

ORIGINAL ARTICLE

Flipped Classroom: An Effective Tool for Teaching Histology to Ist MBBS Students*Netra Gadre¹, Renuka Ahankari¹ and Archana Shekoker¹**¹Department of Anatomy, Smt. Kashibai Navale Medical College and General Hospital, Narhe, Pune - 411041, Maharashtra, India.***Abstract:**

Background: Flipped classroom (inverted classroom) method is a learner centric approach in which the learner is provided study material beforehand, is expected to go through it and then fully participate and actively engage in the discussions. The objective of this study was to compare and evaluate flipped classroom teaching method over regular didactic lecture, for Histology for First M.B.B.S. students. **Material and Methods:** Total one hundred and seven Ist year medical students were involved in this study. The students were divided into two groups, Group A comprising 54 and Group B 53 students. For study group (Group A), the material related to Histology of respiratory system was given 2 days prior to the project than for control group (Group B) which was exposed to routine didactic lecture. This was followed by a practical session conducted for both the Group A and Group B with demonstration of histology slides. Performance test was conducted, results analysed. A feedback was taken using a validated questionnaire which was evaluated. **Results:** A statistically significant (p value <0.0001) improvement was seen in the scores of Group A than Group B. Students response for flipped classroom teaching method was largely positive, with more active participation and better understanding of the topic. **Conclusion:** The technique of flipped classroom helped the students to develop a holistic approach towards the topic resulting in better understanding of the topic. It may be considered as an approach worth pursuing in the future.

Keywords: Flipped class room, Inverted classroom, Histology, Didactic lecture

Introduction:

In medical curriculum, didactic lectures, in which an expert delivers lecture to a group of students, is the most commonly practiced teaching methodology. In this method, student's role is limited to listening and making notes with opportunities for questioning and

interaction usually at the end of the session. The Flipped classroom also known as Inverted classroom aims at increased involvement of the students in the teaching-learning process and also motivates them for self-study [1].

It has been observed that 1st M.B.B.S. students do not pay attention to Histology. They are engrossed in studying gross anatomy and pay less attention to histology which forms an important part of curriculum. So here in this study we have utilized flipped classroom teaching methodology to teach Histology of Respiratory system to 1st M.B.B.S. students. Flipping classroom in which the study material covered in the lecture is given to the students before the class and group discussion is conducted on the topic. To the best of our knowledge, Flipped classroom method has not been used for teaching Histology. The objectives of this study were:

1. To organize flipped small group teaching on "Histology of Respiratory System".
2. To organize traditional didactic lecture for the other students
3. To study the perception of the students regarding flipped small group teaching class.
4. To compare the performance of the students who learned by two different methods.

Material and Methods:

The students were told about flipped class room teaching method and their consent was obtained for the same. The students were randomly divided into two groups - Group A with 54 students and B with 53 students. They were informed about the topic, day, date and venue of conventional lecture and flipped class room. Group A (study group) was assigned for flipped class room method and Group B (control group) was assigned for

the conventional didactic lecture. Group A was provided with validated study material on Histology of Respiratory System via email, 2 days prior to the class. The material included photographs of microscopic structure of slides to be discussed and the books to be referred. The students were asked to come with preparation and they were instructed strictly not to share the study material with Group B students.

Group discussion for group A on the topic was conducted, by dividing the students into smaller groups of 10 students each (the last group contained 14 students). A teaching faculty was present for each group during the group discussion who ensured that the group discussion went on smoothly and all points were covered during discussion. For this 8 faculty members were involved and they were previously instructed about how to carry the group discussion, to ensure uniformity.

Traditional didactic lecture was conducted simultaneously for Group B on same topic; this group was not provided with any study material of the topic before the lecture.

This was followed by a practical session conducted for both the Group A and Group B with demonstration of histology slides. The slides discussed were demonstrated under microscope to both the groups. Performance test was conducted where in 4 slides of the topic concerned were given to all the students. They were asked to identify the slide correctly and answer to questions based on that slide. Their answer books were checked and marks were given. The marks between Group A and Group B are shown in the Table no.1. The result of the test thus obtained was analyzed.

The data was subjected to statistical Analysis .Sample size was calculated based upon number of students present at the time of distribution of topic and study material. (In our next study we plan to take bigger sample size, as we would like to continue this study for upcoming batches.) The software used was “EPI INFO7”. Mean and Standard Deviation was calculated. The statistical test carried out was “Unpaired t” test.

After the practical test was over, a feedback was taken from the students via a validated questionnaire consisting of 10 questions and analyzed.

