SHORT RESEARCH ARTICLE

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A Study to Evaluate the Perception of Learning Outcomes Using Jigsaw Classroom Technique Among Medical Undergraduates

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ABSTRACT

Background: With advancements in technology, active learning methods are being proposed in medical education. The jigsaw classroom method, a type of active learning method, has shown promising outcomes. This study was conducted to understand the effects of the jigsaw technique and learn students' perceptions of the same.

Materials & Methods: A total of 150 students were included in the study. Each student was asked to prepare a subtopic, discuss internally with the students preparing same subtopic, and then taught the other students through seminars. At the end of these sessions, a questionnaire with likert scale was circulated to record the understanding of the topic in the students and their views on continuation of this technique for other important study topics.

Results: Students demonstrated proficiency in comprehending the subtopic assigned to them, but were not very successful in retaining the knowledge of topics taught to them by other students. The results also demonstrated that students were eager to engage in the jigsaw technique if supplemented with regular lectures of the syllabus.

Conclusion: Combining traditional lectures covering the entire topic and employing the jigsaw method can enhance students' comprehensive understanding of the material.

Keywords: Medical education, Jigsaw technique, Active learning method

INTRODUCTION

The realm of medical education is undergoing paradigm shifts, with technological advances and healthcare needs. The didactic lecture method – in which the teachers teach and the students are passive listeners – has been a traditional and most commonly used method in medical education. Didactic lectures depend on the educators, who teach large amounts of information with the possibility of minimal student engagement and are typically conducted in an instructor-centred classroom, centralizing the knowledge and involvement of students.[1] The limitation of this teaching method is that sometimes students are not actively engaged in the lecture, and they might not be able to transform the theoretical knowledge into practical application.[2] Lecturing students on various topics is an important aspect, however, it is essential to recognize that it is not the only method of education.

Recent research on learning techniques demonstrated that students showed increased participation when a wide variety of teaching strategies are used in a class-

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room.[3] Various modern learning techniques are gaining popularity in medical education such as Case-Based learning (CBL), Evidence-based medicine (EBM), Problem-based learning (PBL), Simulation-based learning (SBL) etc.[4] Active learning methods are being proposed to increase the active participation of students in medical education.

The jigsaw classroom method, a type of active learning method, has recently received considerable interest in medical education. The Jigsaw method is a kind of cooperative learning, in which a large topic is divided into subtopics and allotted to a group of students for self-learning. After researching the subtopics, each subgroup has the responsibility to teach the subtopic to the rest of the groups or students. This method enables students to develop skills of critical thinking & effective communication and also promotes positive student attitudes toward their learning.[5]

This experimental study was carried out to understand the effects of the jigsaw technique on medical students. A batch of first-year physiology students was introduced to this active teaching technique, and at the end of the study, were asked to fill out a questionnaire. The questionnaire was formatted, not only to understand the effectiveness of the method but also to learn the students' perceptions toward the technique. We also tried to identify possible modifications in the jigsaw technique for its better implementation of the same in the education industry. Ultimately, this research strives to provide valuable insights for educators seeking to integrate the jigsaw technique into their pedagogical practices.

MATERIALS AND METHODS

Participants: This study was carried out in the Department of Physiology of GS Medical College Hapur. A prior approval from the institutional ethical committee was taken (GSMCH/ 2024/ IEC/ 06). The students and the teaching faculties were informed that the active learning strategy will be introduced in learning a particular topic. The active learning method – jigsaw technique – was explained and discussed in detail with the participants. A total of 150 students were included in the study and the activity was carried out during self-directed learning classes in presence of facilitators.

Sample Size Calculation: The sample size was calculated according to the formula[6] $N= 4pq/d^2$, where, p (Expected percentage of response variable) was 0.9 (Based on 90% absolute response rate), q was (1 – p = 0.1) and d (accepted margin of error) was 0.05.

Based on the equation, the minimum requirement of sample size was 144, while the study was conducted on a total of 150 students.

Materials and Procedures: The study was carried out in the following steps for a pre-determined topic of Physiology.

Step 1: Topic of Nerve Muscle Physiology was chosen and was divided into 10 subtopics.

