

A STUDY ON COMPARISON BETWEEN THE TRADITIONAL LECTURE AND INNOVATIVE MODEL MAKING METHOD IN TEACHING DEVELOPMENT OF HEART AMONG FIRST MBBS STUDENTS

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ABSTRACT

Background: Embryology - A branch of Anatomy which includes development of human with complex mechanisms. Phase I MBBS students find it difficult to understand the concepts and reproduce it in assessments. This study was conducted to analyse the effectiveness of teaching the development of Heart by model making. **Materials and Methods:** Study design Experimental study - Randomized control study. Study population 150 phase I MBBS students. Students were divided into two groups by block randomization - snooze technique. 75 students in each group. Group A (study group) was taught development of heart by model making method using coloured clay material. Group B (control group) was taught by lecture using power point presentation. Duration of both the teaching methods was 2 hours and taught by the same faculty in the same day in different timings. At the end of the session both the groups were asked to fill a structured feedback using 5 point Likert scale via google forms regarding teaching methods. Data were entered in the excel spread sheet and variables were coded accordingly. The statistical analyses were performed using SPSS version 20 trial software. Data were presented as frequency with proportion n(%) for categorical data. **Result:** Significant proportion of students agreed that session was clear, interesting and relevant in study group than the control group. **Conclusion:** The study concludes that the students were able to understand the development of Heart clearly by model making method.

INTRODUCTION

Embryology- is a branch of Anatomy that deals with the development of humans. Knowledge in the development of human embryo is very essential for learning human anatomy and its application in clinics. Development of heart is a complex process, which is difficult for the students to understand and reproduce it in assessment. In order to make them understand the concepts in a clear and interesting way, an innovative teaching method is needed.^[1-7]

The various methods for teaching embryology are classroom lectures, small group teachings, demonstration with the models and animated videos. Our aim is to compare the effectiveness of innovative model making method with traditional lecture method in teaching development of heart.^[8-14]

MATERIALS AND METHODS

Institutional ethical committee approval was obtained from Government Medical College Ariyalur (GMCA-IEC-1/2024/PR-12). Written consent was obtained from the students regarding their willingness to participate in the study.

Study Design: Experimental - Randomised control study

Participants: 150 first year MBBS students of Government medical college Ariyalur

Inclusion Criteria

The students who gave consent to participate in the study were included.

Exclusion Criteria

The students who were absent on that day and those were not willing to participate in the study were excluded.

150 students of first year MBBS were divided into two groups by randomization - Snooze technique. Each group had 75 students and they were named as

Group A and Group B. Group A was taught development of heart by model making method using colored clay material. Group B was taught by traditional classroom lecture method.

The two groups were allocated two different places and the sessions were taken by a same faculty at two different timings in a single day with a duration of two hours each.

Traditional classroom lecture was taken using the power point presentations.

In model making method, students were demonstrated the development of heart in stages using colored clay materials available in the market. The stages of development were demonstrated to students using pre-recorded video done by the faculty. Development of heart is demonstrated in stages as

1. Formation of two heart tubes,
2. The fusion of heart tubes to form single primitive heart tube
3. Segmentations of primitive heart tube into Truncus arteriosus, Bulbus cordis, Primitive ventricle, Primitive atrium and Sinus venosus in cranio-caudal direction.
4. Looping of heart tube and
5. Formation of inter-atrial and inter-ventricular septae to definite heart chambers.

Then the students were asked to do on their own with the guidance of the faculty. Each and every stage were monitored by the faculty till the end.

Data collection: At the end of each session feedback about traditional lecture and model making method were collected from students, using five point Likert scale via google forms separately.

Students belonging to group A were also asked to write about their perspectives in the new teaching method for qualitative analysis.

