

Research Paper:

Jigsaw Teaching VS Small Group Teaching: A Comparative Study Among Phase 3 MBBS Students in the Department of Paediatrics

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ABSTRACT

Background: The traditional large group didactic lectures have many shortcomings, so small group discussions have been proposed to overcome some of these shortcomings. However, a typical Small Group Discussion (SGD) remains a mini-interactive lecture in most cases. To improve students' participation and their better understanding, many newer teaching-learning methods have been tried. Jigsaw teaching method, a type of cooperative learning, is one of these new methods. Obviously, the usefulness of jigsaw teaching must be compared with other small group teaching methods.

Objectives: The aim of this study was to compare the effectiveness of the Jigsaw teaching technique with the small group teaching method.

Methods: A quasi-experimental study was conducted over one month in the Paediatrics Department of DM WIMS medical college. After obtaining written informed consent, 30 students were randomly selected and allocated to the SGD and jigsaw groups (15 students in each group). Four topics were taken to both the groups who were crossed over after one session (a total of eight exposures). Their post-intervention mean scores were tabulated and analyzed. The Likert scale was used to assess the students' evaluations of the jigsaw method.

Results: The results showed that the jigsaw method had better students' performance, which was statistically significant with a $P < 0.05$. Also, the students' evaluation showed that they appreciated the jigsaw teaching method, but time constraints were noted as a drawback.

Conclusions: Jigsaw teaching is an excellent small group teaching method to ensure better students' participation and understanding and can add to our repertoire of teaching-learning methods, which Competency-Based Medical Education (CBME) warrants.

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1. Introduction

The current trends in medical education show a change of teaching-learning methods from the traditional teacher-center one where the role of a teacher is a “Sage on Stage” as knowledge provider to a more student-center one where the teacher acts more like a “Guide by the Side” [1]. Students too are expected to shift from a state of passive dependency to active, self-directed learning, working towards the role of Indian Medical Graduate (IMG) as a life-long learner, as directed by Medical Council of India (MCI) in “Vision 2015 document” [2].

Cooperative learning is one such avenue of teaching method which supports active learning, where a small group of students works with a set of learning objectives to reach a common goal. Here, the learner is responsible not only for his learning but also for others’ learning. The main approaches to cooperative learning used in recent decades include student team achievement divisions, team-games-tournaments, team-assisted individualization, and jigsaw. In some of these approaches, the learners may do their tasks as a group, while in other approaches, the tasks are divided among the members of a group, and each member works independently and only asks for help if needed [3-5].

Jigsaw teaching method, created by Aronson and Bridgeman, Santa Cruz professor at the University of California, is one of the types of cooperative learning [6]. This method guides the students to search, learn and train each other [7]. This method has shown improvement in comprehension, knowledge, problem-solving clinical skills, self-confidence, and communication. Few studies compare the effectiveness of cooperative learning methods like jigsaw with traditional small group teaching.

Aims and objectives

- To compare the effectiveness of the Jigsaw teaching technique with the small group teaching method (i.e., mini-interactive lecture) among phase 3 MBBS students in the Department of Pediatrics.
- To assess student perception of the jigsaw method.

2. Materials and Methods

Setting

Department of Paediatrics, DM WIMS, Wayanad

Design

An experimental study with crossover

Subjects

Phase 3 MBBS (Bachelor of Medicine and Bachelor of Surgery) students, Paediatrics Department

Sample size

A total of 30 students, as a small group teaching method (supplementary batch of the third MBBS students), were enrolled after obtaining their informed consent. They were randomly allocated into small group teaching group (n=15) and jigsaw group (n=15) by the lottery method. All participants underwent 8 exposures (4 topics of similar difficulty level).

Data collection

After Institutional Research Board (IRB) clearance and taking informed written consent from participants, the students were randomly allocated to 2 groups: A) small group teaching and B) Jigsaw group (15 students in each group). Four topics were decided for the 4 sessions (cerebral palsy, Acute Kidney Injury [AKI], nephrotic syndrome, and approach to hemolytic anemia). For the small group teaching, 15 students were taught using a mini-interactive lecture. The mini-interactive lecture is not just a small group didactic lecture, but the students were encouraged to participate and apply their knowledge to a case/problem based on the lecture. On the same day, the jigsaw group had the same topic taken using the jigsaw technique. At the end of their class, both groups were given a validated post-intervention test, and their marks were tabulated. Student evaluations were assessed using a 5-point Likert scale for the jigsaw group. Next time, there was a crossover, and group A became the jigsaw group and B the small group teaching one, eliminating ethical conflicts.

