

# Outcome Assessment of Innovative Teaching on Performance of Medical Undergraduates

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## ABSTRACT

The decreasing interest of students in active learning and problem solving approach by working in groups is felt as a challenge by many teachers. Overdependence of today's medical undergraduates on readymade study material and social media is a matter of concern for the medical fraternity. At the same time it is an opportunity to develop innovative teaching learning methods suitable to present scenario. We planned to evaluate impact of innovative teaching methods on attendance and academic performance of MBBS students. It was a longitudinal type of descriptive study conducted among MBBS students. 'Must know' content for different topics and innovative methods of teaching were decided through faculty consensus. To improve active learning social media chat groups were utilized and students were encouraged to make group presentation, small write up on spotters and to undergo open book exam as a group assignment. Their attendance records and performances were evaluated at the end of study period of 21 months. There was a significant increase in mean percentage of theory marks among those attending  $\geq 75\%$  classes from first to fourth terminal ( $p < 0.001$ ). Although practical exams also observed the same trend but it was not significant ( $p: 0.89$ ). Intervention in form of innovative techniques of teaching and learning contributed in improving the performances of the students. Introduction of innovative teaching learning methods is the need of the hour to improve interest and academic performances of undergraduate students.

**KEY WORDS:** medical graduates, performance, teaching methods

## INTRODUCTION:

In the entire Undergraduate Medical curriculum, Community Medicine is the only subject which provides students an opportunity to learn communication skills and apply medicine in real life setting. Students are exposed to this discipline from the first semester which extends upto the seventh semester. The extended curriculum makes this discipline unique as well as permit to conduct more number of evaluation tests as compared to any other discipline.

It's interesting to see the potential of students in being organized planners, working hard and achieving bigger targets by distributing work in smaller, well coordinated groups, when it comes to cultural fest & Annual function of the college. As we look at the same scenario with regard to interest in learning & performance in studies by our MBBS

undergraduates we find these qualities missing. Hence it may be inferred that the potential of active learning and performing better exists in most of the students. The challenge is how to ignite interest and passion for learning and performing better.

The review of studies we could find about using innovative teaching methods (as stated below under references) reveals that different approaches such as student centered learning, skill based learning, using case study and mentorship have been discussed and implemented, but evaluation of impact of these approaches on marks secured by students is lacking.<sup>[1,2,3,4]</sup> The evaluation of impact of regular attendance on performance of students was also found lacking.

Looking at the poor performance of many students, in internal assessment at the end of 3<sup>rd</sup> semester in the batch going to appear for Final Exam within 21 months, the effort for improvement was started by faculty of the department of community medicine using following techniques: Developing consensus on 'must know' content of each topic; Review methods of teaching and media found interesting & effective for learning by students and

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Explore the innovative approach and process to be used to make learning more participative & interesting with lesser effort and stress.

## **MATERIAL AND METHODS:**

A longitudinal study was conducted in the Department of Community Medicine, ESIC Medical College and Hospital, Faridabad. Students of batch 2015-16 (admission year) were our study population. The assessment of the study population was done at four points of time from March 2017 to November 2018. The data was compiled and analysed in the two months' duration (December, 2018- January, 2019). Time of each Terminal Exam (Internal Assessment) and intervention in the period from March 2017 to November 2018 is presented (Table 1).

For the purpose of study teaching methods were broadly classified into two categories: traditional (passive) and innovative (active). The intervention was actually the innovations adopted from third semester onwards which were as follows: Discussion among faculty members regarding the need and options for innovations in teaching content & methods; Securing Interest & involvement of faculty; Distribution of topics among the faculty to define 'must know' content on each topic and common parameters to be used; Using different teaching methods and media to supplement learning at each opportunity, by sending video to students through social media (whatsapp, Google class room & email), showing videos in the class room, presentation / discussion by students, allotting focused small research projects under guidance of faculty through all steps & demonstration during practical/family study where ever possible. Involving undergraduate students in developing posters and presentations and delivering the presentations and Using different evaluation techniques/ methods for same topics (Usual question papers, MCQ, Group discussion, Open book test & arranging Quiz competition).

### ***Follow up evaluation:***

First terminal exam (baseline evaluation) was conducted at the end of 3<sup>rd</sup> semester. Further evaluation was done subsequently as second (at end of 4<sup>th</sup> semester), third (at the end of 6<sup>th</sup> semester) and fourth

terminal examination at the end of seventh semester.