Table No.1: Marks (M) Obtained by the students in Group A & Group B out of 8

| Group A –Study Group (54 Students) | | | | | | | | Group B– Control Group (53 Students) | | | | | | | |
|------------------------------------|---|-----------|---|-----------|---|-----------|-----|--------------------------------------|---|-----------|---|-----------|-----|-----------|---|
| Roll. No. | M | Roll. No. | M | Roll. No. | M | Roll. No. | M | Roll. No. | M | Roll. No. | M | Roll. No. | M | Roll. No. | M |
| 2 | 4 | 38 | 8 | 84 | 6 | 120 | 3 | 1 | 4 | 51 | 3 | 91 | 5.5 | 123 | 3 |
| 4 | 6 | 42 | 6 | 86 | 4 | 122 | 5 | 5 | 3 | 55 | 5 | 93 | 4 | 125 | 4 |
| 6 | 8 | 44 | 6 | 88 | 5 | 124 | 3 | 9 | 2 | 59 | 3 | 95 | 2 | 127 | 3 |
| 8 | 8 | 46 | 3 | 90 | 5 | 126 | 2.5 | 11 | 3 | 67 | 3 | 97 | 4 | 131 | 4 |
| 14 | 5 | 48 | 3 | 92 | 4 | 128 | 6 | 15 | 4 | 71 | 4 | 99 | 3 | 133 | 4 |
| 16 | 6 | 56 | 7 | 94 | 2 | 140 | 5 | 17 | 5 | 73 | 5 | 101 | 1 | 135 | 3 |
| 18 | 8 | 66 | 7 | 96 | 4 | 134 | 2 | 19 | 3 | 75 | 3 | 103 | 4 | 137 | 6 |
| 20 | 3 | 70 | 6 | 98 | 4 | 142 | 3 | 23 | 2 | 77 | 1 | 105 | 2 | 139 | 4 |
| 22 | 4 | 72 | 6 | 100 | 6 | 144 | 6 | 27 | 4 | 79 | 3 | 107 | 2 | 141 | 3 |
| 28 | 3 | 74 | 6 | 102 | 6 | 146 | 6 | 29 | 3 | 81 | 3 | 109 | 2 | 147 | 5 |
| 30 | 6 | 76 | 5 | 104 | 2 | 148 | 3 | 33 | 4 | 83 | 2 | 113 | 4 | 149 | 5 |
| 32 | 8 | 78 | 5 | 106 | 4 | 150 | 8 | 35 | 2 | 85 | 3 | 115 | 1 | | |
| 34 | 5 | 80 | 2 | 110 | 0 | | | 37 | 5 | 87 | 2 | 119 | 4 | | |
| 36 | 6 | 82 | 2 | 108 | 5 | | | 39 | 4 | 89 | 3 | 121 | 2 | | |

Observations:

Table No. 2: Statistical Analysis

| Groups | n | Mean \pm SD | Confidence interval | Unpaired t test value | Degree of freedom | P value | Statistical Significance |
|---------|----|-----------------|---------------------|-----------------------|-------------------|---------|--------------------------|
| Group A | 54 | 4.84 \pm 1.90 | 0.9256 - 2.137 | 5.013 | 105 | <0.0001 | Highly Significant |
| Group B | 53 | 3.31 \pm 1.17 | | | | | |

Table No. 3: Analysis of feedback

| Sr. No. | Questions | Yes (%) | No (%) |
|---------|---|---------|--------|
| 1 | This method is more effective than traditional classroom teaching | 57 | 43 |
| 2 | Aroused interest in the topic | 52 | 48 |
| 3 | Study material given was adequate | 63 | 37 |
| 4 | Helped in the clarification of doubts in the topic | 80 | 20 |
| 5 | Helped me in practical application of knowledge | 76 | 24 |
| 6 | I contributed more by active participation | 65 | 35 |
| 7 | It aroused interest in Histology in General | 67 | 33 |
| 8 | I would like other topics to be covered by using same method | 61 | 39 |
| 9 | I could correlate structure and function of the given tissue better | 68 | 32 |
| 10 | It will help in long term retention of knowledge | 62 | 38 |

A statistically significant (P value <0.0001) difference in the performance was seen in the scores of group A which was exposed to flipped classroom method than Group B which was exposed to traditional didactic lecture. After analysis of feedback forms we found that 80% students agreed upon the method to helps in better clarification the doubts than didactic lecture, while 76% students felt that the method can help for better application of practical knowledge.

68% students opined that they understood structural and functional correlation of the Respiratory tissue better ; while 62% students felt that the method can help in long term retention of knowledge. for better application of practical knowledge.

We also observed an increased satisfaction level in the students who experienced the flipped class room method. As flipped classroom involved active participation of students, their interest was aroused and as a result it helped them to develop a holistic approach towards the topic starting from understanding of the normal structure and function of the tissue and its correlation with abnormal changes and hence the cause of signs and symptoms in a patient suffering from

Respiratory System Disease.

