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Article

Effect of Model Demonstration in Small Group Discussions on Academic Performance and Student Perception: A Quasi-Experimental Study Among Phase I MBBS Students in Anatomy

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Abstract: Background: It is always very difficult to teach anatomy and make students to understand the topics. Origin and insertion of muscles is easily forgettable and very hard to remember the actions of particular muscle group. Here I decided to implement model-based teaching technique for muscles of certain regions of body which describes the origin; insertion; movements of that particular muscle.
Materials and Methods: The 150 students of the first-year students were divided into six groups of student after routine lecture class about a particular group of muscles. The first three group of students were taught in dissection hall about the origin. insertion and movements of a particular group of muscles. A pre-test questions will be given to test their knowledge about the topic of discussion. A post test questions will be given after the dissection hall teaching. The next three groups of student were asked to stand in front of the skeleton model. A few coloured thread will be given to each student. The origin and insertion will be read loudly by the students of the group and the person having the colour thread will attach one end of the thread to the origin site of the muscle using the double side attachment tape. The other end of the thread is attached to the insertion site. The student is asked to pull the thread to demonstrate the movement of the muscle. The post model teaching questions will be given to the students to assess the students understanding of the topic taught.
Results: The overall response of students about skeleton demonstration method of teaching. Almost 44% students were satisfied by this method of demonstration teaching followed by 31% were very much satisfied by this Skelton demonstration method of teaching respectively. The students opinion on skeleton model demonstration. Almost 19 (25%) felt this demonstration model arouses curiosity and 16 (21%) believes this method stimulates thoughts to learn more about the topic of interest respectively. Teachers observed an increase in student engagement and participation due to model demonstration method and model demonstration method has improved the student understanding the concept easily. They inferred that Workload was decreased in teaching the model demonstration method. Resource availability, Infrastructure, Time taken to arrange models and lack of training on demonstration were the main challenges faced by faculty in model demonstration method.
Conclusion: The model demonstration method effectively enhances student comprehension of complex anatomical concepts like muscle origin, insertion, and functional movements. It promotes active engagement, significantly improves academic performance compared to traditional methods, and creates an interactive learning environment.
Keywords: Anatomy, model Demonstration, interactive learning environment.

INTRODUCTION

The Anatomy being the toughest subject in the entire curriculum of the MBBS. It is very difficult for the first year students to remember the origin and insertion of the muscles. It is very complex to recollect the movements of the muscles. Routine lecture class gives the basic idea of the muscle morphology and its movements. But remembering the muscle origin insertion and movements of the particular muscles are very difficult. The innovative new teaching technique will improve the students understanding of the muscles origin insertion and movements. For a good clinical practice, the anatomical knowledge is very important and is an essential one (1). With new curriculum in place, the anatomy teaching hours are reduced further, it is high time to introduce new teaching technique (2). The new concept of learner centric approach introduced by the national medical commission of India which states that the active engagement of the students in the learning process help them to retain the learned competencies in a better way(3). Active learning will improve the understanding of the competencies and retention of the learning materials down the road (4). Active learning can be done by flipped classrooms, drawing and modelling etc which fosters students' engagement and enjoyment in learning process.(5).

Creating an ideal methodology to teach Anatomy is a big challenge. The usual way of teaching through lecture will not involve students' active participation. But when combined with interactive learning environment it creates a deep understanding of the subject. Many studies states that the model making method of interactive teaching helps the students to understand Anatomy better and apply their clinical knowledge in their practice. Model making can be used for both gross anatomy and cross sectional anatomy and it helps in better understanding of the Anatomy (6).

The purpose of our present study is to assess the first year medical students' level of understanding and retention of the muscle origin, insertion and movements. This study also aimed at bringing the concept of active learning in teaching Anatomy. The study tries to bring an interactive, enjoyable learning environment and aiding conceptual learning of the muscles anatomy. Many studies reveal that the learning by active engagement of students in the learning process will decrease the cognitive load of the materials. As the students engage themselves in the learning process step by step through building their models will increase their understanding of the subject and longer term of remembrance of the muscle origin insertion and movements.

