

# Assessment of Conventional Teaching Technique in the Era of Medical Education Technology: A Study of Biochemistry Learning Process among First Year Medical Students Using Traditional Chalk and Board Teaching

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**Abstract Background:** In traditional class-room teaching, although we deal with processes of human disease, what is very important for a teacher is to know how much the learners can understand it. From the era when only chalk and board was the method of choice for teaching, currently there are several teaching methodologies available that include the audio-visual aids, overhead projection, PowerPoint presentations, computer graphics and videos. Recently there has been an increase in the usage of modern techniques in teaching and learning processes. Also, there is a debate on whether a traditional chalk and board teaching be completely replaced by the newer medical education technologies. The present study attempts to assess the effectiveness of chalk and board method of teaching biochemistry for first year medical undergraduate students. **Methods:** The study was conducted at a tertiary care teaching hospital and included 149 first year Medicine (MBBS) students. Chalk and board teaching was used, and a set of ten multiple choice questions (MCQ) was given as a pre-test to all the students before the class with a 10-minute time duration. After completion of the topic, the same set of ten MCQ's was given as a post-test to all the students in the class. The test was valued, and the marks were noted down. The Microsoft word, and excel were used to prepare and analyze the data. The results of the pre-test and the post-test were interpreted using student t test. **Results:** Of the 149 study participants and 146 students who completed both the pre and post-test, 123 students had scored more in the post-test compared to the pre-test assessment, accounting for 85% increased marks in post-test. The scores for pre-test and post-tests were  $5.87 \pm 1.59$  ( $<0.0001$ ) and  $7.88 \pm 1.58$  ( $<0.0001$ ) respectively. **Conclusion:** The chalk and board teaching appeared to have been beneficial and had increased the understanding of the subject.

**Keywords:** class-room teaching, biochemistry, human disease, chalk and board, teaching methodologies, audio-visual aids, overhead projection, PowerPoint presentations, computer graphics, learning process

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## 1. Introduction

The subject biochemistry deals with chemical processes of life. Although a basic medical science subject, it is volatile and only a little can be retained when the learner is not in continuous touch with the subject. The understandability of biochemistry and the retention of the subject for a long time greatly depends on how well we apply the knowledge gained in the subject, and its practical application with regards to the disease processes. Among the various subjects taught in the first-year of a medical graduate course, the process of teaching

biochemistry appears to be a complex one, which exposes the learners to monotonous lectures. Since biochemistry is an off-shoot branch of organic chemistry, and deals with detailed study of chemical structures, long metabolic cycles, bio-energetics etc., students face difficulty in understanding and retaining the subject. Relating biochemistry to the natural biological and disease processes, and regularly making a brief note of already understood aspects could be instrumental in creating interest among the learners. Therefore, teachers should necessarily start with the previous knowledge of the students and stress on the significance of medical applications of the acquired subject. Now-a-days the value of basic sciences in medical curriculum has assumed

greater significance, because a good knowledge of these subjects is important to succeed in competitive, and exit/licensure examinations [1].

Teaching medical/clinical biochemistry, and making the learner understand the concepts, and apply them while practicing medicine is not an easy task. The success of teaching depends on the attitude, dedication and devotion of the teacher towards the subject. A positive attitude of the teacher helps to improve the learners understanding. Easy approachability of the teacher, and a role model like behavior could inspire the future generation of learners [2]. Medical colleges use various methods of teaching, which involves the use of audio-visual (AV) aids. There are various teaching methodologies available, which include and not limited to the chalk and board (CB), transparency and overhead projector (OHP) and the power point presentation (PPT).

In the era of increased instrumentation and improved information technologies, there has been a radical change in the attitudes of both the teacher and the learner [3]. There is an increased awareness of the use of advanced teaching technologies. The medical council of India (MCI) had also made it mandatory for the medical teachers to undergo a basic medical education technology training workshop as a part of the improvement.

Traditional CB teaching is now considered as least effective and teachers are forced to use the advanced teaching aids. Many teachers, most of them who are in their terminal phases of their career have been facing great difficulty in getting in to terms with the advanced teaching aids.

The present study aims to know the effectiveness of teaching biochemistry using traditional CB method in the era of advanced teaching technologies.

## 2. Material and Methods

The study was conducted at a tertiary care teaching hospital and included 149 first year Medicine (MBBS) students. All participants included in the study had given verbal consent. The study was approved by institutional ethical committee. A set of ten multiple choice questions (MCQ) was given as a pre-test to all the students in the class with a 10-minute time duration. The questions included in the test were prepared from the topic that was going to be taught to them. The topic is new for students and without a prior complete knowledge. The test is valued, and the marks were noted down. The topic is taught to them completely using chalk and board as the only teaching aid. After completion of the topic, the same set of ten MCQ's was given as a post-test to all the students in the class. The Microsoft word, and excel were used to prepare and analyze the data. The results of the pre-test and the post-test were interpreted using student t test.

