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Model Making Competition And Jigsaw Learning As A Tool For Deeper Understanding Of Embryology Of Cardiovascular System

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Abstract:
Background*: Active learning is a student-centered method where learning is made more engaging using various strategies. The aim of the study was to assess whether the teaching-learning methods of model making competition and jigsaw learning improved the knowledge of students in embryology of cardiovascular system*.
Materials and Methods*: Initially, a total of 3 lecture classes were taken by the faculty to cover the embryology of cardiovascular system. A week later pretest was conducted. 63 1ST year MBBS students were divided into 6 home-teams. Topic for each team was given and the students were asked to make models. The 6 teams were regrouped into 6 'Jigsaw teams' which included 1 to 2 students from each pre-formed team and shared their knowledge with other team members. Post-test was conducted after the activity.*
Results*: The post-test scores were higher than the pre-test scores for all the 6 teams. The mean pre-test score of all the teams together was 7.5 and the mean post-test score was 10.9. There was a significant change in the mean scores.*
Conclusion: *Lecture followed by active learning strategies has been shown to improve the knowledge of the students in learning embryology of cardiovascular system.*
Key Word: *Active learning, Embryology teaching, Didactic lectures, Jigsaw learning, Model making*

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I. Introduction

Anatomy, an essential part of medical curriculum, could be overwhelming for students due to the enormous amount of information. However, understanding Anatomy is critical for learning the other aspects of medical curriculum. In India, the traditional approach to teach Anatomy has been through Lecture classes, which is an efficient method as it allows the teacher to present a large amount of information to a large group of students. However, the downsides of lecture are that it imparts passive learning and the students may not develop the desired skills.[1] These aspects raised the question that which mode of instruction can engage students in active learning and is also practically feasible.

Various studies have shown that active learning, especially in small groups, not only improves the performance of the students, but also develops a sense of passion for learning.[2] Co-operative learning methods build interest in learning.[3] Working independently on a topic greatly improves the understanding and retention capacity of key concepts and also improves students' satisfaction.[4] However, students have different learning strategies and one mode of teaching will not fit all the students. Hence, we came up with the idea of combining different Teaching-Learning methods to teach a topic.

Embryology is a key component of Anatomy, where students learn the development of various structures of the body. A routine lecture class followed by active learning was planned. We have used model making competition and jigsaw learning as a tool for deeper understanding of embryology of cardiovascular system.

Co-operative learning is one of the recent learning methods being used in medical education. Group learning activity has both individual and team accountability.[5] Jigsaw learning is a cooperative learning strategy where students interact with each other and learn together.[6] It is one of the most promising pedagogic practices which can bring about improvement in both learning and socializing.[7] Jigsaw learning strategy is a technique in which students become "experts" on a specific topic and then teach that knowledge to their group members, effectively assembling a complete understanding like pieces of a jigsaw puzzle.[8]

Thus, we have assessed whether the teaching-learning method of model making competition and jigsaw learning improved the knowledge of students in embryology of cardiovascular system.

II. Material And Methods

Initially, a total of 3 lecture classes were taken by the faculty to cover the embryology of cardiovascular system.

Pretest: Following the lectures, the students were asked to answer the pre – test consisting of 25 matching questions on the development of cardiovascular system.

Model making competition: As a part of the competition, 63 1st year MBBS students were divided into 6 home-teams. Each team consisting of 10-12 students. Embryology of cardiovascular system was divided into 6 topics, 1 topic for each team and the students were asked to make models of the related topic for the model making competition. Students prepared the models under the guidance of the anatomy faculty. On the day of model making competition, teams were given respective stations for the display of their models. Faculty from the medicine, surgery, Pediatric & anesthesia departments were asked to assess each team. Faculty assessed the teams based on the following criteria:

a) Relevance & coverage of the topic
b) Creativity & 3 dimensionality of the model
c) Concept understanding
d) Team involvement & Participation
e) Cost effective & Durability of the model

