

## Does the Flipped Classroom Method Enhance the Learning of Undergraduate Medical Students: A Review

Article by Arulsamy Anand

Vice Chancellor, Texila American University, East Bank Demerara, Guyana

Email: vc@tau.edu.gy

### Abstract

**Objective:** *There has been a remarkable transformation in medical education, more so with the advent of technology into education and also because of the certain regulatory bodies' requirements. One among the transformation is the flipped classroom method. More and more schools have started to use flipped classroom (FC) teaching approach in an effort to enhance student's active engagement in learning. The aim of this review is to examine the efficacy of the FC model over traditional lecture methods*

**Methods:** *A literature search was conducted using the major electronic databases on researches published from 2016 to 2018. Peer-reviewed papers were screened and reviewed according to explicit inclusion criteria. A total of 426 study were sourced and out of which only 18 were chosen for the review and analysis based on the inclusion and exclusion criteria*

**Results:** *Out of the 18 study chosen study 10 of them explicitly stated that the flipped classroom approach in health professions education yields a significant improvement in student learning compared with traditional teaching methods, however 8 studies stated that FC did not have significant advantages over the lecture methods rather reported more burden and pressure than those from the traditional lectures*

**Conclusion:** *Flipped classroom teaching and learning pedagogy is one of the effective ways of enhancing student engagement and learning, however, this would be more effective only if students are motivated and as such FC does not seem to address the less motivated and thereby engagement of the students is likely to be the same as in other traditional methods*

**Keywords:** *flipped classroom, learning methods. Lecture-based, student's engagement.*

### Introduction

The flipped classroom is an innovative pedagogical approach that focuses on learner-centered instruction.[8] FC is the result of assigning didactic material to learners before class time while using the face-to-face time for more active learning strategies such as reflection, group projects, or discussions. Core elements of an FC include assigned pre-class content, formative assessment, working on learning gaps, developing competency, and the teachers' role as a guide on the side. Studies show that video lectures slightly outperform in-person lectures, with interactive online videos doing even better. Online homework is just as effective as paper-and-pencil homework. According to *Tucker (2012)*, students utilize the time in class to work through problems, advance concepts and engage in collaborative learning. Research also shows that using class time for active learning versus lecture provides opportunities for greater teacher-to-student mentoring, peer-to-peer collaboration and cross-disciplinary engagement. [8]

Ideally, Teachers who use the 'flipped classroom approach' reverse the role of school work and homework; they achieve this by either recording their lectures or using already available video lectures from the internet. Students gain access to their subject videos through Learning Management System prior to the classes, and they watch these lectures and prepare for their classes outside the classroom. During the class hour, normally called as, In Class Session [ICS], the teacher administers reef polling to assess the students' knowledge on the topic. During the ICS the teacher ideally administers 10 or more questions through reef polling, and the teacher gets to see the results instantaneously. In the event of the majority of students not getting the correct answer, the students will be split into small groups for discussion on the topics where they have not scored correctly. In case if the students further need

clarification on the topics then the teacher would conduct a focused mini-lecture for about 10 to 12 minutes.

The flipped classroom has been gaining popularity in recent years. In theory, flipping the classroom appears sound: passive learning activities such as unidirectional lectures are pushed to outside class hours in the form of videos, and precious class time is spent on active learning activities.[13] But does using the flipped classroom approach in medical schools really enhance students learning? Most of the researches cite a positive perception of the students on flipped classroom methods, however, this does not necessarily imply that this instructional approach will significantly enhance student's engagement and improve learning. There are also several barriers to implementing the flipped classroom, which includes access to resources, time, technical support, teacher beliefs, teacher readiness, overall support, and leadership. Technology drawbacks are always a factor when choosing to use technology as a truly integral part of learning. Technology failure—power, software crashes, and Internet connectivity—will inevitably occur from time to time. Teachers must consider back up plans when issues arise. Another fear of some educators is that the increasing use of computers in the classroom threatens to decrease the intimacy between students and teachers, and with it, teacher morale. [19]

The uncertainty about the effectiveness of the flipped classroom approach over the traditional lecture method provided the impetus for the current review. We opted to study the efficacy of flipped classrooms with traditional classrooms because the latter is still widely used in medical schools worldwide.

## Methods

Articles from the various digital database were sourced, 426 related articles were identified from Pubmed, Biomed Central and Google scholar. The articles were chosen only from 2016 to 2018 so as to obtain a more recent perspective.

