



Effectiveness of Flipped Classroom as a teaching-learning as compared to Traditional Method amongst first-year medical students of Biochemistry subject

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Abstract

Introduction: Post-introduction of Competency Based Medical Education in 2019; educators of the medical field are now experimenting with different teaching-learning strategies as per recommendations of National Medical Commission; Flipped classroom provides opportunities for interactive teaching and minimizes direct, passive instructional method of traditional type of teaching-learning. Flipped classroom is not practiced on regular basis in all medical colleges in India. Hence, it was necessary to implement the new teaching-learning method of Flipped Classroom and study student's perception to this pedagogical method.

Materials and Method: Pre and Post-test Questionnaires and One Minute Interactive Worksheets used were validated by expert faculty. The participants of the study were first year MBBS students attending the Practical session (n=50 nos) in Biochemistry. The students were exposed to both methods to various topics during the actual study period of 3 weeks.

Result: The statistical analysis and graphs denote that the post-test results of Flipped Classroom were statistically significant $p = 0.02$ ($p < 0.05$) as compared to the pre-test. The reverse results obtained for Traditional Method.

Discussion: The post-test questionnaire of Quantitative analysis were recall and application based therefore the students performed significantly better in Flipped Classroom method as compared to Traditional Method. Similarly, the qualitative analysis of data denoted that the first year medical students showed preference to Flipped Classroom than Traditional Method.

Conclusion: The exalted positive approach exhibited by the first year medical students denotes that Flipped Classroom shall progressively impact their learning during the entire MBBS course since it is an innovative, interactive teaching method that enables active, self-paced learning.

Keywords: interactive, flipped classroom, traditional method, teaching-learning

Introduction

Ever since the introduction of Competency Based Medical Education in 2019, revolutionary transforming aspects have been observed in the patterns of teaching-learning in medical colleges. The imparting of didactic lectures used to occupy more

time in the Traditional Methods of medical curriculum⁽¹⁾.

Educators of the medical field are now experimenting with different teaching-learning strategies as per recommendations of the National Medical

Commission. The backbone of the success of competency- based curriculum are strategies that are learner –oriented, provide opportunities for self – participation, self-direction , higher order thinking and promotion of self –directed learning ⁽²⁾.

Since medical education in India is posed with several challenges due to drastic increase in the number of students and having students with diverse learning patterns. But at the same time there is also rapid advancement in technology. Students of the recent times are both raised in a period known as the “digital era” with technology –assisted learning .Therefore it is anticipated that education shall also be integrated with the usage of technology. On the basis of these facts, the need to adopt a flexible, blended, student-centered teaching –learning strategies that mitigate the drawbacks of traditional method of teaching and promote adequate usage and utilization of digital tools for active learning ⁽³⁾ .

The Flipped Classroom method of teaching-learning is one such method which has been used for years in humanities and now utilized in medical education. Karl Fisch created a video “Shift Happens” and was credited for coining terminologies like “Fisch Flip” and “Flipped Classroom”. With the growth of technology the resource material distributed amongst students maybe video, power points etc. before the class. These resource materials maybe as simple textbooks, print –outs, hand –outs etc. before the class. This model of flipped classroom was proposed by Walvoord and Anderson (1980s) in which the students gain access to the resource materials mentioned prior to the class and focus on the processing part of the learning in-class in the presence of the facilitator ⁽⁴⁾.

In Flipped Classroom teaching, the teacher has role of a facilitator or a mentor by assisting the students to identify, resolve problems, clarify doubts, encourage teamwork, and motivate learning skills in the medical students. Students get feedback as well as apt guidance from the teachers. Flipped Classrooms encourages students to study asynchronously outside the classroom so that the classroom time could be utilized for the application of knowledge, discussion and understanding the advanced concepts. Students get opportunities to enhance upon the higher cognition features of Bloom’s revised taxonomy like analysis and synthesis ⁽⁵⁾.The goal of flipped classroom is accelerated active learning by fostering skills that are

cognitively demanding such as analysis, synthesis and evaluation. Flipped Classroom engages the students in critical thinking and even facilitates their learning by effectively interacting with and learns from peers and the teacher ⁽⁴⁾.

