ORIGINAL ARTICLE

Comparing Effectiveness of Collaborative Blended Learning and Traditional Teaching Using Students Final Test Scores

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ABSTRACT

Aim: To compare the test scores of Collaborative Blended Learning methodology versus traditional teaching among 4th year M.B.B.S students in the subject of Pathology. It was an Experimental study carried out in Department of Pathology, Lahore Medical and Dental College Lahore, from Jan to Mar 2017.

Methods: Fourth year undergraduate medical students of Lahore Medical and Dental College attending Special Pathology Module of cardiovascular system, in year 2017 were randomly divided into two groups. One group (A) comprising of 75 students covered the topic in 8 didactic lectures of 45 minutes duration each and the other group B of 75 students in four CBLM sessions. Each session was of one hour and 30 minutes duration each. After completion of the cardiovascular Module, students took test comprising of problem based 30 MCQS and 4 SEQs regarding cardiovascular system. ALL the questions were of equal difficulty (C1-C3 level), covering the basic and clinical aspect of the topic. Students' scores in the test were compared by using paired sample t-test.We also found out whether there was any significant difference in their mean scores of final test with CBLM (among these students) with respect to their gender. This data was analyzed by using SPSS version 20.

Results: When results of both groups were compared the final test scores were highly significant (p=0.000)in group B (CBLM)as compared to traditional teaching group A.

Conclusion: Our study showed to have a significant impact of CBLM on student test scores as compared to didactic lectures. Majority of the female students scored more marks as compared to the male students of the class.

Keywords: Traditional teaching, Didactic lecture, Collaborative Blended learning methodology (CBLM).

INTRODUCTION

There is abundant evidence which supports that delivering traditional lecture is relatively less impressive educational tool to promote concept based understanding in medical students. One instructional method aimed at achieving the student centered approach in a conducive environment is collaborative learning. They share multiple ideas in small groups, and develop critical thinking skills through the process of endorsing or conflicting each other's views[1].

Collaborative blended learning methodology (CBLM) is considered as a powerful scholastic tactic in delivering education. The blending of online and face-to-face instruction and interaction in designing courses has found solid acceptance in the current educational era [2-3].

It proposes innovative ideas and educational practices and alters the roles to be played by the teacher as well as student's[4] .The learning becomes easy, pleasurable and quick in blended-learning with an amalgam of student-teacher interaction, peer learning, having some reading content online with reduction in number of hours for forced sitting in class, as compared to traditional lecture-based methodology. This combination gives a sense of achievement and contentment among faculty members and in return the students achieve better learning outcomes[5].

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The collaborative blended learning methodology is based on social constructivist theory[6] (Vygotsky, 1978). Keeping this learning approach in mind the class tasks or assignments were designed for students so they can work collaboratively on complex tasks to construct knowledge , based on useful mind maps, schemas, and storyboards using information and communication technology(ICT) for an effective learning experience. It was assumed that participants would also learn from each other, especially through peer assisted learning activities, and reviewing each other's schemas or concept maps/ storyboards which enhances their problem solving skills[7].

In routine undergraduate medicine course, systemic pathology is usually taught on morphological and microscopic concepts. The students are then expected to apply this knowledge to solve complex medical problems. This is effectively achieved when students work in groups and work towards a solution rather working in isolation by just recalling knowledge facts[8]. Therefore, collaborative activities make increasing sense of conceptual understanding and developing analytical skills in undergraduate courses.

Different data is available regarding collaborative and blended learning in the field of clinical medicine [9-10,] web technologies[11], English literature& English language skills[12], Microbiology[13]and pharmacokinetics[14-15]. Sparse data is available regarding collaborative blended learning in basic sciences especially in the systemic Pathology.

The purpose of this study was to implement a new instructional strategy and determine the effectiveness of collaborative blended learning methodology (CBLM) in undergraduate medical sciences particularly systemic pathology which has conceptual learning.

The beneficial effects of collaborative and blended learning on student learning are quite evident from literature. However, effect on assessment scores is a major concern for all stakeholders while adopting a new teaching methodology. Therefore we planned to study the effect of CBLM on students test scores and to determine its effect on their academic performance with this methodology.

SUBJECTS AND METHODS

An experimental study was conducted with fourth year undergraduate medical Students (N=150) attending a module on Cardiovascular system at Lahore Medical & Dental College (LMDC) Lahore, Pakistan, from January to March 2017. LMDC follows a 5 year discipline based curriculum for MBBS program. Pathology is taught in years 3 and 4 using different instructional methods such as lectures, tutorials and practical demonstrations, followed by assessment of each topic. Special pathology module of cardiovascular system is taught in fourth year using same teaching methods.

