

A COMPARATIVE STUDY ON COLLABORATIVE AND COOPERATIVE LEARNING

Biochemistry

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ABSTRACT

Introduction: Collaborative learning is a term used for a variety of educational approaches involving joint intellectual effort by students. Cooperative learning is another strategy which is very effective in enhancing student motivation, engagement, communication, social interaction and academic achievement. In cooperative learning each student take part in the task, use his /her skills and knowledge to support the fellow members to understand the subject. The similarity in both the strategies is that students should work as a team and the role of the teacher is reduced from extended hours of teaching to an observer. **Aim:** The purpose of this study is to compare the effectiveness of collaborative [Think-Pair-Share (TPS)] and cooperative [Jigsaw] learning. **Methods & Materials:** A total of 150 medical students were recruited and their pre-knowledge on the concepts of biochemistry were assessed. Students were divided in to 2 batches A batch students were trained by using the TPS and B batch students by Jigsaw technique and their post knowledge was assessed. **Result:** There was no statistically significant difference in the student's knowledge and comprehension ability. **Discussion:** The findings of the study indicates that application of both Think-Pair-Share and Jigsaw strategies improve learner's knowledge. **Conclusion:** Both cooperative and collaborative learning methods improves learners perception and can be used as effective learning strategies.

KEYWORDS

cooperative learning, collaborative learning

INTRODUCTION:

Collaborative learning is a method is a learning method where a group of two or more people work together to achieve a common goal, while respecting each person's contribution to the whole work. In collaborative learning Students are encouraged to work well with their peers, learn from and support one another's development, and feel a sense of responsibility to a learning community. Ideally ,during collaborative study ,learners monitors their understanding collaboratively to discover gaps in their knowledge base and actively implement appropriate study tactics and resources to overcome the gaps in coordination between group members [1-2]. Think-Pair-Share is one of the Collaborative methods which has positive features for student's learning [3-5]. In cooperative learning "each person is responsible for a portion of the problem solving". In contrast to collaborative learning, in cooperative learning activities are more structured, with each student assigned a specific role [6-7]. JIGSAW is one of the student centered, cooperative approach which was introduced by by Elliot Aronson in the early 1970's [6-7]. Collaborative learning places more emphasis on group interactions and the learning process, where as cooperative learning places more emphasis on the end result [5,8].

Aims And Objectives:

The purpose of this study

- To assess the existing level of knowledge related to biochemistry concepts by Pre-test.
- To implement collaborative learning (Think-Pair-Share) method and cooperative learning (Jigsaw) method among 1st year MBBS students
- To observe the difference in enhancement of students' knowledge by implementing these methods.

MATERIALS & METHODS:

The present interventional study was conducted among 1st MBBS students of academic year 2022-23 at Department of Biochemistry, Apollo Medical College, Hyderabad, India. The students were divided in to A and B batches comprising 75 students each. The instruments used in this study were pre-test and post-test in the form of Google forms. Four different clinical cases were prepared based on competencies: BI5.1 along with the objectives and were distributed to all the students. The clinical cases were focused on Classification of amino acids, different levels of structural organization of Proteins and structure function relationship of proteins. All the students were subjected to pre-test consisting of Ten Multiple Choice Questions (MCQ's) for Five minutes before implementing the learning methods. TL techniques were explained to all the students. Batch A

students were instructed to pair up with other student voluntarily and were given 40 minutes time to learn all the objectives given for the clinical cases. And the Batch B students were divided into 15 subgroups having 4 students each where every student in each group was assigned a number (eg:1, 2, 3, and 4). All these subgroups were named "Home Groups" or "Jigsaw" group. And each student in the jigsaw group was assigned to one case. (Fig 1)