The terms Flipped Learning , Flipped Education and Inverted Classroom are also used for Flipped Classroom and all these mean the shared idea of making the student ready for the session prior to the class by utilizing the resource materials provided or available to them which spares the free time in class to show proficiencies of skill and knowledge ⁽⁶⁾.A significant advantage that flipped classroom meets the diverse learning needs of the students cannot be ignored .The students are permitted to study the contents at their own pace and re-visit challenging concepts as needed. This flexibility is beneficial in medical education, where students often have varying levels of prior knowledge and different learning requirements ⁽⁷⁾.

Flipped Classroom will elevate the confidence; provide independence in learning in dynamic, challenging educational and work environment. It would permit learning to progress beyond mere knowledge acquisition and impacts the learning process itself ⁽⁸⁾.The Flipped classroom provides scope for interactive teaching and minimizes the direct – instructional method of traditional type of teaching learning. This provides immense opportunities for the students to participate actively in discussions or problem solving. A few studies have been conducted pertaining to the effectiveness on implementation of Flipped Classroom in medical education in India. However, this method is not practiced regularly in all medical colleges in India. Hence, it is necessary to implement and understand the new teaching-learning method of Flipped Classroom and student’s perceptions of this pedagogical method ⁽⁹⁾.The rationale for this study is to adopt the new teaching – learning method of Flipped Classroom; implement it in the subject of Biochemistry and compare it with Traditional Method amongst the first year medical college students.

Methodology:

The present study involves Quasiexperimental Research Design. Study participants were First year MBBS students of SSPM Medical College and Lifetime Hospital; 2025 -26 Batch with 150 intake.

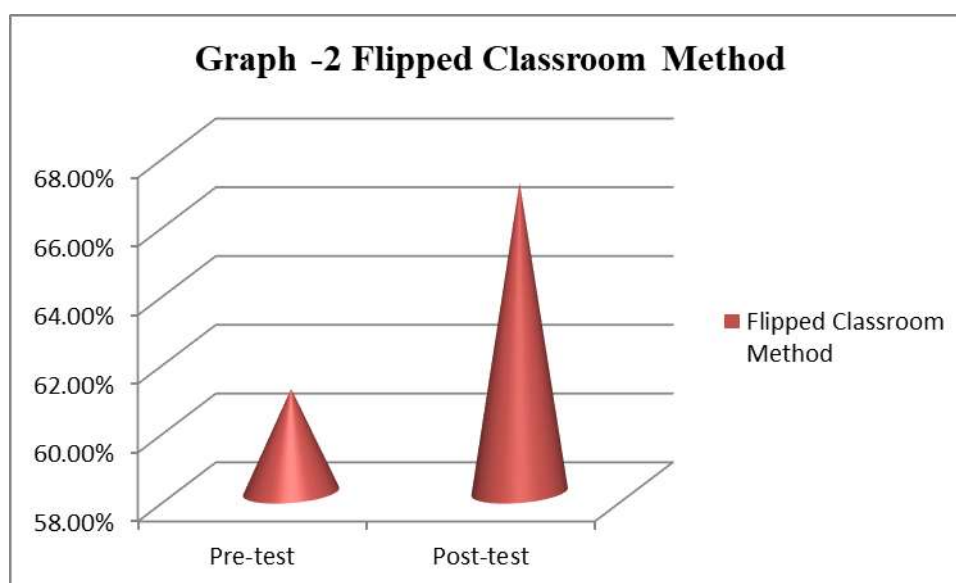
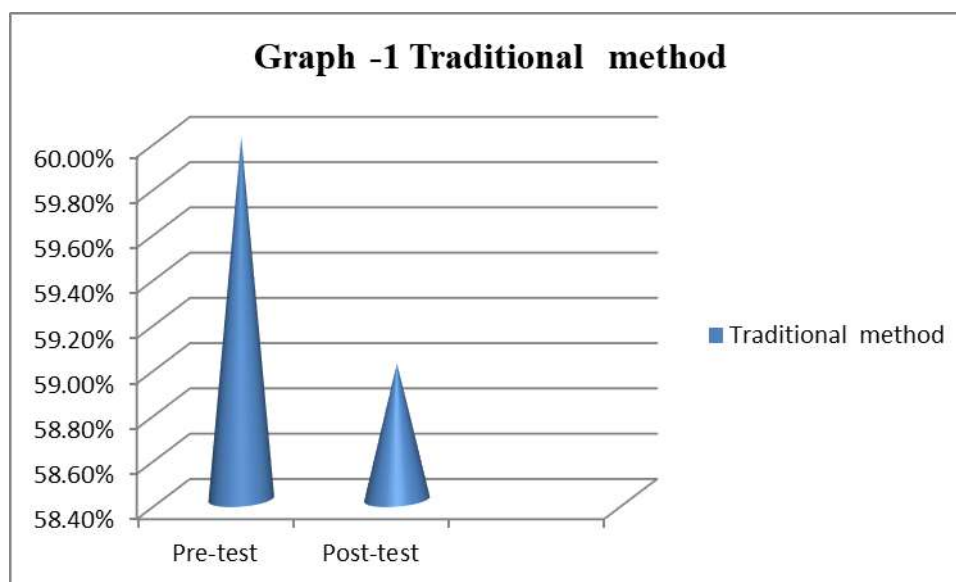
Initially a Pilot study was conducted for 1 week which provided satisfactory results but improvisations had to be made in the tools of research used. The actual study was conducted in a time-frame of weeks. The sample size for each session included 50 students. The sample allocation was such that the students were exposed to both methods and different topics. Inclusion criteria included students who had given Informed Consent and attended the Biochemistry session. Exclusion Criteria was the students not attending the sessions during the study period were excluded. Pre validated Pre-test and Post-test Questionnaires, one Minute