1. Structure of a neuron
2. Functions of a neuron
3. Myelinated and unmyelinated neurons
4. Glial cells
5. Neurotrophins
6. Physiological properties of the nerve fibers
7. Classification of Nerve fibers
8. Properties of nerve fibers
9. Degeneration of nerve fibers
10. Regeneration of nerve fibers

Step 2: In the first session, 150 students were randomly divided into 15 groups, each consisting of 10 members. These groups were called "Parent groups" and were named A to O.

Step 3: Now the 10 students in each Parent group were assigned a number, e.g. A1, A2,..., A10. Each member was assigned one of the subtopics from the list mentioned above. For example, student A2 would prepare for sub-topic 2 – Functions of a Neuron. Each member of the parent group had 1 subtopic.

Step 4: Now the students assigned with the same subtopic were grouped together, called "Expert groups". These groups were made of 15 students. For example, Expert group on the topic properties of nerve fiber would comprised of students A8, B8,…O8. The students were provided a general idea about the subject and were asked to prepare the subtopics in their respective "expert group" in the following session. During the discussions, each team was supervised by a faculty member and they ensured that every student is participating and the discussion is going in a proper direction. If any group is having any concern, faculties made appropriate interventions.

Step 5: Following the expert group session, students returned to their respective "Parents group". Each student taught and discussed the assigned subtopic to the fellow members of their Parents group. Students were informed in advance that "parent group" members need to learn all the sub-topics from one another and any of the members could be asked to speak on any of the subtopic.

Step 6: In the last session, one member from each "parent group" was selected randomly and asked to teach their topic to the whole class. In these seminars, they were allowed to use chalk and board. The whole class was encouraged to ask questions from the presenter at the end of a seminar. 10 seminars were conducted on these 10 subtopics over a period of 2 days.

Questionnaire: To learn the effectiveness of this active learning method, a questionnaire was introduced after the seminars. A 5-point Likert scale questionnaire (1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree) was introduced to the students and their feedback was noted anonymously. The questions for the students were targeted to assess their understanding of the topic as a whole, and their level of satis-

faction. The questions were also asked to learn the benefits of this jigsaw techniques in terms of their attention span & engagement, self-regulation and critical thinking skills.

The feedbacks were recorded and the data was collected, compiled, and analyzed.

RESULTS

The questions asked to the students on Likert scale, and their feedbacks are shown in table 1 and graph 1. The satisfaction index was also measured for each question using the 5-point scoring system. The following formula was used to calculate the satisfaction index.

$$\frac{[(N1 * 1) + (N2 * 2) + (N3 * 3) + (N4 * 4) + (N5 * 5)] * 20}{N1 + N2 + N3 + N4 + N5}$$

Here, N is the total number of students mentioned in the subscript of the particular column of the scale.

The questions were targeted to assess the understanding of the students on the subtopic provided to them as well as their grasp of the overarching topic. Additionally, the efficacy of the jigsaw technique in enhancing students' critical thinking abilities, attention spans, and study methodologies was evaluated. The questions were also asked to gauge students' perception regarding effectiveness of this technique, and to assess its potential incorporation in their routine learning of the physiology subject. The responses obtained for the questionnaire are depicted in the table 1 and figure 1.

Table 1: Response of 150 students on the feedback questionnaire on Likert Scale

No.	Questions	SD	D	N	A	SA	T	SI
1	Learning by Jigsaw technique improved your understanding of the subtopic of your group	4	11	13	65	57	150	81.33
2	Learning by Jigsaw technique improved your understanding of the whole topic	17	63	29	23	18	150	54.93
3	Jigsaw classroom model has increased your attention span & engagement during class	3	9	17	67	54	150	81.33
4	Jigsaw classroom approach is promoting critical thinking skills	5	13	21	80	31	150	75.87
5	Jigsaw classroom model better prepares you for real-world applications of course concepts	6	13	20	54	57	150	79.07
6	Jigsaw classroom model allows for personalized learning experiences	5	7	28	51	59	150	80.27
7	Jigsaw classroom help improve your studying technique	3	11	21	81	34	150	77.60
8	This is an effective way of teaching	2	18	57	41	32	150	71.07
9	More topics in physiology should be taught by jigsaw technique	7	21	46	41	35	150	70.13
10	Combining jigsaw learning with the lectures can improve the understanding the topic	1	12	19	41	77	150	84.13