MATERIALS AND METHODS

Study Design

It is a QUASI experimental study mixed educational research involving both qualitative and quantitative forms of data

Mixed Method Data

Student and Faculty satisfaction survey using a structured questionnaire with open ended and closed question.

Quantitative data

Multiple choice questions as End of Class Assessment after model demonstration method. Data will be entered in XL sheets and analysed by Epi-info software (Table 1).

Questionnaires attached in annexure.

PARTICIPANTS

150 I MBBS students from Government Medical College and Hospital, Karur in Karur will be recruited. Informed consent will be obtained from all participants.

EXCLUSION CRITERIA

Those unwilling will be excluded.

INTERVENTION NEEDED

If the students are unable to perform the origin and insertion of the muscles the Facilitator will guide the students in identifying the bony landmarks of the origin and insertion site. The faculties will be guide the students and ask the students to repeat the procedure until he or she is able to perform independently (Figure 1 & 2).

Figure 1: Faculty explaining the process

Figure 2: students doing the procedure under faculty guidance

STEPS INVOLVED IN THE STUDY:

STEP 1

After the lecture class on the group of muscles that to be demonstrated, the students will be divided into six groups of 25 students with one faculty taking care of each group.

The students will be given a pre questionnaire or test and the results will be collected.

STEP 2

Among the six groups, 1, 3, 5 will go to the dissection hall, where one faculty for each group will be teaching the students about that particular group of muscles, their origin, insertion and movements of muscles.

The students will go for a post-test after the session. They will be given a break to refresh themselves.

STEP 3

The other group 2, 4, 6 will be taken to three demonstration hall where three full skeleton models are placed. One faculty for each group will demonstrate the origin and insertion of muscles using double side attachment tape and threads. One student will be asked to read the origin and insertion of that particular group of muscles. The faculty also demonstrate the movements of each muscle by pulling the threads. In rotation all the students will be asked to demonstrate the above in rotation until everyone completes the demonstration. If any of the students encounter the difficulties it will be corrected by the faculty of that particular group.

The students will go for a post-test after the session. They will be given a break to refresh themselves.

At the end of the both session, all the students will be exposed to all type of teaching learning methods. A feedback will be collected from all the students involved in the study.

The results will be compared and analysed (Figure 3)

Table 1: Structure of the Study Design

Study design	Mixed Method study-Quasi-Experimental & In-depth Interview study
Target population & study area	I year MBBS students and Anatomy teaching faculty in a teaching medical institute
Sampling technique	Simple Random Sampling
Intervention	Dissection Hall teaching methods Skeleton model teaching methods
Study tool	Pre-test and Post-test – using MCQ In-depth interviews to the faculty and students regarding the feedback on the sessions
Data collection	After the Pre-test, students were divided into 6 groups (25 in each group), by convenient sampling 3 groups in Dissection hall teaching and 3 groups in Skeleton model teaching methods were assigned. Each group, faculty was assigned and interventions was implemented. Post test was done after the intervention. For feedback- in-depth interview was done.
Study period	2 months
Data analysis	Data analysis done using SPSS version 20. Descriptive statistics was obtained for Qualitative data and Paired t- tests was used to assess the effectiveness of the intervention. P<0.05 was considered statistically significant.