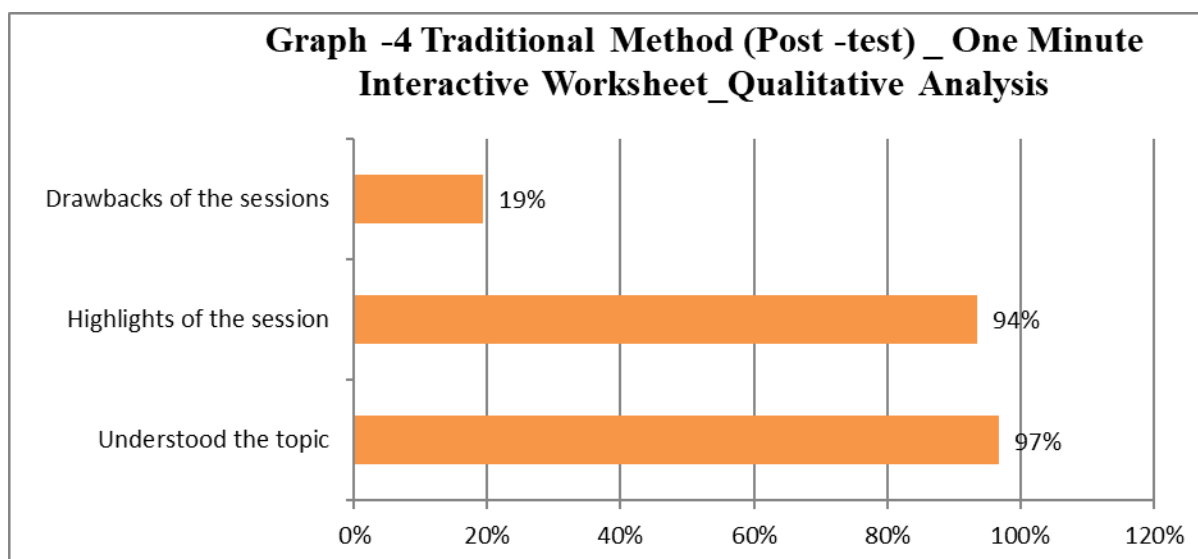
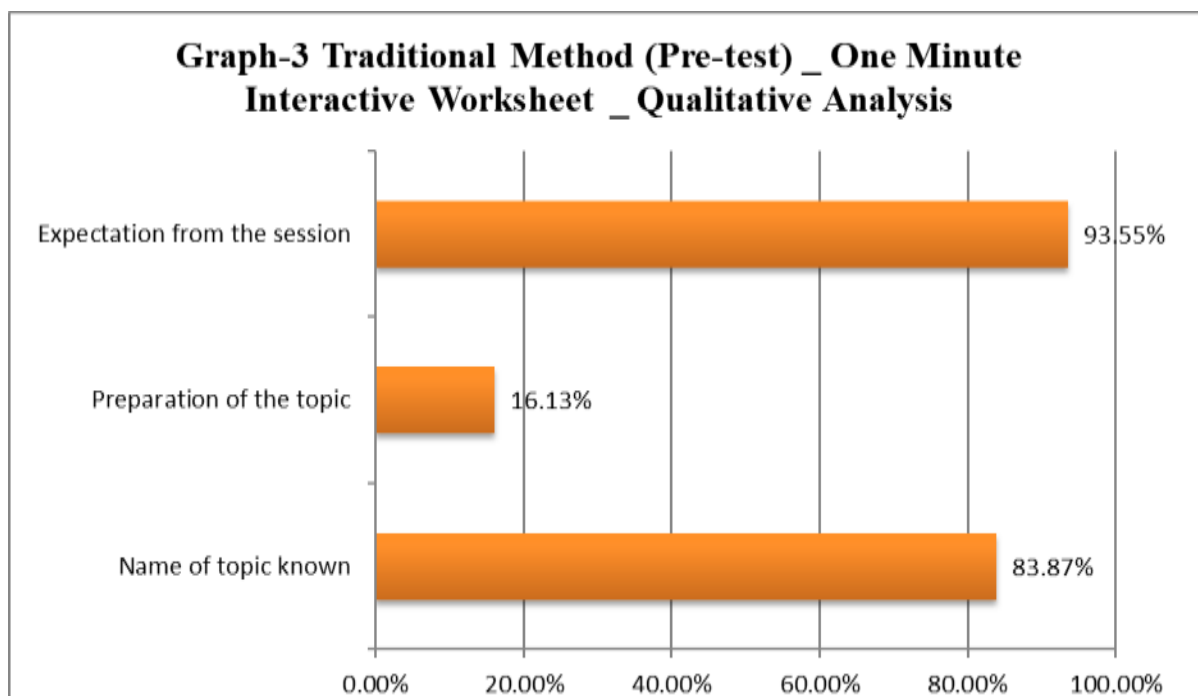
Interactive Worksheets and Checklists all validated by expert Faculty. Statistical analysis was done by frequency distribution on Likert scale and statistical software was Medcalc (Version : 23 .6.2) .

