RESEARCH ARTICLE

Active learning in renal physiology: A students' perspective and its outcome

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ABSTRACT

Background: Active learning refers to a broad range of teaching strategies which engage students as active participants in their learning during class time with their instructor. These teaching methods are better captured, enjoyed, recalled, and understood by students. **Aim and Objective:** This study aims to assess the students' perspective regarding active learning methods and to compare outcome of active learning method to previous traditional teaching methods. **Materials and Methods:** Teaching methods of active learning were introduced in half of the students of current year batch for the topic of renal physiology, which included student-teacher interaction, blended learning, jigsaw technique, peer discussion, pause procedure, discussion of multiple choice questions, seminars, role plays, and use of models. Result of active learning cohort batch was compared with the result of another half of students of the same batch of traditional teaching methods. Five-point Likert scale was administered to the students for feedback questionnaire comparison. **Results:** A significant increase ($P < 0.05$) was seen in the cohort with active learning methods in comparison to the traditional learning cohort. It suggested that active learning methods helped the students in better learning (84%), with interest (87%), good interaction with peers (84%), and associating the topic to clinical content (74%). **Conclusion:** Feedback results as well as test results from both the cohorts indicated that a change in traditional teaching methods is required for betterment of the subject, students' understanding, development of their confidence regarding knowledge of that subject, and better student-faculty interaction.

KEY WORDS: Active Learning; Traditional Learning; Pause Procedure; Jigsaw Technique

INTRODUCTION

The process of acquiring new or modifying existing knowledge, skills, values, or behaviors is known as learning.[1] Living beings such as humans and animals also plants as well as some machines have an ability to learn.[2] Active learning occurs when a person takes control of his/her learning experience. The key aspect of learning is understanding information, so it is important for learners to recognize what they understand and what they do not. Active learning encourages learners to have an internal dialogue, in which they verbalize understandings. Furthermore, learners are keener to learn when they have control over how as well as what they learn. Active learning is a key characteristic of student-centered learning.[3] An learning environment which allows students to read, write, listen, talk, and reflect as they interact with the course content through seminars, role plays, small group discussion, and other activities is called active learning.[4] A student is as knowledgeable as the training they receive. This statement puts a ton of responsibility on teachers assigned to the students'. Many educators agree that students do not perform as expected[5] and also the traditional

learning methods do not promote long-term retention [6], it is still a common method used by many of them. Hence, the key to provide an active learning environment lies in how the teacher views his or her role in the learning environment.[7]

Active learning methods reach to all type of learners no matter which field. Learners also can be categorized or identified on their preference for type of learning such as visual, auditory, reading, or writing. In a study, Baykan and Nacar have suggested that nearly 64% of students' shows multimodality, means that they prefer a combination of learning methods.[8] Traditional methods for teaching physiology are limited to teaching through lecturing and PowerPoint slides. Hence, this new approach provides little opportunity/window for student engagement above lower-order cognition.[9]

Research has shown that traditional lecture method, in which the teacher speaks and students listen, performs in most of the medical colleges, in India. Hence, that is why it is necessary to sensitize and aware the faculty and students the big picture behind active learning and get their feedback on the various techniques used and the effectiveness of these methods.

Objective

The objective of the study was as follows: (1) To assess the students' perspective regarding active learning methods and (2) to compare outcome of active learning method to previous traditional teaching methods.

MATERIALS AND METHODS

The present study was carried out in the Physiology Department of NAMO Medical Education and Research Institute, Silvassa, Dadra and Nagar Haveli. Approval from ethical committee was taken from the institution before this study. Students and faculty were informed and introduced to active learning strategy regarding a particular topic. To make them more familiar with the ongoing project a PowerPoint presentation was given, in which purpose behind this initiative and various techniques were explained and discussed in detail. Informed consent from students was taken in this regard.[10]

In medical physiology class, renal component was presented to the 1st year medical students. Students were divided into two batches of cohort. Both batches were comprised 70 and 72 students, respectively, in cohort 1 and cohort 2. In cohort 1 (70 students), around 30 classes of 60 min each and 10 demonstration classes of 100 min each were taken. Different active learning methods were introduced in all classes one by one. Active learning methods used to teach these classes included student-teacher interaction, blended learning, jigsaw technique, peer discussion and pause procedure, discussion of multiple choice questions (MCQs), seminars, role plays, and

use of models. Students were formed into small groups of five each. In each group, students worked together to understand relative topics and motivated each other in execution.

