive learning, active student role, improved engagement, flexible pace, focus and attention [12], and teacher insight, improved retention and content could be reused.

Objectives

1. To compare the **learning outcomes** of flipped classroom teaching and conventional teaching in Forensic Medicine and Toxicology among MBBS phase III Part I Students.
2. To evaluate the MBBS phase III Part I students' long-term knowledge retention about the flipped classroom approach in comparison to traditional lectures in forensic medicine.
3. To Evaluate the **perception** of the students towards the flipped classroom method of learning compared to conventional method of teaching.

Research Question

Whether blended educational strategy using technology enabled flipped classroom has better learning outcome than conventional lecture in MBBS phase III Part 1 Students?

Hypothesis

1. Alternative Hypothesis (H1): Students exposed to a blended educational strategy applying technology-enabled flipped classrooms will exhibit significantly higher learning outcomes compared to those exposed exclusively to conventional lecture-based teaching methods.

2. Null Hypothesis (H0): There will be no significant difference in learning outcomes between students exposed to a blended educational strategy applying technology-enabled flipped classrooms and those exposed exclusively to conventional lecture-based teaching methods.

REVIEW OF LITERATURE

To achieve the definitive goal of developing the fundamental knowledge and independent learning skills of students, they should be actively assisted in identifying and resolving obstacles as they advance. This method encourages the development of critical thinking and problem-solving abilities, which are crucial for success in both academic and professional contexts, in addition to giving students the autonomy to direct their own learning. A framework for the shift is offered by the Staged Self-Directed Learning Model [1], which reasons that students pass through multiple stages to become self-directed while teachers adapt their techniques to each student's level. The transition from dependent learners to self-directed learners through the stages of motivated learners and involved learners can be accomplished by initially stimulating their desire to learn about the topic, guiding them in taking part in the learning process, and eventually developing their capacity to self-direct their education.

Students may be dependent on their teachers in the beginning; hence, they need clear guidance. Facilitators can, however, steadily take on a more collaborative role as students get more involved and motivated, pushing them to assume greater accountability for their own education [7].

A self-directed learning environment is functionally different from a lecture-based classroom where the educator or the teacher deicides the goals, the assessments applied, and pacing of the course content. During the self-directed learning process, the learner sets goals, figures how progress will be assessed, organises the material and sequence of activities with a timeframe, identifies more resources, and seeks out feedback in case [10].

The flipped approach inverts the traditional classroom model by introducing course concepts before class, allowing educators to use class time to guide each student through active, practical, innovative applications of the course principles that move most information-transmission teaching out of class; use class time for learning activities that are active and social; and require students to complete pre-and/or post-class activities to fully benefit from in-class work.

Though findings provide some degree of confidence that students' expectations of technology usage are being met, students would, on the other hand, like to see faculty make even greater and more effective use of technology in the classroom [9].

The literature on flipped classroom approach was reviewed by Abeysekera and Dawson in 2015 and they tentatively proposed that flipped approaches might improve student motivation and help manage cognitive load [3]. Flipping the classroom represents an ongoing paradigmatic shift in education from teacher-centred instructional strategies to learning-centred instructional strategies such as active student engagement. The flipped classroom is a pedagogical approach in which basic concepts are provided to students for pre-class learning so that class time can apply and build upon those basic concepts [2].

As the relevance of the flipped Classroom started emerging, there were some studies that showed the flipped classroom structure can have severe drawbacks and consequences if it is applied negligently. One of the main issues with the flipped classroom is that if the shift is not properly planned out and executed, it could lead to a compromised learning environment and frustrated faculty and students. As the flipped classroom model calls for a substantial change in the way they teach, faculty members may be reluctant to use it because they see it as a challenge to their conventional roles [4], and in another study in December 2017, it was alarmed that the major problems of using the flipped classroom approach include teachers' considerable workload of creating flipped learning materials and students' disengagement in the out-of-class learning [5]. Despite these disadvantages, studies have demonstrated that students find technology[16] to be useful in the classroom and are comfortable utilizing it for learning. However, they also seem to place great importance on in-person instruction. They also acknowledge that technology can be used to improve instruction rather than to replace it [8].