RESULTS

Out of 75 students allotted in each group, only 72 from control group and 73 from study group have participated and responded to the questionnaires given in a graded manner from strongly agree to

strongly disagree using Likert five point grading scale.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

The responses were received under the following headings:

- The Session was thought provoking
- The Session was relevant
- The Session was interactive, short and made me to learn better
- The Session has made me confident in answering embryology questions
- The Session has made me to understand the embryological basis of the clinical conditions

May be or yes response was received under the heading "The session was clear and understanding."

Data Analysis: Data were entered in the excel spread sheet and variables were coded accordingly. The statistical analyses were performed using SPSS version 20 trial software. Data were presented as frequency with proportion n(%) for categorical data. Fisher's exact test was used to compare the proportions between the two groups. $p < 0.05$ was considered statistically significant.

The results were presented in [Table 1-6].

Among the study group, 70 out of 73 students agreed that the session was thought provoking while one student was neutral and 2 disagreed.

72 out of 73 students agreed that the session was relevant while one student disagreed with that. All in the study group agreed that the session was interactive, short and made them to learn better. 71 out of 73 students told that the session was clear and they understood it.

The session made them confident in answering the embryology questions in 67 out of 73 students while 4 were neutral and two of them disagreed.

71 out of 73 students agreed that the session made them to understand the embryological basis of the clinical conditions while two of them remained neutral.

Table 1: Comparison of 'session was thought provoking' responses between control and study group.

S. No	The session was thought provoking	Control group		Study group		Fisher exact value	df	P value
		n	%	n	%			
1	Strongly agree (n=73)	28	38.4	45	61.6	10.52	4	0.007*
2	Agree (n=67)	42	62.7	25	37.3			
3	Neutral (n=3)	2	66.7	1	33.3			
4	Disagree (n=1)	0	0	1	100			
5	Strongly disagree (n=1)	0	0	1	100			

Data are expressed as n (%). Fisher's exact test was used to compare the proportions between the groups. *indicates $p < 0.05$ and considered statistically significant.

Table 2: Comparison of 'The session was relevant' responses between control and study group.

S. No	The session was relevant	Control group		Study group		Fisher exact value	df	P value
		n	%	n	%			
1	Strongly agree (n=99)	42	42.4	57	57.6	8.181	2	0.009
2	Agree (n=45)	30	66.7	15	33.3			
3	Strongly disagree (n=1)	0	0	1	100			

Data are expressed as n (%). Fisher's exact test was used to compare the proportions between the groups. *indicates $p < 0.05$ and considered statistically significant.

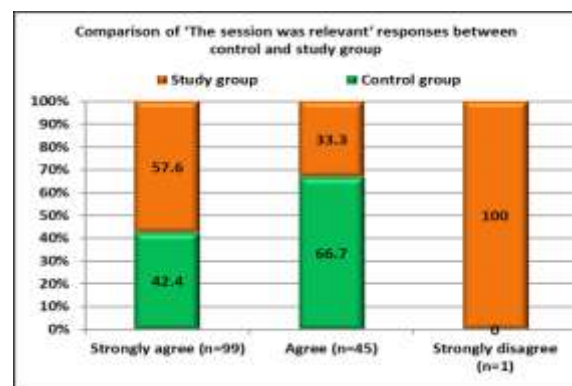
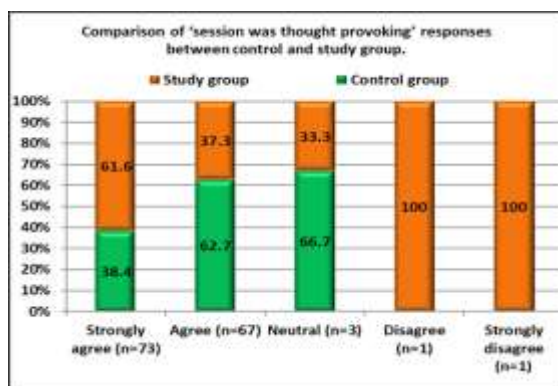


Table 3: Comparison of 'The session was interactive, short and made me to learn better' responses between control and study group.

