

## RESEARCH ARTICLE

# Evaluating the effectiveness of pre- and post-test model of learning in a medical school

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### ABSTRACT

**Background:** Didactic lecture is one of the most widely accepted methods among teaching and learning methodology. Because of time restriction and vast syllabus to be covered through lectures, feedback knowledge before and after the lectures to assess the extent knowledge of learners gained provides the platform for feedback method to improve the lectures to make it more receptive for students. **Aims and Objectives:** Aims and objectives were to evaluate the knowledge of didactic lecture among students by giving pre- and post-test questionnaire based evaluation technique. **Material and Methods:** 2<sup>nd</sup> year MBBS students (4<sup>th</sup> and 5<sup>th</sup> term) after obtaining their consent for voluntary participation, asked to take the pretest containing 10 questions on antiamoebic drugs, and the same 10 questions were provided at the end of the lecture as a post-test questionnaire to assess the effectiveness of the teaching as well as the receptive power of students and their pre- and post-lecture knowledge. Papers were valued on score basis and improvement, data recorded, interpreted, and analyzed. **Results:** There was significant improvement in the recipient knowledge after post-lecture assessment when compared to pretest. Out of 156 students, only 56 (35.90%) obtained scores between 5 and 8 and 100 (64.10%) were below 5. These scores were improved in post-test by 78.21% (122) obtained scores between 5 and 8, while 21.79% (34) got scores more than 8 indicating the high recipient group reflecting good improvement in cognitive structure. **Conclusion:** Voluntary participation in such tests provides feedback on teachers teaching effectiveness and adequacy of knowledge gained by learners.

**KEY WORDS:** Pre-test; Post-test; Questionnaire; Didactic Lecture; Score; Effectiveness

### INTRODUCTION

Pre- and post-tests are used to measure knowledge gained from participating in a training course. Active learning strategies include students are engaged in activities (e.g., reading, discussing, and writing) i.e., involved in more than passive listening, greater emphasis placed on developing student skills.

Students can receive immediate feedback from their instructor; students are involved in higher order thinking (analysis, synthesis, and evaluation).

Undergraduate medical education needs ongoing improvements to meet the changing demands of medical practice in the 21<sup>st</sup> century. Although the complexities of medical care have increased dramatically over the past century, the methods of teaching medicine have changed little. Teachers need to learn about the latest techniques and theories of medical education. Medical education should be given the same emphasis as research and patient care.<sup>[1]</sup>

In 1899, Sir Osler realized that the complexity of medicine had already progressed beyond the ability of the teachers to

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teach everything that students would need to know. Osler recommended abolishing the lecture method of instruction and allowing students more time to study. He also emphasized the important role of teachers in helping students to observe and reason.<sup>[2]</sup>

Traditional method of teaching and learning (TL) has become no longer sufficient. Today's generation of medical students and doctors have grown up in a multimedia civilization, the so called-"new gen." It is insufficient and unreasonable to teach them using methods that have been developed decades ago. Institutional Ethical Committee clearance was obtained. By introducing newer methods, we will be able to catch up with them and cover the current lacunae.<sup>[3]</sup>

Active learning involves students in doing things and thinking about the things they are doing.

We intended bringing in a change to the passive way of teaching pharmacology with no active participation by the students by introducing pre- and post-tests. The intention of administering a pretest before the lecture was to both analyze how much the students are aware of the topic and most importantly to make the students be more focused to the lecture and a post-test after the lecture was to evaluate students learning of the key concepts of pharmacology.

In this context, to continue the new teaching process, we evaluated the knowledge of didactic lecture among students by giving pre- and post-test questions so that the student will be actively involved in education, gaining knowledge than their previous one.

This study was undertaken to determine if they were effective in enhancing attentiveness and learning pharmacology, to determine the perceptions of 2<sup>nd</sup> year MBBS students about pre- and post-tests, and to determine if there was any gender wise difference.

### Need for the Study

An educational program with a pre- and post-test method has better chances of being effective. This method of intervention was designed for undergraduate medical students for the first time in our medical school at Adichunchanagiri Institute of Medical Sciences, B G Nagar, India. It was felt that this method will enhance the receptive capacity. Moreover, this method also helps to improve the thinking, understanding and attention of the students.

### Aims and Objectives

This new TL methodology was adopted for 2<sup>nd</sup> year MBBS students to inculcate the concept of pre- and post-test method of teaching in undergraduate MBBS curriculum to help the undergraduate students in improving their attention and thus to improve their focus toward better understanding. For the

faculty, to motivate the staff members to implement new teaching methodology to make teaching more students centric and inculcate habits in the staff members to work as a team.

## MATERIALS AND METHODS

This study was conducted in the Adichunchanagiri Institute of Medical Sciences, B.G. Nagara, Nagamangala, Mandya, Karnataka, during the month of March 2017. The study subjects were 156 2<sup>nd</sup> year MBBS students out of which 54 were males and 102 were females. Informed consent was obtained from all the student participants. The regular didactic lecture of the second MBBS class in pharmacology was restructured with introduction of a pretest before the lecture and a post-test at the end of the lecture. The pretest administered contained 10 items of multiple choice types covering the key points pertaining to the lecture to be delivered. The lecture was delivered for about 40 min, following which, a post-test comprising a similar set of questions as the pretest was administered. The questionnaire was pilot tested to ensure understanding of the items, wording and adequacy of response. Means and standard deviations were calculated.

