Section: Anatomy

Original Research Article

MODEL PREPARATION – A TEACHING LEARNING TOOL IN ANATOMY & PERCEPTION OF STUDENTS TOWARD IT

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ABSTRACT

Background: In anatomy traditional method of teaching is didactic lecture and dissection. In many topics especially of embryology and neuroanatomy, students find difficulty to understand the concepts. Model preparation helps students by giving detailed and 3-dimensional information about the structure and system concerned. The aim is to use model preparation exercise as effective teaching learning tool in anatomy and increase active participation of students in learning anatomy. The objective is to increase the interest of students in learning of anatomy, to generate understanding of three-dimensional view in anatomy and to collect and analyse the feedback received from students.

Materials and Methods: A total of 196 1st year MBBS Students were divided into 20 groups and allotted various topics for model preparation. Pre validated feedback questionnaires was used for perception of students in 5-point Likert type scale.

Results: In this study, more than 94% students liked the topic for model preparation & had positive approach working with their peer. Around 98% students enjoyed the model preparation activity & 94% students understood 3Dimension architecture by making model.

Conclusion: Model preparation helped students in the learning in terms of knowledge and skills. With the use of the model preparation, the topics were made clearer to students because of the way they did the hands-on activities in model preparation.

Keywords: Model preparation, anatomy teaching, active learning, three dimensional understanding.

INTRODUCTION

Medical students frequently report that the traditional pattern of academic activities can feel monotonous, leading to a lack of interest in learning. Simply memorizing facts without really understanding them doesn't help much. Students need to truly understand the topics and be able to think and explain clearly.

First-year MBBS students often struggle with the subject of Anatomy, which is complex, terminology-heavy, and inherently three-dimensional. Anatomy forms the bedrock of medical sciences, yet its complexity and three-dimensionality pose challenges for both teaching and learning. Traditional teaching methods like lectures and dissections may not always help students fully understand tricky topics like embryology and neuroanatomy.

To solve this, new and interesting teaching methods should be added. One useful method is model preparation. By making models, students can see and understand body structures in 3D, which helps them learn better and remember the information for a longer time. Models allow students to appreciate the spatial relationships between structures, which is often not possible through textbooks or two-dimensional images. This practical method also supports their thinking and problem-solving skills, which are important in clinical practice later. There were positive gains in the learning of the students thru

the model-making projects in terms of knowledge, skills, attitudes, and values.[1-5]

Furthermore, model making engages psychomotor skills, encourages creativity, and enhances teamwork. It not only reduces academic anxiety but also motivates students by giving them a sense of ownership in their learning process—helping them to build confidence and a stronger foundation for their future medical careers.

Aim & Objectives:

Aim: To use model preparation exercise as effective teaching learning tool in anatomy and increase active participation of students in learning anatomy

Specific Objectives:

1. To Increase the interest of students in learning of anatomy
2. To generate understanding of three-dimensional view in anatomy.
3. To collect and analyse the feedback received from students.

MATERIALS AND METHODS

Study Design: Educational Interventional Study

Study Setting and Participants: The study was conducted among 196 first-year MBBS students at GMERS Medical College, Vadnagar.

Sampling and Grouping: Students were randomly divided into 20 groups, each comprising 10 students. Every group was assigned a faculty mentor and allocated a topic for model preparation from the syllabus previously covered in class.

Procedure: Students were instructed to prepare anatomical models within a time frame of 8–10 days using readily available materials such as paper, cardboard, plaster of Paris, clay, thermocol, and waste fabric. Upon completion, each group presented their model, which was then evaluated by faculty members based on structure, presentation, and conceptual clarity.

A pre-validated, structured feedback questionnaire based on a 5-point Likert scale was administered to assess students' perceptions of the activity. Prior to participation, the purpose of the study was explained, and informed consent was obtained from all students.

Inclusion Criteria:

- All first-year MBBS students willing to participate
- Students who provided informed consent

Exclusion Criteria:

- Students who were absent during the model preparation sessions

Ethical Considerations: Ethical approval for the study was obtained from the Institutional Ethics Committee.

