Study of students perceptions for Jigsaw-collaborative learning in Forensic Medicine

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Abstract

Introduction: The traditional didactic teaching in Forensic Medicine happens to be less interactive & non collaborative monolog resulting in poor learning outcomes. Study attempts intervention of student centric, active, collaborative group activity "Jigsaw" to make them accountable for their own learning while determining its effect in improving students' self, active & collaborative learning through their feedback & perceptions.

Materials and Methods: This prospective cross sectional, interventional study carried out on first semester – II MBBS students in Forensic Medicine at MPSGMC Jamnagar. Participants divided in 10 groups each of 6 to 7 students making 2 clusters of 5 groups. Two pre-decided assignments of Toxicology with 5 different topics were distributed as learning tasks to each 5 groups of both clusters. Teacher facilitated, suggested resources & guided groups in preparing their topics. Subsequently when group reassembled, one member of each group was randomly merged with other groups in a way that both clusters of 5 groups would comprise of all 5 different topics of respective assignments. In such new groups, each member presented their topic which was subjected to analysis and synthesis by rest of the members under facilitation by teacher. Thus, both clusters of 5 groups learned their whole assignment. Thereafter, effectiveness of Jigsaw learning experience was evaluated by administering a pre-validated feedback questionnaire to students which was analyzed.

Results and Observations: Jigsaw protocol feedback on likert rating scale showed average rating of 3.91 to 4.22 for each item. Satisfaction index was highest (90.45) for item - 'Jigsaw activity enabled active student participation & discussion.' whereas, it was lowest (83.41) for item –'Many more topics shall be taught by this method' which exhibits students' apprehension to learn without teacher. Analysis of open ended questionnaires' revealed students' perceived positivity & effective learning through Jigsaw due to responsibility of teaching. However, they felt barriers of time constraint, improper group dynamics & need of teacher.

Conclusions: Jigsaw intervention induced active engagement & accountability through responsibility of peer teaching while encouraging cooperative learning. Students' perceived positivity of accomplishment of learning in cooperative, refreshing & enriching Jigsaw learning environment which added benefits of sharpening their learning, social & communication skills.

Keywords: Jigsaw, collaborative learning, peer teaching, Group learning.

Introduction

In view of the judiciary system requirements of our country, the MBBS graduate need to be better equipped for the knowledge application of Forensic Medicine which is taught to second year medical students at undergraduate level.[1] Traditionally, Forensic Medicine is taught in a teacher centered approach of delivering didactic monolog with little scope for interactivity and is criticized by learners' as creating a boredom of passive information transfer encouraging only rote memorization & dissatisfaction. Due to this reason, students tend to show little interest in the learning process.

The nuances of engaging learners in classroom is very complex.[2] The Medical Council of India in its vision document 2015 categorically emphasizes self-directed and learner centric approach.[3] To achieve the desired competencies, a paradigm shift from teacher centered approach to learner centered approach is need of the hour to make over an activated learner with critical thinking skills and reflective qualities capable to work in team. [1, 4] Learning outcomes or skills can be achieved if active learning is in vogue [2] and these skills can be intellectual, cognitive strategies, attitudes or motor skills (Gagne& Driscoll, 1988).

Jigsaw is such a student centric approach wherein, students are effectively taught by peers in a collaborative group activity. In this approach, the learning process takes place through the inter-communication among students regarding a particular skill or procedure, topic or problem.[5] Jigsaw learning cycle ensures that student remain central to learning activity and in chorus allows collaborative learning where student by relying on one another improves his group dynamic attributes. Jigsaw strategy facilitates learners to accomplish multiple tasks at once with in-depth analysis and synthesis during the achievement of learning objectives.

In present study, Jigsaw strategy of learning is implemented on the second year students in the subject of Forensic medicine so as to determine effects of Jigsaw intervention in improving active learning, peer interaction & collaborative learning through students' perceptions of Jigsaw on feedback using validated questionnaire.

Aim and Objectives
Aim
To study students' perception about the effectiveness of Jigsaw in making them accountable for their own learning while promoting active engagement, peer interaction & cooperative learning in Forensic Medicine.