Individuals scoring <5 are considered as low recipients; scores between 5 and 8 as moderate to average recipients and scores more than eight as high recipients. And for each pre- and post-test 10 min were provided for filling their answers.

2<sup>nd</sup> year medical students were included into study. In phase I, the study group completed a subject-specific multiple choice question (MCQ) pretest immediately before a teaching demonstration on antiamoebic drugs. In phase II at the completion of teaching same groups did the same subject-specific post-test.

Statistical analysis: Paired Student's *t*-test was used for comparing pre- and post-test scores while unpaired Student's *t*-test was used for comparing the perceptions of male and female students and *P* values were calculated using SPSS 20. *P* < 0.05 was considered as significant.

## RESULTS

A total of 156 2<sup>nd</sup> year MBBS students participated in pre- and post-test. Total post-test correct responses were highly significant (*P* < 0.05) than pretest responses (Table 1). Gender wise both males (*P* = 0.004) and females (*P* = 0.001) post-test response was significantly improved, further revealed that the improvement in post-test score was more significant in the females (Tables 2 and 3). Overall marks were improved in post-test where majority of the students scored above five and none of them were low performers (Table 4). The overall mean scores which showed highly significant improvement in the post-test scores of all the students compared to their pretest scores (Tables 5 and 6).

**Table 1:** Student's pre- and post-test responses ( $n=156$ )

Questions	Correct responses ( $n$ )		$P$ value
	Pretest	Post-test	
Q1.	139	156	0.0002*
Q2.	81	156	
Q3.	48	150	
Q4.	75	156	
Q5.	41	110	
Q6.	82	106	
Q7.	32	73	
Q8.	83	105	
Q9.	61	143	
Q10.	31	117	

\*This difference is considered to be extremely statistically significant. Q1: Amoebiasis causing parasite?; Q1: Drug of choice for tissue amoebiasis; Q3: Antiamoebic drug interaction with ethanol; Q4: Type of drug interaction seen with Q3; Q5: Luminal amoebicidal agent; Q6: Drug of choice for Pseudomembranous colitis; Q7: Chloroquine indications; Q8: Antiamoebic drug causing subacute myelo-optic neuropathy; Q9: Drug for resistance extra-intestinal amoebiasis; Q10: Mechanism of action of metronidazole

**Table 2:** Pre- and post-test response among male students ( $n=54$ )

Questions	Correct responses $n$ (%)		Two-tailed $P$ value
	Pretest	Post-test	
Q1.	54 (100)	54 (100)	0.0040*
Q2.	47 (81.48)	54 (100)	
Q3.	14 (25.93)	48 (88.89)	
Q4.	07 (12.96)	54 (100)	
Q5.	07 (12.96)	42 (77.78)	
Q6.	14 (25.93)	34 (62.96)	
Q7.	15 (27.78)	22 (40.74)	
Q8.	33 (61.11)	37 (68.52)	
Q9.	27 (50)	41 (75.93)	
Q10.	14 (25.93)	34 (62.96)	

\*This difference is considered to be extremely statistically significant. Q1: Amoebiasis causing parasite; Q1: Drug of choice for tissue amoebiasis; Q3: Antiamoebic drug interaction with ethanol; Q4: Type of drug interaction seen with Q3; Q5: Luminal amoebicidal agent; Q6: Drug of choice for Pseudomembranous colitis; Q7: Chloroquine indications; Q8: Antiamoebic drug causing subacute myelo-optic neuropathy; Q9: Drug for resistance extra-intestinal amoebiasis; Q10: Mechanism of action of metronidazole

The pre- and post-test method introduced to improve the learning ability and improvement in knowledge received the positive response from the students and majority of them agreed it could help in improving the concentration and focus with better performance since it acts as a triggering factor to be attentive and encourages to study further (Table 7 and 8).

**Table 3:** Pre- and post-test response among female students ( $n=102$ )

Questions	Correct responses $n$ (%)		Two-tailed $P$ value
	Pretest	Post-test	
Q1.	85 (83.33)	102 (100)	0.0040*
Q2.	34 (33.33)	102 (100)	
Q3.	34 (33.33)	102 (100)	
Q4.	68 (66.67)	102 (100)	
Q5.	34 (33.33)	68 (66.67)	
Q6.	68 (66.67)	72 (70.59)	
Q7.	17 (16.67)	51 (50)	
Q8.	50 (49.02)	68 (66.67)	
Q9.	34 (33.33)	102 (100)	
Q10.	17 (16.67)	83 (81.37)	

\*This difference is considered to be extremely statistically significant. Q1: Amoebiasis causing parasite?; Q1: Drug of choice for tissue amoebiasis; Q3: Antiamoebic drug interaction with ethanol; Q4: Type of drug interaction seen with Q3; Q5: Luminal amoebicidal agent; Q6: Drug of choice for Pseudomembranous colitis; Q7: Chloroquine indications; Q8: Antiamoebic drug causing subacute myelo-optic neuropathy; Q9: Drug for resistance extra-intestinal amoebiasis; Q10: Mechanism of action of metronidazole

**Table 4:** Students pre- and post-test scores/marks

Scores	$n$ (%)	
	Pretest scores	Post-test scores
<5 (low performers)	100 (64.10)	-
5-8 (moderate performers)	56 (35.90)	122 (78.21)
>8 (high performers)	-	34 (21.79)

## DISCUSSION

A prospective study was conducted to see if a pretest, given immediately before teaching, improved performance in a subsequent post-test. The study was also used to assess the educational value of a structured teaching method.