The learning efficacy of physiology can be enhanced by flipped classrooms, as shown by Ming Ji *et al*. 2022 study. Flipped classrooms have been shown to enhance the learning effectiveness of subsequent basic and clinical medical courses. Despite the fact that flipped classroom instruction required more time from students, it had no impact on how well they learned in the concurrently offered other courses. Free discussion with teachers and peers during class also promoted in-depth information retention and provided students with the opportunity to apply what they had learned from self-study to problem-solving. As a result, flipped classroom instruction develops students' higher order thinking abilities and complete ability to analyse and solve complicated situations. The efficacy of students' physiology learning is clearly enhanced by Flipped classroom instruction, and this effect is likely to continue to grow. It was observed that more research would be necessary to evaluate student compliance and identify efficient strategies for directing and inspiring students during their pre-class preparation if flipped classrooms were to be pushed on a wider scale. As such, teacher preparation programs and quality assurance measures should be prioritized as well [13]. The flipped classroom model has been found to be more effective than traditional lecture-based instruction in improving student performance, retention [12].

442 students from the medical college and the school of nursing and midwifery participated in a study conducted by Sultan *et al*. in 2023. It was noted that the students were able to clear up any misunderstandings, and that they were given plenty of time during the face-to-face session to do so with the facilitator. The fact that they can use their expertise in clinical practice was another promising thing they discovered. Furthermore, learners also mentioned that they were able to communicate more effectively. The fact that students assumed ownership of their education was essential to the effectiveness of this teaching strategy. Increased opportunities for peer interaction were given, and it would be beneficial to have more reading materials and learning resources available so that students could access them and adjust as often as needed [15].

To expand the idea and utility of the flipped classroom approach, another study was conducted in 2024 by Suire *et al*., which demonstrated the viability of the flipped classroom approach—a well-supported pedagogy in academic institutions that has not before been investigated in a clinical setting—for health education in a clinical weight reduction program. A clinical weight reduction program that combined flipped classroom pedagogy with health education was organized for six months for individuals who were overweight or obese and was shown to be viable to implement and support a weight loss of more than 9%. Subjects expressed great satisfaction with the way health education was delivered [16].

A mixed method study was conducted in 2024 with 100 Phase 2 medical students. According to the study, there was a statistically significant difference in test scores between groups who participated in flipped classrooms and typical didactic lecture groups. Students who received instruction in flipped classrooms reported that they "could explore the topics," "pre-learning videos provided helped to learn," and other similar statements. The benefit was increased student involvement. Nonetheless, several students thought that the teacher wasn't providing them with enough structure throughout the flipped lesson. Students also thought that studying in a flipped classroom required a lot of time. They believed that, in contrast to traditional classrooms, flipped classes do not exclusively emphasize exam-oriented learning. Students listed "didactic lectures are monotonous, loss of attention span, and traditional

lectures provide lesser comprehension of concepts" as the main drawbacks of traditional classroom instruction [17].

Study published by Liu *et al*. in 2024 showed that a partially flipped classroom teaching model enhanced the deep learning strategy and motivation. Additionally, by raising the surface learning motive, the traditional lecture-based teaching model enhanced the surface learning strategy. Furthermore, in order to encourage students, it was recommended that they move from surface learning to deep learning, and instructors in universities and colleges implement the reform of teaching and progressively adapt the traditional lecture-based teaching model to a partially flipped classroom. Therefore, for disciplines with a heavy course load, it was shown that flipped is a valuable teaching style because it not only reduces workload but also benefits students [18].

MATERIALS AND METHODS

Area of study: Teaching learning method.
Study design: Comparative study/ Prospective study
Study setting: Department of Forensic Medicine, KVG Medical College, Sullia, Dakshina Kannada, Karnataka.
Study population: MBBS Phase III Part I Students.
Sample size and Sampling method: Simple random sampling.
Study period: Classes are taken over six weeks, and two retention tests are done in two weeks. Total duration of the study is ten weeks.