Before starting, we conducted orientation lecture for the students and faculty regarding the new instructional methodology separately. The students were randomly assigned in two groups consisting of 70-75 students each, based on the roll numbers using computer software/lottery method. The group (A) received traditional teaching and group (B) received Collaborative Blended learning teaching. The two teaching methods used in the study are as follows:

1. **Traditional teaching:** This teaching was carried out by a teacher of Pathology in 8 lectures of 45 minutes duration each, over the period of 4 weeks to group A. In this method the teacher /instructor was the lead educational role and the students were passive receivers of the information presented by the instructor in her multimedia slides. The teacher used verbal skills to transfer the knowledge of the topic as routinely done in didactic lectures.

2. **Collaborative blended learning teaching methodology:** One week before starting the new method, all the students of group B attending CBLM were explained the new instructional technology and pattern to be followed for accomplishing their given tasks in the CBLM session. The learning outcomes and the topics along with resources such as reference books with page numbers specified and websites were displayed on the notice board one week before the start of the CBLM. The group B of 75 students were further divided into 9 preformed groups having 8-9 students in each group. Students had to remain with their assigned group for all CBLM sessions so that they could evolve into functioning teams over the course of time.

They were given hands on practice to connect to their electronic gadgets with internet and Wi-Fi and access data online and retrieve from their emails. They were also guided to do practice of making schemas/flowcharts, so all the students should get equal chance of active participation. This was followed by a practice CBLM session which was duly supervised by the researcher/ Assistant professor and all queries by students were addressed.

One day before the CBLM session the reading material of the specific topic from cardiovascular system was posted to them through emails. The students were directed to come prepared in classes after giving a reading to the specified book chapters or notified pages and the allocated content was mandatory to be present or downloaded in their smart phones, tabs/IPad /or laptops. The instructor made sure that all the students should have their electronic gadgets and reading material with them before entering the session. In the start of the session 4 Clinical scenarios regarding the topic of the cardiovascular system were given to all the students of group B. These were of C1, interpretation C2 and problem solving C3 levels and prepared by the faculty members according to the table of specifications.

The students were asked to do problem solving of the clinical scenarios with the use of the study material in their electronic gadgets or by using internet, retrieving the learning material from their emails and also discussing with each other to reach the diagnosis. One trained facilitator supervised all the activity and guided the students whenever required.

After completion of the group discussion of 30 minutes regarding solution of the clinical scenario the students were asked to make schemas regarding the specific topic starting from presentation to investigation to reach the differential diagnosis in another 30 minutes. In this process each member was responsible for their own learning as well as those of other group members. Thus students played vital role in each other's learning by collaboration. In last 30 minutes they used to discuss the main answers with the teacher and cleared their queries.

The key of the scenario and schema were regularly emailed and also displayed on multimedia to the students at the end of the session so that students can compare their schemas and answers with the proposed answer and improve their concepts and acknowledge the right answer of the clinical scenario. This information was saved in their electronic gadgets. Students used concepts of cardiovascular pathology for solving complex medical problems by making schemas.

After completion of the module of cardiovascular system with both groups, students took a written test comprising of 30 clinical scenario based MCQS of 30 marks and 4 problem based SEQs of 20 marks, to test application of knowledge. Enhancement in their Problem solving skills were determined by analyzing their academic test records.

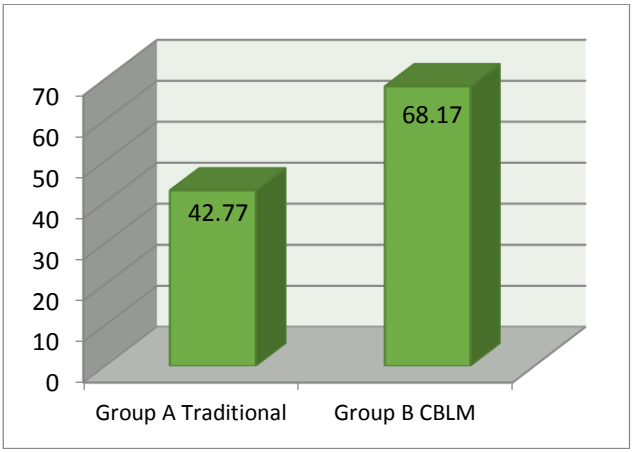
Data Analysis: The data was analyzed using SPSS version 20. Data analysis included test scores of 140 students who attended all lectures and sessions of CBLM. Data of students who missed any teaching session and final test of module were excluded. Descriptive statistics were used to determine frequency, percentage, mean and standard deviation of test scores in group A and group B. These were compared by using paired sample t-test. A *p*-value of less than 0.05 was taken as statistically significant.