Abbreviations: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree, T = Total, SI = Satisfaction Index

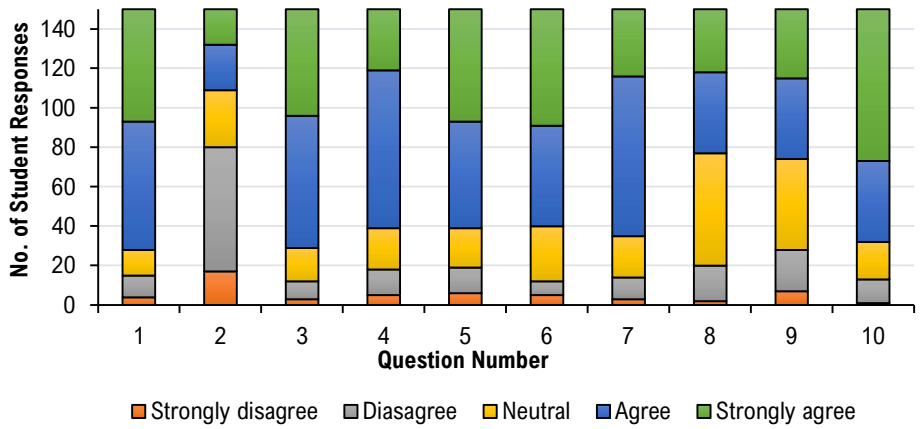

Figure 1: Student feedback on the questionnaire

DISCUSSION

Traditional didactic lectures have been a mainstream teaching technique for a very long period of time. Classroom lectures often follow teacher centered strategies and are conducive to passive learning on behalf of the students.[7] In contrast, active learning methods, (i.e. containing student participation) are proven to be more effective in retention of knowledge and self-directed learning skills.[8] Modern active learning techniques, such as case-based learning, evidence-based learning and Problem-based learning improve competency, logical reasoning and clinical skills.[4]

One such active learning method is jigsaw technique, in which the class is taught to work in smaller interdependent groups; each student is given a subtopic to be studied, and when finished, the students fit their pieces of the topic area together to form a complete "jigsaw" picture.[9] Jigsaw method has shown to encourage cooperativity among students and to improve listening and communication skills.[10] Although it was developed by

Dr. Elliot Aronson in 1970s, there has not been too many studies about its impact on medical education.

The purpose of this study was to explore the impact of jigsaw teaching on first year MBBS students. The study was based on the hypothesis that studying the topic on their own, and teaching the topic to their peers would improve individual students' performances. The study was conducted with promotion of co-operative learning among the students and included group discussion and seminar presentation in front of the whole class. At the end of the seminars, feedback was collected from the students through a questionnaire. The feedback was targeted to understand students' understanding of the topic and their perception towards the method. The questions were also asked to understand students' opinion of supplementing jigsaw technique in their routine classes. Satisfaction index was also calculated for each question participants' collective satisfaction with the intervention.

The satisfaction index was 81% for question 1, and just 54 % for question 2. This outcome implies that while students demonstrated proficiency in comprehending the subtopic assigned to them, acquisition of knowledge of the subtopics from peer-led seminars was less successful. Satisfaction index pertaining to questions 3 to 7 indicate an average level of improvement in students' critical thinking skills, attention span and personalized learning experience. Notably, students displayed limited enthusiasm towards the application of the jigsaw method for teaching new topics in physiology. However, when queried about their receptiveness towards supplementing jigsaw to their regular lectures, their responses were notably positive.

In the jigsaw technique, each student acts as a student as well as an instructor. It is a blend of independent acquisition of knowledge and co-operative & collaborative teaching.[10] There have been studies in the past related to the implementation of jigsaw technique. One study found that the jigsaw technique made the class alive and the students could decrease their nervous to perform because they worked collaboratively with their friends in a group.[11] Another study also showed that Jigsaw activities had a positive effect on students' anxiety and speaking ability, and students had positive opinions towards it.[12]

The present study suggested that students enjoyed this teaching technique, and it helped them gain an individual learning experience. The students were able to comprehend and retain for a longer period of time when they are also asked to teach their peers. At the same time, our results also suggest that the students' performance was compromised when learning unassigned topics from fellow students. Potential explanations for this suboptimal outcome could be limited exposure to the subtopic, only 1 presentation of the subtopic or students' heightened focus on their assigned topic. The feedback received from the students reflected that if this technique is combined with their routine lectures of the various topics, it could lead to more successful outcomes, including the better comprehension of peer taught subtopics. The conventional lecture format, if complemented by a jigsaw technique, has the potential to enhance the efficacy of overall academic teaching.

