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Comparative study on conventional lecture classes versus flipped class in teaching conservative dentistry and endodontics

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ABSTRACT

In the modern era every knowledge providers designs the class in such a way that students understand every possible concepts. In the Dental education system where the students have to conceptualize the lectures as it mandates for them to do day to day dental procedures. The aim of this prospective study is to evaluate students performance university examination of conservative dentistry and endodontics subject. A total of 150 students enrolled in this study from two consecutive academic sessions. In Group I (2015-2016) final year graduate students of 75 students received conventional class room lectures; group II (2016-2017) final year graduate students of 75 students received flipped class room lectures. The curriculums for both the groups were approved from the department of conservative dentistry and endodontics, Saveetha dental college and committee members for education, Saveetha University. At the end of each academic year marks scored out of 200 marks were obtained and subjected to statistical analysis. All the students cleared the university examination held at respective academic years for both the groups. The mean marks obtained for CCR group was 130.93 ± 9.12 and for FCR group was 150.35 ± 10.93 . Independent samples test revealed there is highly significant difference seen ($p < 0.01$). Flipped class room showed promising results when compared to conventional class room groups in conservative dentistry and endodontics subject amongst final year graduate students. Designing the curriculum for flipped class room lectures takes some additional time than conventional classes. The number of distinctions obtained in flipped class room group was higher than conventional class room group.



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INTRODUCTION

Over the years the educational system constantly undergoing paradigm shift in making the students to involve in thought process, problem-based learning, case-based learning and activity-based learning. Lecturing can be the valuable form of learning but at the same time it should not be the only way for the students to learn. The call for reforming the "sage on the stage" (King at al 1993) learning to guide based learning made the way for the student-centered learning.

Flipped class room is a pedagogical method which incorporates the technology and knowledge for teaching purpose (Rahman AA, *et al.*, 2014). Flipped class room or inverted class room has been developed by Lage et al in 2000, where the traditional events in conventional class rooms are shifted entirely outside the class rooms. This new way of approach defines two components: moving the conventional electronically based lecture to home work and the practical oriented questions inside the lecture class (Educause, C., 2012).

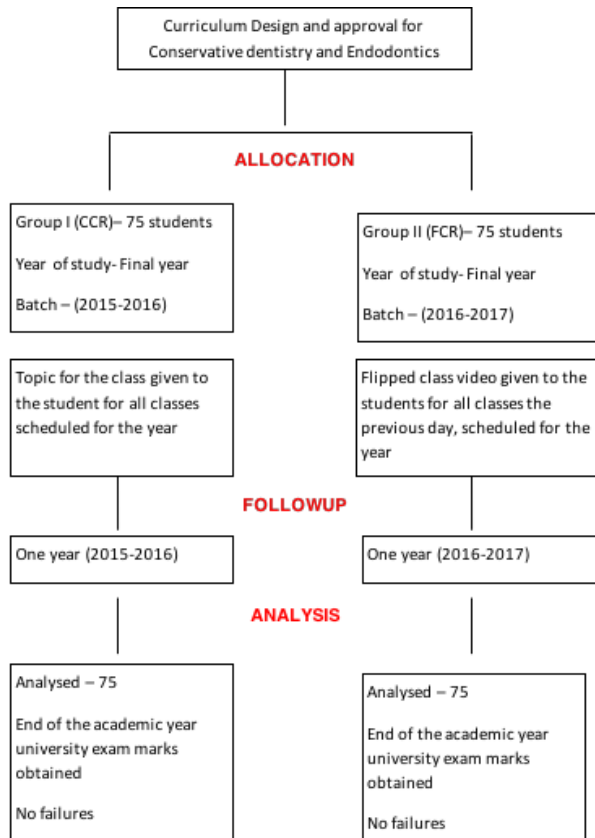


Figure 1: Consort 2010 Flow chart for the trial

Flipped class room are happening in many areas of fields from medical to engineering. These fields rely mainly on application of theoretical knowledge into practice. (Gannod GC, *et al.*, 2008). The majority of flipped class room takes place as pre-class and in-class activities. However, it is imperative that learning should not terminate at the end of class as it should be the ongoing process (Persky AM and McLaughlin JE. 2017). In the modern era, the inquisitives makes the students to browse more books or articles than earlier. Combination of digital lecture and face to face class discussions, the flipped classroom can effectively transform the outcomes, critical thinking and student activities (Eddy SL an Hogan KA 2014; McLaughlin JE, *et al.*, 2014; Persky AM and Pollack GM 2010; Persky AM and Pollack GM 2011).

As with any new techniques in teaching methodology, implementing and executing it makes more

important for the success. No two flipped class will be the same, the success of it requires some utilization of the multimedia and to put all those complex process of learning into smaller and multiple videos (Tucker B. 2012).