## 3. Results

Of the 149 students who took pre-test assessment MCQ exam, only 146 students completed the post-test assessment. 123 students had scored more in the post-test

compared to the pre-test assessment, accounting for 85% increased marks in post-test and there were 10 students who got same marks in both the tests. The mean, standard deviation (SD), p values of pre-test and post-test are shown in Table 1.

Table 1. Interpretation of the effectiveness of traditional teaching

Traditional Chalk and board teaching	PRE-TEST			POST-TEST		
	Mean	SD	p-value	Mean	SD	p-value
Total number of students						
149	5.87	1.59	<0.0001*	-	-	-
146	-	-	-	7.88	1.58	<0.0001*

\*extremely statistically significant.

## 4. Discussion

Teaching and learning are continuous processes. Teaching facilitates and supports learning character in the students [4,5]. During the process of learning, the learner acquires professional and ethical values. Students also acquire clinical knowledge, behavioral, reasoning and psychomotor skills necessary for professional competence [6]. The learning process causes a permanent change in the behavior of the learner [7,8]. There is a continuous change in the curriculum of medical education and the teacher is supposed to be in pace with the ever-changing needs of the learner in education. The needs of the learners should be considered during teaching and make the process of teaching/learning an effective one.

A previous study had noted that the PPT usage may improve the learner's ability to grasp the subject and improve their concentration during a lecture. In the same study it was noted that a combination of CB and PPT with animations was preferred by 59% students. Students preferred CB as most effective in small group teaching and PPT for a large group teaching, and 66% students rejected the idea of a full-fledged PPT class alone [9].

A study from India which included 506 students compared the CB, PPT, OHP, and a combination of PPT and CB. This study had concluded that 43% students preferred CB teaching followed by PPT (40.1%) and OHP (15.6%). It was also noted that the student's post-test results were better after a CB teaching [10].

A recent study by Wolf AB et al., had noted that during an online education course, the student's satisfaction level was found to be great with CB teaching videos [11].

In a recent study from United Arab Emirates (UAE), it was observed that although there are several methods of teaching, each method has its own benefits and disadvantages, and a teacher should cautiously choose an appropriate method or a combination to achieve learning objectives [12].

In a study from Pakistan, a novel approach (flipped classroom (FCR) approach) was noted to be instrumental in achieving the learning objectives among undergraduate medical students. The FCR approach included a pre-test followed by printed material, video classes, case description, discussions, and quizzes which is then followed by a post-test that included multiple choice questions [13].

Analysis of teaching methods and their significance in teaching various undergraduate medical disciplines was assessed in previous studies [14-19].

A study from the United States of America (USA) had observed that the evolution of computer technologies had been instrumental in revolutionizing the anatomical lectures [20].

In an interesting study recently by White LJ et al. who worked on teaching human anatomy to medical undergraduate students, it was observed that the mode of teaching may not influence the learning process completely and that the students' attitude and involvement in a learning process is of greater significance [21].

The CB type of teaching is a traditional way of teaching, where no special equipment is required. A good teacher motivates students to interesting facts one after the other and maintains the magical eye-to-eye contact, thereby taking the students on the journey of learning and discovery. The only drawback of CB teaching could be a loss of focus in a student even for a moment of lost continuity. Lectures delivered through Microsoft power point presentation (PPT) could influence the students in an improper manner. Students may fail to pay more attention to the discussion part of the topic and may engage in writing down the notes robotically. Another major disadvantage of PPT teaching is that the teacher has minimal eye-to-eye contact with the student, due to reduced visibility of the class room.

Application of teaching aids can help in the process of learning only with the appropriate attitudes of the teacher and the student. As we are talking about the attitudes, it has to be noted that before joining the medical schools the students are more habituated to routine memorization and are in the race of getting more marks in the assessments, which makes them less knowledgeable. The student's attitudes and beliefs about learning matters a lot for their success as learners. The teacher has a hectic schedule to make the students normal, create a favorable environment for them, should keep in pace with the topic, and design activities which increase their interest in subject and make learning a satisfactory process [22,23,24].

In the present study, the students felt that CB teaching helped them a lot. In the CB type of teaching the teacher takes the pain of writing complicated structures, names on the blackboard and the natural pauses in between the class (writing, cleaning blackboard) also gives learner, the time to understand the topic.

## 5. Limitations of the Study

Although the study results clearly demonstrated a significant improvement in the retention of the knowledge imparted after a chalk and board teaching, further testing of the same group incorporating other active learning/teaching methodologies would be desirable.

## 6. Conclusion

The art of teaching biochemistry, and other basic medical science subjects should focus on preparing the learner with concepts of the subject and its medical

applications. The pattern of teaching should be more concept-oriented, and teacher should actively engage the learners to enhance their interest towards learning the subject. The results of the current study clearly indicate the fact that the attitude of both students and the teachers is as important as the teaching/learning methodology used. We conclude that the traditional chalk and board teaching could be as effective as the other advanced methods and what really matters is the attitudes of the students and the teachers to make the process of learning a success.

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