Intervention: Flipped classroom of teaching one of the batches and only conventional mode of teaching to the other batch, both the batches were exposed to both modalities by swapping them. All the interventions are handled by principal investigator.

Tools: Google Classroom, Microsoft PowerPoint Presentation, MCQ at the end of each class and Likert scale-based questionnaire for the perception analysis after each class with the help of Google form.

METHODOLOGY

Grouping was done based on random sampling, which was done in the classroom, with an internet based simple random sampler, in the presence of all the students, where 109 students were divided into batch A (54) and batch B (55). Informed consent was taken at the time of recruitment of participants. Competencies FM2.27, FM2.28, FM3.21, FM3.27 were divided into six specific learning objectives. Google classroom was created for the purpose, through which all the materials were shared to students of flipped classroom batch. Classes materials for the flipped classroom group was prepared and posted 3 days prior to each session taken which included doc files, links to videos, URL's and Pdf's. During the dedicated hours for lecture and SDL the same lecture was delivered to both batches, although one batch would have received the content earlier. In three distinct sessions, week 1, week 2, and week 3, Batch A experienced a flipped classroom mode of teaching, with three separate lectures covering three different topics, on three different days (A1, A2, and A3). The same topics were covered in a traditional manner in the same week for the other group (B1, B2, and B3). In total, in the first three weeks, six sessions were held. After a gap of 2 weeks, in the 5th week to assess the retention, the previous three multiple choice questionnaires were clubbed for twenty pointers each and the results were collected. In the next three weeks, that is week 6, week 7 and week 8, the batches were crossed over or swapped where B1, B2, B3 batches were exposed to flipped model of teaching for three more different classes, while A1, A2, and A3 were subjected to conventional model. Altogether a total of twelve sessions of teaching were held which covered six topics where each student faced six topics. In all the 12 classes conducted, at the end of each class there was a multiple-choice questionnaire-based assessment for both the batches for 10 pointers to compare the result of their scores, and a Likert's score questionnaire was obtained at the end of each class. On the 10th week to assess the retention, the previous three MCQ's were clubbed for twenty pointers each and the results collected to analyze the knowledge retention with both the modalities. The scores were analyzed for the results. All the materials were made accessible to both the batches of students at the end of the study.