Method

In each case, the subjects that were supposed to be taught using the jigsaw technique were split into sections of equal difficulty with no overlaps, as in accordance with the requirements of the jigsaw technique. Every student was given a sheet of paper containing details of the subject they need to master, a series of information about it, and proper references to be studied a day before the class. On the day of the class, they initially assembled as home groups. Expert groups were

then formed to discuss and exchange ideas on the subject assigned to them for 20 minutes. The discussion was supervised and facilitated by the teacher. Each member of the expert groups then returned to their initial groups and taught the part assigned to them to the other members of that group. The topic was then discussed with a case scenario, and then assessment was done by Multiple Choice Questions (MCQs) (out of 10), and the scores were tabulated. The same teacher took all sessions (Figure 1).

3. Results

The study was conducted on 30 students, divided into two groups: A) the jigsaw group, and B) small group teaching of 15 students each. After their respective classes, they were given a test, and the scores were tabulated. Descriptive analysis was done by calculating the mean of the post-intervention scores and then inferential analysis using the independent t test in SPSS 15. $P < 0.05$ were considered significant. The jigsaw group were then given questionnaires to fill out. A total of 4 sessions (8 exposures) were done on the topics of cerebral palsy, acute kidney injury, nephrotic syndrome, and approach to hemolytic anemia. The observations were as follows:

Test score comparison

As seen in the Table 1 on the test scores of the four sessions and the final depiction in the bar diagram, the post-intervention scores of the jigsaw group are significantly higher than the small group teaching group, with all being statistically significant with a P of less than 0.05, and 3 of these sessions having a P of less than 0.01 making it statistically very significant (Figure 2).

Student evaluation of Jigsaw teaching

It was assessed by a 5-point Likert scale containing "strongly agree" =5, "agree" =4, "neutral" =3, "disagree" =2, and "strongly disagree" =1.

The above diagram shows the different scores on the various statements using the Likert scale. Of all the statements, easy understanding of the topic seems to have the highest scorer, showing that students found jigsaw teaching an excellent method to enhance understanding of the topic, followed by finding it an interesting method. The students generally evaluated the jigsaw method as an effective way of teaching/ learning which they found beneficial. On the downside, students were skeptical about its usefulness in helping retain it for the long term. Comparing the mean test scores of the jigsaw and the small group discussion, the jigsaw teaching emerged as the clear winner, and the students' opinion of the jigsaw method seems to be promising (Figure 3).