### ***Outcomes measured:***

The students were evaluated in theory and practical both. In order to assess all the three domains of learning i.e cognitive, psychomotor and affective domains, theory and practical examinations (Spotters, problem based exercises, family/ case study) were conducted during each evaluation. Theory examination consisted of long answer questions, problem based questions and short answer questions. All the faculty of department participated in evaluation. While evaluating a question /topic, all students were evaluated by same faculty.

Similarly in practical the evaluation was done in form of spotter identifications, numerical exercises, case based evaluation in community and viva voce. Every student during every terminal examination visit each evaluator where he was assessed. Marks are presented as percentage.

### ***Statistical analysis:***

We assessed the relationship between attendance at four point of times and the performance measures by using repeated measure analysis of variance (ANOVA) using SPSS version 21 (IBM).

## **RESULTS:**

There were 93 students out of 100 who were followed up from 1<sup>st</sup> semester through 7<sup>th</sup> semester. Seven students were demoted to previous batches as they could not pass their first or second professional examinations. The attendance of these 93 students at the end of seventh semester in theory and practical classes has been shown in table 2. The classes attended have been grouped in three groups. The students who attended 50% to 74% of theory as well as practical classes were 77.4% (Theory) and 54.8% (Practical) respectively. More than 75% of practical classes were attended by 38.7% students as compared to theory classes which were attended by 19.4%. (Table 2).

There were four theory and practical exams conducted at the end of third, fourth, sixth and seventh semester each. The mean of percentage marks scored by students in theory has been distributed among the three attendance groups.

It was observed that there was a significant increase in mean percentage of theory marks among those who attended more than or equal to 75% classes

**Table 1:** Interventions and Terminal Exams conducted during the study period.

1 <sup>st</sup> terminal exam	Intervention	2 <sup>nd</sup> terminal exam	Intervention	3 <sup>rd</sup> terminal exam	Intervention	4 <sup>th</sup> terminal exam
At the end of 3 <sup>rd</sup> Semester in March 2017	Consensus on must know areas and its implementation	At the end of 4 <sup>th</sup> Semester in August 2017	Involving students in developing posters and presentations for department	At the end of 6 <sup>th</sup> semester in July 2018	Quiz competition	At the end of 7 <sup>th</sup> Semester in Nov. 2018
	Distribution of topics among faculty according to different teaching methods		Sharing notes on social media platform		Role plays	
	Group work by students		Tutorials for revision		Problem based group work in practical classes	
	Open book tests					
	Research projects in small groups					

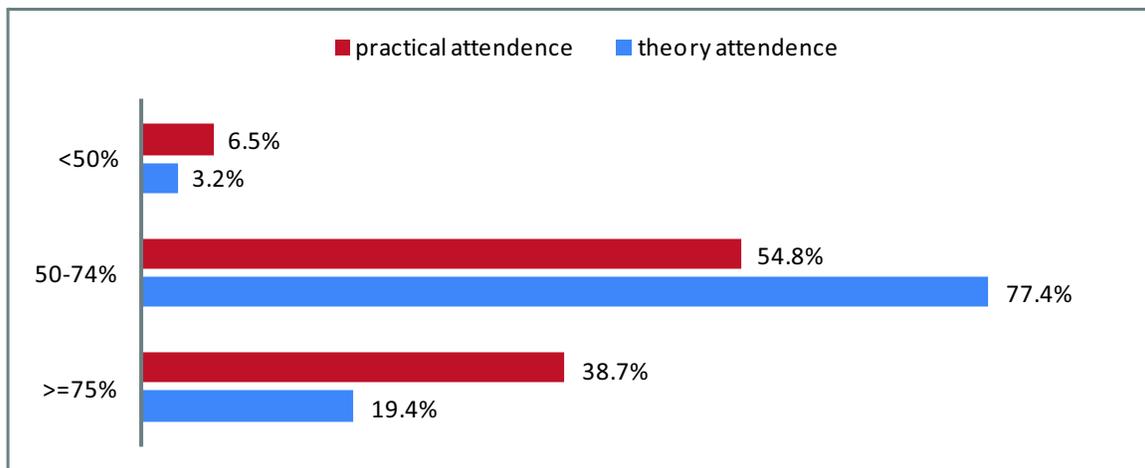
**Table 2:** Category wise attendance (percentage) in theory and practicals.

Attendance groups	Theory attendance Number (Percent)	Cumulative Percent	Practical attendance Number (Percent)	Cumulative Percent
=>75%	18 (19.4)	19.4	36 (38.7)	38.7
50-74%	72 (77.4)	96.8	51 (54.8)	93.5
<50%	3 (3.2)	100.0	6 (6.5)	100.0
Total	93 (100)		93 (100)	

from first to fourth terminal ( $p < 0.001$ ). There was an increase in marks from 18.96% in first terminal to 46.62% in fourth terminal exam among those who attended 50-74% theory classes. There was significant increase in marks as we move from lower attendance group to higher one in first ( $p: 0.023$ ) and second terminal exam ( $p: 0.004$ ). (Table 3).