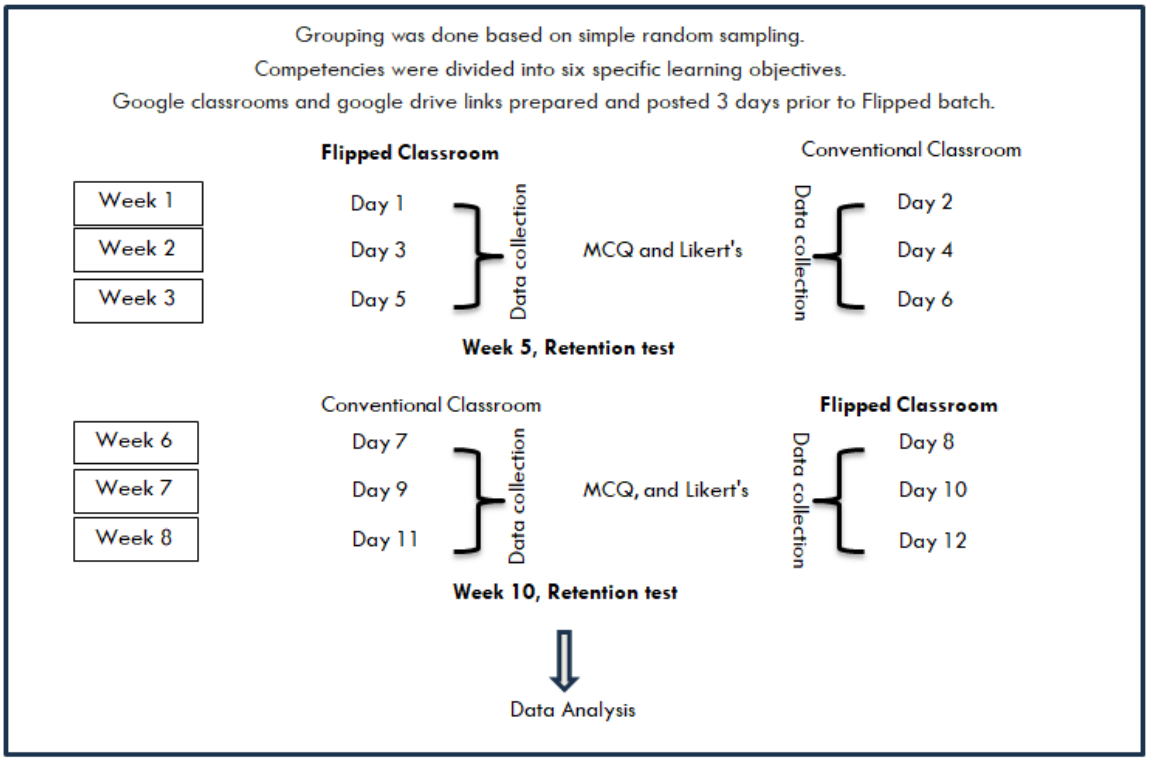

Figure-1: Showing the flow chart of study

Statistical Analysis:

Each score of similar topics held with both flipped and conventional mode were compiled to derive the mean and standard deviation which was later subjected to Student t-Test analysis. And for assessing the knowledge retention Student t-Test and paired T test were used (GraphPad) among both group and same group respectively.

RESULTS

Table-1: Topic wise stratification of the difference in mean scores between the two groups.

Sr No	Method	Score Obtained (Mean ± S.D)	T-value	p value	Interpretation
Topic 1	Flipped Classroom	7.69 ± 1.50	1.8342	0.0697	Difference is not statistically significant.
	Conventional Classroom	8.25 ± 1.56			
Topic 2	Flipped Classroom	4.87 ± 1.01	3.9831	0.0001*	*p value is statistically significant.
	Conventional Classroom	3.98 ± 1.20			
Topic 3	Flipped Classroom	6.96 ± 1.16	3.8216	0.0002*	*p value is statistically significant.
	Conventional Classroom	5.84 ± 1.79			
Topic 4	Flipped Classroom	6.42 ± 1.79	2.0891	0.0392*	*p value is statistically significant.
	Conventional Classroom	5.68 ± 1.78			
Topic 5	Flipped Classroom	6.97 ± 0.98	1.2448	0.2162	Difference is not statistically significant.
	Conventional Classroom	7.22 ± 1.09			
Topic 6	Flipped Classroom	5.36 ± 1.16	2.1425	0.0346	*p value is statistically significant.
	Conventional Classroom	4.85 ± 1.2			

There was statistically significant difference between the two groups for the topics no 2, 3, 4 and 6. Indicating that the students who were exposed to the flipped classroom scored better compared to the conventional classroom method.

In topic 1 and 5, the students who were exposed to the conventional classroom method scored better compared to the flipped classroom. But this difference was not found to be statistically significant.

Table-2: Retention score analysed among the same study groups.

Sr No	Method	Score Obtained (Mean ± S.D)	T-value	p value	Interpretation
Retention 5th week	Flipped Classroom	6.47 ± 0.73	7.447	0.0001	*p value is statistically significant.
	Flipped Classroom (Retention)	4.74 ± 1.43			
Retention 5th week	Conventional Classroom	6.05 ± 0.89	8.4203	0.001	*p value is statistically significant.
	Conventional Classroom (retention)	3.92 ± 1.468			
Retention 10th week	Flipped Classroom	6.02 ± 0.82	3.7981	0.0004	*p value is statistically significant.
	Flipped Classroom (retention)	5.04 ± 1.46			
Retention 10th week	Conventional Classroom	6.21 ± 0.85	7.0742	0.0001	*p value is statistically significant.
	Conventional Classroom (Retention)	4.31 ± 1.56			

In both the flipped classroom and conventional classroom method groups it was noticed that the retention score has decreased which is statistically significant.