For the comparison of how effective these new active learning strategies, the results of cohort 1 was compared with the result of the cohort 2, who have taught with traditional learning methods. Both batches were identified with the name of cohort 1 (active learning method) and cohort 2 (traditional learning method) according to the methods they have been taught. An identical test was taken in both batches. The test was of 50 marks each, having 12 marks MCQs and 38 marks short structured questionnaire.

A feedback questionnaire based on 5-point Likert scale was administered to the students after completion of the project. It consisted of both closed- and open-ended questions. Feedback from students was compiled and analyzed by frequency analysis.

Statistical Analysis

The data were entered into Microsoft Excel 2010 and analyzed using EPI INFO Ver.7 software. "Z test" was used to find out any significance. Apparently, $P < 0.05$ was considered as statistically significant, and the result was shown in mean ± standard deviation.

RESULTS

As per our study results, Table 1 indicates number of students participated in this project and their obtained marks from test taken about renal physiology as mean + standard deviation of cohort 1 (active learning method) and cohort 2 (traditional learning method). The mean value and standard deviation for Group 1 consisting of 70 participants and Group 2 consisting of 72 study participants were 31.41 + 9.10 and 25.62 + 8.23, respectively. It indicated that students of active learning group performed significantly better than students with traditional learning methods ($P < 0.0001$).

For students' feedback and their response, two types of questionnaire were formed. For feedback of this new teaching technique, closed-ended questionnaire was selected. Table 2 represents the feedback response given by the students from closed-ended feedback form, which is expressed in percentage form. Overall result was indicating of positive response in favor of active learning methods. Majority of students (84%) were in favor of this new teaching method. Students developed more interest (87%) and better understanding (88%) in lectures. Group study discussion leads them to develop their knowledge more in comparison to traditional methods and also better interactions and environment created due to this method (84%). Pause period method (79%) made a good impact in understanding the topic. Furthermore, the use

Table 1: Result of both groups in renal physiology test					
Groups	Number of students (*n*)	Marks obtained (Mean+SD)	SE (M1-M2)	Z value	*P*-value
Cohort 1 (active learning method)	70	31.41+9.10	1.45	3.98	<0.0001
Cohort 2 (Traditional learning method)	72	25.62+8.23			

Table 2: Feedback form from the students						
No.	Questions	SA	A	N	D	SD
1.	Better than traditional learning methods	33.8	50.2	8.8	5.7	1.5
2.	Development of interest in lectures of physiology	25.8	61.1	10.1	2.1	0.9
3.	Better understanding in lectures than before	30.0	57.9	12.1	0.0	0.0
4.	Better understanding found with the help of models	52.6	41.3	5.4	0.7	0.0
5.	Increased frequency with fellow group members regarding study	34.7	48.9	9.5	4.4	2.5
6.	Did the pause period help in discussing topic better	31.5	47.7	13.0	6.8	1.3
7.	Using MCQs helpful in learning various topics	51.2	35.2	10.1	3.3	0.2
8.	Create interest in learning even after classes	22.3	46.3	9.8	13.5	8.1
9.	Role plays create more interest in learning and understanding	67.9	28.5	3.3	0.3	0.0
10.	Easy correlation with clinical content	41.2	32.6	15.9	10	0.3
11.	Did short seminars make better impact	26.9	42.6	21.6	6.2	2.7
12.	Frequency of seminar should be increased	26.6	39.4	23.1	7.7	3.2
13.	Short work assignments should be included to increase knowledge	30.5	28.7	26.7	9.9	4.2
14.	Atmosphere in class was tensed	1.2	17.8	22.5	18.7	39.8
15.	Number of tests should be more after this type of session	27.6	34.8	20.0	12.6	5.0

*SA: Strongly agree, A: Agree, N: Neutral, D; Disagree, SD: Strongly disagree

of MCQs (86%), models (93%), and role plays created more healthy surroundings in understanding renal physiology. Students' also find it easy to correlate with clinical content (74%). Even students were keen to attend more seminars (66%) like this, also ready to increase more number of tests (62%) and short work assignments (59%). Majority of students' felt a healthy change in atmosphere due to these new methods.