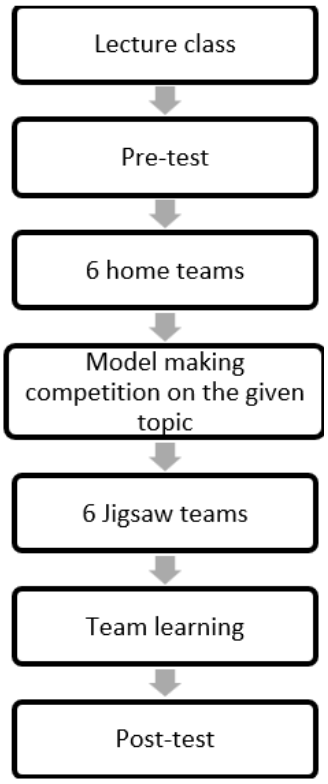
Top 3 teams based on the assessment scores were awarded prizes.

Jigsaw learning: As a part of Jigsaw learning, the 6 teams were regrouped into ***6 'Jigsaw teams'*** which included 1 to 2 students from each *pre-formed team.* The Jigsaw teams circulated between the 6 topic stations spending 1 hour at each station with the expert students of the particular topic teaching the remaining students. This assured that all the students have learnt all the 6 topics of cardiovascular system development.

Post test: Following the Jigsaw learning, the students were asked to answer the post – test consisting of 25 matching questions on the development of cardiovascular system.

Statistical analysis

The mean and standard deviation of pre and post – test scores were calculated for each team. The pre-test and post-test scores were compared using paired t-test. The total pre - test & post - test mean of all the teams was also calculated and compared using paired t-test.



Flowchart showing the sequence of events

III. Results

The mean and standard deviation of Pre – test & Post – test scores of the teams were tabulated and the scores were compared using paired t test (table 1). As illustrated in the table, the post-test scores were higher than the pre-test scores for all the 6 teams. With an exception of team 2, all the other teams have shown a significant improvement in post-test ($p < 0.05$). The mean pre-test score of all the teams together was 7.5 and the mean post-test score of all the teams was 10.9. There was a significant change in the total teams mean scores as well ($p < 0.05$).

Eighteen students who were a part of this activity gave their feedback. Most of the students felt that this activity enabled them to interact with others and developed a sense of team-spirit. Few students reported that model-making activity helped them with deep-understanding of the topic. However, some students highlighted the drawbacks of model-making, which were lack of time and unavailability of material for the models. Few students suggested that they should be given more time for jigsaw learning. Overall, this method of learning was good provided they were given adequate time for preparation and learning.

Table no 1: Table showing mean & standard deviation of pre - test & post-test scores

Teams	Pre-test		Post-test		P value
	Mean	Standard Deviation	Mean	Standard deviation	
Team 1	7.1	3.4	11.5	3.8	0.004
Team 2	9.5	7.8	9.7	4.7	0.951
Team 3	6.6	2.4	9	4.5	0.022
Team 4	8	2.5	10.5	3.1	0.002
Team 5	7.3	2.7	10.7	4.4	0.002
Team 6	7	3	14.1	2.3	0.001
All teams	7.5	1	10.9	1.7	0.015

IV. Discussion

From a very young age, children are taught using active learning techniques like stories, songs, tracing letters, etc. The active methods are helpful not only for young children, but also for professional students.[9] Despite this knowledge, over the course of a student's education, the learning becomes more passive. In higher education teaching is largely dependent on didactic lectures and PowerPoint presentations.

Active learning is a student-centered method where learning is made more engaging using various strategies. Active learning develops interest and motivates the students to learn better. In contrast, lectures are more teacher-centered and transfer of knowledge occurs more passively. However, it has been told that lectures can be an effective mode of teaching when handled properly and organized efficiently.[10] A complete shift to active learning is currently not feasible, considering the medical curriculum followed in India. Hence the author has used a mixed approach combing lecture followed by active team-based learning. Active learning is an umbrella term which includes various strategies.[11] The methods used by the author were model-making in teams and jigsaw learning.