S. No	The session was interactive, short and made me to learn better	Control group		Study group		Fisher exact value	df	P value
		n	%	n	%			
1	Strongly agree (n=86)	37	43	49	57	6.251	3	0.033*
2	Agree (n=55)	31	56.4	24	43.6			
3	Neutral (n=4)	4	100	0	0			

Data are expressed as n (%). Fisher's exact test was used to compare the proportions between the groups. *indicates $p < 0.05$ and considered statistically significant.

Table 4: Comparison of 'The session was clear and understanding' responses between control and study group.

S. No	The session was clear and understanding	Control group		Study group		Fisher exact value	df	P value
		n	%	n	%			
1	Yes (n=143)	72	50.3	71	49.7	2.001	1	0.497 (NS)
2	Maybe (n=2)	0	0	2	100			

Data are expressed as n (%). Fisher's exact test was used to compare the proportions between the groups. NS = Not significant.

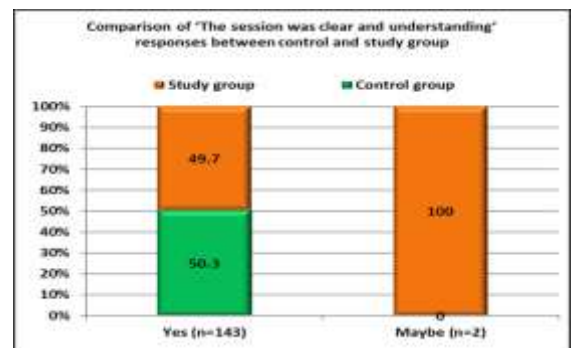
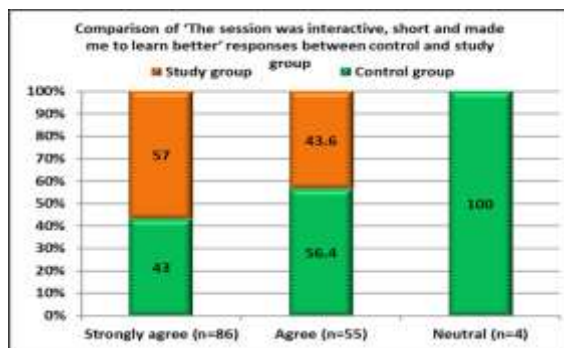


Table 5: Comparison of 'session has made me confident in answering the embryology questions' responses between control and study group.

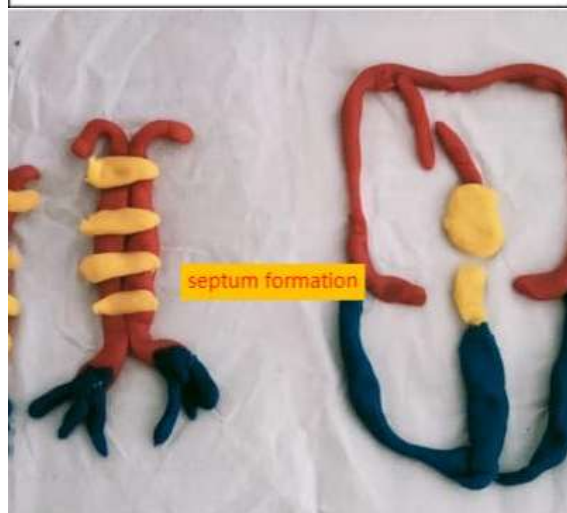
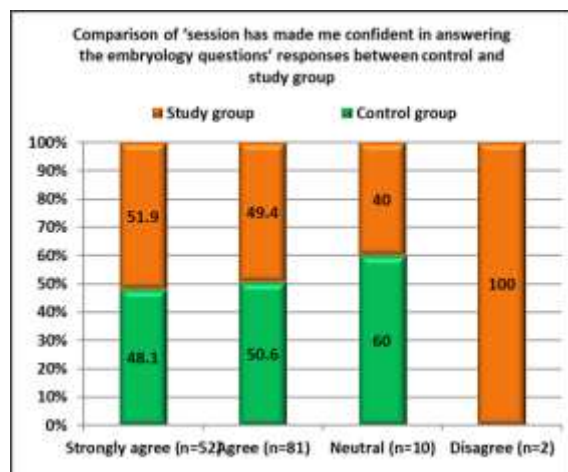
S. No	session has made me confident in answering the embryology questions	Control group		Study group		Fisher exact value	df	P value
		n	%	n	%			
1	Strongly agree (n=52)	25	48.1	27	51.9	2.136	3	0.606 (NS)
2	Agree (n=81)	41	50.6	40	49.4			
3	Neutral (n=10)	6	60	4	40			
4	Disagree (n=2)	0	0	2	100			