The mean of percentage marks scored by students in practical has been stated for the three attendance groups. The mean of percentage marks for practical exam increased from first to fourth terminal

exam among those who attended more than 75% practical classes. However there was no significant trend observed ( $p: 0.89$ ). There was a dip in practical marks from first to second terminal and increase thereafter in  $\geq 75\%$  and 50 to 74% attendance groups. The mean of percentage marks increased significantly as the attendance increased in first ( $p: 0.001$ ), second ( $p < 0.001$ ) and third terminal ( $p < 0.001$ ). There was an increasing trend in fourth terminal also but it was statistically non significant ( $p: 0.116$ ). (Table 4, last row).



**Figure 1:** Distribution of students based on categorisation of attendance (percentage) in three groups.

**Table 3:** Mean marks obtained in theory terminal exam with respect to their theory attendance

Theory attendance	First terminal percentage Mean (SD)	Second terminal Percentage Mean (SD)	Third terminal Percentage Mean (SD)	Fourth terminal Percentage Mean (SD)	p value (Difference between first and fourth)
=>75%	25.27 (10.77)	31.32 (10.89)	51.01 (9.75)	50.74 (6.46)	<0.001
N	18	17	18	18	
50-74%	18.96 (9.89)	22.55 (10.81)	42.84 (11.22)	46.62 (8.41)	<0.001
N	59	51	72	72	
<50%	-	9.75 (5.30)	37.22 (28.82)	38.47 (16.51)	0.180
N	0	2	3	3	
Total	20.44 (10.39)	24.32 (11.53)	44.24 (12.09)	47.15 (8.57)	<0.001
N	77	70	93	93	
p value (difference Between attendance groups)	0.023	0.004	0.020	0.037	

**DISCUSSION:**

The increasing performance of the study participants in terminal exams in 21 months duration reveals in quantitative terms the gradual impact on quality of teaching by using innovative teaching

methods. The qualitative impact of these innovations has been observed as better understanding of subject and increased interest in teaching & learning among the faculty and students as well. However, further study may be required to demonstrate it through case

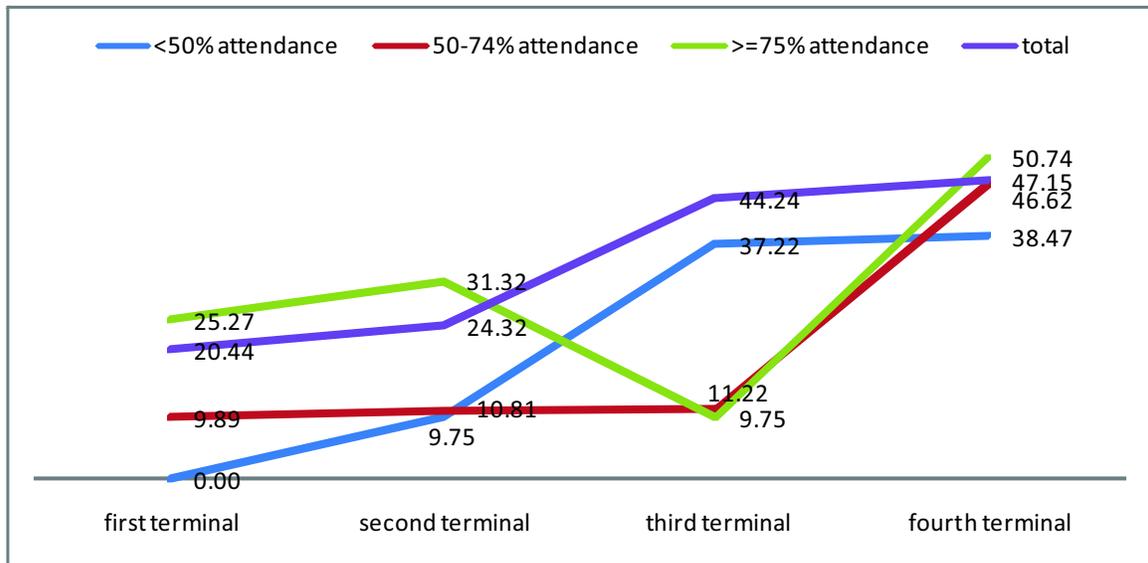


Figure 2: Theory attendance wise trend of mean marks obtained by the students in each semester

Table 4: Mean marks obtained in practical terminal exams with respect to their practical attendance.