Another response questionnaire was open-ended one and it also gave some interesting facts regarding active learning methods in teaching physiology. Students were excited to learn more through these methods, MCQs and role plays made more impact than traditional lecture methods. Use of models and other methods made them learning and understanding more about clinical content of the subject and they also demanded that other topics of physiology should be taught with these type of different active learning methods, also this lead to a better relationship between teacher and students, which made this all project very successful in terms of its outcome. There was also a very positive feedback from departmental faculty as well as other faculty of college.

DISCUSSION

We are now looking at the era where active learning methods are taking over in each and every field for understanding the subject better than before, but with that adopting, these

methods are also a challenge. Changing traditional teaching methods and replacing them with these new methods is not an easy task. There have been some studies regarding this change and its outcome in the past. In our study, there were two groups consisted of Group 1 (*n* = 70) and Group 2 (*n* = 70), which was nearly similar sample size (n_1 = 97, n_2 = 94) and also the obtained marks by students with their mean and SD values were similar (Group 1 = 29.42 + 8.67 and Group 2 = 26.01 + 9.70) in a study done by Thaman *et al.*[6]

A statistically significant association (*P* < 0.0001) was seen with active learning methods than traditional ones in our study. A study by Freeman *et al.*[9] also suggested that traditional lecture methods promotes a "teaching by telling" approach, in which the students' involvement is very limited in terms of capturing and understanding the topic than just taking notes regarding it. Another study done by Pushpa *et al.*[10] revealed that the use of active learning methods including student-centered tutorial activities, group-based study, online support, and intrasemester assessment was clearly helpful in achieving the better result and improving students' knowledge. Suhail *et al.*[7] in his study suggested that being taught by new active learning methods students' really loved and enjoyed it. The faculty was also very happy with the result they found after feedback response of these methods. Students' understanding and their learning capabilities also improved due to these methods which were similar in our study. A study was done for teaching renal-cardiovascular integration with

active learning methods, which includes a patient simulator exercise, small group problem-solving, and a worksheet plus classroom discussion by Michael *et al.*[11] Students' did enjoy these new initiatives and also stay focused and engaged during classes. As we also added role plays into our ALMs to make better the understanding of renal physiology, Dowlati[12] and his team also use dramatization in teaching cardiac cycle in physiology class of medical students. The knowledge and performance by the students who learned this topic by role plays were better than those who have been taught by only traditional methods. Similarly, we also found positive response in students' knowledge improvement and remembering capacity after the role play method. Another study regarding teaching cardiac physiology to dental students with the effect of puzzle on the process by Lais *et al.*[13] suggested that this educational game improved the learning process of undergraduate dental course students and confirmed student perception that the use of this game helped them to understand the topic better. Helena *et al.*[14] also tried active learning methods in understanding of physiology better and showed that group who had been taught the subject through active learning methods improved their performance and got a greater percentage of correct answers compared with the other group that received only traditional teaching. Similar findings were recorded in our study also.

CONCLUSION

Active learning methods definitely helps in better understanding of the subject in comparison with the old didactic method of teaching. This conclusion suggests that we should need to promote active learning methods more in different fields so that the development of knowledge occurs in way which is beneficial to all. These new methods also developed interest of teacher and due to this a student-teacher relationship also became better. Hence, overall for memorizing, clearing the concepts, easy understanding, and for better outcome, we need to change with time and should utilize all the new initiatives to carry out desire outcome.

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