Data are expressed as n (%). Fisher's exact test was used to compare the proportions between the groups. NS = Not significant.

Table 6: Comparison of ‘The session has made me to understand the embryological basis of the clinical conditions’ responses between control and study group.

S. No	The session has made me to understand the embryological basis of the clinical conditions	Control group		Study group		Fisher exact value	df	P value
		n	%	n	%			
1	Strongly agree (n=80)	40	50	40	50	1.647	2	0.618 (NS)
2	Agree (n=32)	32	50.8	31	49.2			
3	Neutral (n=2)	0	0	2	100			

Data are expressed as n (%). Fisher’s exact test was used to compare the proportions between the groups. NS = Not significant.



Inference

1. Significant proportion of students strongly agree that session was clear and interesting in study group than the control group and on the other hand significant proportion of students agree that session was clear and interesting in control group than study group.
2. Significant proportion of students strongly agree that session was relevant in study group than the control group and on the other hand significant proportion of students agree that session was relevant in control group than study group
3. Same observation of point 1 and 2 was also noted for session was interactive, short and made me to learn better’ response

No significant difference was noted between control and study group in terms of other responses.

DISCUSSION

As told by Winston Churchill “Personally, I am always ready to learn, although I do not always like being taught”, a new concept is well understood by the students when they learn on their own. With the introduction of Competency Based Medical Education in medical curriculum, there is a necessity to shift from teacher centered learning to student centered learning. The different teaching modalities like lectures, group discussions, learning by demonstrations, role playing, technology based learning and their effectiveness among the students were studied by many scholars.^[15-18]

In learning a new concept, which is difficult to understand by lecture alone is learnt easily when the students involve themselves. Development of heart in human is a complex process, which is difficult for students to understand and reproduce it in assessments. To overcome this, an innovative teaching learning method is introduced to first year MBBS students.

Development of heart, when taught by making models with clay was understood by the students in an easy and interesting way.

Mallashetty et al,^[1] (2015) in their study on “Model making exercise- A new tool for teaching and learning anatomy and perception of students towards it” concluded that all the students agreed that the session was ‘Interactive, short and made them to learn better’ which coincides with our study (100%). Vipin Garsa et al,^[2] (2017) in their study on “Learning anatomy with model making along with dissection” reported 94% of students agreed that “the session was clear and understanding” which was 97.3% in our study.

91.4% of students were confident in answering the questions in study conducted by Uma SV,^[3] (2022) on “Model Making, An Interesting Method of Learning Anatomy: Students’ perceptions. In our study it was 91.8%, which coincides with it.

The results were comparable with the previous studies. And majority of the students have responded positively about the session.

The perspectives of the students were analyzed under the following themes.

Under the theme - Way of learning, the students expressed the following:

- It reduces the mental pressure in learning important concepts,

- It helps to know the shape, parts and development of the organ,
- Self oriented learning,
- It helps to learn in 3 dimensional view,
- Learning with fun and joy, Not feeling sleepy,
- New terminologies felt to be easy now, The orientation and curvatures which were difficult earlier are clearer now, Realistic way of learning, Creativity and active involvement, Got a good pictorial knowledge.
- It involved senses like touch, vision - active learning, Concept oriented learning,
- I felt like god, as I am creating the heart,
- Hand to head learning technique is more beneficial,
- Completely engaged in the class.
- Able to concentrate more, Improves thinking skills
- Made concepts eager to learn and provoke my imagination.