Discussion:

Jonathan Bergmann and Aaron Sams started using Flipped Classroom as a teaching technique in 2007 [2]. Students watched recorded lectures for homework and completed their assignments, labs and tests in class with their teacher available. This study found that their students demonstrated a deeper understanding of the material than ever before. Since then the method has been used in many other disciplines, including medical teaching.

Flipped classroom is comparatively a new method, which involves active learning by the students rather than a didactic lecture which is a passive way of learning. In the flipped classroom, course material such as recorded lectures, tutorial videos, animations, notes and podcast are provided outside the class. This course material is provided before the actual training session and the students are asked to come prepared. They provided a simple model of flipping the classroom. It consists of three components: Pre-class component that requires student's interaction with the learning material through online or offline activities. In class activities

which involves interactions between students and teacher, and student - student collaboration in the class for real learning concepts.

While implementing a flipped classroom, a six step guide is used [2].

- 1) Plan – Figure out which lesson you want to flip. Outline the learning outcomes and a lesson plan.
- 2) Make video when you feel it necessary, you can also prepare any other teaching material whatever is appropriate
- 3) Share – Share the video with students. Make it engaging and clear.
- 4) Change – As the students have viewed the lesson, they are prepared to go more in-depth.
- 5) Group - Effective way to discuss the topic is to divide the students in groups and given a task to perform.
- 6) Regroup - Get the class back together and share group's work with everyone. In traditional learning, lower levels of learning such as remembering and understanding happen in the class, while higher levels of learning are left to the students to be done after the class.

However, in flipped classroom, learning is flipped, that means, lower levels of learning can be finished by the student before the class and they can engage in higher levels of the cognition with peers and teacher during the class. (Revised Bloom's taxonomy)

The four pillars of flipped classroom are : F- Flexible environment, L- Learning culture, I –Intentional content, P- Professional educator [3].

In traditional method of teaching, a didactic lecture is followed by homework/ assignment/ course material provided to the students, which is reversed in Flipped classroom. Other strategies that can be used in the class are Active learning, Peer instruction, Collaborative learning, Problem-based learning, Discussion or debate.

The traditional classroom has applied the I achieve, You achieve, We achieve as an approach for teaching and learning for many years. The flipped classroom method turns the table :- the teacher utilizes You

achieve , We achieve, I achieve as a substitute [4].

Many literature searches were conducted using electronic database also and reviews were taken. Recent Peer-reviewed papers were screened and reviewed according to explicit inclusion criterias. Total 118 articles were reviewed. They suggested flipped classroom as a promising teaching approach; some suggesting benefits while some reporting negligible improvement. Students were generally satisfied with the approach, particularly usefulness of online modules because of easy access to resources and self-paced learning. However long-term benefits of flipped classroom with regards to knowledge retention and transfer of knowledge to professional practice and patient care should be studied [5].

Majority of the studies were done in gross anatomy, including neuroanatomy and dental science showing the positive impacts of this method [6, 7, 8, 9]. In our study we used flipped classroom method for the Domain of Histology and we came up with positive results.

To the best of our knowledge use of flipped classroom method in histology teaching has been done for the first time, which makes our study unique. In first year MBBS students, it has been observed that student's attention is focused on learning gross anatomy and they hardly pay attention to histology, but understanding histology is very important as it forms the basis for pathology and later on clinical subjects & in the new 1st year MBBS curriculum, it has got major weightage.

In the current study, students who underwent flipped classroom showed better performance in the test conducted which is statistically significant with P value < 0.0001 (Table no. 2) and also the feedback analysis (Table no. 3) shows that students could develop structure- function correlation, practical application of the knowledge, clarification of the doubts, long term retention of knowledge and most of all, that aroused interest in histology in general, 61% of students stated they would like to study other topics by the same method.

There are some limitations of the present study:

1. Study material given to one group could have been shared with the other group.

2. Requires a greater number of faculty members and also needs motivation of faculty for conducting class by this method.

3. Need time for preparation as the teachers have to prepare the resource material before hand.

However, in our opinion, the flipped classroom small group teaching method is a student friendly method and involves active participation by the students, arouses interest in the topic and can definitely help in better retention of knowledge.

In the new curriculum laid down by MCI, in which special time slot for self-directed learning is provided, the flipped class room teaching method can be utilized. So it is worth pursuing this method as an important future teaching learning tool.

Conclusion:

As flipped classroom involved active participation of students, their interest was aroused and as a result it

helped them to develop a holistic approach towards the topic helping them in better understanding.

This was reflected in the higher scores obtained by the students exposed to flipped classroom method (Group A), than those who were exposed to traditional didactic lecture (Group B).

In contrast to didactic lecture, every student in the class could be approached by the teacher, resulting in better interaction between the students and the teacher.

The method also helped the students to learn skills of task orientation and imbibed value of cooperation in them. There was an increased satisfaction level in the students who experienced the flipped class room method.

Conflict of Interest - Nil

Sources of Support - Nil

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