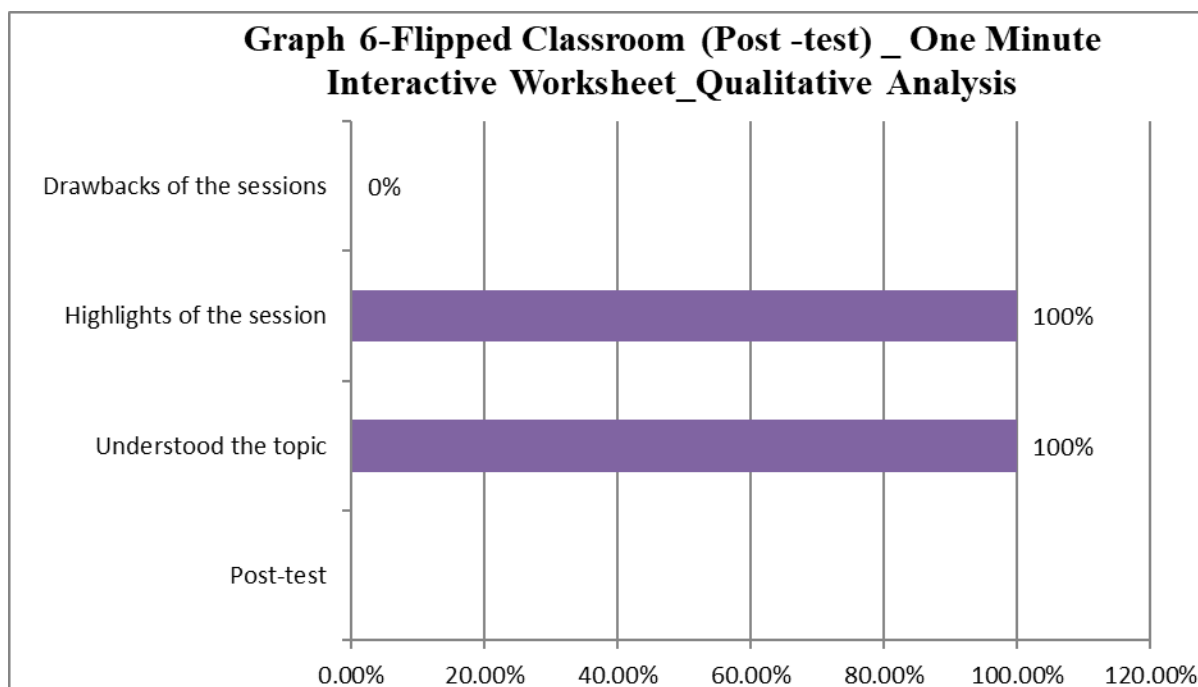
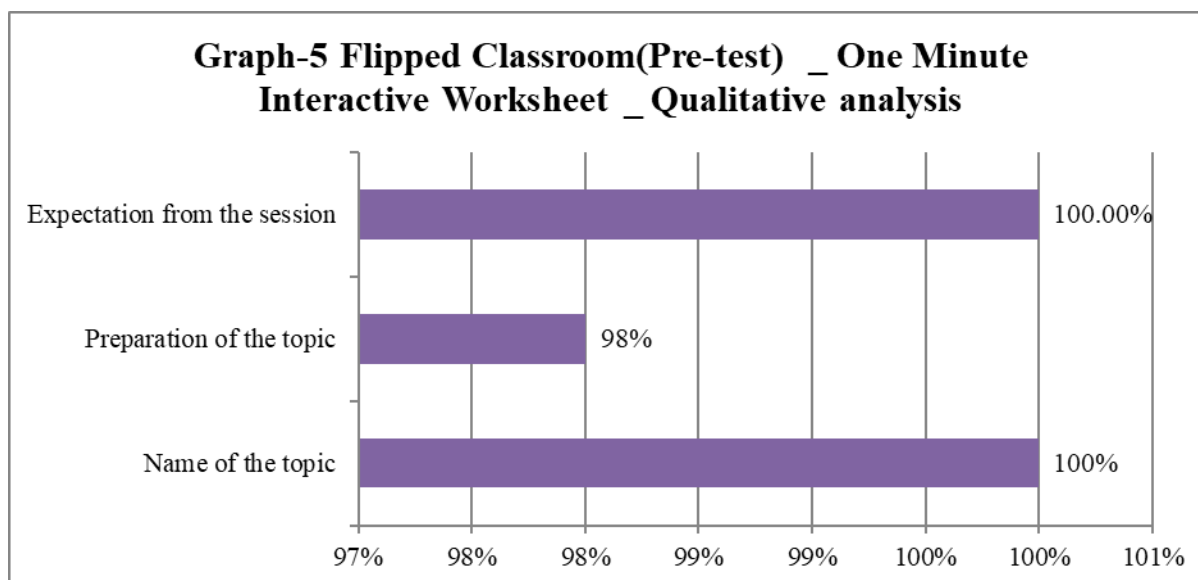
IEC approval : IEC GMC Sindhudurg /37/2025 dated 29/05/2025.