Under the theme - Effect of learning, the students expressed the following:

- It helps to remember the location of structures.
- Visual memory lasts longer than auditory memory.
- It helps to draw the diagrams easily.
- It was like a movie which cannot be forgotten.
- Complete learning and never forget until the life end.
- This method cleared all my doubts.
- Short-term memory to long term memory.
- Understand the subject in depth
- Recollect various diagrams in the textbook.

The following suggestions were given by the students:

- This model making method of teaching can be extended to other systems in embryology,
 - Breaks in between,
 - Mind maps, flow charts,
 - 3D Videos,
 - Embryology classes could be taken prior to gross anatomy
 - Teach us with the app 'Visible body anatomy'
- Under the theme- Distractions one student told he went into a state of playing.
- Under the theme- Acclaim, the students expressed the following:
- Nostalgic part that taken us back to our childhood,
 - It relieves stress,
 - It was colorful,
 - Improves interaction with everyone,
 - Short and very productive,
 - Near reality experience,
 - It reminded me about my hobbies.

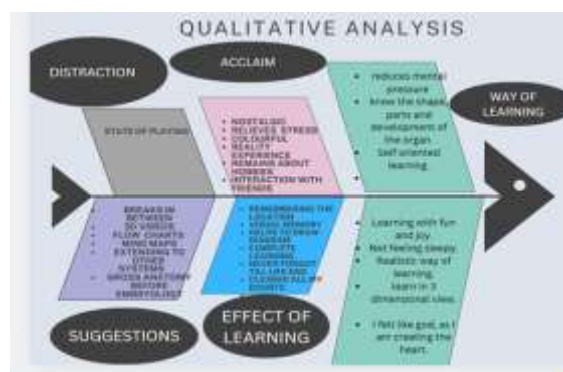


Table 7: Comparison of responses with previous studies - 'Interactive, short and made me to learn better'

S.No	Author's name	Outcome in percentage
1.	DeHoff Mary Ellen et al, ^[4] (2011)	77.3%
2.	Ayman Mustafa et al, ^[5] (2013)	92.4%
3.	Mallashetty N et al, ^[11] (2015)	100%
4.	Uma et al, ^[3] (2022)	87%
5.	Shobha Chikkavaddaragudi Ramachandra et al, ^[6] (2022)	63.8%
6.	Present study	100%

Table 8: Comparison of responses for the question 'the session was clear and understanding' with previous studies

S.No	Author's name	Outcome in percentage
1.	Vipin Garsa, ^[2] (2017)	94 %
2.	Shobha Chikkavaddaragudi Ramachandra et al, ^[6] (2022)	84%
3.	Present study	97.3%

Table 9: Comparison of responses for the question 'Confident in answering embryology questions' with previous studies

S.No	Author's name	Outcome in percentage
1.	Claudia et al, ^[7] (2011)	81 %
2.	Uma et al, ^[3] (2022)	91.39%
3.	Present study	91.8%

CONCLUSION

Most of the students strongly agreed that this innovative model making method of teaching was clear and interesting, relevant about the development of heart. In this method of teaching students were

actively participated enthusiastically throughout the session. Ultimately the students were able to understand the concepts in an easy manner. At the end of the session they were able to answer most of the questions relevant to the topic which made this study successful. This model making activity can be

introduced as a module in teaching embryology for first MBBS students in future.

Ethical Considerations: Students in the control group was taught by model making method on the next day after getting their responses via google forms.