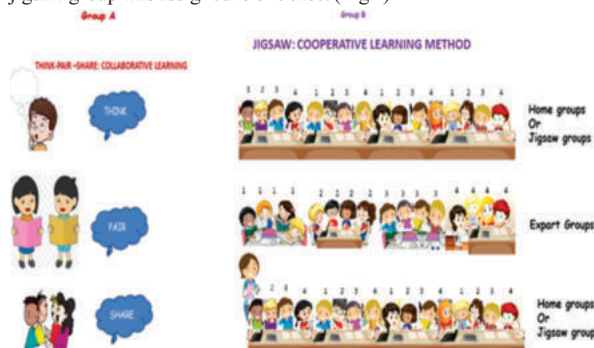


Fig 1. Description of JIGSAW and Think-Pair-Share Methods

After each student had a number, the home groups were broken apart, were reorganized by numbers allotted to them into new "Expert Groups." The students numbered with ones, twos, threes and fours constituted expert groups, respectively. So that each expert group will be assigned a specific subtopic related to the focus of overall topic:

The subtopic distribution was as follows:

Expert Group A: Nutritional Classification of amino acids

Expert Group B: Primary structure of insulin

Expert Group A: C: Structure function relationship of Hemoglobin

Expert Group D: Structure function relationship of collagen

The students in the expert group were allowed to read from text book or internet, share their ideas and discuss the key points amongst themselves and understand the concepts regarding the case given to them. Then they were instructed to go back to their jigsaw groups and share the knowledge gained from expert group with their peers for 20 minutes.

Teacher acted as facilitator to monitor the development of the discussion about the topic given to the students and answered their queries. After completion of the discussion the students knowledge

was again assessed by answering the by post –test with the same 10 MCQs. Finally the students were asked to fill a feedback questionnaire consisting of closed ended questions, on a five-point Likert's scale[9].

Statistical Analysis:

The mean and standard deviation of the pre and post test scores were calculated. The statistical significance between the pre and post – test means were calculated by Paired t – tests over time with in the groups. P value less than or equal to 0.05 was considered statistically significant.

RESULTS:

The participants were First MBBS students during the academic year 2022-23. A total of 92 students were enrolled in the study out of which 49 were female and 43 were male. The students were divided into A & B groups. Question wise Percentages of the students with correct answers in Pre test & Posttest in Group A and group B and their P values were shown in Table 1.

Table 1: Percentage Of Students With Correct Answers In Pre & Post Test In Group A (TPS) & Group B (JIGSAW) And Their P Values

Q. No	Percentage & P value of students with correct answers in pre test			Percentage of students with correct answers in Post test		
	Pre test (TPS)	Pre test (JIGSAW)	P VALUE	Post test (TPS)	Post test (JIGSAW)	P VALUE
1	81.8%	75%	0.428	100%	100%	1
2	54.5%	56.3%	0.869	88.6%	89.6%	0.884
3	34.1%	8.3%	0.002	79.5%	85.4%	0.458
4	59.1%	54.2%	0.634	88.6%	93.8%	0.385
5	95.5%	91.7%	0.462	86.4%	87.5%	0.872
6	34.1%	33.3%	0.939	86.4%	93.8%	0.234
7	79.5%	70.8%	0.335	88.6%	93.8%	0.385
8	43.2%	39.6%	0.726	88.6%	93.8%	0.385
9	54.5%	29.2%	0.014	93.2%	93.8%	0.912
10	63.6%	64.6%	0.925	93.2%	93.80%	0.912