### Eligibility criteria

To examine the possible effects of the flipped classroom on student achievement, a review was done on eligible articles. The eligibility criteria are as follows:

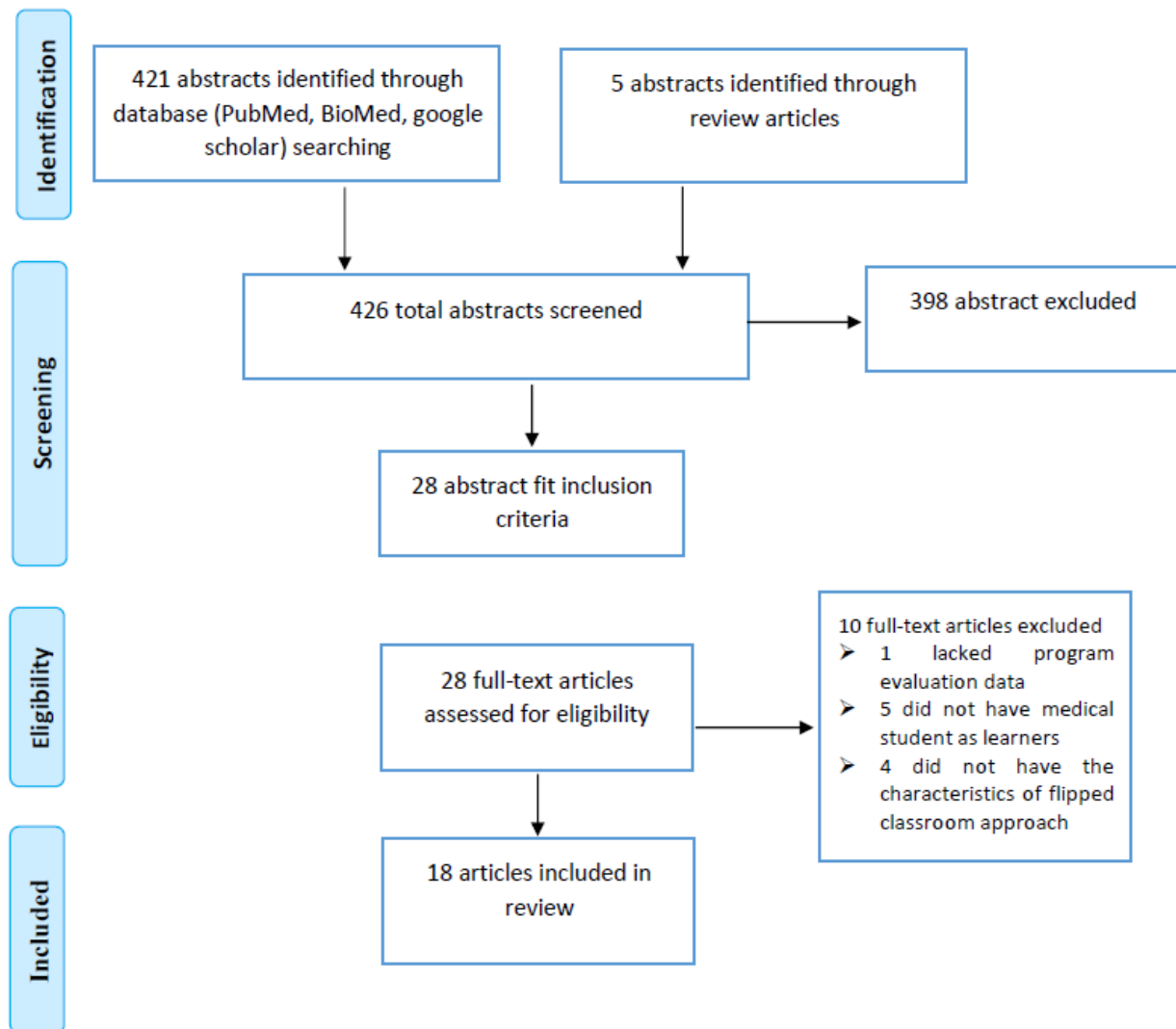
**Inclusion:** The objectives of the studies should be primarily focused on the efficacy of the FC model over traditional lecture-based.

**Exclusion:** The articles were excluded if the study was not conducted on undergraduate medical education and if the data was incomplete.