Outcomes of previous studies showed that implementing the flipped class amongst students helped in content retention, flexible learning, self-paced learning. However, the overall effectiveness of flipped classes is being debatable in dental education system. This study evaluates the effectiveness of conventional class to flipped class by taking their final year university theory exam marks in conservative dentistry and endodontics in dental students.

MATERIALS AND METHODS

Subjects and Study design

In this study one hundred and fifty students from two consecutive batch of final year dental students majoring the subject of Conservative Dentistry and Endodontics at Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences (SIMATS), Saveetha University.

This prospective study happened in two batches (2015-2016, 2016-2017). In Group I- 75 students received Conventional Class Room (CCR) for 2 hours per week which includes lecturing and question and answer session (2015-2016), in Group II- 75 students received Flipped Class Room (FCR), where the flipped class was given one day prior and students were asked to report the next day, the session held was two hours where lecture, discussion and question and answer session took place (2016-2017).

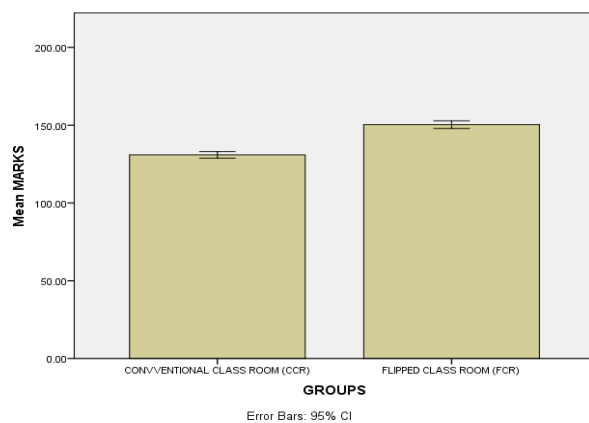


Figure 2: Bar Chart

Curriculum design

The curriculum design was formed by the Department of Conservative Dentistry and Endodontics after getting approval from Head of the Department and Director of Academics, Saveetha University.

Table 1: Distribution of marks

Marks	<120	120-149	150-200
Group I	4	67	4
Group II	0	40	35

Table 2: Academic year details, Mean and standard deviation for all groups

Groups	Name	Academic Year	Students	Mean \pm SD
Group I	Conventional Class Room (CCR)	2015-2016	75	130.93 \pm 9.12
Group II	Flipped Class Room (FCR)	2016-2017	75	150.35 \pm 10.93

Table 3: Independent t test

Groups	95% Confidence interval	t	Sig. (p Value)
Pair Group I	-16.071	-11.813	.000*
Group II			

statistically significant $p < 0.05$

The classes scheduled for CCR group the topic only was given to them a day prior, the next day two

hours didactic lecture was taken followed by question and answer session weekly once by the respective faculty member. At the end of the class the student was given assignment and asked them to submit within a week time.

The class scheduled for FCR group for the flipped class video was given a day prior and the student asked to view. The next day the faculty gave a brief lecture for 20 minutes about the topic and agenda for the class. To encourage the flipped class session the students were divided into 15 per team. Each team were given an unsolved question for in class discussion. After 20 minutes, one representative from each team was asked to present the answers and it was discussed about 15 minutes per team. In the end of the class, the faculty completed the lecture by solving the tough questions raised by the students for 20 minutes.

Data Collection and analysis

At the end of the year university exams were conducted for the students for 200 marks (100 marks for theory and 100 marks for practical) for both the groups, 75 per group respectively.

The marks obtained were then statistically analyzed for independent samples test using SPSS 23 (SPSS inc., Chicago, IL, USA).

RESULTS

A total of 150 students were enrolled for this study, group I CCR - 75 students (batch 2015-2016) and Group II FCR- 75 students (batch 2016-2017) for the subject on Conservative Dentistry and Endodontics. The class attendance for both groups was 100%. All the students in conventional class room group completed the assignments in the stipulated time by the instructor. In the flipped class room group watched the video and read the supplementary class materials assigned by the instructor. The

response rates for both the groups were 100%. All the students were appeared for the university exams (Figure 1).

At the end of the academic year for respective groups university examination was conducted which includes theory and practical examination. The distribution of marks based on class obtained: second class, first class and distinction categorized (Table 1). The marks obtained were analysed statistically. The mean marks obtained for CCR group was 130.93 ± 9.12 and for FCR group was 150.35 ± 10.93 (Table 2), (Figure 2). Independent samples test revealed there is highly significant difference seen ($p < 0.01$) (Table 3).

DISCUSSION

This study conducted in a prospective manner. In this study two consecutive academic sessions of final year students who are eligible in giving university examination in the conservative dentistry and endodontics subjects were chosen. A total of 75 students were enrolled for this study per academic session respectively. Group I (2015-2016) Conventional class room and group II (2016-2017) Flipped class room.