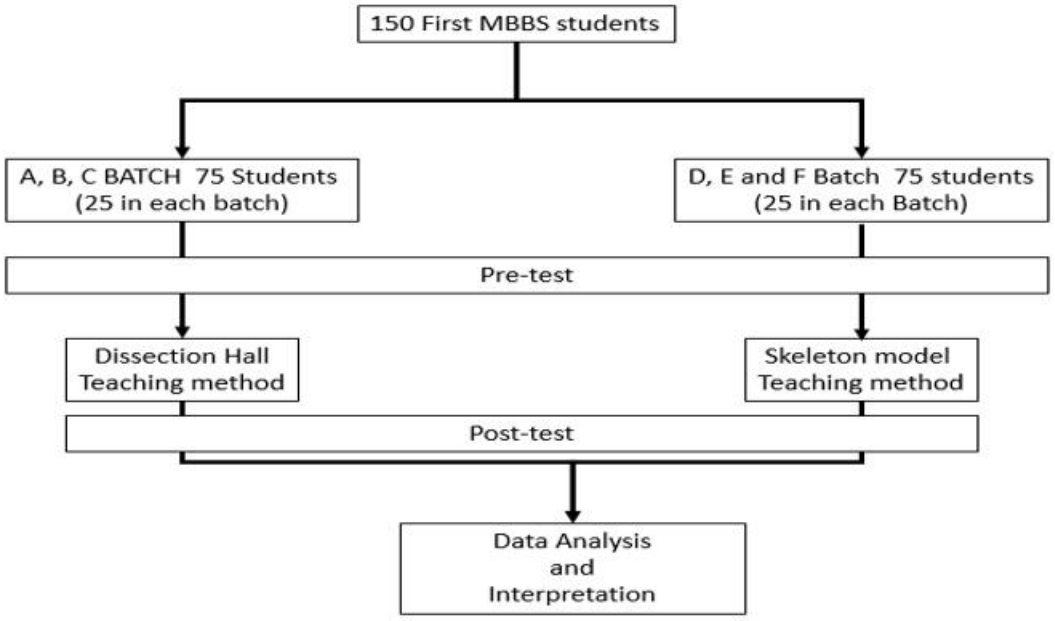

Figure 3: Flowchart of the study

Statistical analysis will be performed using appropriate tests. Qualitative data from the students and faculty satisfaction survey will be analyzed thematically.

RESULTS:

Total of 150 students and six faculties were included in the study. Students were divided into six groups with 25 each along with one faculty as a moderator. The overall response of students about skeleton demonstration method of teaching. Almost 44% students were satisfied by this method of demonstration teaching followed by 31% were very much satisfied by this Skelton demonstration method of teaching respectively (Figure 4). The students' opinion on skeleton model demonstration. Almost 19 (25%) felt this demonstration model arouses curiosity and 16 (21%) believes this method stimulates thoughts to learn more about the topic of interest respectively. Teachers observed an increase in student engagement and participation due to model demonstration method and model demonstration method has improved the student understanding the concept easily. They inferred that Workload was decreased in teaching the model demonstration method. Resource availability, Infrastructure, Time taken to arrange models and lack of training on demonstration were the main challenges faced by faculty in model demonstration method (Table 2&3).

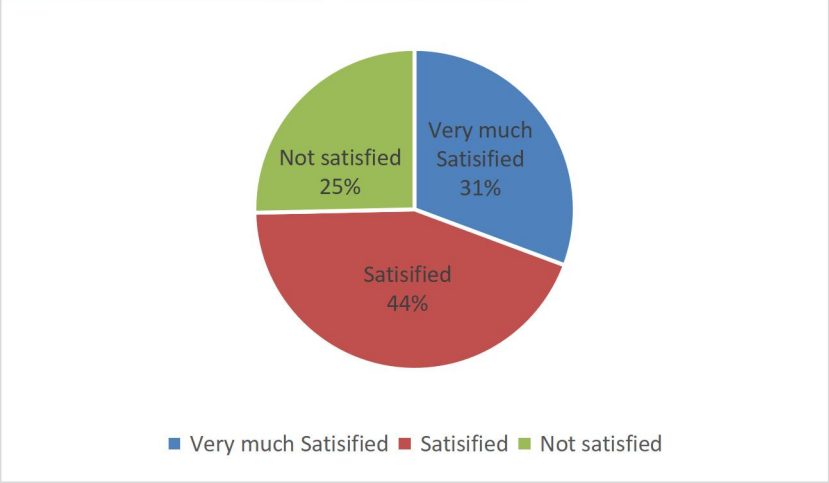

Figure 4: Students overall response on Model demonstration method (n=75)

Table 2: Study participants response/ Feedback on Skeleton Demonstration Method(n=75)