Practical attendance groups	First terminal percentage Mean (SD)	Second terminal Percentage Mean (SD)	Third terminal Percentage Mean (SD)	Fourth terminal Percentage Mean (SD)	p value (Difference between first and fourth)
=>75%	62.88 (10.68)	58.67 (9.13)	55.14 (9.32)	63.92 (7.25)	0.89
N	30	36	35	36	
50-74%	51.30 (15.09)	48.95 (8.81)	49.01 (6.62)	62.01 (8.02)	0.003
N	31	51	50	51	
<50%	-	38.66(12.22)	40.20 (9.39)	57.08 (7.31)	0.020
N	0	3	5	6	
Total	57.00 (14.25)	52.50 (10.43)	50.91 (8.76)	62.43 (7.79)	0.007
N	61	90	90	93	
p value (Between attendance group difference)	0.001	<0.001	<0.001	0.116	

\*p value <0.05 is considered as statistically significant

study and statistics.

Feasibility and replicability of innovative teaching methods used by us does not seem to be difficult if the faculty decides to do it systematically and the management of the college allows the basic

freedom, infrastructure and support required. The only constraint to some extent may be acute shortage of faculty.

As stated under our observations above other researches have also reiterated that the pattern of

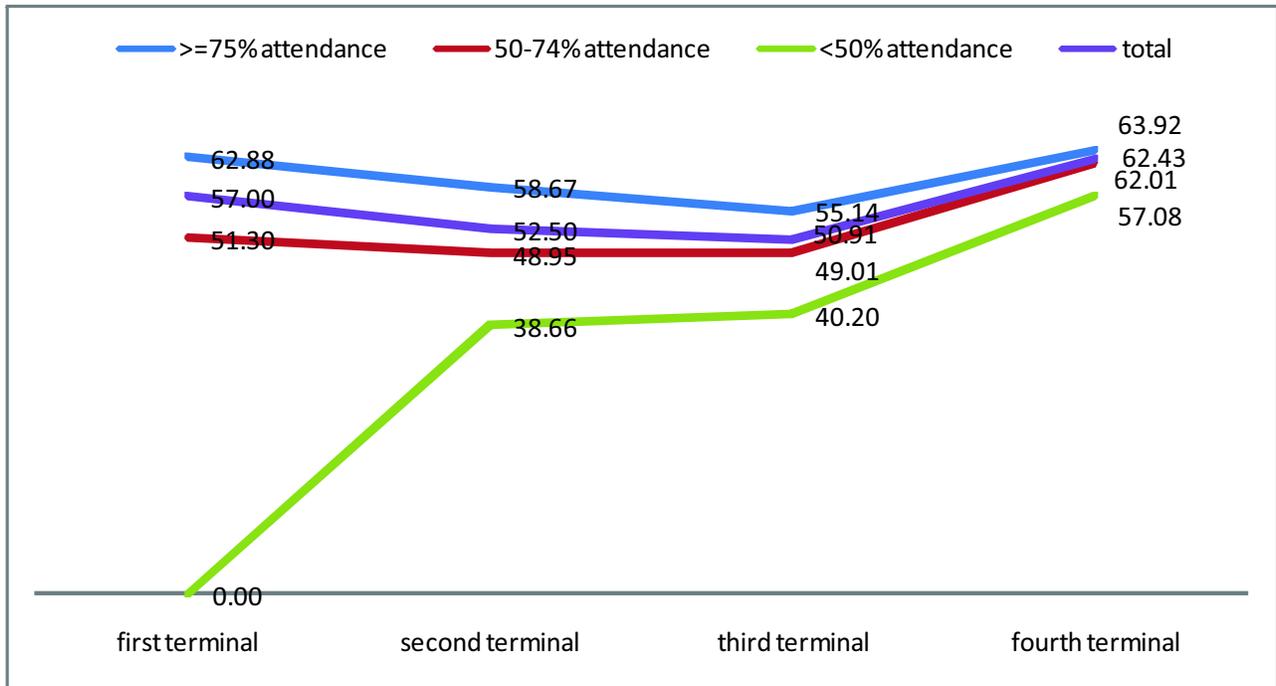


Figure 3: Practical attendance wise trend of mean marks obtained by the students in each semester.

conducting the internal assessment can be done in a different method which includes evaluation of assignments/practical, projects, presentations and the conduct of the student in a proportionately weighted manner rather than following similar method of assessing the performance of the student like in final examinations. Technology is an important aspect of today's life, so are presentation skills. Evaluation of presentation of seminar topics, their research work etc will give the students confidence to face the professional world in the future. Thereby psychomotor, affective and communication skills also can be assessed<sup>[4]</sup>.