### Study selection and data extraction

The title and the abstract of various studies from the initial search were screened in order to derive a primary set of full articles for the proposed final review. Further, the author verified the relevance of the full article and came into a conclusion to include the article for the final review. To extract the data, the author looked for information including authors of the study, publication year, location in which the study was conducted, subject topic, participant sample, study design, and details of the flipped classroom implementation such as the uses of video lectures and in-class session activities. To reach consensus, the discrepancies between the extracted data of the two researchers were reviewed, discussed, and resolved prior to data entry and analysis.

The initial search strategies yielded 426 original candidate articles, but after abstract review, 28 articles remained eligible for inclusion. Among the common reasons for article exclusion were the following: the learners described were not medical students and did not focus on the efficacy of the FC in enhancing the learning. After reviewing full texts, an additional 10 studies were excluded for reasons including lack of program evaluation, nonmedical student learners, and insufficient characteristics of the flipped classroom approach (Figure 1). As a result, 18 articles were selected for inclusion in this review.



**Figure 1.** Search process by data source, stage, and yield

## Results

Out of the 18 articles reviewed 55% of the study found FC to be advantageous and enhanced learning. The following are the findings

1. The findings reveal that the FC is a promising teaching approach to increase learners' motivation and engagement. The most frequently reported advantage of the flipped classroom is the improvement of student learning performance [1]
2. In addition, the flipped classroom approach was proven to be more effective when instructors used quizzes at the start of each in-class session. More respondents reported they preferred flipped to traditional classrooms. [9]
3. Current evidence suggests that the flipped classroom approach in health professions education yields a significant improvement in student learning compared with traditional teaching methods. [9]
4. It was observed from the responses of the students of a particular survey, that flipped learning is helpful for the interaction and collaboration in the classroom
5. The FC method is associated with greater academic achievement than the lecture-based approach for higher-level learning outcomes, which has become more obvious in recent years.
6. A study was done with ophthalmology students, comparing the effectiveness of the flipped classroom and the traditional lecture-based approach. More students in the flipped group agreed that FC helped to promote their learning motivation, improve their understanding of the course materials, and enhance their communication skill and clinical thinking. Students from the flipped

group performed better on the posttest over the ocular trauma-related questions when compared to those from the traditional group. [20]

7. The redesigned course, which integrates the flipped classroom approach, improved student test performance and perceptions of the learning experience during the first year of implementation.
8. This study provides evidence that the Inverted Classroom Method of teaching clinical microbiology can replace the traditional method without loss of student performance. Respondent perceptions of the inverted classroom were positive, with students favoring the flexibility
9. In conclusion, medical students have generally expressed strong satisfaction with early applications of the FC to undergraduate medical education, and generally, prefer this method to lecture-based instruction.
10. Flipped classroom teaching and learning pedagogy is an effective way of enhancing student engagement and active learning. Thus, this pedagogy can be used as an effective tool in medical schools.

Eight out of the eighteen reviews did not find it to be advantages nor did they find it better than the traditional lecture methods, their results are given below

1. We found a number of challenges in the flipped classroom model. The majority of these are related to out-of-class activities, such as much reported inadequate student preparation prior to class.
2. More students agreed that FC helped to promote their learning motivation, improve their understanding of the course materials, and enhance their communication skill and clinical thinking. However, students in the FC did not show a preference for this method of teaching, and also reported more burden and pressure than those from the traditional lectures.
3. Some students have expressed concerns with the FC and noted that suboptimal student preparation and insufficient direction and structure during active learning sessions may limit the student-centered benefits.
4. Our findings also reveal that in general, students resist learning the topics on their own outside the classroom in the FC Model. Instead, they prefer learning the topics from the instructor inside the class. The problems encountered in this model can be categorized into three main titles: Motivation, Content, and Learning. As reported by our participants, in a new learning environment, students who are typically willing to put effort into learning tend to have difficulty getting motivated. The students studying outside the classroom stated they experienced problems regarding the difficulty of the contents and insufficiency of the resources. Among the other problems were lack of time to study outside the class, difficulty in understanding the topics, and learning difficulty. [4]
5. Studies suggest the lack of strong evidence for the effectiveness of FCs in promoting knowledge acquisition above and beyond the traditional learning methods.
6. Competency assessment after simulation-based training in ACLS undergone by senior medical students randomly assigned to flipped and traditional classrooms showed no statistical difference in competency between the two groups.
7. Meta-analyses revealed that the FC had significantly better outcomes than the lecture-based method in examination scores (post-intervention and pre-post-change) and course grades, but not in objective structured clinical examination scores. [6]
8. The FC method is associated with greater academic achievement than the lecture-based approach for higher-level learning outcomes, which has become more obvious in recent years. However, results should be interpreted with caution because of the high methodological diversity, statistical heterogeneity, and risk of bias in the studies used. Future studies should have high methodological rigor, a standardized FC format and utilize assessment tools evaluating higher cognitive learning and behavior change to further examine differences between FC and Lecture-Based learning.