4. Discussion

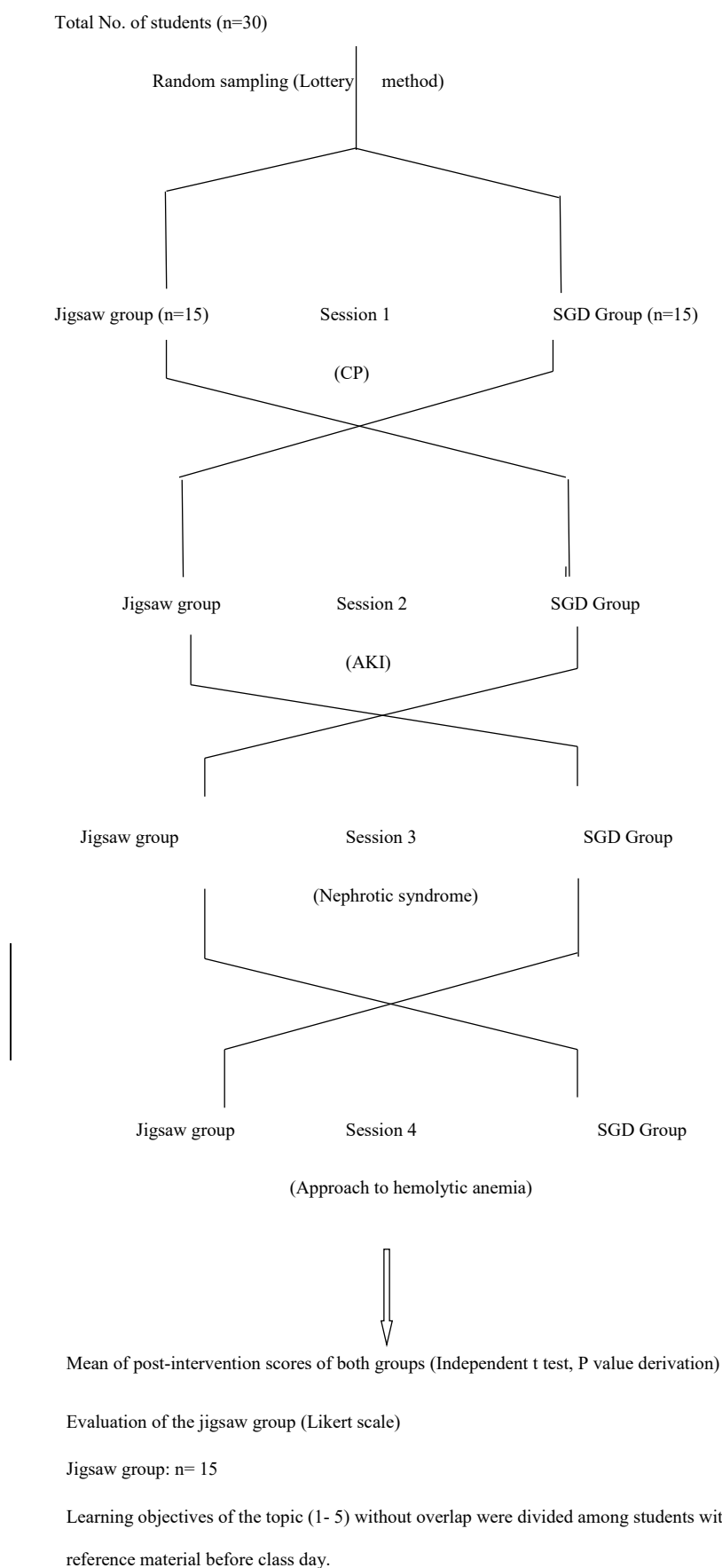
With the Competency Based Medical Education (CBME), teaching has taken a paradigm shift towards student-centered learning, problem-based learning, integrated teaching, community-based education, elective studies, and a systematic or planned approach model where many innovative teaching-learning methods are being probed into to improve student-centered learning. The need for this approach comes from the many shortcomings of the traditional lectures, which paved the way to use small group discussions. Though this approach was a bit more effective, it was still a small group lecture in most scenarios. To overcome this problem and find newer methods to promote self-directed learning, active involvement, and better subject understanding, which might plausibly work in our setup, this study compared jigsaw teaching with a small group discussion.