Results revealed that majority of the students (98.72%) felt that pretests helped them to improve their focus toward didactic lecture and for better performance. The possible reason could be realization of their loop holes and lacuna following pretest. Thus, administering pretests before lecture would increase the attentiveness, curiosity, eagerness to listen to the lecture among the students. 96.15% of the students felt that pretest helped in acquiring new learning as well as important points which were unknown previously.

These perceptions of better performance after the pretest were confirmed to be true by post-test scores was significantly higher ( $P \leq 0.001$ ) This finding is in agreement with the findings of Cramer and Mahoney<sup>[4]</sup> and Muthukumar et al.<sup>[5]</sup>

**Table 5:** Comparison of the students' scores in the pre- and post-tests

Gender	Mean±SD			t	d.f	P value
	Pretest	Post-test	Increase			
Males	23.20±16.572	42.00±10.656	18.800±15.512	3.833	9	0.004*
Females	44.10±22.917	85.20±19.298	41.100±24.569	5.29	9	0.001*
Total	67.30±32.520	127.20±28.940	59.900±30.950	6.120	9	0.000*

Results are expressed as mean and standard deviation of the total scores obtained in pre- and post-tests. Significance (*P* value) obtained using a paired *t*-test. \*Highly significant, SD: Standard deviation

**Table 6:** Comparison of the level of improvement in post-test scores between the males and females

Gender	Mean±SD	Difference	t	df	Significance <i>P</i> value
Males	18.800±15.512	22.300	6.0563	154	0.0001
Females	41.100±24.569				

Results are expressed as mean and standard deviation of the level of increase in post-test scores of males and females. Significance (*P* value) obtained using an unpaired *t*-test, SD: Standard deviation

**Table 7:** Student's perception on pre- and post-test method

Student's perception	n (%)		
	Strongly agree	Neutral	Strongly disagree
Improves focus toward lecture and helps for better performance	154 (98.72)	2 (1.28)	0
Helps in acquiring new learning as well as important points	150 (96.15)	6 (3.85)	2 (1.28)
Triggering factor and encourages to study	155 (99.36)	1 (0.64)	0

**Table 8:** Gender wise student's perception on pre- and post-test method

Strongly agree	Male (n)	Female (n)	<i>P</i> =0.0001
Improves focus toward lecture and helps for better performance	54	100	
Helps in acquiring new learning as well as important points	52	98	
Triggering factor and encourages to study	54	101	

Post-test scores were high when compared to pretest scores (Table 4) and post-test results showed 21.79% had become higher performers where none of them scored more than eight in pre-test; moderate performers were raised to 78.21% (post-test) from 35.90% (pre-test) with an improvement of 42.31%; and none of them were below average performers following post-test. This suggests that the students were attentive to the lecture and so were able to understand the key objective of the lecture.

Nearly 96.15% also agreed that pre- and post-test are useful method to acquire new knowledge and learning process, as

well as important points of the lecture. This response was also seen with two more studies stating that pretests with MCQs enhance learning.<sup>[6]</sup> 99.36% agreed that this method of evaluations as such is a triggering and encouraging stimulus for them to study by instantly knowing their level of performance in class itself which was even shown by study done by Muthukumar et al.<sup>[5]</sup> that post-tests normally gives an instant feedback to the students about their level of understanding of that lecture topic and MCQs also trains the students for in depth learning of the subject.

The present study was having the similar response as that of Hartley<sup>[7]</sup> suggesting that pre-tests can have orienting and motivational and (hence) teaching functions — in addition to the sought-for testing function and Hill<sup>[8]</sup> concluded that the pretest did not result in a measurable increase in learning. The study did demonstrate that the teaching method was effective as post-instructional knowledge increased by nearly half when compared with pretest levels.

Pre- and post-test designs are widely used in behavioral research. The measurement of change provides a vehicle for assessing the impact of interventions.<sup>[9]</sup> Therefore, our study suggests that introduction of a pre- and post-test instrument supported achievement of the learning objectives with a better understanding and this helps students begin to focus on the key topics that will be covered.

## CONCLUSION

Increasing the knowledge of students has a direct positive impact on the antiameobic agents. The application of a pretest was observed to be a feasible tool to shape group specific education programs. In planning and pre- and post-test based learning method, the student will be actively involved in education; also the assessment of medical students and prospective doctors is done more efficiently.

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