## Discussion

Benjamin Franklin once stated, “Tell me and I forget, teach me and I may remember, involve me and I learn.” Franklin’s quote embodies the core of the flipped classroom concept. As the call for innovative teaching-learning methods becomes stronger, the use of the flipped classroom approach is becoming increasingly popular in health professions education. However, there has not been any detailed review

published that specifically examines the effect of flipped classroom versus traditional classroom on student learning. This study examined the findings of comparative articles through analysis in order to summarize the overall effects of teaching with the flipped classroom approach. We focused specifically on a set of flipped classroom studies in which pre-recorded videos were provided before face-to-face class meetings. The findings reveal that the most frequently reported advantage of the flipped classroom is the improvement of student learning performance. Students recognized the benefits of being able to revisit the online resource (in this case, the video) pre-lecture. They indicated that they found the 'pause' and 'rewind' functions in the video recording very useful in helping them revisit points in the lecture, something which is not possible to do so in a lecture delivered in a conventional way. Participating in the lecture's active learning activities (e.g. group discussions and brainstorming activities) was beneficial to learning new concepts. [15] We also found a number of challenges in this model. The majority of these are related to out-of-class activities, such as much reported inadequate student preparation prior to class. Although students generally perceive that FC approaches can improve their learning and knowledge, this has not been conclusively shown via performances on assessment tools, which may be related to caveats with the assessment tools used. [16] Flipped classroom also places a huge burden of learning the concepts on students, whereas previously it was the responsibility of teachers to ensure that the learning process is happening. In their research, *Chen Hsieh et al. (2017)* pointed out that many students had difficulties adapting to the FC Model since it is a new approach. Most of the students stated that the course included heavily-loaded requirements, and they did not have time to watch the videos outside the class. Not all students have the same grasping power. Through FC, students would depend heavily on self-directed learning. This undermines the opportunity to discuss and clarify doubts with the lecturer. While the flipped classroom method poses a lot of advantages, it does have a few shortcomings, as were discussed. Considering medical schools, in particular, the flipped classroom method must be used with caution. In medical school, students will be faced with the task of covering vast material, which is hard enough to do with didactic lectures. In such a scenario, employing FC, which relies mostly on SDL (self-directed learning) would be cumbersome and futile for the students. Hence, we would suggest that a hybrid of lectures and FC be used in the course, where the larger and more important topics are covered with lectures, and smaller, more basic topics are handled by students themselves. This will ensure that students don't miss out on understanding important topics, and are not overburdened with a responsibility beyond their capability. At the same time, they can experience the FC method and move forward as they feel comfortable.

### **Limitations of the study**

One of the major limitations of this review is that the long terms benefits and shortcomings of flipped classroom were not considered. The real impact of the flipped classroom can only be understood through long term implementation and subsequent monitoring of the students' academic performances.

### **Conclusion**

One of the common challenges in the medical education is to actively engage students in learning activities and the medical education transformers have always been coming up with various innovations like Problem Based Learning, Team-Based Learning, Blended Learning, Web-Based Learning, Self-directed Learning, Small Group Discussion and Flipped Classroom teaching. The FC seems to be a promising teaching approach to increase learners' motivation and engagement and currently adopted by many schools, however, as known, there is no single comprehensive method that would suit all learners, teachers, and institution. In the opinion of the author, the flipped classroom concept should be part of the entire educational package, used in conjunction with other modes of instruction.

There could be many new methods in teaching and many newer approaches to teaching and learning and they can never replace or become better than the traditional lecture method, which has existed for centuries and will exist for centuries, at least at the undergraduate levels.

## Disclaimer

This disclaimer informs readers that the views, thoughts, and opinions expressed in the text belong solely to the author, and not necessarily to the author's employer, organization, committee or other group or individual.