The faculty of Armed Forces Medical College, Pune has tried mentoring combined with innovative teaching/learning technique of “hands-on” training for Undergraduates with the involvement of postgraduate (PG) students in the Department of Community Medicine, by involving students in small focused Research projects. This has created a positive attitude among students<sup>[1]</sup>. As we introduce more of psychomotor component (skills) of a topic to students; they become more confident in acquiring the concepts. Similar technique was used by our faculty where reaserch methodology was taught in form of

theory lecture in 3<sup>rd</sup> semester but the hands on training was given during 4<sup>th</sup> semester. There was a better understanding of the topic observed among students. The faculty at Government Medical College Chandigarh found that the quiz program was the one that was highly appreciated with the highest scores, followed by the undergraduate projects and the vertical orientation program in that order according to feedback received from medical undergraduate students<sup>[5]</sup>. Similar improvement in marks (practical>theory) was observed after introduction of quiz programmes at the end of 6<sup>th</sup> semester. The Microbiology department of Manipal Medical College, Karnataka assessed the effectiveness of Case Based Learning (CBL) with feedback from students that; apart from helping them acquire substantive knowledge in microbiology, CBL sessions enhanced their analytic, collaborative, and communication skills. The block examination scores in CBL topics were significantly higher than those obtained for lecture topics<sup>[6]</sup>. We used problem based teaching techniques in the final semester during our family postings and extramural visits and this improved the knowledge and attitude of students towards the subject. Similar observations have been reported

about CBL as teaching method, by Biochemistry department of a medical college of Piparia, Gujarat<sup>[7]</sup>.

The medical students studying pharmacology at Christian Medical College, Ludhiana, Punjab showed preference for tutorials, short answer questions, revision classes, clinical pharmacology & bedside teaching in place of lecture, seminars & pharmacy exercises. The performance score of students indicated 12% improvement in their scores when their feedback suggestions stated above were implemented<sup>[8]</sup>. Tutorials were used by our faculty also for revision of various topics during 5<sup>th</sup> semester and it was observed that mean marks in theory increased by almost 20 points. However there was a decline in marks obtained in practicals probably due to more emphasis on theoretical topics in that semester. This was rectified by introducing efforts to improve marks in practicals in next semester.

A study from Lock Haven University, U.S.A. reported increase in engagement of students and faculty when social media platform-twitter was used for discussion and study material sharing<sup>[9]</sup>. We created groups on whats app and used it for sharing study material and interactive discussions among students and faculty on news & research articles on public health issues. This intervention was started in 4<sup>th</sup> semester and it improved the theoretical knowledge of students. Martinez et al., and Low et al., conducted randomized controlled trials using smartphone application as an intervention and demonstrated an improvement in academic and clinical competency scores<sup>[10,11]</sup>.

The innovations at CMC Vellore emphasize focusing on all the areas namely Curriculum Planning, Using different teaching and learning methods & Assessment. Similar to our innovation they have focused on removing unimportant and irrelevant materials that are still in the curriculum & increasing emphasis on training doctors as good 'first contact' physicians who can manage common medical problems and be aware of when to refer. An assessment matrix is made for every topic that needs to be taught and assessed and this has 3 major domains-cognitive, psychomotor and affective<sup>[2]</sup>.

The students with higher attendance in classes were found to secure significantly better marks in the

terminal exams, in our study and other similar studies as well<sup>[12,13]</sup>. At the same time we could also find a study by Kauffman et al., which found no significant relation between marks secured in internal exams and attendance of students in the class room<sup>[14]</sup>.

#### **LIMITATIONS:**

In the existing teaching & evaluation system of medical students, similar assessment methods are used for both the internal assessments and the final examinations. Hence this becomes a limitation while assessing the students. Other than cognitive skills, the psychomotor and affective skills are not adequately evaluated and very minimal emphasis is given on assessing communication skills, as stipulated in the foundation course based on the latest competency based Medical Council of India recommendations.

#### **CONCLUSION:**

Our study reveals that it is high time for curriculum developers and teaching faculty to read mind of students, their expectations and aspirations. It is very much required to create interest in studies rather than imposing mammoth sized syllabus and traditional methods of education. In spite of formal teaching in form of lectures and traditional practicals if social media, quiz on individual topics, poster making and educational videos can be incorporated in medical education, it will work wonders. As depicted in the results of this study such innovations are helpful in improving attendance as well as academic performance of medical undergraduates.

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