QUESTIONS	YES	NO
Do you had any difficulty?	**34 (45.3)**	**41 (54.7)**
Whether the faculty was able to solve your difficulties?	**73 (97.3)**	**02 (2.7)**
Did you get the clear understanding of the muscle, its origin and insertion?	**64 (85.3)**	**11 (14.7)**
Did you get the clear understanding of the muscle movements?	**68 (90.7)**	**07 (9.3)**
Whether the session is interactive?	**70 (93.3)**	**05 (6.7)**
Whether the environment is positive and supportive?	**69 (92)**	**06 (08)**
Will you recommend this method to be adopted for all regions?	**56 (74.7)**	**19 (25.3)**
Was the model demonstration method was useful and helpful to learn more?	**67 (89.3)**	**08 (10.7)**

Test	Dissection Hall Teaching Method (n=75)	Skeleton Model Teaching Method (n=75)	p-value
Pre-test	**4.64±2.22**	**4.84±2.14**	**0.27**
Post-test	**6.70±1.99**	**7.41±2.15**	**0.03***
p- value	**0.001***	**0.001***	

*p<0.05, statistically significant

Table 3: Mean (sd) of pre and post test score between study groups (n=150)

DISCUSSION:

Our recent study indicated that most of the students are showed more interest in model way of teaching to learn anatomy. Interactive model making method of teaching significantly improved the understanding of the muscle morphology which inclines with our present study (7). A systemic review done by Keegan Curlewis et al., showed that modelling is an effective learning method for teaching gross anatomy and it must be an effective teaching method alternative of routine traditional way of teaching. It must be incorporated into Anatomists' toolkit (7). One of the study done by Lawrence J Rizzolo states that the newer teaching techniques will definitely improve the students perspective of learning Anatomy along with the dissection method (8). The above finding coincides with our present study.

Howard.K.motoike et al (Jan-Feb 2009), stated that the clay modelling as a method was a very good teaching tool for learning the human muscles at the community college level. The above study states that the clay modelling students have scored higher grade than the the students in the group of dissection method of teaching (9). The above study is also comparable with our study results.

Incorporating the modelling into teaching gross anatomy and neuro anatomy appears to supplement to conventional anatomy education. Its effectiveness will be greater when applied with routine teaching of anatomy as said by Chang-Seok oh et al (Jul-Aug 2009), also implicates our study results (10).

The action of the muscles about joints can be explained by their spatial relationship analysis. A model demonstrating this

relationship will be very valuable in learning and understanding the action of a muscle. This type of teaching with model to demonstrate the action of muscles across the joints will enhance the understanding the subject. This supports our present study which states the same principle as said by the Beth A Cloud et al (11).

As said in a chinese proverb, when I hear, I forgot, when I see , I remember and when I do I understand, involving the students actively in the learning process will improve their attitudes towards learning, and increases knowledge and retention. The same was the basic principle of our study which is also proved by our study results. The same results were produced by the study conducted Anita Herur et al (12).

Sharadkumar and Shaheen Ravi (Sep 2015) demonstrated that the model making group of students able to remember the topics easier and improved the learning in human anatomy same as stated by our study (13).

Uma SV said in her study that the anatomy can be understood and retained easily if model making method of teaching is used along with the routine dissection. The above study supports our study results (14).

Most of the recent literature in innovative teaching methodology states that active involvement of students in the learning process will enhance their learning abilities. Construction of model and figuring out its complexities will improve the long term retention of the anatomy as stated by the results from the study conducted by Christine I Yu et al also add value to the results of our present study (15).

The present research demonstrates the benefits of learning by doing. It helps in the long term retention of subject. Most of the literature supports the innovative way of teaching than the routine teaching of anatomy. Though the lectures are the easiest way of disseminating the information for large group of students, long term retention and understanding the complex of Anatomy the innovative teaching methods particularly the model method of teaching are very helpful.

CONCLUSION:

The present study details the benefits of the teaching Anatomy by actively involving students in the learning process. Use of models and making the students involved in the process of model making will improve their long term retention and better understanding of the complex muscle movements across the joints. When the model making is used as adjuvant to the conventional teaching methods, it makes the students more engaging, motivating, inspiring and enjoyable environment for them to study Anatomy. The innovative teaching methods with active participation of the students will make them more confident in understanding their subjects and make them to achieve all goals of the Indian Medical Graduate roles and responsibilities particularly the Life Long Learner.

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