

# DOES THE SMART BOARD IMPROVE SKILLS OF THE FIRST YEAR MEDICAL STUDENTS IN LEARNING BIOCHEMISTRY?

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## ABSTRACT

Biochemistry is one of the basic medical sciences subject introduced in the first year of the medical curriculum. At Saveetha University Medical College Hospital, the approach used in teaching biochemistry is lecture-based strategy by using SMART board. The purpose of this study was to investigate the correlation between use of the SMART board as a teaching- learning methodology in a first year MBBS classroom and student attention to and participation in learning the lessons. Student attention was identified as looking at the speaker, looking at the smart board, looking at reading material and materials used to present during the learning sessions. This study examines the effect of SMART board on 1<sup>st</sup> year medical student's academic performance in Biochemistry. Also this paper examines the ways in which the SMART board technology was integrated into number of areas in the curriculum during the 1<sup>st</sup> year of the medical students at Saveetha Medical College, Saveetha University. The purpose of this study was to investigate teacher's use and student's perceptions regarding the SMART board as an instructional tool to teach biochemistry to the medical students. The SMART board is a computerized white board through which new ideas can be recorded, saved, recalled and integrated with the other information. Because of these special features it was assumed that the SMART board would facilitate interactive and collaborative learning and these effects would be evident in improved test scores, generation of ideas and satisfaction of the students with most aspects of the SMART board. Participants were 1<sup>st</sup> year MBBS students who were admitted to Saveetha Medical College, Saveetha University during the academic year 2008-09. An intervention group of 75 students used the SMART board to facilitate the active learning process while a comparison group of 75 students, not assigned to a SMART board intervention, used a conventional method of black board teaching. To diminish the intervention effects between the two groups, the comparison group completed a post-discussion evaluation exercise using SMART board. It was observed that there is a significant increase in the test scores in the intervention group as compared to the control group. A 5-point Likert scale questionnaire containing 15 questions was administered to the students to know their perception on the usefulness of the SMART board and completed by all the 150 students of 1<sup>st</sup> year MBBS. 98% of the students reported improvement in motivation. All students thought that the SMART board was effective in terms of learning gains and 98% thought it was essential for their learning outcome to be achieved in learning clinical biochemistry. All of them were enthusiastic about the SMART board and all were impressed by instructor's use in teaching biochemistry.

## KEYWORDS

Teaching-learning methodology, SMART board, Biochemistry, 1<sup>st</sup> year MBBS students, Student perception, Motivation, Saveetha Medical College, Saveetha University

## INTRODUCTION

Studies on the role of computer-assisted learning in promoting concept development, interactive learning, collaborative learning and transfer of learning have produced modest support. However, the utility of technologies for improving the learning process is not fully understood (Carey and Kacmar, 1997). This academic year (2008-2009), a SMART Board was brought into the Lecture Theatre of Saveetha University. Its purpose was to give the I year medical students an opportunity to improve their learning environment using interactive technology. The SMART Board served as a motivational tool that also augmented attentiveness of the students to the biochemistry classes. Most of the students had never seen or used a SMART Board before. Therefore, they responded with a great zeal of enthusiasm and were anxious to get out of their seats when it came time to learn the complicated metabolic

pathways in biochemistry. By the end of the research period (end of the academic year), my goal was to find a variety of ways that SMART Board technology could be used to amplify my 1 year medical students' skills to learn biochemistry according to Medical Council of India (MCI) standards. Would the implementation of metabolic pathways and clinical cases presented differently on the SMART Board unit benefit the students' understanding of how to remember and understand them? Can the concepts in biochemistry presented with interactive SMART board technology be impressive and made an impact on the student's learning environment? With this focus in mind, the SMART Board interactive whiteboard was used to create a productive learning environment throughout the academic year in teaching biochemistry to the medical students.