Table-3: Retention score analysed among both study groups.

Sr No	Method	Score Obtained (Mean ± S.D)	T-value		p value	Interpretation
Retention 5th week	Flipped Classroom (Retention)	4.71 ± 1.42	2.7357		0.0074*	*p value is statistically significant.
	Conventional Classroom (Retention)	3.92 ± 1.47				
Retention 10th week	Flipped Classroom (retention)	5.04 ± 1.42	2.5938		0.011	*p value is statistically significant.
	Conventional Classroom (retention)	4.24 ± 1.57				

The retention score was higher among the students who were exposed to the flipped classroom when compared to that of conventional classroom method. This difference was found to be statistically significant.

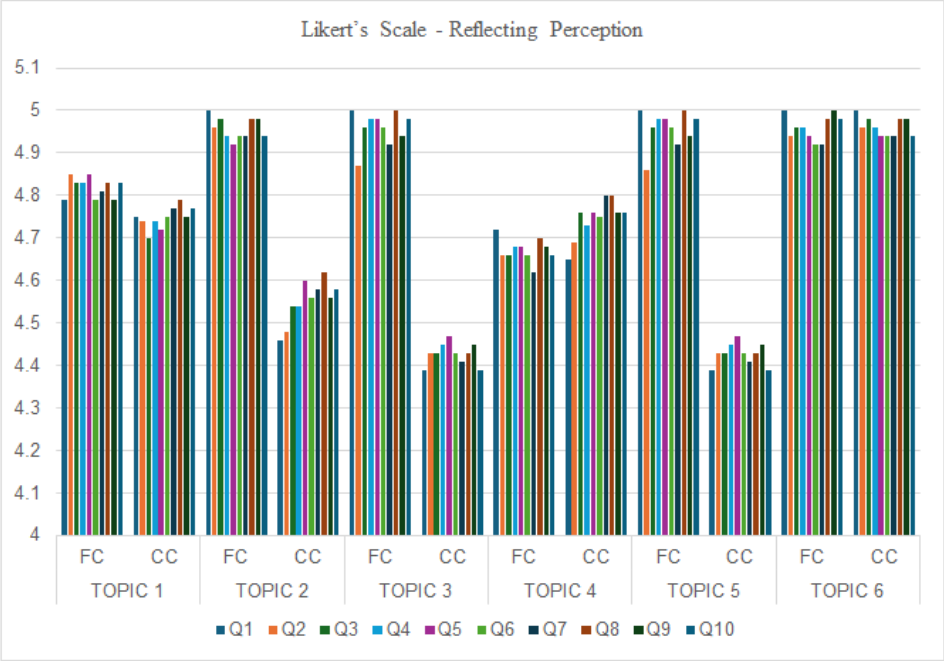

Figure-2: Likert's Scale - Reflecting Perception

DISCUSSION

The present study of teaching and learning method was conducted to compare the learning outcomes of SDL through flipped classroom and conventional lectures in Forensic Medicine among MBBS phase III Part I Students. Results were collected with a multiple-choice questionnaire at the end of each dedicated session and after two weeks of completion of the sessions to analyze the knowledge retention. The study also included Likert scale-based questionnaire for perception analysis after each class.

The self-directed learning through flipped approach flips the traditional classroom model where the study materials are provided beforehand [9] and discussion on the topic during the dedicated hours. Studies have shown that flipped classroom has been found to be more effective than traditional lecture [3, 6-18] which was evident in few instances in this study too. Table 1 shows the benefits in flipped classrooms for topics No 2, 3, 4 and 6. The mean scores indicate that the flipped classroom was better when compared to conventional teaching methods. This difference was seen to be statistically significant.

The difference in mean scores for Topic 1 between the flipped classroom and conventional lecture groups was not statistically significant. While both groups demonstrated high performance, this may reflect factors such as prior cognitive load rather than inherent topic simplicity. Considering the increased faculty workload [11] associated with flipped classroom implementation, traditional lectures may be a more pragmatic option for relatively straightforward topics with limited conceptual complexity.