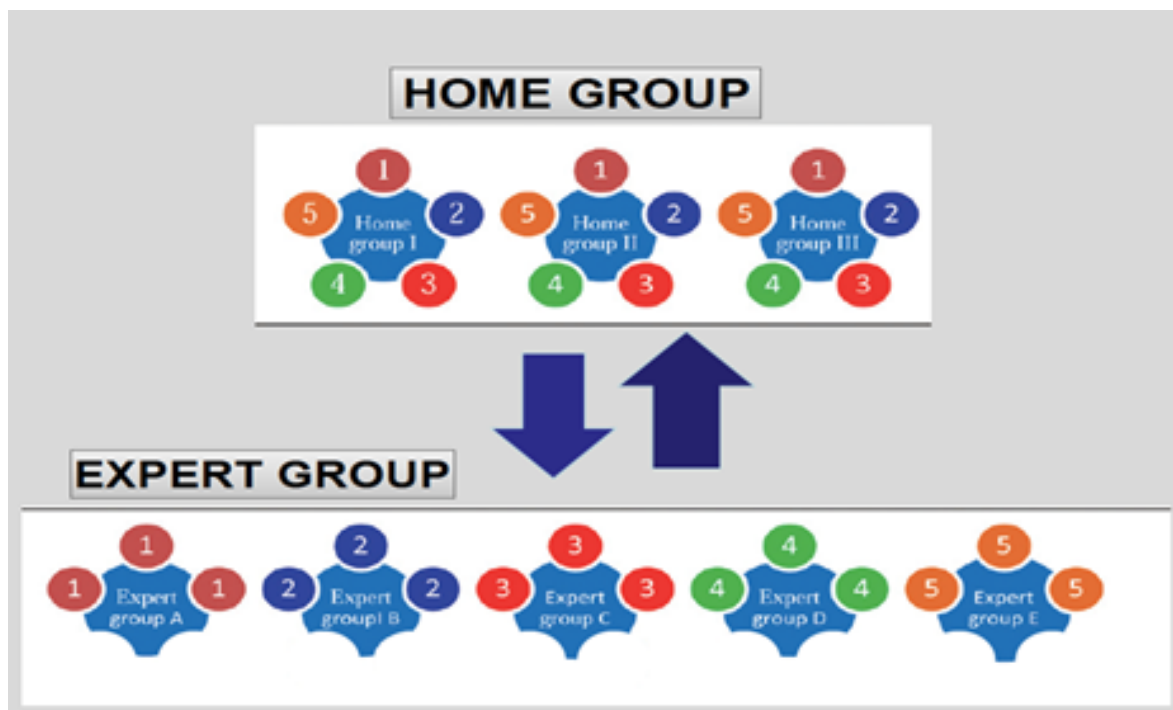
According to the results, jigsaw teaching clearly showed better student performance when compared to small group discussion. This result follows some prior studies like Srivastava et al., who studied the effect of interactive intra-group teaching. They found a significant difference in the post-intervention scores by the interactive method as compared to the traditional teaching method [8]. Saleh et al. compared didactic lectures with

Table 1. Mean test scores in Small Group Discussion (SGD) and Jigsaw Groups (out of 10)

Variables	Mean \pm SD		Independent t-test	P
	Small Group Teaching Group	Jigsaw Group		
Post-intervention scores, Session 1	7.2 \pm 1.014	8.2 \pm 1.146	2.53	0.01*
Post-intervention scores, Session 2	7.06 \pm 1.099	8.3 \pm 1.112	3.13	0.004*
Post-intervention scores, Session 3	7.13 \pm 0.990	8.6 \pm 0.617	5.08	0.001*
Post-intervention scores, Session 4	7.6 \pm 0.985	8.93 \pm 0.798	4.07	0.003*

* $P < 0.05$ is considered significant.



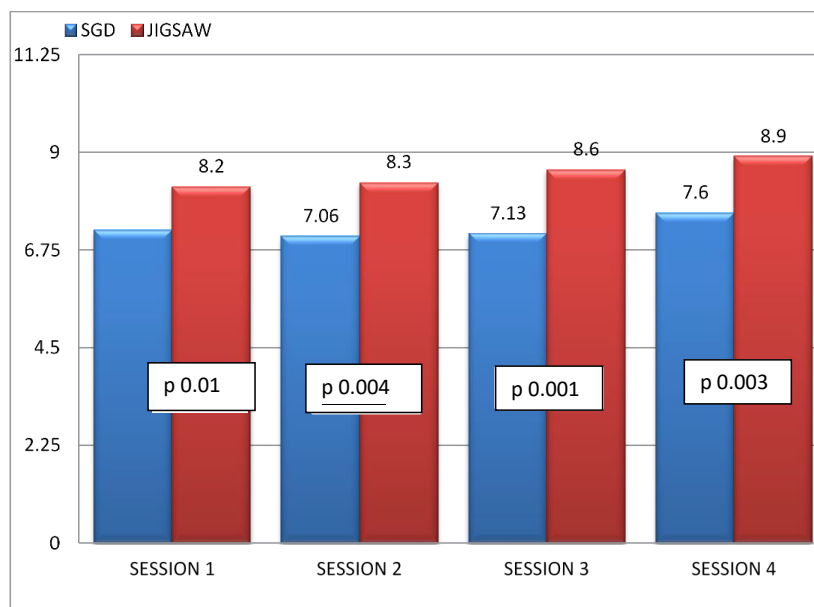


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Figure 1. Flow chart depicting the methodology

