

Flipped Classroom Teaching and Learning Improves Dental Students Performance in Pharmacology

Research Article

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Abstract

Introduction and Aim: Flipped classrooms learning refers to teaching and learning activities where students watch a lecture video outside the class and have hands-on activities in the class. There is growing concern among medical and dental educators that conventional modes of teaching neither create interest in students nor imparts a life-long respect for learning. The aim of this study was to measure the effectiveness of a conventional teaching method versus a flipped classroom methodology in pharmacology.

Materials and Methods: The present study was planned for 2nd year professional Bachelor of Dental Surgery students (n=278) studied pharmacology between the years 2015-2017. We have introduced a flipped class based pharmacology teaching and learning from the year 2016 onwards. The annual student's performance in the pharmacology exam for the years 2015 (conventional teaching methodology), 2016 and 2017 (flipped class teach methodologies) was obtained and analyzed using Graph Prad Prism software version 5.00.

Results: The average marks obtained after implementing flipped classes for the years 2016 and 2017 are 147.6 ± 1.28 ($p < 0.6066$) and 154.95 ± 1.015 ($p < 0.0973$) respectively as compared to conventional teaching methodology in the year 2015 (147.7 ± 1.228). The average marks and distinctions secured by the students belong to 2017 flipped class learning batch was increased when compared to students with conventional teaching methodologies 2015 batch.

Conclusion: This study suggests that flipped class learning is a contemporary model to be applied in teaching-learning activities for higher education.

Keywords: Dental Education; Dental Graduate; Teaching Method; Interactive Learning.

Introduction

There is growing concern among medical and dental educators that conventional modes of teaching medical/dental students through conventional lecture-based curricula neither, create interest in students nor imparts a life-long respect for learning [1]. Therefore, the conventional teaching and learning methodology in pharmacology needs to be modified. In recent years, the flipped classroom has become one of emerging technologies in education and it can be a standard of teaching-learning practice to foster student's active learning in higher education [2]. According to Bishop and Verleger (2013) flipped classroom teaching and learning methodology involves interactive group learning activi-

ties inside the classroom, and direct computer-based individual instruction outside the classroom [3].

In flipped class learning, one of the common advantages for the students is to watch prerecorded subject video lectures prior to attending class [4]. Therefore, we introduced the flipped class based learning in 2016 for undergraduate dental students to expand their interest towards subject and to provide students with a greater combination of activities and such activities may be useful for students to secure high marks and think out of box. The aim of this study was to measure the effectiveness of a conventional teaching method versus a flipped classroom methodology in pharmacology.

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Material and Methods

Study setting

The present study was planned for 2nd year professional Bachelor of Dental Surgery students (n = 278) studied during the years 2015-2017. This study was conducted in department of pharmacology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Chennai, India.

Study design

We have introduced a flipped class teaching and learning from the year 2016 onwards. The annual student's performance for the years 2016 and 2017 was obtained and compared with the conventional teaching methodology (2015).

Flipped classroom based teaching methodology

Each Pharmacology class scheduled for 2 hours. The classes were divided into 20 mins intervals and alternatively allocated for flipped classes and their associated activities (Table 1). The activities commonly given were process oriented guided inquiry learning (POGIL), JIGSAW, puzzle, peer-led, case study and journal discussions, critical pedagogy, quizzes etc. commonly given to students.

Statistical Analysis

The data is presented as mean ± S.E.M. An independent "t" test was performed to compare the mean of two groups using Graph-Pad Prism software (Version-5.00). p<0.05 was considered as significant vs conventional teaching methodology.

Results

Flipped class learning improved the over results in the pharmacology examination.

The grouped frequency distribution for the pharmacology examination scores are presented in Table 2. In the year 2015, out of 92 students, 26 students have secured < 140 marks. While in the year 2016 and 2017, the number of students who score < 140 marks was decreased to 14 and 5 respectively. The number of students who scored marks between 150 -160 was increased in 2016 and 2017 after the introduction of flipped class based learning when compared to conventional teaching methodologies in 2015. Similarly, in the year 2017, nearly 29 students scored in between 161-170 and it was only 10 students with conventional teaching and learning in the year 2015. Interestingly, around 32 students scored >170 marks in 2017 versus only 13 students in 2015. In the year 2017, one student has secured marks in between 181-190.