Statistical Analysis: Descriptive statistics were used. The data collected from the feedback forms were analysed using mean and standard deviation to evaluate student responses.

RESULTS

Image 1: Model of Fertilization and Implantation.

Image 2: Model of Skin

Table 1: Student's Feedback on Model Preparation

Questionnaire	Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly Disagree (1)	Means +SD
Introduction for the model preparation was well explained by faculty	108	77	10	1	0	4.49 + 0.62
I liked my topic for model preparation	98	86	8	3	1	4.41 + 0.69
I have positive approach working with peer	125	62	7	2	0	4.58 + 0.61
I contributed to my best extent for model preparation	132	60	4	0	0	4.65 + 0.52
Viewpoint of each group member was well heard and appreciated during model preparation	90	88	15	2	1	4.35 + 0.71
I enjoyed the model preparation activity	147	45	3	1	0	4.72 + 0.51
I understand 3 Dimension architecture by making model	113	71	11	1	0	4.51 + 0.63
The activity allowed me to link different subjects with the anatomy course	103	75	15	2	1	4.41 + 0.72
I had opportunity to show my creativity in model preparation.	87	87	18	3	1	4.31 + 0.74
Time allotted for model making is sufficient for me	152	40	3	1	0	4.75 + 0.50

Model preparation activity did not disturb my routine activity	73	92	27	3	1	4.19 + 0.76
I would like to upload the picture of model prepared in social media	79	66	45	4	2	4.10 + 0.89
I had positive impact on my attitude toward learning	53	128	14	1	0	4.19 + 0.57
I would like to prepare models in future	90	83	20	2	1	4.32 + 0.74

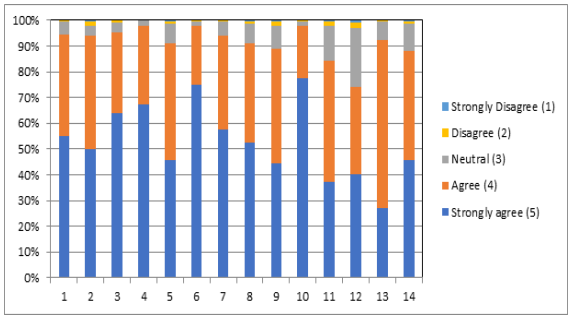

Figure 1: Students' feedback on Model Preparation

The questionnaire responses from students for their experience and perceptions of the model preparation activity in anatomy gives important findings. The results, as presented in the table above, highlight positively skewed responses, with a significant proportion of participants expressing satisfaction and enthusiasm for the activity. A high agreement was seen with the clarity of faculty instructions, with a mean score of 4.49 ± 0.62, indicating that the introduction and guidance for the activity were well communicated, helping students understand the purpose and process of model preparation effectively. Most students reported satisfaction with their assigned topics (Mean = 4.41 ± 0.69), showing a favourable attitude toward the subject matter. Statements related to collaborative learning yielded high mean scores. Students reported a strong positive approach while working with peers (Mean = 4.58 ± 0.61), and acknowledged their own active contributions to the group effort (Mean = 4.65 ± 0.52). Additionally, appreciation of team members' viewpoints was positively evaluated (Mean = 4.35 ± 0.71), reflecting effective communication and teamwork. Participants strongly agreed that the activity helped them understand anatomical structures in 3D (Mean = 4.51 ± 0.63) and allowed them to integrate knowledge from multiple disciplines (Mean = 4.41 ± 0.72). A mean score of 4.31 ± 0.74 indicated that students felt the activity provided a platform to unleash their creativity. Most students felt that time allotted for preparation was sufficient (Mean = 4.75 ± 0.50), and importantly, the activity did not interfere significantly with other academic responsibilities (Mean = 4.19 ± 0.76), suggesting that the activity was well scheduled and balanced within the academic calendar. The activity had a noted positive impact on students' attitudes toward learning (Mean = 4.19 ± 0.57) and fostered interest toward future engagement in similar activities (Mean = 4.32 ± 0.74). Additionally, a considerable number of students accepted the idea of sharing their projects on social media platforms (Mean = 4.10 ± 0.89), which underlines a sense of pride and ownership of their work.