interactive sessions in small group teaching and found that students performed better in interactive sessions. They also found a positive attitude among students toward interactive sessions [9]. Parmar and Rathod also observed a significant increase in mean post-intervention score for the innovative teaching methods for all

topics [10]. Eachempati et al. reported that the post-test revealed a significant difference between the two groups as students in the experimental group (jigsaw) enjoyed greater success by helping each other, as well as a greater exchange of information than they had experienced in traditional teacher-centered lectures [11].



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Figure 2. Bar diagram showing mean post-intervention scores in the Small Group Discussion (SGD) and Jigsaw Group

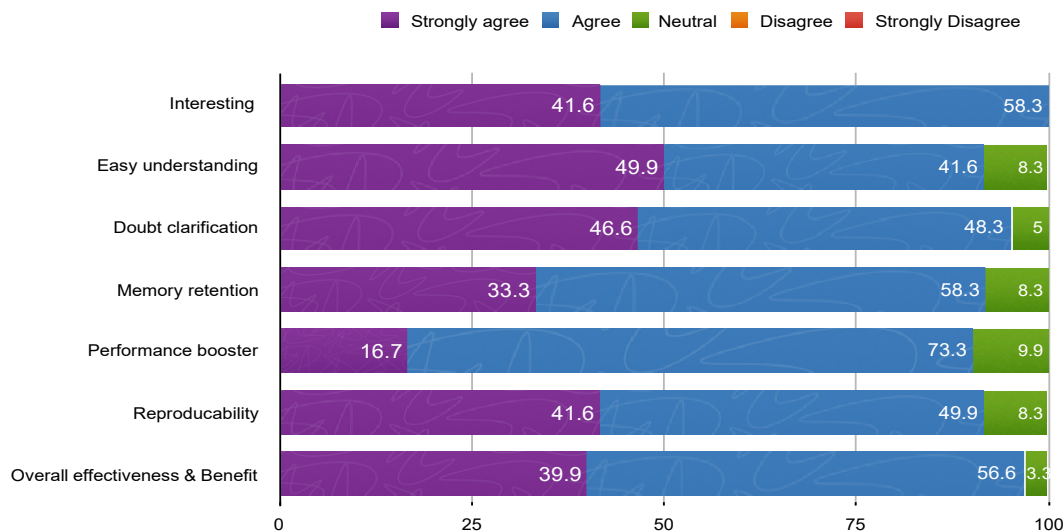


Figure 3. Diagram depicting the scores of evaluation in the Likert scale

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Bertucci et al. reported that cooperative learning promoted higher achievement and greater academic support from peers than did individualistic learning [12]. Sanaie et al. reported that the jigsaw technique helped improve students and self-regulated learning and academic motivation [13]. Bogam and Khan have mentioned that jigsaw methodology can make a significant gain of knowledge in medical students regarding diabetes mellitus type 2 [14]. Walker et al. reported that the jigsaw method of peer teaching is an educational and enjoyable way to teach [15]. The point to be noted here is that most of these studies compared jigsaw with the traditional teaching, and the jigsaw method emerged as a clear winner.

This finding is contrary to some studies like Puppulwar and Jambhulkar [16], and Sagsoz et al. [17]. They reported no difference in scores between the jigsaw group and traditional lecture group. Anderson et al. showed no significant difference between jigsaw and lecture in biochemistry lessons in medical students [18]. Moskowitz and Nash [19] showed that the use of the jigsaw method had no positive effect on learning.

This study also involved taking students' evaluations. It showed a positive response concerning better topic understanding, communication skills, student satisfaction which is in line with other studies with similar experiences. Studies like Phillips and Fusco's study [20] showed that students' opinion on this method is positive, and they prefer to experience this method more in their courses which represents an increase in student satisfaction [21, 22]. This teaching method also develops self-confidence [23], communication among students, student support, logical thinking, problem-solving abil-

ity, motivation [24], and critical thinking [23]. Studies confirm the effectiveness of participatory methods such as jigsaw on the learning of academic disciplines at different levels and in various courses [21].