RESULTS

The results are based on analysis of testscores from students who attended both lectures and CBLM sessions, n=140. There were (76) females (54.3%) and 64 males (45.7%) among both groups) ranging in age from 21-23

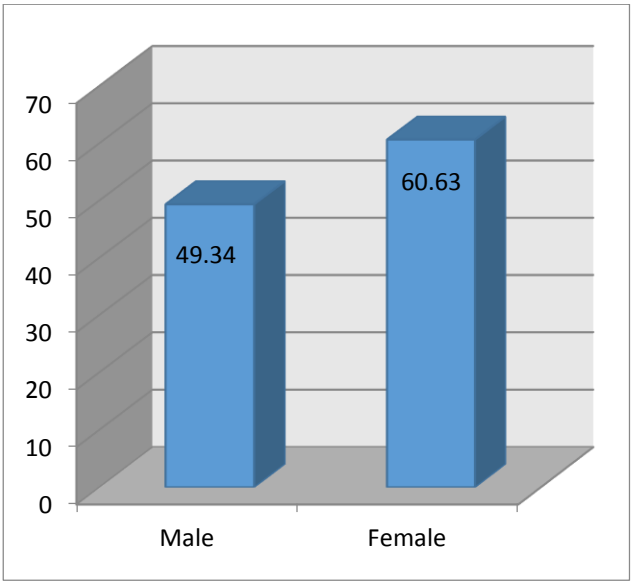
years. Mean scores obtained by group A was (42.77± 13.09) and group B was (68.17±12.57) as shown in Fig 1. Paired t-test was used for the comparison of final scores of students in the two groups. Statistically significant difference was detected in the final scores between the two groups (p<0.0001).

Fig. 1: Comparison of test scores between two groups.



Considering the gender of students it was observed that mean test scores obtained in females among both groups was higher as compared to male participants of both groups which was statistically significant (p<0.0001) (Fig 2). Mean test scores in males of both groups were 49.34±17.91 and in females of both groups were 60.63±16.61. However Mean test scores of males in group A was (40.86±13.2) and females (45.6 ± 12.5) respectively with (p<0.0001). Mean test scores of males in group B was (65.5±14.1) and females (69.3±11.7) respectively.

Fig. 2: Mean test scores comparison in males and females of both groups.



DISCUSSION

In our study the difference in scores of the students taught by lectures and the CBLM was significant. The findings of our study showed that group A achieved lower test scores as compared to higher test scores achieved by group B, which is in favor of Collaborative Blended learning. Our findings are consistent with the study conducted by Herbert et al (2017)[16], who reported in his research that online learning activities in conjunction with traditional face-to-face lectures and small-group tutorials, thus created a blended environment were much appreciated and used by students of first year Economics class. However they did this among large group of students.

A study conducted at Griffith University in Australia, compared two consecutive cohorts of Dental students taking the general pathology course. Control cohort of 90 student's experienced traditional methods only and study cohort of 104 students attended online microscopy classes with online resources in addition to self-directed learning materials, thus provided students a blended environment. Comparison of the final course assessments showed that test scores of study cohort improved with new teaching strategy introduction in comparison to traditional didactic lecture session (p<0.01). Majority of the students noted that blended learning course was a better learning strategy and found the course more helpful and engaging than those who experienced only the traditional lectures[17]. This finding correlates with our work which also showed improvement in the test results of students by CBLM. Our students were enthusiastic to adopt the newer strategy as it breaks the routine teacher centeredness and keeps student, awake alert, and fully engrossed in the learning.

Jacob et al [18] also compared Collaborative learning to conventional teaching method to check for measuring the retention of knowledge as the primary outcome. Collaborative teaching strategy for acid base physiology was done to experimental group and conventional teaching to control group followed by posttest exam.The collaborative group confidently reached higher total test scores by correctly diagnosing the Arterial blood gases data than the control group which was taught by conventional teaching method.

The Collaborative blended learning encouraged self-directed learning among medical students through the process of peer discussion and self-reflection. Students were more responsible in blended learning than in traditional learning environment. Students take blended learning environment positively and suggestions promoted to opt for blended learning in the subject of anatomy[19].

Our study also showed that in overall test assessment scores female medical students haveoutshinedthe male students. Similar results of better academic performance of females are reported from agricultural university of Faisalabad [20], and in collaborative learning in engineering classes[21].

In the present study, the students were able to understand the subject better by peer discussion,coming prepared to sessions, gotguidance& reinforcement of knowledge face to face by teacher, receiving some help by online materials and problem solving of clinical scenarios in an enjoyable relaxed atmosphere by which they are

deprived of in traditional didactic/ teacher centered teaching.

There was no conflict of interest noted. Ethical considerations including complete disclosure about the study, confidentiality of the participant's data was assured. The limitations of this study are the small sample size limiting the generalizability of the results. We plan to conduct the research on more number of students in future.

CONCLUSION

Our study proved to have a significant impact of CBLM on student test scores as compared to didactic lectures. Furthermore, majority of the female students made good use of collaborative learning and performed better than the male counterparts. The 4th year pathology students achieved higher mean test scores on test questions that assessed their knowledge of cardiovascular system content learned using the CBLM compared with Traditional teaching method ($p < .001$).It helped in meaningful engagement of students, and worked synergistically to provide a holistic experience that was highly effective in reinforcing student learning.

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