DISCUSSION

Anatomy teaching and learning is not only limited to theory classes and dissection but also to other teaching tools. one such tool is by preparing anatomy model. By utilizing diverse teaching tools, we can actively engage students, maintain their focus, and enhance their comprehension of the subject matter.[6-10]

In this study, more than 94% students liked the topic for model preparation & had positive approach working with their peer. Around 98% students enjoyed the model preparation activity & 94% students understood 3Dimension architecture by making model. 91% students believed that model preparation allowed them to link different subjects with the anatomy course. Model preparation give opportunity to students to show their creativity. Around 88% students like to prepare models in future. Strategies such as constructive learning (occasion for repetition and scaffolding), collaborative learning (interaction between learners), contextual learning (learning in context) are crucial when it comes to knowledge acquisition and retention. While the less complex structures can be studied from a textbook or cadaver material, it is possible that students may get a better understanding of more complex anatomical structures (Embryology, brain, courses of blood vessels). With the use of the model preparation, the topics were made clearer to students because of the way they did the hands-on activities in model preparation.

This shown a positive impact on learning when students participate in lessons that require them to construct and organize knowledge, consider alternatives, inquiry, writing and analysis and require them to employ subject knowledge to solve real-world problems.

Although students showed interest, gained a better understanding of the subject, and retained the knowledge for a longer period, the model-making methodology for teaching and learning anatomy has certain limitations. It is a time-consuming process, and it is not feasible to create models for all topics. Additionally, only students who were interested took part in the activity, which may have introduced a selection bias. Furthermore, the difficulty level of the topics chosen for model-making was not uniform, which could affect the overall learning experience.

Nagaraj Mallashetty reported that this method enabled students to enjoy learning without disrupting their regular schedule (95%) and significantly aided

in understanding three-dimensional structures (95%). It also sparked further interest in creating such models among students (90%). Additionally, 60% of the students shared images of their models on social media—primarily to spread knowledge (90%) and partly for publicity (10%).[11-15]

A study conducted at AIIMS Raipur (Singh, 2019) assessed medical students' perceptions of 3D anatomical model preparation as a pedagogical tool. Findings revealed that 78% of students found the activity fruitful for understanding 3D spatial orientation, with a majority reporting high engagement. However, 29% noted disruptions to their routine academic activities. Despite this, 77% expressed willingness to engage in similar model-based learning in the future. The study concluded that student feedback overwhelmingly supported model-making as an effective method to enhance the quality of anatomy teaching and learning.

To make learning Anatomy more enjoyable and motivating, medical colleges are trying new teaching methods for gross anatomy. They aim to include new topics in the curriculum without leaving out the essential knowledge of anatomy.[12]

On comparing the teaching methodologies of gross dissection and model making, Mary Ellen[14] showed that both methodologies were equally effective with respect to knowledge gained, whereas Motoike,[15] described that dissection is wherein the structures are dissected from superficial to deep whereas in model making it is a skilful activity of construction of structures from deep to superficial plane.

In a study involving one hundred medical students, the primary objective was to emphasize the effectiveness of using play dough to model nervous tracts for a better understanding of physiology, as well as to compare the outcomes of this active learning approach with those of traditional passive learning. The findings indicate that engaging in model-making activities significantly aids in the long-term retention of acquired knowledge.[16]

CONCLUSION

Model preparation plays an important role in maximizing student's learning by allowing them to venture into independent inquiry, making their experience more meaningful.

Model making project helped students to work cooperatively and collaboratively with the members of their group. It provides them an opportunity to work in a group and learn team building skill. Students agreed that model preparation is good way to learn and apply anatomy. Model-making in anatomy aids interest and retention but is time-consuming, not suitable for all topics, may involve selection bias, and varies in topic difficulty.

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