The SMART Board is an interactive whiteboard, which a learner can use with a computer alone or with a data projector to capture written or typed information on the Board, manipulate the data, store it and recall it later for integration with information from internet sources or data previously stored on a disk. Prior research suggests that computer technologies may enhance the extent, quality and depth of group discussion (Ocker and Yaverbaum, 1999), but findings on user satisfaction with computer-assisted group learning are mixed (Johnson, 1997; Ho, 1999). No studies were found that examined the impact of such technologies on collaborative learning of biochemical concepts or the attitudes of students about the role of technology in this process. According to Griffith (1999), the extent to which people use technology may depend upon their understanding of its features and their ability to make sense of it. Therefore, we examined the effect of the SMART Board in enhancing face-to-face discussions, group processes and satisfaction with technology features on a group of undergraduate medical students enrolled in Saveetha Medical College, Saveetha University during the academic year 2008-09.

## LITERATURE SURVEY

Although findings on the impact of computers on learning are mixed, current studies show some evidence of productivity in group interaction, generation of ideas, test scores and satisfaction with technologies. Gilliver et al. (1998) showed that use of technology resulted in an eleven percent gain in productivity in an academic class. Phillips and Pierson (1997) speculated that software supports problem solving by shifting the cognitive load for low-level cognitive tasks, so that attention can be focused on more complex tasks. Deadman (1997) found that a computerized reflective writing exercise induced better reasoning skills than did teacher support alone. Similarly, Cohen (1997) reported that an interactive approach to learning through computers resulted in greater depth of learning for a group of students than that achieved by a control group. According to Raatz (1993), collaborative computing allows groups to build common databases or repositories of information and together retrieve, replicate, edit and expand it. User satisfaction is a key indicator of the utility of computing innovations. House et al. (2000) showed the effect of SMART board interactive white board on concept learning, generation of ideas, group processes and user interaction satisfaction. Smith et al. (2000) conducted an evaluation on Interactive white board and compared the white board use with black board. Gilbert et al. (2007) showed the writing improvement through white board. These findings suggest that computing technologies have the potential for enhancing the concept learning and there by improving the performance of the students. Hence in this study we build on some of these approaches to examine whether the SMART Board could induce more effective concept learning, greater generation of ideas, satisfaction with the group learning process and positive attitudes toward the technology itself.

## SMART BOARD

It is an innovative learning tool which gives unlimited creativity in the hands of teacher. The SMART Board brings ideas, lessons and resources to life. Teacher uses interactive tools and designs higher level thinking activities that involve student collaboration, creativity and problem solving. SMART board maximizes the impact of the lessons by using a high quality interactive digital and multimedia content, keeps the track of past lessons and activities, involve enthusiastic participation from every student from any where in the class room, modify and customize interactive material to suit the teacher's approach and style of teaching, plan and share lessons collectively or access a huge wealth of teaching resources. In Saveetha University Medical College, SMART board was installed by Globus Infocom Limited, INDIA. The SMART board and SMART class room in Saveetha Medical College, Saveetha University was shown in Figures 1 and 3 respectively. The representation of biochemical and metabolic pathways on SMART board is shown in Figure 2.



