

# The Flipped Classroom and Mind Mapping in Teaching Basic Sciences to Postgraduate Dental Students

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## Research Article

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## Abstract

**Context:** There is a strong need to implement an effective teaching learning method to make the student to apply the knowledge that was acquired to be an efficient medical professional in the future. Hence, the current study was undertaken to observe the effectiveness of flipped class and mind mapping in teaching Basic sciences to Postgraduate Dental students.

**Materials and methods:** The present study was a Descriptive cross-sectional study. 36 Male (n=14) and female (n=22) MDS students who were willing to participate voluntarily were included in the study after obtaining the written informed consent. The topic for flipped class was blood pressure in physiology and tongue in anatomy. MCQ and mind mapping test was conducted before and after the flipped class model. One way ANOVA was used to observe significance of difference of the scores of pre and post-test. P value less than 0.05 was considered as significant. The perceptions of students were expressed as frequency and percentages.

**Results:** There was significant improvement in both the MCQ and mind mapping scores of physiology (P<0.01) and anatomy (P<0.001) followed by flipped classroom model. There was a highly positive feedback by the majority of students on flipped class and mind mapping.

**Conclusion:** As there is a gradual shift of medical education scenario from passive to active, it is the need of time to consider the latest teaching techniques which are apt for teaching the present generation students whose attention span was limited and happier to use the electronic gadgets. Both flipped class and mind mapping helps the students to apply the knowledge they have acquired and also to remember and recall the subject easily. Hence, these methods can be incorporated as a part of regular curriculum in both undergraduate and postgraduate teaching.

**Keywords:** Mind Mapping; Flipped Class; Higher Order Thinking Skills; Postgraduate Dental Students; Basic Sciences

## Introduction

In recent years, the medical education was subjected to a drastic transformation from teacher centered model to the learner centered model. In teacher centered model, that is the traditional classroom where the teacher delivers a lecture and the interaction between the teacher and student is limited. The application of the subject has to be done by the student himself as homework. In contrast, the flipped class is a learned centered model that provides more interaction between teacher and student. This is called as reverse class room because the pre study materials will be prepared and uploaded in to the software. Student can login to the software at his choice of time and download the content of his choice. He can go through the content online and off line modes and how many numbers of times he likes. Hence, these students will have a basic understanding on the topic before they come to class. This helps to convert the class into active learning sessions by introducing the problem based learning, discussion, seminar etc. All these will help to stimulate the higher order thinking skills of the students [1-4]. As the present era students are more familiar and likes to use the gadgets if the teaching also involves these gadgets, it may attract the students attention. Further, the application of the acquired knowledge was done by the student in the classroom under the guidance of the teacher. In fact, in this model, the role of the teacher will be a facilitator, who constantly observes, helps and provide feedback to students. Hence the teacher can be called as a professional educator [5,6]. Mind mapping makes mandatory to apply the knowledge what was acquired. As it makes the student to draw the understand concepts in the form of a diagram, it will be easy for them to recall the concepts. It was well known that we can remember pictures more easily than words. Though flipped class model and mind mapping have shown successful results in many countries, very few studies was there on implementation of these new technology based teaching methods in India [7]. Hence, the current study was undertaken to observe the effectiveness of flipped class and mind mapping in teaching Basic sciences to Postgraduate Dental students.

## Materials and Methods

### Study Design and Study Population

The present study was a Descriptive cross-sectional study. 36 Male (n=14) and female (n=22) MDS students who were willing to participate voluntarily were included

in the study after obtaining the written informed consent. Unwilling participants were excluded from the study.

### Study Setting

The present study was conducted at Department of Physiology and Department of Anatomy, Vishnu Dental College, Bhimavaram, West Godavari District, Andhra Pradesh.

### Structure of the Class and Evaluation

The topic selected was Blood pressure from Physiology. A training class was conducted to MDS students to familiarize them to flipped class and mind mapping. Ten MCQ questions were related to blood pressure was prepared and given to the students to answer. The students were also asked to draw a mind map on blood pressure. This was considered as pre-test. The correct answers were given score 1 and wrong answer was given score 0. Mind map was graded on 5 points. As there will be different type of learners like audio/visual learners, reading/writing learners and kinesthetic learners, we have prepared video, written material and case examples related to blood pressure and shared to students through whats App. All the students were asked to go through the study material before attending to the physiology class. Before starting the physiology class we have conducted a post-test with ten MCQ questions and also they were asked to draw a mind map. Then the class was conducted using problem based learning by actively interacting and involving the students. During the class all the queries by students related to topic was clarified in question and answer session. At the end of the class post-test 2 was conducted with ten MCQ questions and also they were asked to draw a mind map. Three different sets of MCQs were used for pre-test and post-test one and two. All the students were also asked to give their perceptions on flipped class and mind mapping. Data was compared to observe the effectiveness of flipped class and mind mapping. All evaluations of MCQs and mind mapping were performed by the person who is not related to the study. The same procedure was followed in anatomy and the topic selected was tongue.

### Ethical Consideration

The study protocol was approved by research committee of Vishnu Dental College. As there are no ethical issues involved in the study, it was exempted from the same.

### Statistical Analysis

Data was analyzed by using SPSS 20.0 version. One way ANOVA was used to observe significance of difference of the scores of pre and post-test. P value less than 0.05 was considered as significant. The perceptions of students were expressed as frequency and percentages.