## References

- [1]. Akçayır, G. and Akçayır, M., 2018. The flipped classroom: A review of its advantages and challenges. *Computers & Education*, 126, pp.334-345.
- [2]. Burnham, K.D. and Mascenik, J., 2018. Comparison of student performance and perceptions of a traditional lecture course versus an inverted classroom format for clinical microbiology. *Journal of Chiropractic Education*, 32(2), pp.90-97.
- [3]. Cabı, E., 2018. The Impact of the Flipped Classroom Model on Students' Academic Achievement. *International Review of Research in Open and Distributed Learning*, 19(3).
- [4]. Chen Hsieh, J.S., Wu, W.C.V. and Marek, M.W., 2017. Using the flipped classroom to enhance EFL learning. *Computer Assisted Language Learning*, 30(1-2), pp.1-21.
- [5]. Chen, F., Lui, A.M. and Martinelli, S.M., 2017. A systematic review of the effectiveness of flipped classrooms in medical education. *Medical education*, 51(6), pp.585-597.
- [6]. Chen, K.S., Monrouxe, L., Lu, Y.H., Jenq, C.C., Chang, Y.J., Chang, Y.C. and Chai, P.Y.C., 2018. Academic outcomes of flipped classroom learning: a meta-analysis. *Medical education*, 52(9), pp.910-924.
- [7]. DeLozier, S.J. and Rhodes, M.G., 2017. Flipped classrooms: a review of key ideas and recommendations for practice. *Educational Psychology Review*, 29(1), pp.141-151.
- [8]. Gilboy, M.B., Heinerichs, S. and Pazzaglia, G., 2015. Enhancing student engagement using the flipped classroom. *Journal of nutrition education and behavior*, 47(1), pp.109-114.
- [9]. Hew, K.F. and Lo, C.K., 2018. Flipped classroom improves student learning in health professions education: a meta-analysis. *BMC medical education*, 18(1), p.38.
- [10]. Jung, H., An, J. and Park, K.H., 2018. Analysis of satisfaction and academic achievement of medical students in a flipped class. *Korean journal of medical education*, 30(2), p.101.
- [11]. Koo, C.L., Demps, E.L., Farris, C., Bowman, J.D., Panahi, L. and Boyle, P., 2016. Impact of flipped classroom design on student performance and perceptions in a pharmacotherapy course. *American journal of pharmaceutical education*, 80(2), p.33.
- [12]. Larry Hurtubise, Elissa Hall, Leah Sheridan and Heeyoung Han (2015) The Flipped Classroom in Medical Education: Engaging Students to Build Competency *Journal of Medical Education and Curricular Development*
- [13]. Mok, H.N., 2014. Teaching tip: The flipped classroom. *Journal of Information Systems Education*, 25(1), p.7.
- [14]. Moraros, J., Islam, A., Yu, S., Banow, R. and Schindelka, B., 2015. Flipping for success: evaluating the effectiveness of a novel teaching approach in a graduate level setting. *BMC medical education*, 15(1), p.27.
- [15]. Musib, M.K. (2014). Student perceptions of the impact of using the flipped classroom approach for an introductory-level multidisciplinary module. *CDTL Brief*, 17(2), 15-20
- [16]. Ramnanan, C.J. and Pound, L.D., 2017. Advances in medical education and practice: student perceptions of the flipped classroom. *Advances in medical education and practice*, 8, p.63.
- [17]. Riddell, J., Jhun, P., Fung, C.C., Comes, J., Sawtelle, S., Tabatabai, R., Joseph, D., Shoenberger, J., Chen, E., Fee, C. and Swadron, S.P., 2017. Does the Flipped Classroom Improve Learning in Graduate Medical Education?. *Journal of Graduate Medical Education*, 9(4), pp.491-496.
- [18]. Rotellar, C. and Cain, J., 2016. Research, perspectives, and recommendations on implementing the flipped classroom. *American journal of pharmaceutical education*, 80(2), p.34.
- [19]. Snowden, K.E., 2012. Teacher perceptions of the flipped classroom: Using video lectures online to replace traditional in-class lectures (pp. 1-71). Denton, TX: University of North Texas.
- [20]. Tang, F., Chen, C., Zhu, Y., Zuo, C., Zhong, Y., Wang, N., Zhou, L., Zou, Y. and Liang, D., 2017. Comparison between flipped classroom and lecture-based classroom in ophthalmology clerkship. *Medical education online*, 22(1), p.1395679.
- [21]. Tucker, B. (2012). The flipped classroom. *Education Next*, 12(1), 82-83.

[22]. Tusa, N., Sointu, E., Kastarinen, H., Valtonen, T., Kaasinen, A., Hirsto, L., Saarelainen, M., Mäkitalo, K. and Mäntyselkä, P., 2018. Medical certificate education: controlled study between lectures and flipped classroom. BMC medical education, 18(1), p.243.