Objectives

1. To determine change in perceptions among students after a student centric Active
2. learning experience of Jigsaw in Forensic Medicine
3. To determine students' perceptions about effectiveness of Jigsaw in promoting self
4. Learning & improving learning outcomes
5. To determine students' perceptions about effectiveness of Jigsaw in improving peer
6. Interaction & cooperative learning

Materials and Methods

Study Design: Prospective, Cross sectional, Interventional.
Study duration: 3 months
No of students: 65

Approval of Institutional Ethics Committee for present cross sectional study to be conducted with second year medical students (first semester) in Forensic Medicine Department of shri M. P. Shah Govt. Medical College, Jamnagar was obtained after due submission of the proposal. Study activity was part of routine scheduled lecture & utilization of additional proxy time (convenient to students) in February 2018. Pre-validated feedback questionnaires were kept ready to obtain anonymous feedback of students about Jigsaw learning experience.

Study activity was commenced by sensitization of II M.B.B.S. students of age 18-19 years without any prior experience of Jigsaw learning; through discussion of framework & proposed plan of jigsaw educational intervention & obtaining their informed consent for voluntary participation. Participant students (N=65) were broken down in 10 groups each of 6 to 7 students and placed in to 2 clusters of 5 groups. Two pre-decided assignments of Toxicology with 5 different topics were distributed as learning tasks to each 5 groups of both clusters. Teachers facilitated the groups as and when required for clarifying doubts and suggesting necessary resources to enhance learning. After these students were given one day time for groups to go through the literature, research, discuss and prepare the particular topic.

On the second day when the groups reassembled, one member of each group was randomly merged with other groups of the cluster so as to ensure that both the clusters would be reformed in to clusters of 5 new groups which comprise of members having learnt all five different topics of respective assignments. In such reorganized - new

groups, each member presented the topic and each presentation was subjected to analysis and synthesis by rest of the members under the supervision of facilitator. This jigsaw experience ensured that all the five groups had the opportunity to learn the whole assignment.

At the end the effectiveness of jigsaw intervention & perception of students to this experience was evaluated by administering a pre-validated feedback questionnaire to students. The questionnaire had two kinds of questions: 1) Seven questions with a 5-point Likert scale (1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly agree) to assess their learning experience, perception & level of satisfaction with Jigsaw activity by appropriate tick and 2) Three open-ended questions directed to invite free opinion about (Apparent advantages and disadvantages) jigsaw technique along with their suggestions to improve it. It also asked suggestions / comments with regards to the use of the Jigsaw technique to learn new concepts in Forensic Medicine. A total of 48 students responded to feedback questionnaire and submitted the forms.

Feedbacks on Likert scale rating were analyzed by counting average rating of each items. Also, the satisfaction index for each item was calculated using the formula:-

$$\frac{[(n1 * 1) + (n2 * 2) + (n4 * 4) + (n5 * 5)] * 20}{(n1 + n2 + n4 + n5)}$$

Where, n is the total number of students gaining the score mentioned in the subscript for that particular item. The scores were rated on a 1–100 satisfaction index scale.

Voluntary responses to open ended questionnaire by students were analyzed by studying the comments for the purpose of understanding & exploring their perceptions towards jigsaw method. The various comments by the students were segregated into various core ideas and suggestions along with representative statements.

These observations of analysis were used to draw final conclusions.

Observations and Results

Students' feedback about their perception & experience pertaining to jigsaw intervention obtained on Likert rating scale is shown in Table 1.

Table 1: Students' feedback on jigsaw intervention (Likert rating)

Questions	Strongly Disagree (1)	Disagree (2)	Uncertain (3)	Agree (4)	Strongly Agree (5)	Satisfaction Index
Aims & objectives of methodology were explained well beforehand	0	0	2	34	12	85.21
Active learning by Jigsaw method were refreshing	0	1	5	28	14	85.58

Jigsaw method encouraged active student participation & discussion	0	0	4	21	23	90.45
Jigsaw method motivated student to self learn (visit to library /search internet)	0	4	10	20	14	87.77
Jigsaw learning enhanced clarity & understanding of topic	0	0	9	23	16	88.20
Jigsaw was helpful in improving my learning Skills	0	1	5	24	18	87.44
Many more topics shall be taught by such Jigsaw active learning methods	1	1	7	27	12	83.41

As in Table 1
The average rating of each item in the questionnaire ranged from 3.91 to 4.22. The minimum average score was 3.91 for item 4, which indicated that jigsaw method motivated students to search literature either in the library or online. The maximum mean score of 4.22 was obtained for item 6, which indicated that students felt jigsaw activity helped them to improve learning skills.