Figure 1. SMART board facility in Saveetha Medical College, Saveetha University

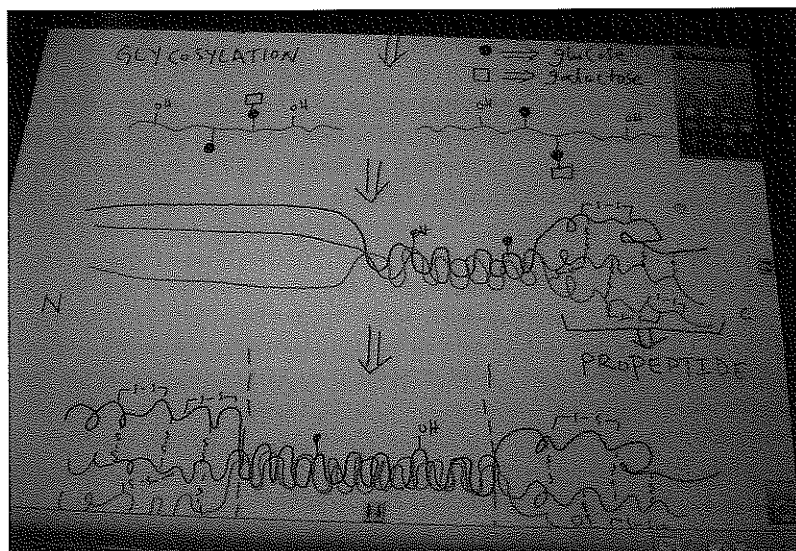


Figure 2. Representation of biochemical and metabolic pathways on SMART board

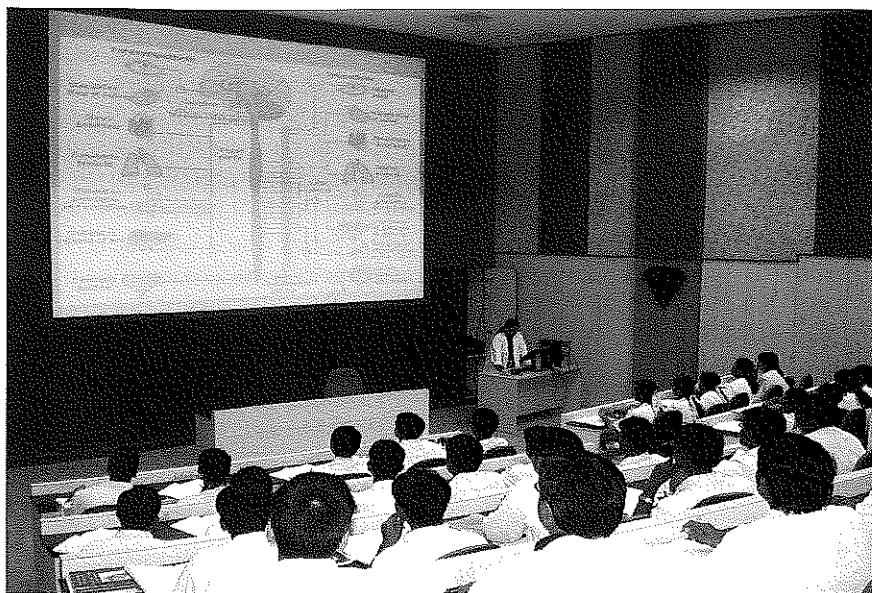


Figure 3. SMART class room in Saveetha Medical College, Saveetha University

## MATERIALS & METHODS

This study was conducted and participated by 150 medical students who were admitted to the 1<sup>st</sup> year MBBS during the academic year 2008-09. We used a comparative approach to study the influence of the SMART board over a single academic term. A total of 150 medical students in the first year of an undergraduate medical program participated in the study and were randomly assigned to an intervention and comparison group, consisting 75 students for each condition. All students were in the range of 19-25 years age range. Both groups participated in four lectures sessions in biochemistry as part of their regular curriculum, which included testing of academic performance in biochemistry followed by the lecture sessions. The intervention group received lectures by using SMART board. Those in the comparison group used a conventional presentation approach using black board and/or over head projector. At the end of the research period, all students completed attitudinal survey on the usage of the SMART board. To diminish the intervention effects between the two groups, the comparison group completed a post-discussion evaluation exercise using SMART board.

The controls and patients were divided into two groups.

- Group 1 (Controls): Seventy-five medical students of 1<sup>st</sup> year MBBS using black board and/or OHP for presentation.
- Group 2 (Study Subjects): Seventy-five medical students of 1<sup>st</sup> year MBBS using SMART board for presentation.