Group activities facilitate students not only in acquiring knowledge of the subject, but also improves communication, socializing skills, team work, time management, etc. Model-making helps students acquire in-depth knowledge and understand the 3-dimensional aspect of development.[12] Jigsaw is a co-operative learning strategy where students are made into mixed groups in which they learn from each other. This method helps in sharing knowledge and improves socialization.[13] The author has combined different modes of learning viz., lecture, model making in teams and jigsaw learning. The combined approach enhances the learning process and helps in better understanding.[14]

The response from the students indicated that they preferred active learning to traditional teaching methods. Given the varied sources of information in current times, the students can acquire knowledge on their own and apply them in problem-solving, which is an essential skill for a clinician. Group activities enhance communication and the art of working as a team, which is also important for a physician.

Some of the drawbacks of this method were discussed in the feedback provided by the students. Time constraint is a major difficulty faced. Back-to-back class schedules doesn't offer flexibility in modifying the class hours. Adequate time needs to be provided for the students to prepare and for the students to learn from each other in jigsaw learning. Thus, combing the traditional lecture method to deliver the key concepts, combined with active learning strategies could be a practical way forward.

V. Conclusion

Lecture followed by active learning strategies has been shown to improve the knowledge of the students in the current article. Students have a welcoming approach for active learning methods. Thus, wise use of lecture and active strategies could help students become better clinicians.

References

[1] Knight JK, Wood WB. Teaching More By Lecturing Less. Cell Biology Education. 2005 Dec;4(4):298-310.
[2] Steinert Y. Student Perceptions Of Effective Small Group Teaching. Medical Education. 2004 Mar;38(3):286-93.
[3] Slavin RE. Cooperative Learning. Review Of Educational Research. 1980 Jun;50(2):315-42.
[4] Felder RM, Brent R. Cooperative Learning. Active Learning: Models From The Analytical Sciences. 2007 Aug;970:34-53.
[5] Parmelee D, Michaelsen LK, Cook S, Hudes PD. Team-Based Learning: A Practical Guide: AMEE Guide No. 65. Medical Teacher. 2012 May 1;34(5):E275-87.
[6] Slavin RE. Cooperative Learning In Elementary Schools. Incontemporary Issues In Primary Education 2022 Oct 3;102-111. Routledge.
[7] Casey A, Goodyear VA. Can Cooperative Learning Achieve The Four Learning Outcomes Of Physical Education? A Review Of Literature. Quest. 2015 Jan 2;67(1):56-72.
[8] Nalls AJ, Wickerd G. The Jigsaw Method: Reviving A Powerful Positive Intervention. Journal Of Applied School Psychology. 2023 Jul 3;39(3):201-17.
[9] Michael J. Where's The Evidence That Active Learning Works? Advances In Physiology Education. 2006 Dec 1.
[10] Snell YS. Interactive Lecturing: Strategies For Increasing Participation In Large Group Presentations. Medical Teacher. 1999 Jan 1;21(1):37-42.
[11] Lom B. Classroom Activities: Simple Strategies To Incorporate Student-Centered Activities Within Undergraduate Science Lectures. Journal Of Undergraduate Neuroscience Education. 2012 Oct 15;11(1):A64.
[12] Singh P, Rathore M, Trivedi S, Sharma DK, Pandey S. Model Preparation: A Novel Implement For Teaching & Learning Anatomy And Its Perception On Undergraduate Medical Students At AIIMS Raipur. Indian Journal Of Clinical Anatomy And Physiology. 2019;6(4):457-61.
[13] Lalit M, Piplani S. Assessing The Outcome Of Implementation Of Jigsaw Technique As A Learning Tool And Its Effect On Performance Of 1st Year Medical Students In Anatomy. National Journal Of Clinical Anatomy. 2021 Apr 1;10(2):97-102.
[14] Shankar N, Roopa R. Evaluation Of A Modified Team Based Learning Method For Teaching General Embryology To 1 St Year Medical Graduate Students.