In Leyva-Moral and Camps's study, students' satisfaction with jigsaw teaching was low. In his research, most students believed that jigsaw teaching should not be used in the future, and it was not more effective than traditional methods. Students said that they could not take notes, and this shortcoming brings about insecurity [25].

5. Conclusion

Based on students' preferences, performances, and positive acceptance of the method, we recommend that this interactive and proactive technique be adopted in teaching. It helps provide another method to add to our bag of tricks as we embrace the CBME and aim at the holistic development of the IMG. It is also important that faculty be sensitized and trained to implement this method effectively.

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this research.

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The study is self-funded.

Authors' contributions

Study concept and design: Vidya Singaravelu & Madhusudhan U; Acquisition of data: Vidya Singaravelu; Analysis and interpretation of data: Vidya Singaravelu & Madhusudhan U; Drafting of the manuscript: Vidya Singaravelu & Madhusudhan U; Critical revision of the manuscript for important intellectual content: Vidya Singaravelu; Statistical analysis: Vidya Singaravelu & Madhusudhan U; Administrative, technical, and material support: Vidya Singaravelu; Study supervision: Vidya Singaravelu.

Conflicts of interest

The authors declared no conflict of interest.

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References

- King A. From sage on the stage to guide on the side. *College Teaching*. 1993; 41(1):30-5. [DOI:10.1080/87567555.1993.9926781]
- Medical Council of India. Reforms in under-graduate and post-graduate medical education, Vision 2015 [Internet]. 2011 [Updated 2011 March 29]. Available from: https://www.tnmgrmu.ac.in/images/medical-council-of-india/MCI_book.pdf
- Sha'bani H. [Instructional skills (methods and techniques of teaching) (Persian)]. Tehran: Samt; 2014. pp. 347-362. <http://opac.nlai.ir/opac-prod/bibliographic/2850234>
- Johnson DW, Johnson RT, Stanne MB. Cooperative learning methods: A meta-analysis [Internet]. 2000 [Updated 2000 May]. Available from: <https://www.researchgate.net/publication/220040324>
- Zakaria E, Iksan Z. Promoting cooperative learning in science and mathematics education: A Malaysian perspective. *Eurasia Journal of Mathematics, Science & Technology Education*. 2007; 3(1):35-9. [DOI:10.12973/ejmste/75372]
- Aronson E, Bridgeman D. Jigsaw groups and the desegregated classroom: In pursuit of common goals. *Personality and Social Psychology Bulletin*. 1979; 5(4):438-46. [DOI:10.1177/014616727900500405]
- Karimi Moonaghi H, Bagheri M. Jigsaw: A good student-centered method in medical education. *Future of Medical Education Journal*. 2017; 7(1):35-40. [DOI:10.22038/FMEJ.2017.8757]
- Srivastava T, Waghmare L. Interactive intra-group tutorials: A modification to suit the challenges of physiology tutorial in rural medical schools. *National Journal of Physiology, Pharmacy & Pharmacology*. 2014; 4(2):128-31. [DOI:10.5455/njppp.2014.4.111020132]
- Saleh AM, Al-Tawil NG, Al-Hadithi TS. Didactic lectures and interactive sessions in small groups: A comparative study among undergraduate students in Hawler College of Medicine. *British Journal of Education, Society & Behavioral Science*. 2013; 3(2):144-53. [DOI:10.9734/BJES-BS/2013/2521]
- Parmar P, Rathod GB. Study of innovative teaching methods to enhance teaching and learning in Forensic Medicine. *International Archives of Integrated Medicine*. 2015; 2(8):78-80. https://www.iaimjournal.com/wp-content/uploads/2015/08/iaim_2015_0208_11.pdf
- Eachempati P, KS KK, Ismail ARH. Cooperative learning through jigsaw classroom technique for designing cast partial dentures: A comparative study. *MedEdPublish*. 2017. <https://pdfs.semanticscholar.org/dc00/fc5a8f1e6bd-6418773fd7c8b35ac4e0b7585.pdf>
- Bertucci A, Johnson DW, Johnson RT, Conte S. Influence of group processing on achievement and perception of social and academic support in elementary inexperienced cooperative learning groups. *The Journal of Educational Research*. 2012; 105(5):329-35. [DOI:10.1080/00220671.2011.627396]
- Sanaie N, Vasli P, Sedighi L, Sadeghi B. Comparing the effect of lecture and jigsaw teaching strategies on the nursing students' self-regulated learning and academic motivation: A quasi-experimental study. *Nurse Education Today*. 2019; 79:35-40. [DOI:10.1016/j.nedt.2019.05.022] [PMID]
- Bogam RR, Khan AS. Jig saw technique: An interactive approach to sensitize medical students in Saudi Arabia about Type 2 diabetes mellitus. *Journal of Education Technology in Health Sciences*. 2016; 3(3):107-10. <https://www.ipinnovative.com/journals/JETHS/article-details/3350/volume/104/issue/294>
- Walker S, Olvet DM, Chandran L. The jigsaw technique of peer teaching and learning: An efficient and enjoyable teaching strategy in medicine. *MedEdPublish*. 2015; 6:14. [DOI:10.15694/mep.2015.006.0014]
- Puppalar PV, Jambhulkar RK. Jigsaw technique - A novel method of teaching biochemistry to medical undergraduates. *International Journal of Medical Science and Public Health*. 2019; 8(12):1052-6. [DOI:10.5455/ijm-sph.2019.0823204102019]
- Sagsoz O, Karatas O, Turel V, Yildiz M, Kaya E. Effectiveness of jigsaw learning compared to lecture-based learning in