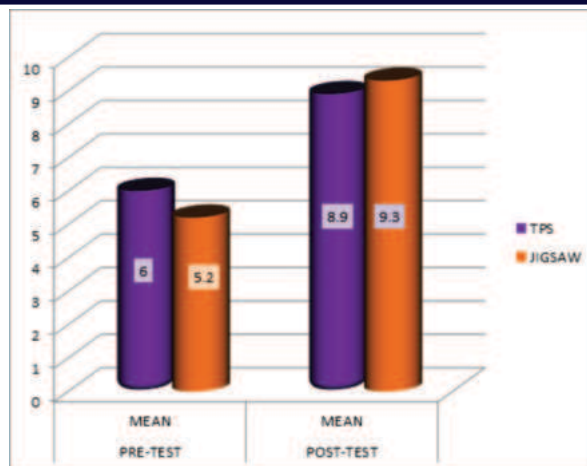
The Mean and SD of Pretest in Group A (TPS) and Group B (JIGSAW) were 6 ± 2.61 and 5.2 ± 2.01 . There is no significant difference in P value between the groups ($P=0.119$). Similarly, the Mean and SD of Post test in Group A (TPS) and Group B (JIGSAW) were 8.9 ± 1.11 and 9.3 ± 0.93 and. There is no significant difference in P value between the groups ($P=0.139$). But there is a significant difference in P value over the time ($P=0.001$) in both the groups. Comparison of Mean & SD of Pre & Post test in Group A (TPS) & Group B (JIGSAW) and the difference in P Values overtime was represented in table 2, Graph 1 & Graph 2.

Table2 : Comparison Of Mean & SD Of Pre & Post Test In Group A (TPS) & Group B (JIGSAW) And The Difference In P Values Overtime.

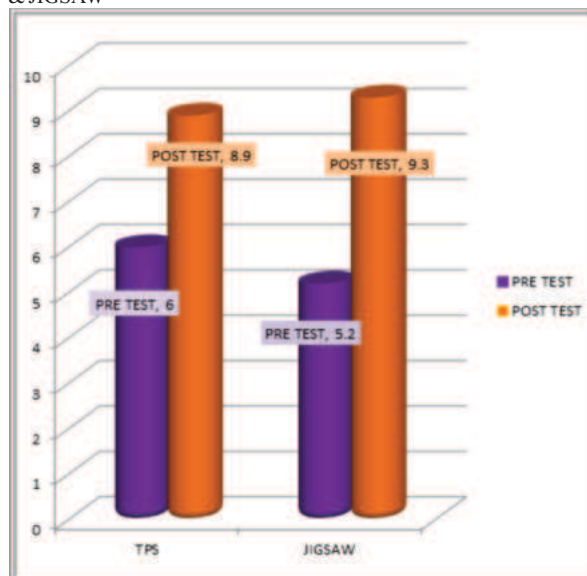
	pre-test			post-test			difference in P value overtime
	mean	SD	P value	mean	SD	P value	
TPS	6	2.61	0.119	8.9	1.11	0.139	0.001
JIGSAW	5.2	2.01		9.3	0.93		0.001

Table 3: Response Of Students For TPS & Jigsaw Method Using Likert Scale.

No	Question	Learning Method	1 Strongly disagree	2 disagree	3 Neutral	4 Agree	5 Strongly Agree
1	This new method generated interest in learning Biochemistry	TPS	0	0	0	44.4%	55.6%
		JIGSAW	0	0	0	38.3%	61.7%
2	This method enabled in depth understanding of the desired topic	TPS	0	0	5.6%	5.8%	36.1%
		JIGSAW	0	0	6.4%	48.9%	44.7%
3	The Method creates opportunities for team members to share their information	TPS	0	5.6%	5.6%	38.9%	50%
		JIGSAW	0	4.3%	4.3%	36.2%	55.3%
4	The Method can be applied for other concepts of Biochemistry in future	TPS	0	2.7%	8.1%	35.1%	54.1%
		JIGSAW	0	2.1%	6.3%	31.3%	60.4%
5	The new method enhanced my referral habits	TPS	0	0	8.1%	44.4%	48.6%
		JIGSAW	0	0	6.3%	41.7%	52.1%
6	The Method improves my analytical ability	TPS	0	0	13.9%	38.9%	47.20%
		JIGSAW	0	0	11.0%	44.0%	55.0%
7	The Method is an effective way of learning	TPS	0	2.8%	8.3%	38.9%	50%
		JIGSAW	0	2.1%	6.4%	31.9%	59.6%
8	I could easily adapt to this technique	TPS	2.7%	5.4%	16.2%	43.2%	32.4%
		JIGSAW	2.1%	4.2%	14.6%	41.7%	37.5%
9	This method improves teaching skills in the participants	TPS	0	0	16.7%	47.2%	36.1%
		JIGSAW	0	0	12.8%	40.4%	46.8%
10	The method helped me to improve my communication skills	TPS	0	0	19.4%	27.8%	52.8%
		JIGSAW	0	0	14.9%	29.8%	55.3%