## ATTITUDE SURVEY OF STUDENTS WHO USED SMART BOARD

We administered the same attitude survey to all the students who had used the SMART Board during the academic year 2008-09. The survey (Appendix A) asked fifteen questions and allowed a free response to three questions. A 5-point Likert scale questionnaire containing 15 questions was administered to the students to know their perception on the usefulness of the SMART board and completed by all the 150 students of 1<sup>st</sup> year MBBS. Multiple Bar Diagrams of student responses are shown in Figures 5-7.

### STATISTICAL ANALYSIS

Statistical analysis between group 1 (controls) and group 2 (study subjects) was performed by the student t-test using the SPSS package for windows. The data were expressed as mean  $\pm$  SD.  $p < 0.05$  was considered as significant.

### RESULTS & DISCUSSION

The mean  $\pm$  SD of Evaluation Test 1, 2, 3 and 4 are indicated in the Table 1 and Figure 4. There was a statistically significant increase in the academic performance test scores in study subjects compared to controls.

Table 1. The mean  $\pm$  SD values of the evaluation test scores to assess the academic performance in Group 1 (Controls) and Group 2 (Study Subjects)

Evaluation Tests to assess Academic Performance	Group 1 (Controls) (mean $\pm$ SD), n=75	Group 2 (Study Subjects) (mean $\pm$ SD), n=75
Evaluation Test 1	9.44 $\pm$ 1.53	15.81 $\pm$ 1.38*
Evaluation Test 2	10.58 $\pm$ 1.61	14.93 $\pm$ 1.25*
Evaluation Test 3	9.73 $\pm$ 1.36	16.10 $\pm$ 1.68*
Evaluation Test 4	7.90 $\pm$ 1.04	14.26 $\pm$ 1.20*

\*  $P < 0.001$  compared to controls

Results of the Questionnaire are shown in Figures 5-7.

No one thought that the SMART board was of no use. 99% students felt that the presentation of biochemical metabolic pathways on the SMART board is more effective and easier to understand and remember. 98% of the students opined that the visual presentations on the SMART board made it easier to understand and remember the information. In all biochemistry classes, students were very much excited and really got involved into the lectures with great enthusiasm. Students agreed that class presentations that included the SMART Board were interesting to them. Students believed that the SMART Board helped them remember more of the lectures. Students liked the idea of seeing having a large focal point and colour image with in the class room. This made the students more attentive in the class. All students agreed that the instructor's use of the "drag and move" option on SMART board made the ideas clearer to them and the use of colours on the SMART board helped them to better understand the ideas. 96 % students expressed that it is a good tool to study and revise the content where as 06 of the students were neutral about it. 96% students believed that they remembered more of lectures when SMART board was used. 98% students opined that viewing media on the SMART board helped them

to understand the topic better and it was more motivating when we used the SMART board in teaching biochemistry. 98% students expressed that the teacher gave better class presentations when he used the SMART board. The students who enjoyed writing on the SMART Board were 85% and 17 students did not express their views. No students found the Board to be a distraction. In general, students totally disagreed with the statement that they would have preferred that the instructor use the SMART Board less often. When interacted with students, all students opined that they all enjoyed the lessons and they had been motivated to learn biochemistry in easier way. The large image and a focal point in the room supported the learning outcomes both in terms of motivation and understanding.

The results suggest that the use of SMART board in teaching biochemistry to 1<sup>st</sup> year MBBS students resulted in improvement in their academic performance which is evident by the results of Evaluation tests. Also it resulted in greater generation of ideas and motivated towards meaningful learning of biochemistry.

### RESPONSES TO OPEN ENDED QUESTIONS

Three open ended questions were posed in the last section of the questionnaire survey. Participants provided thoughtful responses.

The first question asked was, "**The thing I LIKED THE BEST about the SMART Board was:**" The following responses were obtained from the majority of the students.