The satisfaction index was highest (90.45) for item 3, emphasizing the fact that Jigsaw activity enabled active student participation & discussion and lowest (83.41) for item 7, indicating that many more topics shall be taught by this method. Hence it is derived that students are not willing or apprehensive to learn more topics by such activity. It reflected that students lacked confidence to learn independently without teacher's guidance. Overall, a high satisfaction score on a five point Likert scale on learning of different aspects the topic is the observation of this study.

Table 2 gives the results of student opinion regarding benefits or harms of jigsaw method, modifications suggested for improvement and topics suited to be learned using this method.

Table 2: Students' feedback on jigsaw intervention (Open ended questionnaires)

Core Idea	Representative comments
Opinion about Jigsaw Method Effective way of learning	It help to learn more than book I can find many integrated things Students prepare topic to teach so memorize it better We retain more due to reinforced reading & teaching It is easy to approach by discussion I am inspired to learn more because of responsibility We get personal attention by teacher We can remember more than self-studying
It promote cooperative learning	It reduces effect of learning Easy to learn from colleague as they teach in easy way. There is interaction & exchange of learning methods We can find new things from others It encourage discussion & understanding
It improves communication skill	It improves friendship Good for all, it increases interaction It improve speaking skill It improves oratory & expressive skills & boost confidence It reduce time consumption
It saves time	We learn more topics in few time
It is interesting & innovative	Help in studying boring topics Refreshing, better concentration & boost confidence It's fun to learn like this way It made us active for reading & searching
Disadvantages	Due to shortage of time I benefitted only by topic I prepared Time limitations do not allow learning of full topic Not nice that some contributed too less Some students are not cooperative so dependency on group Studying with friend create environment of fun & distraction

Mention about Any modification to improve	Use of pictures, audio & extra knowledge to stimulate interest. Separate facilitator for each group would benefit Need more time to learn Need pre -organization & preparation & complex Liberty to choose group members to learn better It is difficult to cooperate with unknown colleagues Group should inclusive of shy & open, bright & dull & facilitation Members should be really interested to participate To give small recall time after cycle of learning a topic in group
Contribution	We can do on daily basis, It's useful. Require 2 students per subtopic to prepare I Google it for more information I do searching from reference books
Suggestions about Topics better learned with Jigsaw	Poisoning, Injury, Fire arm (Difficult topics), medico legal case Practical & real life experience related to topic All aspects of subjects can be learned this way
Hindrance in learning	No, without sir it's not better learned

As in Table -2: The students exhibited positive perceptions with Jigsaw learning in terms of responsible learning, retaining the knowledge through reinforcement and searching and teaching of topics. Study also revealed that students also felt barriers in Jigsaw like time constraint, maintaining of group dynamics and necessity of having the presence of teacher. Suggestions like modifications for improvement; pre planning & organization of the method, freedom to choose group members and provision for individual facilitator were also received.

Discussion

The present study was aimed to introduce a student centric jigsaw method of learning in the subject of Forensic Medicine so as to make students accountable for self-directed learning and simultaneously evaluating their experience about improved active engagement, interaction among peers and degree of cooperative and collaborative learning. This study was not meant to compare traditional teaching with jigsaw method.

Jigsaw intervention kindled an element of accountability of thorough learning of topics amongst each group so each student actively participated in learning process and researched (87.77 of item 4) and in collaborative discussion learned the topic. In jigsaw method each student has to work for common goal through cooperative learning and this aspect makes students to work with maximum interaction, maintaining empathy & keen listening ensuring high level of engagement to contribute maximally.[6] These aspects were evident in the present study when we look at the highest satisfaction index of 90.45 for item 3. This is further corroborated through the open ended responses making it clear that such interaction helped each student to share new things and exchange of their learning methods. Group discussion seemed to improve comprehension and learning.[7]

It is an age old adage that the best way of learning is to teach or in other words the one who explains learns better.[8] The essence of jigsaw method is that it provides an opportunity of learning through reading, hearing, seeing, talking over with others and teaching someone else making it more output oriented. Results of the present study provide ample proofs of this when we see the score of 87.44 for item 6. This contention is also well supported by the matching of open ended responses about students' perception that responsibility of teaching inspired them to learn, read, memorize and understand thoroughly. Students also realized that peer teaching resulted into more productive output as collaboration encouraged their understanding of topic. It not only helped them to prepare well to teach but also found that their peers can teach in an easier manner.