REFERENCES

1. Mallashetty N, Itagi V, Angadi a V. Model making exercise- A new tool for teaching & learning anatomy and perception of students towards it. 2015;3(1):34–6.
2. Vipin Garsa, Neeru Ghalawat, Ravi Kant Narayan, Sanjay Gupta, Suresh Kanta Rathee. Learning anatomy with model making along with dissection. *Int J Anat Res* 2017;5(2.3):3993-3996. DOI: 10.16965/ijar.2017.238
3. Uma SV. Model Making, An Interesting Method of Learning Anatomy: Students' perceptions. *Int J Anat Res* 2022;10(1):8291-8296. DOI: 10.16965/ijar.2021.210
4. DeHoff ME, Clark KL, Meganathan K. learning outcomes and student perceived value of clay modelling and cat dissection in undergraduate human anatomy and physiology. *Am J Physiol- Adv Physiol Educ*. 2011; 35(1):68-75.
5. Mustafa AG, Allouh MZ, Mustafa IG, Hoja IM. Anatomy learning styles and strategies among Jordanian and Malaysian medical students: The impact of culture on learning anatomy. *SurgRadiol Anat*. 2013;35(5):435–41
6. Ramachandra, Shobha Chikkavaddaragudi; Ojha, Vivek Anand; Devegowda, Devananda; Nataraj, Suma M; Vishwanath, Prashant; and Prashant, Akila (2022) "3-Dimensional model making as an innovative tool for enhanced learning through student engagement among early professional medical graduates," *International Journal of Health and Allied Sciences: Vol. 11: Iss. 1, Article 4*. DOI: 10.55691/2278-344X.1004
7. Claudia Diaz. For stimulating multidisciplinary first year students to learn Anatomy for life via innovative, pro-active approaches to improve engagement and learning outcomes. Citations for Outstanding Contributions to Student Learning. 2011;1—4.
8. Marks SC. The role of three-dimensional information in health care and medical education: the implications for anatomy and dissection. *Clin Anat* 2000;13:448e52. [https://doi.org/10.1002/1098-2353\(2000\)13:63.0.CO;2-U](https://doi.org/10.1002/1098-2353(2000)13:63.0.CO;2-U)
9. Kaufman DM. ABC of learning and teaching in medicine: applying educational theory in practice. *Br Med J* 2003;326: 213e6. <https://doi.org/10.1136/bmj.326.7382.213>.
10. Barling PM, Ramasamy P. Model construction by students within an integrated medical curriculum. *Clin Teach* 2011;
11. Dee Fink L. Creating significant learning experiences: an integrated approach to designing College courses, revised and updated. Wiley; 2013.
12. Parimala K, Subash KR, Jagan N, Vijay Kumar S, Viswanathan SCM. Assessment of pharmacology teaching A critical appraisal by medical school learners. *Int J Med Res Health Sci* 2013;2:1e6.
13. Pujol S, Baldwin M, Nassiri J, Kikinis R, Shaffer K. Using 3D modeling techniques to enhance teaching of difficult anatomical concepts. *Acad Radiol* 2016;23:507e16. <https://doi.org/10.1016/j.ACRA.2015.12.012>.
14. Joshi A, Ganjiwale J. Evaluation of students' perceptions towards an innovative teaching-learning method during pharmacology revision classes: autobiography of drugs. *J Clin Diagn Res* 2015;9:FC01e4. <https://doi.org/10.7860/JCDR/2015/12775.6153>.
15. Husain M, Khan S. Students' feedback: an effective tool in teachers' evaluation system. *Int J Appl Basic Med Res* 2016;6: 178e81. <https://doi.org/10.4103/2229-516x.186969>.
16. Gupta S, Parekh UN, Ganjiwale JD. Student's perception about innovative teaching learning practices in Forensic Medicine. *J Forensic Leg Med* 2017;52:137e42. <https://doi.org/10.1016/j.jflm.2017.09.007>.
17. Agarwal AK. Medical council of India. *Natl Med J India* 2018; 9:50.
18. Traynor G, Iu Shearn A, Milano EG, Ordonez MV, Nieves M, Forte V, et al. The use of 3D-printed models in patient communication: a scoping review. *J 3D Print Med* 2022;6: 13e23. <https://doi.org/10.2217/3DP-2021-0021>.