1. "It is advanced and a boon for medical students where around 150 students have to listen to a lecture at a time which is not possible with an ordinary black board or/and OHP teaching".
2. "It gave a nice opportunity to me to get a clear idea of the topic taken, especially the metabolic pathways. It served as a best tool in the way that I remembered almost all the topics that were taken on the SMART board".
3. "The touch screen compatibility which can help the teacher to write on the SMART board manually and using the technology of the colours simultaneously".
4. "It made the concepts very clear. The best thing is from every where that is from any corner of the lecture hall the SMART board was fully viewed. Hence the grasping of the subject was easier". SMART board teaching was very fascinating and drags your concentration".
5. "SMART board was a totally innovative learning experience for me in this college. SMART board gives an easy learning experience, easy to remember, beautiful experience and easy to revise the content area taught before".
6. "Since I am a slow learner this SMART board teaching makes me to study and remember the complicated metabolic pathways easily".
7. "Teaching biochemistry with the SMART board makes classes more informative and fun filled experience. It made us understand the concepts completely unlike the power point presentations".
8. "The representation of the biochemical pathways or whatever the related topics being put on a single page and they remain as such and could be revised whenever was the best part of it".
9. "This is the best opportunity I have got to study using the SMART board. It is mostly expressive, easy to learn and remember and also easy to copy from it. It gave me a good learning experience."

The second question asked was, **“The thing I LIKED LEAST about the SMART Board was:”**. Majority of the students opined that they did not find any disadvantages of the SMART board learning. Apart from this response, the common answers were:

1. “There are not many negative points to be mentioned about the SMART board, except for a few limitations like - difficulty in using it for computer illiterates”.
2. “SMART board is student friendly in all ways. The one problem in that is it takes a few minutes to open the saved documents”.
3. “I don’t like the SMART board only when it is taught by a person who doesn’t know how to operate it properly”.
4. “When power goes off it will take few minutes to come back to normal. So there occur some interruptions on our concentration”.
5. “For new learners it is difficult to write on the SMART board. So it will be comfortable to the students if the lecturer learns the writing and then using it”.

The third question asked was, **“Do you wish to make any additional comments:”**. The common answers were:

1. “I want to make this SMART board technique in upcoming years, a major tool in teaching community to make students SMART”.
2. “It would be nice if this concept of SMART board gain more popularity among the medical faculty as is it is a very good tool to teach the concept clearly”.
3. “It is an extremely comfortable and interesting way off learning difficult thing like metabolic pathways”.
4. “Biochemistry classes were interesting and they were dealt with the shape of the art facilities like the SMART board. SMART institutions use SMART board”.
5. “SMART board should be followed in all the institutions. A novel experienced technology which will be well accepted by students and professionals all over the world”.
6. “SMART board teaching will be a milestone in the new teaching method introduced to students. This technique will soon be incorporated in all the colleges will take over black boards very soon”.
7. “The person using the SMART board must be well trained so that lecture is pleasure and pleasant experience for the students”.
8. “Lots of thanks to biochemistry sir, he made us to feel the subject easy by presenting each and every topic in a better way by using colours, mind maps, drag and move options etc.,”.
9. “Proud to have SMART board in our college, whenever we think of biochemistry we will get reminded about SMART board because we are more benefited to learn metabolic pathways in biochemistry in an easy way.”
10. “SMART guys are always SMARTER when they use SMART board, it resembles our smartness”.

## CONCLUSION

From the results of the study it is evident that the use of SMART board in teaching biochemistry to the I MBBS medical students improved their academic performance evaluation test scores. The use of SMART board helped to gain and improve the knowledge as well as in easy understanding of the complex concepts in biochemistry like metabolic pathways. The use of SMART board also brought the motivation in the students to study and learn biochemistry. In addition, most students surveyed had a positive response to the use of SMART Board. Students self-reported that lectures featuring the Board were more interesting and that the use of color helped them understand ideas better. It may be obvious, but if the students find the class interesting, they may retain more of the information.

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