Benware believed that when people learn to teach, their learning will be more active with intrinsic motivation & will have high conceptual learning score than those learn to be tested.[9, 10] It is evident from response score of 88.20 for item 5 underpinned by the open ended response suggesting that Jigsaw helped them in self directed learning & that they were able to remember more compared to text book study. Sousa (2006) in his reports indicated that there is retention of 50% & 75% with discussion & practice respectively but it goes up to 90% when students' teach others.[8] Lom reported that Jigsaw activity is a blend of independent acquisition of expertise followed by collaborative teaching.[7] In the following day when the groups were reformed to cover all the topics of assignment by respective cluster of groups, wherein peer teaching was carried out with each student of the group by teaching different topics. This process helped the student to overcome hesitation or shyness and building of rapport with each other simultaneously improving their communication skills. These positive attributes are visible from the open ended responses like 'It improves oratory, expressive skills & boost

confidence' as well 'it improves friendship. This session also improved personal and public accountability.[7, 11]

It is evident from the responses of feedback questionnaire that the experience of jigsaw made learning enjoyable, refreshing and boosted the levels of confidence and even the topics which were less interesting became more interesting as we see the 85.58 score of item 2.

It is general assumption that students from the Asian continent are known to be less confident to seek information independently in the absence of teachers. The general trend we observe is that students tend to be less participative and take long time to express during discussion.[9] The Jigsaw method introduced in the present study transformed passive learners to active ones and helped them to improve their abilities to obtain practical learning and communication skills. It also increased their proficiency in understanding and developed a positive attitude of self-directed learning.[12, 13]This method has decreased competitive ranking rush among individuals but encouraged competitive learning environment through collaborative learning. Self-directed learning of jigsaw will give a sense of leadership & accomplishment apart from gaining & refining knowledge.[14] It is well known belief that this type of active learning methods would facilitate in improving critical thinking, problem solving abilities and information retention paving the way for lifelong learning skills among medical students.[7] Jigsaw method has been tried and tested in other streams of education but in medical education it is scarcely used and we have not come across any published material using this method in the subject of Forensic Medicine. Positive ratings & feedbacks about Jigsaw intervention in present study has encouraged both teachers and students to implement this method not only in Forensic Medicine but also in other of subjects of undergraduate medical education.

Limitations

This study only takes a look at students' perception about jigsaw intervention in one cohort and at one point in time by allocating only 2 assignments. In Jigsaw intervention, we could accomplish only 3 topics out of 5 from both assignments within merged groups, albeit provision of more time would have resolved it to an extent. Additionally, only I have analyzed students free opinions to mark representative comments, therefore bias in interpretation could have occurred.

Jigsaw is encouraging active participation & discussion is rated high by students. However, in open ended response few students have issues with dependency, individual contributions & even distraction due to group interactions. Thus, we were unable to evaluate interaction & participation thoroughly by remaining in their constant contact due to a day time given to prepare on topic. Furthermore, our feedback is not inclusive of comments of peer about other's contribution which could have reflected more convincing account of actual participation or interaction.

We do recommend further study to investigate truth of students' claim of better learning, memorization & retention due to Jigsaw by pre & post test as well as delayed retention tests.

Conclusions

Despite the availability of many teaching -learning methods & technological dominance, students' direct active engagement in processing of information & accountability as generated by Jigsaw is irreplaceable. Responsibility of peer teaching in Jigsaw provoked them to read research & prepare well with motivation of personal & public accountability of presentation. Jigsaw experience was of cooperative active learning instead of competitive one & they perceived better clarity, understanding, memorization & retention of learning task reinforced by teaching. An additional benefit of honing of social & communication skills in Jigsaw educational environment was refreshing & positive. We look forward to implement & utilize this method more vigorously for undergraduate medical education.

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