### Results

Tables 1 and 2 presents the MCQ (multiple choice questions) and Mind mapping scores of the participants in

physiology and anatomy, before and after flipped class. There was significant improvement in both the MCQ and mind mapping scores of physiology ( $P < 0.01$ ) and anatomy ( $P < 0.001$ ) followed by flipped classroom model. Table 3 represents the student's perception on flipped class model. There was a highly positive feedback by the majority of students on flipped class. Table 4 represents the student's perception on mind mapping. There was a highly positive feedback by the majority of students on mind mapping.

Parameter	Pre-test score (n=36)	Post-test 1 score (n=36)	Post- test 2 score (n=36)	F value	P value
MCQ	2.41±1.02	4.72±1.61	5.88±0.39	88.384	P<0.01***
Mind Mapping	1±0.41	1.88±1.65	2.63±1.45	14.467	P<0.01***

**Table 1:** MCQ and Mind mapping scores in of the participants in physiology before and after flipped class model. (Data was presented as mean ± SD. \*\*\*P<0.01 is significant)

Parameter	Pre-test score (n=36)	Post-test 1 score (n=36)	Post- test 2 score (n=36)	F value	P value
MCQ	2.66±0.88	5.48±1.85	8.54±1.27	145.864	P<0.001***
Mind Mapping	2.09±0.63	2.48±0.87	3.96±0.95	47.161	P<0.001***

**Table 2:** MCQ and Mind mapping scores of the participants in Anatomy before and after flipped class model. (Data was presented as mean ± SD. \*\*\*P<0.001 is significant)

Q. No	Question	SA (%)	A (%)	N (%)	D (%)	SD (%)
1	More engaging than traditional classroom	10 (27.7)	20 (55.5)	5 (13.8)	0(0)	1(2.7)
2	Liked watching lessons on video	16 (44.4)	17 (47.2)	1 (2.7)	1 (2.7)	1 (2.7)
3	Reading at home helped in classroom performance	16 (44.4)	17 (47.2)	2 (5.5)	1 (2.7)	0 (0)
4	Time spent on classroom was more effective	7 (19.4)	24 (66.6)	4 (11.1)	1 (2.77)	0 (0)
5	Helped to understand the text better	7 (19.4)	25 (69.4)	4 (11.1)	0 (0)	0 (0)
6	Quality of learning experience	4 (11.1)	26 (72.2)	4 (11.1)	2 (5.5)	0 (0)

**Table 3:** Students perception on flipped class model (n=36). (Data was presented as frequency and percentage)

Q. No	Questions	SA (%)	A (%)	N (%)	D (%)	SD (%)
1	Creating Mind mapping was easy	14 (38.8)	19 (52.7)	1 (2.7)	1 (2.7)	1 (2.7)
2	Was very helpful	15 (41.6)	21 (58.3)	0 (0)	0 (0)	0 (0)
3	Would use them again	25 (69.4)	10 (27.7)	1 (2.7)	0 (0)	0 (0)
4	Enjoyed creating them	22 (61.1)	12 (33.3)	1 (2.7)	1 (2.7)	0 (0)
5	Helped my recall	28 (77.7)	6 (16.6)	1 (2.7)	1 (2.7)	0 (0)

**Table 4:** Students perception on mind mapping. (Data was presented as frequency and percentage)

## Discussion

The current study was undertaken to observe the effectiveness of flipped class and mind mapping in teaching Basic sciences to Postgraduate Dental students. There was significant in the students' performance in both MCQ and mind mapping followed by flipped class model. The combination of pre-study material and discussion in the class room was found to be more effective than the pre-study material alone. As there is advancement in the technology and majority of students were more comfortable with electronic gadgets, it is the need of time to use the technology in teaching. Slowly the momentum has started in India also which is evident with the research articles published from different medical, dental and nursing colleges [1,6-9]. These studies includes review and original articles and most of the articles has taken the perception of students and some of them conducted tests also. Majority of the studies using flipped class model has shown a improvement in the performance of the students and there was highly positive feedback from the students worldwide [10-13]. However, major limitation was lack of studies where the comparison of flipped class with other types of teaching has been made [14]. Hence, there is a need for more studies and multi centered studies comparing the flipped class model with other models. Nursing research revealed mixed results using the flipped class model [15]. Major advantage of the flipped class model is that it stimulates the higher order thinking skills of the students. It increases the interpersonal relationships. Flipped classroom shifts the class room activity from passive to active learning. As it is a learner centered teaching there will be more interaction between the teacher and student and this helps the teacher to identify the slow learners and facilitate them to understand the concepts. AJ Crothers, et al. recommended implementation of flipped class model into the dental curriculum to maximize the class room time [16]. A mind map is a simple, creative and logical way of taking notes [17]. It helps the students to present his ideas thoughts in a creative manner. Though mind mapping can be made by manual and software methods, we have used manual method in this study [18]. Earlier studies reported that there was significant improvement in learning and memory followed by the mind mapping technique [19-22]. As it was well known that it's easy to remember a picture than a word, mind maps helps the students to remember and recall the topics easily. Further it promotes the thinking of the students. In the present study there was a significant improvement in the grades of mind mapping followed by

combination of the pre-study materials and the active class room time. Further, the feedback of students on mind mapping was highly positive.

## Conclusion

As there is a gradual shift of medical education scenario from passive to active, it is the need of time to consider the latest teaching techniques which are apt for teaching the present generation students whose attention span was limited and happier to use the electronic gadgets. Both flipped class and mind mapping helps the students to apply the knowledge they have acquired and also to remember and recall the subject easily. Hence, these methods can be incorporated as a part of regular curriculum in both undergraduate and postgraduate teaching.

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