In conventional class room the students often subjected to monotonous lecture for two full hours per week in the subject. Continuous lecturing makes the student subjected to loss of concentration, failed to listen and finally ending up in memorizing the concepts without understanding the subject for the upcoming examinations (Ofstad W and Brunner LJ 2013). Grasping the concepts of the topic which is required for the practical purpose especially in dental profession. The students often end up in "Bulimic learning" for their examination purpose (Zorek JA *et al.*, 2010; Gleason BL, *et al.*, 2011).

In the digital era, where the learners having the wider range of views in learning the subject in their own ways, self-centered approach and by applying it practically with the help of computers. The

flipped class room preparation often requires the blending of concepts making it smaller videos less than few minutes with the help of technology paved the way for student centered learning (McLaughlin JE *et al.*, 2014).

The flipped class ensures the following: increases the student motivation, student can learn in their own pace, active learning mandates for the class room activity, application of concepts in a practical environment, self-evaluation, group discussions, class room assessments after every lecture make them to develop determination towards the subject. In this study a total of 48 topics were covered in 72 hours for conventional class room group and assignments were given subsequently at the end of the lecture and evaluated within a week time. In Flipped class room group 48 topics were covered in 64 flipped class sessions with each video less than 5 minutes were made. The flipped videos were given to the students a day prior. During the class brief discussion, articles reading, case discussion and in class assignments were given and evaluated.

All the enrolled students were asked to give university theory and practical examination for 100 marks each, at the end of 2016 and 2017 academic year for CCR group (2015-2016) and FCR group (2016-2017) respectively.

Results of the university examination for the subject conservative dentistry and endodontics were out in two weeks time. The marks obtained were categorized into three classes second class (<120), first class (120-149), distinction (150-200). In CCR group 4 students secured second class, 67 students secured first class and 4 students secured distinction. In FCR group none of the students secured second class, 40 students secured first class and 35 students secured distinctions respectively (Table 1). Highest Score for CCR group is 156 and FCR group being 183.

The mean and standard deviation (table 2) were 130.93 ± 9.12 and 150.35 ± 10.93 for both CCR and FCR groups respectively. The independent samples test (Table 3) showed the results were highly statistically significant ($p < 0.00$).

The transition of flipped class environment requires some additional time from the faculty members for planning and making the video. A few of the faculty members had some fear of delivering the adequate study materials in the given time (Hurtubise L, *et al.*, 2014). Some of the faculty members overshoot the time in delivering the lectures by videos (Pastirik PJ 2006). The time invested in making those flipped class cannot be

taken as extra time considering the fact that students will be learning the concepts in small video lectures (Baepler P, *et al.*, 2014).

Recently a comparative study done on ophthalmology subject by Tang et al in 2017, the results of flipped class group had better understand of subject ($p < 0.029$), helpful in final examination ($p < 0.001$), learning motivation towards the subject ($p < 0.012$) compared to traditional learning group respectively (Tang F, *et al.*, 2017).

In 2017 yang et al 2017 did on ophthalmology subject in china the result showed that students felt largely positive after the flipped class discussion in ocular trauma (Yang Y, 2017). Implementation of the fully flipped class in preclinical physiology had better understanding, satisfaction of lectures and improved performance n examination when compared to previous years where the curriculum was on conventional lectures (Street SE, 2015).

Flipped class room models performed better in graduate students in learning cardiovascular ($p < 0.05$) and respiratory medicine ($p < 0.05$) by an average of >12 point percentage and 11 point percentage in renal physiology ($p = 0.06$) when compared to conventional lectures respectively (Tune JD, *et al.*, 2013). In a study done by Bohaty et al 2016, in dental graduate subject pediatric surgery subject the over-all grade was improved in students (Bohaty BS, *et al.*, 2016).

In a systematic review done by Rahman et al in 2014 on the influences of flipped class rooms he concluded that flipped classes gained a positive impact on student's achievement. The flipped class environment should be integrated in various fields like Medical, Dental, Engineering, Mathematics and Sciences. The flipped class rooms are also suitable for school children as well as higher education levels.

CONCLUSION

In recent years, flipped class gained a significant attention amongst all educators. This pedagogical approach translates to student centered learning from teacher centered learning. The Characteristic feature of flipped class room discussion will have pre class videos, in class discussions followed by evaluation and assessments. The ever-evolving practice of health care requires a teaching methodology that makes the students to involve in thought process and application of the same in diagnosing and planning the treatment in order to provide high quality health care for the patients. Furthermore, research has to be implemented in designing different forms of flipped class session at all levels of education system, thereby improving the quality of education.

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