- dental education. *European Journal of Dental Education*. 2017; 21(1):28-32. [DOI:10.1111/eje.12174] [PMID]
18. Anderson WL, Mitchell SM, Osgood MP. Comparison of student performance in cooperative learning and traditional lecture-based biochemistry classes. *Biochemistry and Molecular Biology Education*. 2005; 33(6):387-93. [DOI:10.1002/bmb.2005.49403306387] [PMID]
19. Moskowitz EJ, Nash DB. Accreditation council for graduate medical education competencies: Practice-based learning and systems-based practice. *American Journal of Medical Quality*. 2007; 22(5):351-82. [DOI:10.1177/1062860607305381] [PMID]
20. Phillips J, Fusco J. Using the jigsaw technique to teach clinical controversy in a clinical skills course. *American Journal of Pharmaceutical Education*. 2015; 79(6):90. [DOI:10.5688/ajpe79690] [PMID] [PMCID]
21. Jafariyan M, Matlabi M, Esmaili R, Kianmehr M. Effectiveness of teaching: Jigsaw technique vs lecture for medical students' physics course. *Bali Medical Journal*. 2017; 6(3):529-33. [DOI:10.15562/bmj.v6i3.400]
22. Sadeghnezhad Forotagheh M, Bagheri M. [Comparison of lecture and puzzle for teaching medical emergency to anesthesiology students: Students' learning and viewpoints (Persian)]. *Iranian Journal of Medical Education*. 2013; 12(10):786-95. <http://ijme.mui.ac.ir/article-1-2151-en.html>
23. Raoufi S, Farhadi A, Sheikhan A. [Impact of the team effectiveness design of teaching on critical thinking, self-confidence and learning of nursing students (Persian)]. *Journal of Medical Education and Development*. 2014; 9(2):23-32. <http://jmed.ssu.ac.ir/article-1-308-fa.html>
24. Haghani F, Rahimi M, Ehsanpour S. [An investigation of "perceived feedback" in clinical education of midwifery students in Isfahan University of Medical Sciences (Persian)]. *Iranian Journal of Medical Education*. 2014; 14(7):571-80. <http://ijme.mui.ac.ir/article-1-3164-en.html>
25. Leyva-Moral JM, Camps MR. Teaching research methods in nursing using Aaronson's jigsaw technique. A cross-sectional survey of student satisfaction. *Nurse Education Today*. 2016; 40:78-83. [DOI:10.1016/j.nedt.2016.02.017] [PMID]