In Topic 5 in the table Students liked the flipped classroom better but performed better in conventional classroom. Lower scores appeared in the flipped classroom, compared to the conventional way of teaching. This may be attributable to the nature of the subject matter, which involved medico-legal concepts requiring familiarity with technical legal terminology. The provision of multiple learning resources may have increased cognitive load and led to confusion among students despite subsequent in-class discussion. In contrast, it appeared to be simpler from structured, guided instruction, highlighting the need for structured guidance when teaching complex medico-legal content within undergraduate curricula.

The findings highlight the importance of considering the cognitive level of the content being covered before implementing flipped classroom models. There is a need to consider when designing the flipped classrooms, Topics with higher cognitive level, harder to understand topics or competencies involving greater critical thinking and problem-solving skills[5] could be avoided from being dealt from the flipped classroom method. Which in fact should motivate facilitators to focus more on these subjects when providing instruction in settings where the ratio of students to facilitators is generally smaller, which could be a conventional small group discussion or teaching.

It should also be noted that for certain topics, particularly those with high instructional complexity, the effort required to design and implement a flipped classroom which requires considerable faculty effort may not be proportionate to the learning gains achieved. For topics where traditional lectures already achieve adequate understanding, selective rather than universal adoption of flipped classroom may be more pragmatic.

Table 2 shows the retention score among the same study groups on the fifth and tenth week. Comparison was made between the scores obtained with the multiple-choice questionnaire-based assessment among the flipped classroom group (A1, A2, and A3 on week 1, week 2 and week 3) to the scores obtained on fifth week to the same group. Similar comparison as made among the conventional classroom group (B1, B2, and B3 on week 1, week 2 and week 3) to the scores obtained on fifth week by the same group. Both the results are statistically significant. Statistically significant results were obtained even in the tenth week between the flipped classroom ($6^{th,}$ 7^{th} and 8^{th} vs 10^{th} week) and conventional classroom ($6^{th,}$ 7^{th} and 8^{th} vs 10^{th} week). The table also shows that the mean scores for both fifth week and tenth has reduced, which suggests that the retention of the cognitive knowledge does tend to decrease with time.

Table 3 is about the assessment done to reckon the retention among both groups. Assessment was done after two weeks of classes, on week five for the flipped group (A1, A2, A3) as well to the conventional group (B1, B2, and B3) by clubbing the multiple-choice questions used earlier for 20 markers. Later it was converted to 10 markers for analysis purposes. The results showed statistically significance between these two groups.

It can also to noticed that in the table 3, the mean score of flipped class was more than the conventional classes in both the occasions which could suggest that the retention level observed is better with flipped mode of teaching than the conventional classroom or the drop in the mean score of flipped groups to that of conventional group is less, which rejects our null hypothesis [8,12].

Outcomes shown in the Figure 2 reflects that the perception among students for flipped model of classroom is better when compared with the conventional mode of teaching.

CONCLUSION

The flipped classroom tool for SDL approach was associated with improved learner engagement, positive student perception, and enhanced knowledge retention.

However, its effectiveness appeared to be content-dependent. Didactic lectures performed better for recall-based medico-legal topics, particularly those involving higher cognitive load, where structured guidance and closer facilitation are essential. In such contexts, conventional lecture-based teaching or small-group approaches may be more appropriate.

While flipped classroom offers advantages for standalone, introductory, and low-dependency topics, its implementation requires substantial faculty effort, with variable gains in learning outcomes. These findings highlight the need to align instructional design with content complexity and assessment type. Self-directed learning is best facilitated after foundational knowledge is established, with appropriate guidance, rather than as unguided independent study.

Recommendation

Within the Competency-Based Medical Education (CBME) curriculum, which allocates dedicated hours for self-directed learning (SDL), Topic characteristics should decide the teaching–learning method. Therefore, subject experts may identify and align specific competencies that are best suited for SDL-based approaches. Such selective integration, guided by content characteristics and learning objectives, may enhance the effective implementation of SDL within undergraduate teaching. While reserving conventional or guided teaching methods for topics requiring greater structure and facilitation.