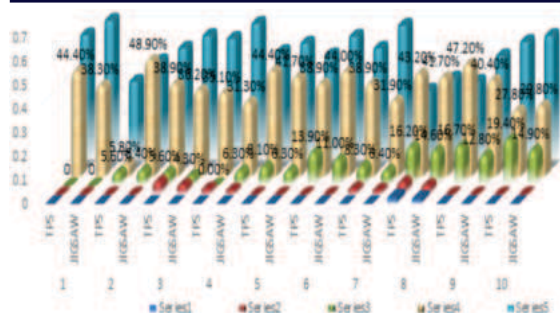


Graph 1: Comparison Of Pre Test Means & Post Test Means Of TPS & JIGSAW



Graph 2: Comparison Of Pre Test & Post Test Means Of TPS & JIGSAW

The students Response for TPS & Jigsaw method were represented using likert scale in Table 3 and graph -3 [9]. The Mean & SD of Feed back from Group A (TPS) & Group B (JIGSAW) and the P Values were represented in Table 4



Graph 3: Comparison of responses between TPS & JIGSAW

Table 4 : Mean & SD of Feed back from Group A (TPS) & Group B(JIGSAW) and the P Values

	MEAN	SD	P VALUE
TPS	43.1	5.25	0.4
JIGSAW	44.1	5.16	

DISCUSSION:

The Present study was done to witness TPS & Jigsaw techniques as effective ways of learning method. In our study there was no significant difference between mean scores of pretest & means of post tests in between the groups. But there was significant difference in the mean scores over time, shows that both the interventions are effective. This is consistent with what has been previously reported, shows that both the interventions are effective ($P < 0.001$) in both Group A & Group B. In a comparative study on class X students it was concluded that there is no difference to the competence of student learning outcomes using JIGSAW and Think-pair-Share [10]. In the same way in a quasi-experimental study on business education students in Principles of Accounts in Colleges of Education in Northeast, Nigeria, revealed that jigsaw and think-pair-share methods assist the Students to improve academic performance regardless of their gender difference [11]. In our study the minimum marks obtained in pre tests of TPS and Jigsaw were '0' and '1' respectively. In addition, around 14 (31.8%) students from in Group A and 15 (31.3%) students from Group B scored less than 5/10 (50%) marks in the pretest. At the same time none of the students from both Group A & B scored below 50% the post test, indicating that there was a remarkable improvement in the scores of these students. Surprisingly, 80% of the students from Group A & 85% of the students from Group B scored 10/10 (100%) marks. This indicates that there was an enhancement in knowledge of more number of students with implementation of both the learning methods.

When we observed the students response majority of the participants from both group A and B agreed that both methods generated interest learning Biochemistry, enhanced their referral habits, improved their analytical ability, effective ways of learning, improved the teaching skills in the participants, useful to improve their communication skills. But around 8% of the students from group A and 6% students from group B felt that they could not adapt to this technique easily.

CONCLUSION:

The current study investigated the use of TPS and JIGSAW methods as effective learning methods. The findings of the study indicates that application of both Think-Pair-Share and Jigsaw strategies improve learner's knowledge and perception. So, both methods can be used as effective learning strategies to improve students academic performance.

Conflicts Of Interest: There are no conflicts of interest.

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