In the year 2015, 45 students have secured distinctions. After implementing the new teaching and learning methodology i.e, flipped class based teaching/learning in 2016, the number of student's secured distinction was reduced to 38. However, subsequently, in the year 2017, 69 students have secured distinctions (Figure 2).

Discussion

In the context of pharmacology, the undergraduate dental and medical students often finds difficult to remember the drug names and their kinetics and dynamics. Therefore, an effective and interactive mode of teaching and learning methodologies are need of the hour. It has been reported that method and activity based learning increase the students interest towards the subject and their performance [5]. Flipped classrooms are an innovative

Table 1. A model flipped class with time schedule.

Flipped videos	Activity	Flipped videos	Activity	Flipped videos	Activity
20 mins	20 mins	20 mins	20 mins	20 mins	20 mins

Table 2. Grouped frequency distribution for the pharmacology examination scores.

Marks (ci)	Frequency (f)		
	Conventional Learning	Flipped Class Learning	
	2015	2016	2017
111-120	3	3	0
121-130	2	4	1
131-140	21	14	5
141-150	28	32	24
151-160	25	28	32
161-170	10	6	29
171-180	3	5	2
181-190	0	0	1
Total Number of students	92	92	94

Figure 1. Comparative analysis of student's annual performance with conventional and flipped class based teaching methodologies. CTM-Conventional Teaching Methodologies, FCL-Flipped Class Learning. Values are presented as mean \pm S.D. ns-not significant change.

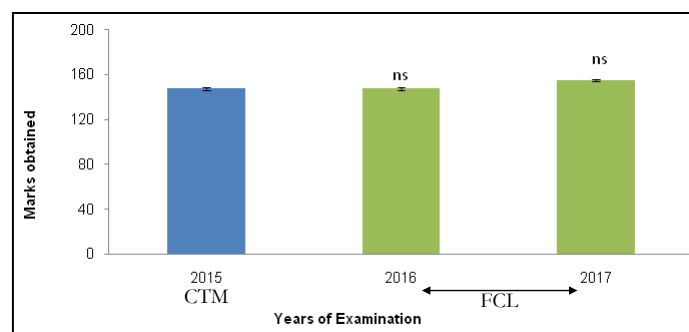
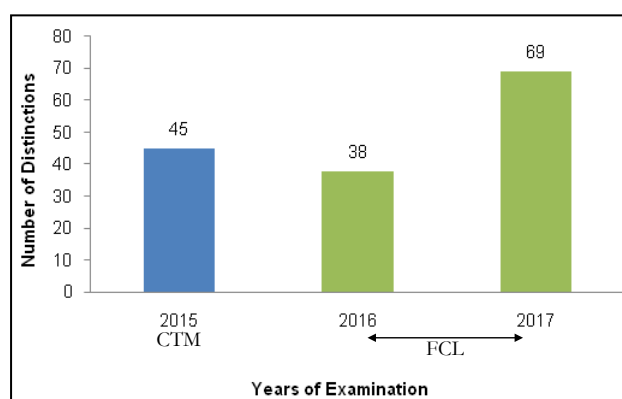


Figure 2. Number of distinction secured by students CTM-Conventional Teaching Methodologies, FCL-Flipped Class Learning.



method of teaching and learning activities, where students watch a lecture video outside the class and have hands-on activities such as closed-ended problems or quizzes and student discussions in the class [6]. The flipped classroom is an instructional method commonly employs group-based activities and interactive students centered learning in the classroom. In clinical and its associated medical teaching, flipped classroom teaching and learning improves students performance and satisfaction [7].

In a previous study, physiology exam averages for students followed flipped class methodology were significantly increased when compared to traditional lecture-based methods [8]. In consistent with the above reports, we found that the student average marks, and distinction secured by them was significantly increased after the introduction of flipped classroom. In our experience and feedback from students, we suggest that flipped class and activities such as closed-ended problems or quizzes, case studies and interactive student discussions were increases memory of students remembering various classes of drug names and motivating them to think out box that likely attributed to the increase in students exam performance.

Conclusion

We suggest that the flipped classroom teaching methodology is highly effective means in which to impart key pharmacological concepts to dental graduate students. In teaching aspect, the main

limitation of flipped class based teaching is the faculties should be technically aware and advanced enough to handle and prepare the pharmacology based flipped classes using latest software. In student's point of view, flipped class learning make students intellectually sound enough to understand the concepts and the lecture videos may useful to listen pharmacology subject videos outside the class room without having text books.

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