Limitations:

1. Small sample size from one institution is utilised.
2. Study was done in a time frame of 15 week.

Budget: All expenses were borne by the principal investigator.

Conflict of interest: Nil.

Ethical considerations:

Ethical clearance was obtained from the institutional ethical committee. Informed consent was obtained from the participants.

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Annexure
Annexure 1.

Participant Information Sheet with Consent Form

I,_____hereby consent to participate in the flipped classroom model as part of my medical education curriculum at KVGMC&H.
Purpose of the Flipped Classroom Model: The flipped classroom model is designed to enhance student learning by shifting traditional lecture-based instruction to interactive, student-centered learning activities. In this model, students are expected to engage with instructional materials (e.g., pre-recorded lectures, readings, online modules) outside of class and participate in active learning exercises, discussions, and collaborative projects during class sessions.

Description of Participation: As a participant in the flipped classroom model, I understand that I am responsible for, Reviewing assigned materials and completing pre-class activities before scheduled class sessions.
Actively participating in class discussions, problem-solving activities, and group exercises during scheduled class sessions. Demonstrating knowledge and understanding of course content through assessments, assignments, and evaluations as outlined by the course instructor(s).

Benefits of Participation: Participation in the flipped classroom model offers several potential benefits, including:

- Enhanced engagement with course content through active learning strategies. Opportunities for collaborative learning and peer interaction, Development of critical thinking, problem-solving, and communication skills. Flexibility in accessing instructional materials and completing coursework at my own pace.

- **Risks and Discomforts:** While participation in the flipped classroom model is generally considered safe and beneficial, potential risks and discomforts may include Increased workload due to self-directed learning outside of class, Challenges in managing time and balancing coursework with other responsibilities, Discomfort or anxiety associated with participating in group discussions or presenting ideas in class.
- **Confidentiality and Data Usage**: Any information shared or produced during class discussions, group activities, or assessments will be treated with confidentiality and used solely for educational purposes. Personal identifying information will be kept confidential in accordance with applicable privacy laws and institutional policies.
- Voluntary Participation and Withdrawal. Participation in the flipped classroom model is voluntary, and I have the right to withdraw from participation at any time.
- **Contact Information:** If I have any questions, concerns, or complaints about my participation in the flipped classroom model, I may contact: Dr Bharath Shetty, Professor, Department of Forensic Medicine, KVGMC&H, 8951638883, doctorbharathshetty@kvgmch.org
- By signing below, I acknowledge that I have read and understand the information provided in this consent form. I voluntarily consent to participate in the flipped classroom model for my medical education.

Date: **Participant Signature:**
Place: **Batch:**

Annexure 2.

Likert's Scale questionnaire for figure 2.

Q1	Please rate your overall satisfaction with the classroom model as a learning approach.	1	2	3	4	5
Q2	The classroom model has improved your understanding of course material?	1	2	3	4	5
Q3	The instructional materials provided for the class in helping you understand the course material was effective.	1	2	3	4	5
Q4	Please rate the quality of class discussions and activities facilitated in the classroom model was excellent.	1	2	3	4	5
Q5	The classroom model promotes active learning and student engagement?	1	2	3	4	5
Q6	How satisfied are you with the level of support and guidance provided by your instructors throughout the course?	1	2	3	4	5
Q7	You are comfortable participating in group discussions and collaborative activities during class sessions?	1	2	3	4	5
Q8	There is a perceived improvement in critical thinking, problem-solving, and communication skills as a result of the classroom model.	1	2	3	4	5
Q9	How satisfied are you with the opportunities for active learning and participation during class sessions?	1	2	3	4	5
Q10	Overall, how do you perceive the effectiveness of the classroom model in enhancing your learning experience in medical education?	1	2	3	4	5

Range: Strongly Dissatisfied -1 to Strongly Satisfied - 5