One limitation of the study was that it was not possible to compare students taught by teachers with the students who learned the topic from their classmates. All the students did not get a chance to present a seminar, and dividing the topic into very small subtopic may resolve this issue. Another limitation was that the study was performed only in one subject and one topic – Nerve Muscle Physiology. Applying the technique on various topics in different subjects, could provide broader range of insights.

CONCLUSION

Learning is a continuous process, and it is essential that medical education accommodates modern learning techniques. In the study conducted, the understanding of assigned subtopic was quite successful, while peer reviewed subtopics, had a relatively substandard cognizance. Integrating regular lectures focused on the entire topic, and the jigsaw method, can prevent such shortcomings and facilitate a more thorough grasp of the material by students. Additional research might be required to examine the efficacy of combining academic lectures and jigsaw together, particularly in terms of comprehension and long-term retention. Exploring diverse subjects beyond physiology could provide valuable insights into the broader applicability and effectiveness of this pedagogical approach.

INDIVIDUAL AUTHORS' CONTRIBUTIONS

TG: Design of the study, collection of data, and manuscript Preparation, and Editing, **SD:** Review of the study design, performed analysis of data, proofread of the manuscript

AVAILABILITY OF DATA

Author can be contact at gogiataru@gmail.com for data.

REFERENCES

1. Cortazzi, M., et al., Sharing Learning Through Narrative Communication. International journal of language & communication disorders / Royal College of Speech & Language Therapists, 2001. 36 Suppl: p. 252-7.
2. Betihavas, V., et al., The evidence for 'flipping out': A systematic review of the flipped classroom in nursing education. Nurse Educ Today, 2016. 38: p. 15-21.
3. Salwani Ismail, Nor Iza A Rahman, Nasir Mohamad, Norhasiza Mat Jusoh, Aminatul Izzah Binti Hood, Liyana Aqilah Binti Arif, Wan Siti Aishah Binti Wan Abdullah, Zetty Nasfariza Binti Zainal, Md. Zakirul Islam, Wan Putri Elena Wan Dali, Mainul Haque., Preference of Teaching and Learning Methods in a new Medical School of Malaysia. J App Pharm Sci, 2014; 4 (02): 048-055.

4. Challa, K., A. Sayed, and Y. Acharya, Modern techniques of teaching and learning in medical education: a descriptive literature review [version 1]. MedEdPublish, 2021. 10(18).
5. Chopra, D., et al., Jigsaw Classroom: Perceptions of Students and Teachers. Med Sci Educ, 2023. 33(4): p. 853-859.
6. Veena Bhaskar Sampangi Rame Gowda, M.S., Shyamali Chatterjee, Sajana Paul Effectiveness of Cooperative Learning by Jigsaw Method in Understanding Biochemistry for First Year MBBS StudentsA Randomised Interventional Study National Journal of Laboratory Medicine, 2022. Vol. 11(no. 4): p. pp. 6 – 10.
7. Mazur, E., Education. Farewell, lecture? Science, 2009. 323(5910): p. 50-1.
8. Hernández-Torrano, D., S. Ali, and C.K. Chan, First year medical students' learning style preferences and their correlation with performance in different subjects within the medical course. BMC Med Educ, 2017. 17(1): p. 131.
9. Aronson, E. and et al., The jigsaw classroom. The jigsaw classroom. 1978, Oxford, England: Sage. 197-197.
10. Rathore, B., et al., Jigsaw Method : An Innovative Way of Cooperative Learning in Physiology. Indian J Physiol Pharmacol, 2017. 61.
11. Hersulastuti, Implementing jigsaw technique in speaking class of describing someone reflection. Journal Magistra in English UNWIDHA Klaten., 2010.
12. Qian, L., Cooperative learning using jigsaw activities in college English speaking classes. Master's Thesis, Suranaree University of Technology, Arts in English Language Studies., 2012.