Results:

Statistical Analysis: : 95% CI =1.25% to 14.6%,Chi squared =5.39, DF=1,Significance level =0.02 (<0.05) statistically significant.







Discussion:

In the present study the validated resource materials for the study were provided prior to the Flipped Classroom session in the form of power points / handouts/ text book resources well in advance. This provided the opportunity to study the topic and understand the concepts ahead of the actual in-class session. During the actual in-class session of Flipped Classroom the increase in the levels of confidence, the interactions between student –faculty and the well -coordinated peer –group, team –work in the Question –answer session in class were clear proof that Flipped

Classroom facilitated it. However in case of Traditional Method since the resource materials were not shared with the students; all the concepts and aspects of the topic had to explained in-class in detail without missing the minutest detail. Even results of the present study denote that the Post –test results are statistically significant 0.02 (<0.05) as compared to the Pre-test result in case of Flipped Classroom but the reverse results are obtained for the Traditional Method of teaching-learning.

The one Minute Interactive Worksheet for Post –Test of flipped Classroom gave exalted positive response

from students as compared to the Pre-test of Flipped Classroom. Whereas the result were not as remarkable in Traditional Method when compared [Graphs 1 and 2]. According to the present study Flipped Classroom outperforms the Traditional Method in terms of teaching –learning. Due to provision of resource materials well ahead of the session in Flipped Classroom the medical students contribute actively and are more interactive during the in-class session. The responses of the medical students to the Pre-test and Post –test One Minute Interactive Worksheets are suggestive in the favor of usage of Flipped Classroom session and haven't mentioned of any drawbacks in the Flipped Classroom session (Graphs 3& 4). The results obtained in the One Minute Interactive Worksheets by the Traditional Method are not as remarkable when compared to the Flipped Classroom Method [Graphs 5& 6]. The post –test questionnaire of Quantitative analysis were recall and application based therefore the students performed significantly better in Flipped Classroom method as compared to Traditional Method. Similarly, the qualitative analysis of data denoted that the first year medical students showed preference to Flipped Classroom than Traditional Method. During the in-class sessions of flipped Classroom the time was spent in interactions question and answers wherein the students explained the concepts , terminologies, significances and even skills were exhibited which were verified in the form of Checklists. Checklists also showed better outcome for the Flipped Classroom as compared to the Traditional Method. The medical students have expressed strong satisfaction towards the Flipped Classroom than Traditional Method of Teaching – Learning.

In a study by Samaila et al in 2021 it was concluded that students preferred Flipped Classroom more than traditional lecture-based method. Hence Flipped classroom was considered to be an effective teaching –learning pedagogy which improved the quality of learning by exposing students to different learning styles ⁽¹⁰⁾. Whereas in a separate study; Brahma and Enanee in 2021 ; Flipped classroom is an innovative method for medical education should be incorporated into the medical curriculum; as they have conducted a study in surgery subject ⁽¹¹⁾.

As per a metanalysis conducted by Prudente and Sablan in 2022 , Flipped Classroom Method was found

to be significantly improve academic achievement of students even better than the Traditional Method ⁽¹²⁾.

In a study by Patel JD et al in 2023 they reported that students performed significantly better on utilizing Flipped Classroom and scored better marks in medical biochemistry and showed positive approach towards the new teaching-learning method as compared to the traditional didactic lectures ⁽¹³⁾.

Similar study by Patel DS et al in year 2024 it was understood that Flipped Classroom Method encourages students towards self-studies , better communication skills , group tasks , interactions, active –learning as compared to Interactive Lectures ⁽¹⁴⁾ .

Siddiqui et al in year 2024 also suggested of the fact that Flipped classroom approach improved the student performance and learning experience as compared to the conventional method ⁽¹⁵⁾.

In a study by Fareha et al in 2024 it was noted that Flipped Classroom teaching is acceptable and has high satisfaction levels amongst medical students. Although, in the beginning, investment of extra time and energy by the faculty involved that serve as facilitator is required ⁽²⁾.

Recently last year in 2025 it was reported by Shilpasree et al that Flipped Classroom can be considered as an effective alternative to traditional lectures as it enhances student engagement, active learning and academic performance. Students also considered Flipped classroom as an excellent approach as compared to traditional lecture method ⁽³⁾.

The advent of the Flipped Classroom as an exemplary educational strategy holds promise for improving the medical students in terms of learning outcomes, learner engagement and critical thinking skills. For the successful implementation and adoption of Flipped Classroom consideration of variables such as curriculum design, technological infrastructure, faculty development and student's co-operation is imperative Flipped Classroom ensures active learning by the usage of technology, and student centered techniques but there has to be a striking balance between self –study and significant face –face interaction, maximizing the advantages of both elements ⁽¹⁶⁾.

This study is the first documented evidence regarding the Flipped Classroom Method in the first author's institution. The teaching –learning method had a positive change in the learning habits of the first year medical students in the subject of Biochemistry. Simultaneously, due to the learning impact due to the Flipped Classroom Method; it has been agreed upon that the same teaching –learning method shall be conducted in the second year too. This plan is to progressively impact their learning.

However, this study is conducted only in one medical college, whereas involvement of multiple medical colleges will further ascertain the results. The present study was conducted in session that included a small group of students only hence the interactive mode and group dynamics were excellent. Hence, the faculty should be able to co-ordinate and facilitate the learning process by including all the students in the group whether small or large.

Conclusion: The exalted positive approach exhibited by the first year medical students denotes that Flipped Classroom shall progressively impact their learning during the entire MBBS course since it is an innovative, interactive teaching method that enables active, self –paced learning.

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